

ITEM: PUD-000547-2025 – Redtail Ridge Planned Unit Development No. 1 South

PLANNER: Matt Post, AICP, Senior Planner

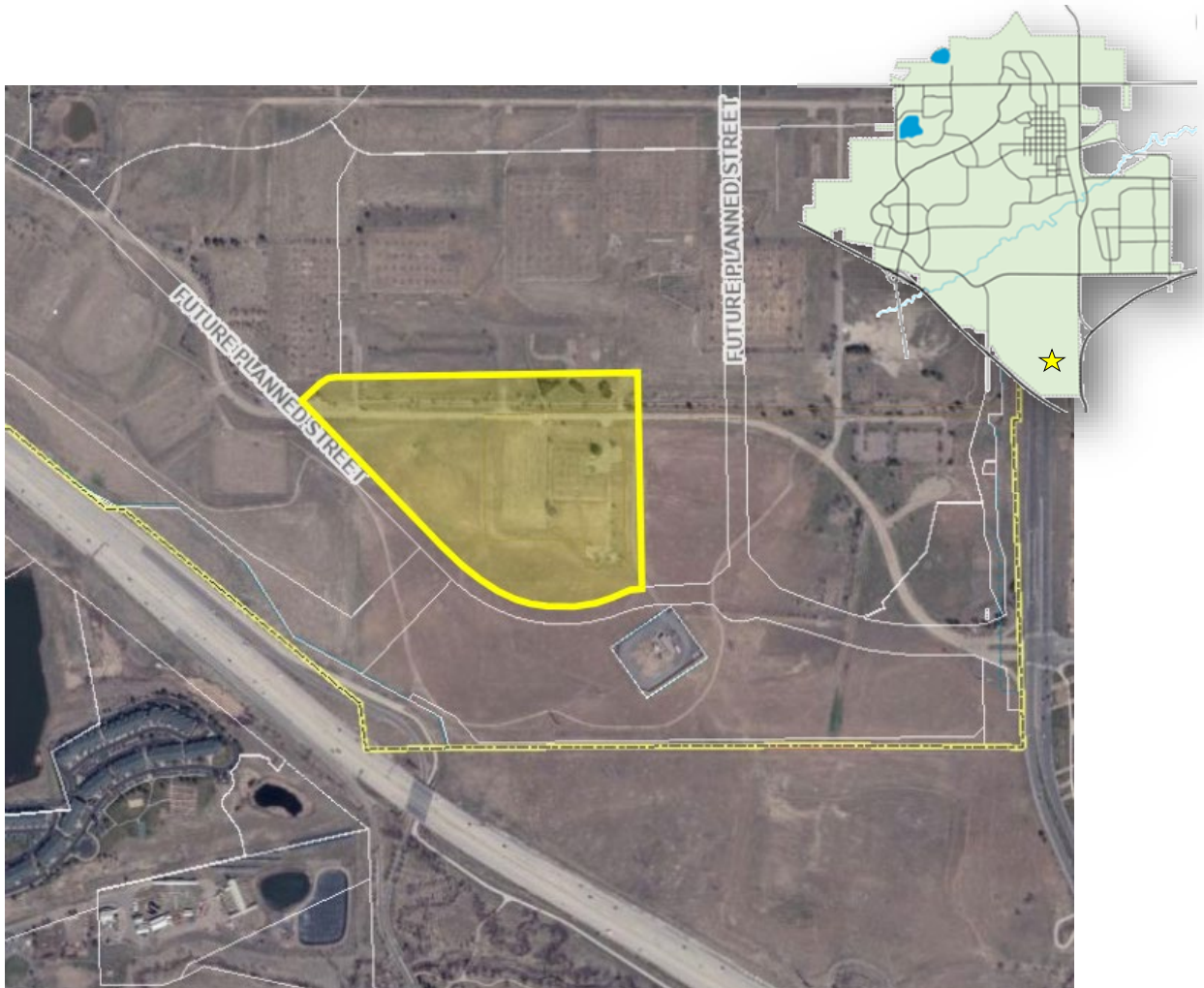
EXISTING ZONING: PCZD-C – ConocoPhillips General Development Plan

LOCATION: Lot 1, Block 1 of Redtail Ridge, Filing No. 1

TOTAL SITE AREA: 21.68 Acres

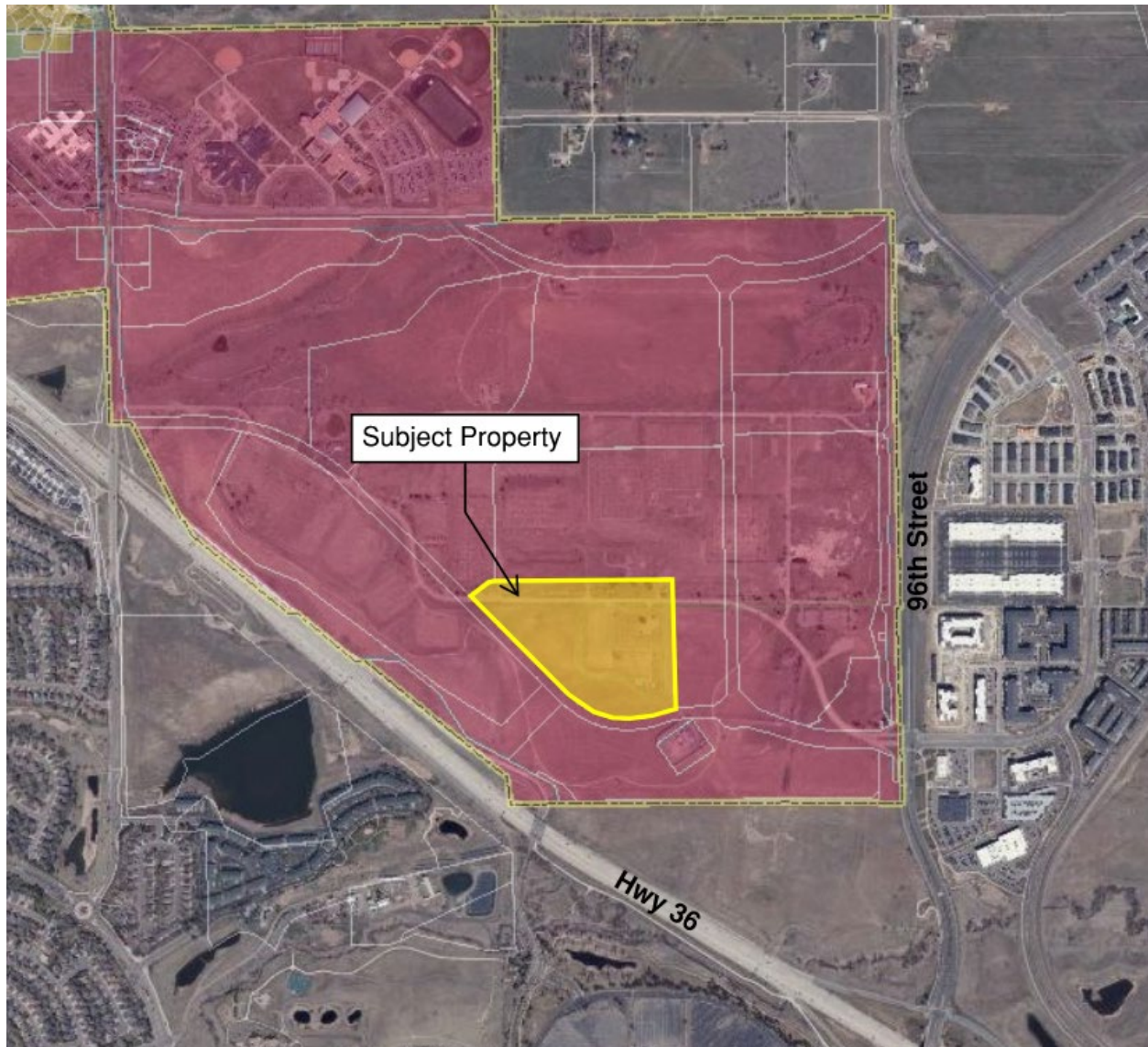
REQUEST: Approval of Resolution No. 21, Series 2025, recommending to the City Council approval with conditions of the Redtail Ridge Planned Unit Development No. 1 South to allow 236,993 SF industrial buildings and associated site development.

VICINITY MAP:



SUMMARY:

The applicant, Sterling Bay, is requesting approval of the Redtail Ridge Planned Unit Development No. 1 South to allow for the development of two light industrial buildings totaling 236,993 square feet and associated site development on 21.68 acres located at Lot 1, Block 1 of Redtail Ridge, Filing No. 1.



Vicinity Map

BACKGROUND:

The subject property was part of the original 310-acre StorageTek corporate campus development, annexed into the City in 1978 and built out to approximately 1.6 million square feet. In 2008, ConocoPhillips acquired the property and subsequently demolished the existing campus to facilitate development of a new research facility. That same year, the company petitioned for annexation of an additional 80 acres and

requested rezoning of the combined 390-acre site to Planned Community Zone District – Commercial (PCZD-C).

In 2010, the City approved the ConocoPhillips General Development Plan (GDP), Zoning Agreement, Preliminary Subdivision Plat, and Preliminary Planned Unit Development (PUD). The GDP established a 2.5-million-square-foot development cap, permitted land uses, setbacks, and a 12% minimum public land dedication, and mandated that development on the property abide by the Commercial Development Design Standards and Guidelines (CDDSG). The preliminary PUD included 38.9 acres of on-site public land dedication, an additional 20 acres of preserved land in Boulder County, and clustering of buildings to retain 222 acres of private open space. The PUD authorized building heights up to 65 feet, with one subarea allowing a 95-foot structure. The project was envisioned as a ConocoPhillips research campus but was never constructed following a corporate restructuring.

In 2021, City Council approved a revised GDP for the property known as Redtail Ridge, proposing up to 3 million square feet of commercial and industrial development. However, a referendum election held on April 19, 2022, overturned the Council's approval, reinstating the 2010 ConocoPhillips GDP as the effective governing plan for the property.

In 2024, City Council approved a Final Plat of the 389-acre property to enable development consistent with the ConocoPhillips Campus GDP approved in 2010. The plat established lots, tracts, rights-of-way, and easements to support future hospital, medical office, light industrial, commercial, and office uses.

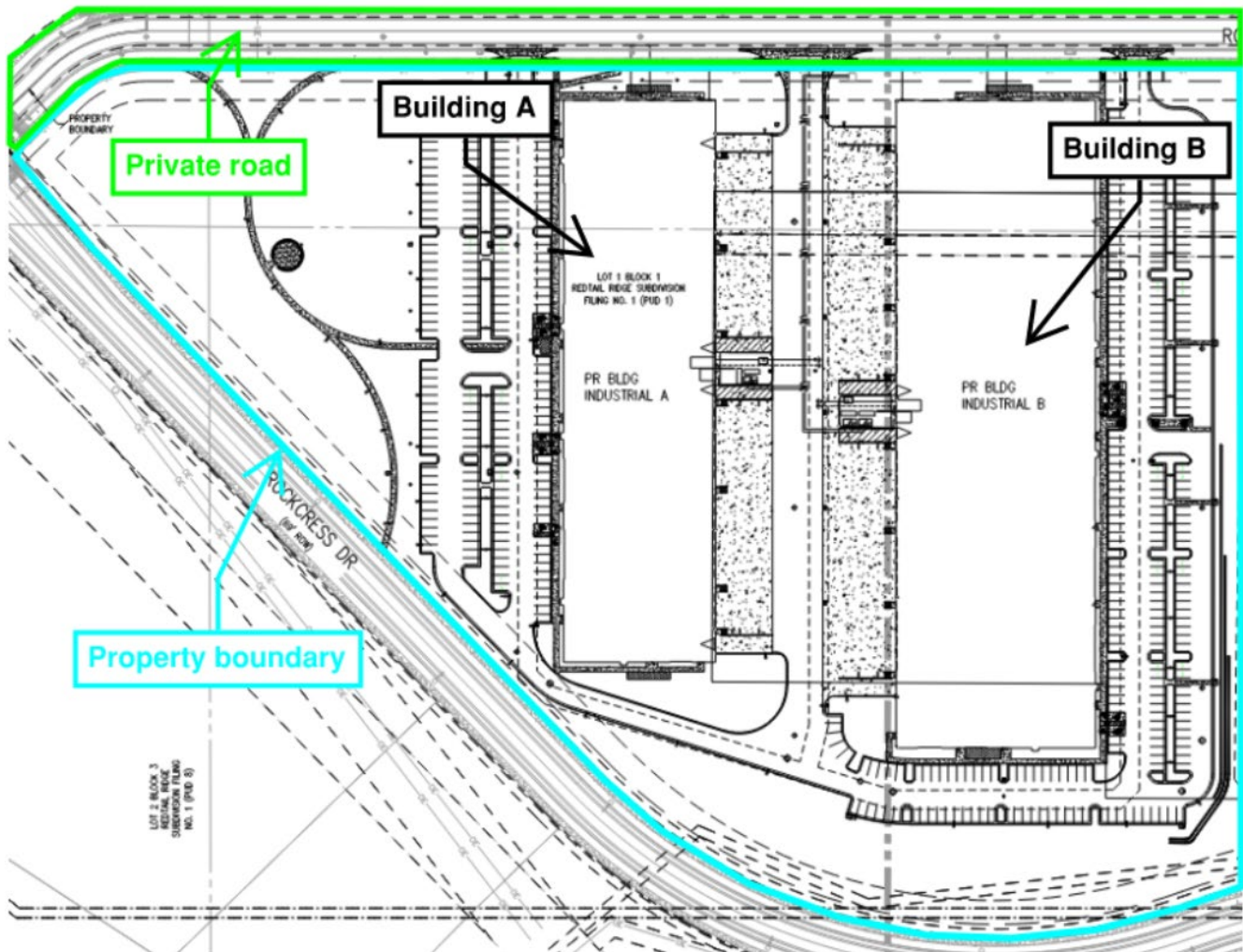
In September of 2025, the City Council approved the 1st amendment to the ConocoPhillips Campus GDP to enable development of a new hospital campus (AdventHealth) on Lot 1, Block 2 of Redtail Ridge Filing No. 1. The amendment reallocated development area to the hospital site and established new height and massing standards to guide building scale and design on the affected parcel.

In October 2025, City Council reviewed a Concept Plan proposing the use of the Industrial Development Design Standards and Guidelines (IDDSG) for this site and other centrally located parcels within the Redtail Ridge development area, in place of the currently applicable Commercial Development Design Standards and Guidelines (CDDSG). City Council expressed support for a hybrid design approach that would provide additional flexibility while maintaining key design expectations. Concurrent with this PUD application, an amendment to the ConocoPhillips Campus GDP is also being considered to formally authorize the application of the IDDSG with specified design enhancements.

PROPOSAL:

The applicant is requesting approval of a Planned Unit Development to construct two industrial buildings totaling 236,993 square feet on a 21.68 acre property, platted as part of the Redtail Ridge Filing No. 1 subdivision plat approved in 2024. Proposed site

development includes associated parking for both buildings and approximately 8.28 acres of private landscaped area, featuring a large private open space with trails and an enhanced pedestrian plaza central to the west side open space area. The property is bounded on the south by the Rockcress Road right-of-way, which is currently under construction, and on the north by a future private road that will provide three vehicular access points to the site.



Proposed Planned Unit Development

The easternmost building (building B) is the larger of the two structures, proposed at 142,658 square feet and a height of 39 feet, 6 inches, which is below the 40-foot height limit under consideration for this application. The westernmost building (building A) is proposed at 94,335 square feet with a height of 38 feet, 6 inches, maintaining a compatible scale between the two buildings.

Together, the two buildings will provide a total of 555 parking spaces and 40 bicycle parking spaces. Of these, Building B will be served by 264 vehicle spaces and 20 bicycle spaces, while Building A will include 191 vehicle spaces and 20 bicycle spaces. Parking areas are arranged to support efficient access to each building while incorporating landscaped islands and walkways for improved on-site circulation.

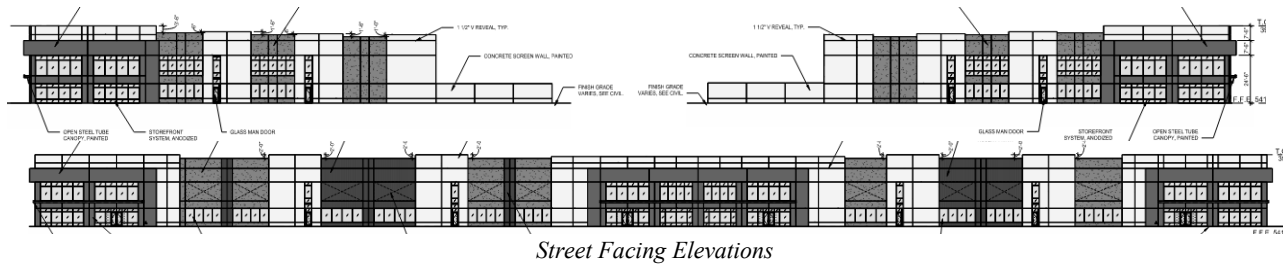
As part of this proposal, a total of 34 electric vehicle (EV) charging stations will be installed, with 14 serving building A and 20 serving building B. In addition, the development includes 36 EV-ready spaces, 45 EV-capable spaces, and 45 EV-capable (light) spaces across the two parking areas. The proposed EV infrastructure meets the minimum requirements of [LMC Sec. 17.20.170](#) and supports the applicant's broader commitment to achieving Fitwel Campus Certification, specifically the program's green vehicle objectives

Both buildings incorporate outdoor plaza areas on their north and south sides, designed with seating and patterned concrete to create identifiable and functional pedestrian spaces. These areas provide opportunities for outdoor use and help break up the building massing with visually distinct site elements.

Additional pedestrian walkways and paths are proposed on the western portion of the site, creating continuous connections from the parking areas to the building entrances and linking into the broader on-site sidewalk system. These walkways are intended to improve internal circulation, provide direct routes for employees and visitors, and reinforce a pedestrian network throughout the development. Although the large open space area on the west side of the property will remain privately owned, the applicant has indicated that the internal paths and the associated seating area will remain publicly accessible, offering opportunities for passive use and enhancing the overall pedestrian experience within the larger site.

Building B is designed with its primary façade oriented to the east, facing the adjacent public right-of-way and a planned open space area. This façade incorporates the enhanced design standards proposed with the accompanying GDP Amendment, including three primary entrances featuring accent materials and articulated entry design. Similarly, the west elevation of Building A incorporates the same set of enhanced façade and entry standards, also visible from a public street.

Both buildings include enhanced architectural treatments on their north and south elevations, reflecting their visibility from public and private streets. These elevations incorporate the enhanced transparency, materials variation, and entry elements required under the proposed design standards, ensuring a consistent and high-quality design character on all publicly visible .



Enhanced Entry Design Facing a Street with this PUD Proposal

The landscape plan includes more than 3,000 low-water shrubs, grasses, and perennials distributed throughout the site and around both buildings. A total of 317 trees of varying species are proposed within the internal landscape areas, parking lots, and building perimeters. Street trees and perennial plantings along Rockcress Road and the private street are addressed in a separate landscape plan reviewed and approved with the 2024 final plat civil construction documents. That plan requires an additional 40 trees and more than 300 shrubs and grasses along the site's perimeter, which will be installed as a condition of final construction acceptance. Remaining landscape areas will be seeded with a native shortgrass prairie mix and low-water buffalo grass to ensure long-term water efficiency and compatibility with the surrounding natural landscape

As part of the 2024 subdivision, a Subdivision Improvement Agreement (SIA) was executed and recorded requiring that all development within the ConocoPhillips Campus GDP meet the following commitments:

- All buildings must achieve a minimum of LEED Silver Certification
- Solar power generation must be provided at a rate of 1 watt per building square foot, with a minimum of 2.54 MW campus-wide.
- The project must obtain [Fitwel Campus Certification](#).

The applicant has indicated that the proposed buildings will meet LEED Silver requirements and that the solar commitments will be satisfied, with final confirmation occurring during the building permit review process. These commitments are noted on the PUD cover sheet. Components of Fitwel Campus Certification are incorporated into this PUD, including solar power, LEED Silver design, electric vehicle charging infrastructure, bicycle facilities, low-water landscaping, pedestrian networks, and other site and building features that support occupant health and well-being. A Fitwel scorecard will be submitted to document compliance with the campus-wide certification requirements.

As part of the 2024 subdivision application, a Transportation Demand Management (TDM) Plan was adopted for the entire Redtail Ridge development area. Under this plan, each PUD must demonstrate how the proposed development meets the applicable minimum TDM commitments and how it will achieve the relevant TDM goals. The City and property owner may also agree to alternative methods based on best available technology and industry best practices, provided the original intent and commitments of the TDM are maintained. A memorandum was provided as part of this application indicating how the proposed development satisfies these minimum standards (Attachment E).

ANALYSIS:

Development of the site is regulated by the ConocoPhillips Campus GDP, 1st Amendment. The applicant has submitted a concurrent application to amend the GDP (ConocoPhillips Campus GDP, 2nd Amendment) to allow the Industrial Development

Design Standards and Guidelines (IDDSG) to apply in place of the currently applicable Commercial Development Design Standards and Guidelines (CDDSG). In addition to applying the IDDSG, the proposed GDP Amendment would establish enhanced building design standards requiring all future development within the affected areas of the ConocoPhillips Campus GDP, 2nd Amendment to incorporate architectural elements that exceed baseline industrial design expectations.

Because the PUD and GDP Amendment are being processed concurrently, and at the applicant's request, staff has reviewed this project under the IDDSG and the enhanced design standards proposed in the GDP Amendment. Staff's analysis and recommendations are therefore based on the assumption that the GDP Amendment will be approved as proposed.

ConocoPhillips Campus General Development Plan

The ConocoPhillips Campus GDP establishes use restrictions, key bulk standards, such as setbacks and height, parking requirements, and a sitewide floor area ratio (FAR) limitation, which regulates the total buildable floor area relative to the size of the property.

The GDP currently establishes a maximum FAR of 0.15 for all development areas subject to the plan, with the exception of the AdventHealth hospital parcel on Lot 1, Block 2 of the Redtail Ridge Filing No. 1 Subdivision Plat, which received an additional 364,400 square feet of gross floor area through a recent density swap. Based on the total GDP area of approximately 389.1 acres (16.9 million square feet), the maximum allowable gross floor area across the ConocoPhillips Campus is approximately 2.5 million square feet. With 236,993 square feet proposed as part of this PUD application, the development remains well within the overall FAR limitation imposed by the GDP. Accounting for the AdventHealth hospital project currently under review on Lot 1, Block 2 of Redtail Ridge Filing No. 1, including the additional floor area allocated to that parcel, the remaining available gross floor area within the ConocoPhillips Campus GDP area is approximately 1.8 million square feet, providing substantial capacity for future development under the GDP.

The GDP also establishes applicable use restrictions. It permits facilities for the research, development, manufacturing, fabrication, processing, or assembly of scientific or technical products, and allows associated warehouse and storage uses. The applicant has indicated that the proposed development will operate as a light industrial facility focused on manufacturing and warehousing in support of that use.

Setbacks, height limits, and parking requirements are also established by the GDP. The proposed development meets all applicable setback standards for both buildings and parking areas. While current height limits reference the CDDSG, the applicant is seeking application of the IDDSG through the concurrent GDP Amendment. Under the IDDSG, the maximum permitted building height is 40 feet. The proposed building heights, 38 feet, 6 inches for Building A and 39 feet, 6 inches for Building B, conform to this standard and remain below the maximum allowed height. Parking shall be provided

at a rate of 1.25 spaces per 1,000 square feet of manufacturing space. At 236,993 square feet proposed, 296 parking spaces are required. The applicant is exceeding the total number of spaces 555 parking spaces proposed. There is no maximum parking restriction.

Enhanced Design Standards

The proposed development meets the intent of the enhanced design standards under consideration with the concurrent GDP Amendment application. Street-facing elevations incorporate a substantial amount of glazing at the pedestrian level, with window placement and transparency patterns consistent with the guideline to provide visual interest and improved street activation. Upper-level transparency is also included where appropriate to break up building mass and mimic a multi-story building.

Primary building entrances are prominently located and designed to be clearly visible from the public right-of-way. The building façades incorporate well-defined entry features that provide articulation through projected elements and the use of canopies and glazing that matches the height of the building.

The façades include variation in textures and colors consistent with the goal of the enhanced standards. Multiple materials are incorporated along the street-facing elevations, including accent elements placed strategically at entries and corners. These treatments collectively contribute to a more nuanced and visually engaging building design that aligns with the enhanced design objectives.

IDDSG Analysis

IDDSG: 1. Site Planning

This application complies with all applicable site development standards, including site orientation, coverage, and overall layout. The project exceeds the minimum landscape coverage requirement, providing 38 percent of the site in landscaped area. Loading docks and service areas are positioned internal to the site on the non-street-facing sides of the buildings, ensuring these functions are screened from public view. Trash enclosures are similarly located behind screening walls and are not visible from adjacent streets or pedestrian areas. The proposal also meets the grading and drainage standards contained in the IDDSG, with site improvements designed to ensure proper stormwater management and compatibility with surrounding development.

IDDSG: 2. Vehicular Circulation and Parking

Access to the site is provided through three separate driveways from a private street that will be constructed along the north side of the development. Two of these access points serve the individual parking areas for each building, while a centrally located access point provides direct entry to the shared loading and service areas situated between the buildings. The internal circulation system is designed to be robust, accommodating fire apparatus and other service vehicles throughout the site. The parking layout meets all applicable industrial design requirements and incorporates additional pedestrian connections to improve movement between parking areas, building entrances, and on-site walkways.

IDDSG: 3. Pedestrian and Bicycle Circulation

The applicant has incorporated internal pedestrian paths with a minimum unobstructed width of 5 feet, providing direct connections to the trail system to the west and to the broader Redtail Ridge sidewalk network, which will ultimately tie into the larger trail system at full buildout. Bicycle parking is provided at the primary entrances of both buildings, and the associated plaza spaces are integrated into the overall pedestrian network to support safe and convenient multimodal access throughout the site.

IDDSG: 4. Architectural Design

The building layouts include primary, storefront-style entries with enhanced features conforming to the proposed enhanced design guidelines. Service entries and loading areas are internal the site, as is mechanical equipment associated with the buildings.

IDDSG: 5. Landscape Design

The proposed landscape plan meets applicable landscape standards by providing more than 3,000 low-water shrubs, grasses, and perennials throughout the site, along with 317 trees distributed within parking areas, internal landscape zones, and around building perimeters. Right-of-way landscaping for Rockcress Road and the private street was previously reviewed and approved with the 2024 final plat civil construction documents, through which the applicant agreed to install an additional 40 trees and more than 300 shrubs and grasses along the site perimeter as a condition of final construction acceptance. Remaining landscape areas will be seeded with a native shortgrass prairie mix and low-water buffalo grass, ensuring consistency with water-efficient design requirements and the surrounding natural landscape.

IDDSG: 6. Fences and Walls

The application includes a retaining wall system associated with existing grading on the southeast side of the site. The walls are terraced to reduce the height of each individual segment and will be constructed of decorative block. Due to the overall length of the retaining system, additional design treatments are incorporated, including vertical breaks and staggered wall heights to provide visual interest and reduce the appearance of mass. The retaining walls, as proposed, meet the applicable IDDSG design standards.

IDDSG: 8. Exterior Site Lighting

The application includes wall-mounted LED fixtures and freestanding light poles throughout the site. All lighting is full cut-off and shielded, with warm color temperatures of 3000K, and is consistent with the IDDSG lighting standards as well as prior commitments made by the applicant, including requirements associated with FitWel Campus Certification.

Compliance with 17.28.120

Section 17.28.120 of the Louisville Municipal Code lists 28 criteria for PUDs that must be satisfied or found not applicable in order to approve a PUD. Analysis and staff's recommended finding of each criterion is provided in the attached appendix.

Subdivision Improvement Agreement Commitments

The 2024 Subdivision Improvement Agreement (SIA) established three campus-wide development requirements: (1) achievement of LEED Silver Certification for all buildings, (2) provision of solar power generation equal to 1 watt per building square foot with a minimum of 2.54 MW campus-wide, and (3) attainment of Fitwel Campus Certification. The proposed PUD satisfies these requirements. The applicant has confirmed that all buildings are designed to meet or exceed LEED Silver standards, and the solar generation commitment will be fulfilled, with detailed verification occurring at the time of building permit review. These commitments are documented on the PUD cover sheet. Additionally, the PUD incorporates the key elements necessary to support Fitwel Campus Certification, including on-site solar power generation, LEED-aligned building features, electric vehicle charging infrastructure, bicycle accommodations, low-water landscaping, and an interconnected pedestrian network. A Fitwel scorecard will be provided with permit applications to demonstrate compliance with the campus-wide certification framework.

A traffic conformance review was completed for this application to confirm consistency with the Master Transportation Study (MTS) and the adopted Transportation Demand Management (TDM) Plan. The analysis finds that the proposed industrial uses are consistent with the MTS Phase 1 assumptions and that the modest increase in square footage results in only a slight increase in peak-hour trips, well within the roadway capacity analyzed in the MTS. Importantly, several key TDM strategies identified in the master plan will be implemented as part of this application. These include construction of pedestrian connections linking the buildings to surrounding streets, internal parks, and multimodal facilities, improved access to shuttle stops, and supporting infrastructure for bicycle commuters, such as paths and connections to showers and changing facilities. These improvements are intended to reduce single-occupant vehicle trips and support non-auto travel, consistent with the TDM goals for the Redtail Ridge development. The memo concludes that the planned roadway network can accommodate projected traffic volumes and that this application effectively advances the TDM commitments established for the overall campus.

Staff finds that all Planned Unit Development criteria have been satisfied, including the requirements of the ConocoPhillips Campus General Development Plan and its amendments, as well as the amendment under concurrent consideration. Furthermore, the application complies with all applicable standards of the Louisville Municipal Code and the Industrial Development Design Standards and Guidelines.

PUBLIC COMMENTS:

No public comments have been received as of the date of this report.

STAFF RECOMMENDATION:

Approval of Resolution No. 21, Series 2025, recommending to the City Council approval of the Redtail Ridge Planned Unit Development No. 1 South to allow 236,993 SF industrial buildings and associated site development with the following condition:

- The applicant shall resolve all outstanding technical and administrative comments related to the PUD documents, the associated Development Agreement, the Transportation Demand Management (TDM) memorandum, the Utility Conformance Report, and drainage conformance report. Final revisions addressing these items shall be completed to the satisfaction of the City prior to a City Council hearing for final consideration (Attachment G).

ATTACHMENTS:

- A. Resolution No. 21, Series 2025
- B. Application Materials
- C. Redtail Ridge Planned Unit Development, No. 1 South
- D. Drainage Report
- E. Transportation Demand Management Memorandum
- F. ConocoPhillips Campus General Development Plan, 1st Amendment
- G. Conditional Materials

APPENDIX: PUD Criteria Analysis – Redtail Ridge PUD #1 South

Criteria 17.28.120 (A)	Finding	Narrative
1. An appropriate relationship to the surrounding area.	Compliant	The use is appropriate for the area and permitted in the ConocoPhillips Campus GDP. Robust open space and landscaping is proposed, providing a appropriate relationship to the surrounding area.
2. Circulation in terms of the internal street circulation system, designed for the type of traffic generated, safety, separation from living areas, convenience, access, and noise and exhaust control. Proper circulation in parking areas in terms of safety, convenience, separation and screening.	Compliant	The application provides for adequate and safe internal circulation.
3. Consideration and provision for low and moderate-income housing	Not applicable	Zoned PCZD-C; residential uses are not allowed.
4. Functional open space in terms of optimum preservation of natural features, including trees and drainage areas, recreation, views, density relief and convenience of function	Compliant	The PUD complies with landscape requirements in Chapter 5 of the IDDSG, and includes a large number of native grasses, including over 300 hundred new trees.
5. Variety in terms of housing types, densities, facilities and open space	Not applicable	Zoned PCZD-C; residential uses are not allowed.
6. Privacy in terms of the needs of individuals, families and neighbors	Compliant	The PUD complies with site planning provisions in the IDDSG and the GDP, assuring appropriate privacy of neighboring properties.
7. Pedestrian and bicycle traffic in terms of safety, separation, convenience, access points of destination and attractiveness	Compliant	The PUD complies with pedestrian and bicycle requirements in the IDDSG, ensuring adequate pedestrian and bicycle access.

8. Building types in terms of appropriateness to density, site relationship and bulk	Compliant	The PUD complies with site planning and building height requirements in the GDP, ensuring an appropriate bulk for buildings and relationship to other developments in the area.
9. Building design in terms of orientation, spacing, materials, color, texture, storage, signs and lighting	Compliant	The PUD complies with the architectural design and site planning requirements in the IDDSG and the GDP. The enhanced design incorporates adequate articulation, building materials, and site configuration.
10. Landscaping of total site in terms of purpose, such as screening, ornamental types used, and materials used, if any; and maintenance, suitability and effect on the neighborhood	Compliant	The PUD complies with landscape requirements in Chapter 5 of the IDDSG. Over 3,000 shrubs, native grass seed, and over 300 trees are proposed.
11. Compliance with all applicable development design standards and guidelines and all applicable regulations pertaining to matters of state interest, as specified in <u>chapter 17.32</u>	Compliant	The PUD complies with all applicable development design standards and guidelines.
12. None of the standards for annexation specified in <u>chapter 16.32</u> have been violated	Not applicable	No annexation.
13. Services including utilities, fire and police protection, and other such services are available or can be made available to adequately serve the development specified in the final development plan	Compliant	The Public Works Department and Louisville Fire District reviewed the PUD and it meets their requirements. Other key utility providers are available to serve the development.

Criteria 17.28.120 (B)	Finding	Narrative
1. Development shall be in accordance with the adopted elements of the comprehensive development plan of the city, and in accordance with any adopted development design standards and guidelines.	Compliant	The PUD complies with the adopted elements of the comprehensive plan, and the adopted development design standards and guidelines.
2. No structures in a planned unit development shall encroach upon the floodplain. Existing bodies of	Compliant	The property is neither located in a floodplain nor are there any bodies of water in the area.

water and existing stream courses shall not be channelized or altered in a planned unit development plan.		
3. No occupied structure shall be located on ground showing severe subsidence potential without adequate design and study approved specifically by the city.	Compliant	There is no known subsidence on the property.
4. The proposal should utilize and preserve existing vegetation, land forms, waterways, and historical or archeological sites in the best manner possible. Steep slopes and important natural drainage systems shall not be disrupted. How the proposal meets this provision, including an inventory of how existing vegetation is included in the proposal, shall be set forth on the landscape plan submitted to the city.	Compliant	The PUD is appropriate for the context of the existing conditions of the property.
5. Visual relief and variety of visual sitings shall be located within a development in the overall site plan. Such relief shall be accomplished by building placements, shortened or interrupted street vistas, visual access to open space and other methods of design.	Compliant	The PUD complies with site planning requirements in the IDDSG and the GSP, ensuring proper building placement, vistas, and access to open space.
6. Open space within the project shall be located in such a manner as to facilitate pedestrian use and to create an area that is usable and accessible to residents of surrounding developments.	Compliant	The PUD complies with requirements in the IDDSG and GDP.
7. Street design should minimize through traffic passing residential units. Suggested standards with respect to paving widths, housing setbacks and landscaping are set forth in public works standards of the city and applicable development design standards and guidelines. The system of	Compliant	The PUD complies with requirements in the IDDSG and GDP, ensuring properly designed landscaping adjacent to public streets.

streets, including parking lots, shall aid the order and aesthetic quality of the development.		
8. There shall exist an internal pedestrian circulation system separate from the vehicular system such that allows access to adjacent parcels as well as to parks, open space or recreation facilities within the development. Pedestrian links to trail systems of the city shall be provided.	Compliant	The PUD complies with bicycle and pedestrian requirements in the IDDSG, ensuring adequate pedestrian and bicycle access.
9. The project and development should attempt to incorporate features which reduce the demand for water usage.	Compliant	The PUD proposes water use consistent with expectations for Redtail Ridge. Low-water plantings and native grass seeds are proposed throughout the site.
10. Landscape plans shall attempt to reduce heating and cooling demands of buildings through the selection and placement of landscape materials, paving, vegetation, earth forms, walls, fences, or other materials.	Compliant, with condition	The PUD complies with landscape requirements in the IDDSG.
11. Proposed developments shall be buffered from collector and arterial streets. Such buffering may be accomplished by earthen berms, landscaping, leafing patterns, and other materials. Entrance islands defining traffic patterns along with landscaping shall be incorporated into entrances to developments.	Compliant	The PUD complies with the requirements of the IDDSG and the GDP and includes adequate landscaping and buffering from adjacent streets and properties of the same or similar uses.
12. There shall be encouraged the siting of lot arrangement, building orientation and roof orientation in developments so as to obtain the maximum use of solar energy for heating.	Compliant	The PUD has committed to achieving the solar requirements as outlined in the associated Subdivision Improvement Agreement.
13. The overall PUD shall provide a variety of housing types.	Not applicable	Zoned PCZD-C; residential uses are not allowed.
14. Neighborhoods within a PUD shall provide a range of housing size.	Not applicable	Zoned PCZD-C; residential uses are not allowed.

15. Architectural design of buildings shall be compatible in design with the contours of the site, compatible with surrounding designs and neighborhoods, shall promote harmonious transitions and scale in character in areas of different planned uses, and shall contribute to a mix of styles within the city.	Compliant	The PUD proposes architecture that is compatible in design with the contours of the site, with surrounding buildings, and neighborhoods.
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**RESOLUTION NO. 21
SERIES 2025**

**A RESOLUTION RECOMMENDING APPROVAL WITH CONDITIONS OF THE
REDTAIL RIDGE PLANNED UNIT DEVELOPMENT NO. 1 SOUTH TO ALLOW
236,993 SF OF INDUSTRIAL DEVELOPMENT AND ASSOCIATED SITE
IMPROVEMENTS ON LOT 1, BLOCK 1 OF REDTAIL RIDGE, FILING NO. 1**

WHEREAS, there has been submitted to the Louisville Planning Commission an application for a planned unit development to allow two industrial buildings totaling 236,933 square feet of industrial development and associated site improvements on Lot 1, Block 1 of Redtail Ridge Filing No. 1.

WHEREAS, City staff has reviewed the information submitted and found that, with conditions, the application complies with the ConocoPhillips Campus General Development Plan and its amendments, and applicable sections of the Louisville Municipal Code; and

WHEREAS, the Planning Commission has considered the application at a duly noticed public hearing on December 11, 2025, where evidence and testimony were entered into the record, including the findings in the Louisville Planning Commission Staff Report dated December 11, 2025.

NOW THEREFORE, BE IT RESOLVED that the Planning Commission of the City of Louisville, Colorado does hereby recommend approval with conditions of a planned unit development to allow development of two industrial buildings totaling 236,933 square feet of industrial development and associated site improvements on Lot 1, Block 1 of Redtail Ridge Filing No. 1.

PASSED AND ADOPTED this 11th day of December, 2025

By: _____
Steve Brauneis, Chair
Planning Commission

Attest: _____
Cullen Choi, Secretary
Planning Commission

ELECTRONIC LAND USE HEARING REQUEST

CASE NO. _____

APPLICANT INFORMATION

Firm: Sterling Bay
Contact: Evan Pesonen
Address: _____

Mailing Address: (see above)

Telephone: _____
Fax: _____
Email: _____

OWNER INFORMATION

Firm: Sterling Bay
Contact: Evan Pesonen
Address: _____

Mailing Address: (see above)

Telephone: _____
Fax: _____
Email: _____

REPRESENTATIVE INFORMATION

Firm: Harris Kocher Smith
Contact: Jarrett Grant
Address: _____

Mailing Address: (see above)

Telephone: _____
Fax: _____
Email: _____

PROPERTY INFORMATION

Common Address: N/A
Legal Description: Lot 1 Blk 1
Subdivision Redtail Ridge Filing No. 1
Area: _____ Sq. Ft.

TYPE (S) OF APPLICATION

- ☐ Annexation
- ☐ Zoning
- ☐ Preliminary Subdivision Plat
- ☐ Final Subdivision Plat
- ☐ Minor Subdivision Plat
- ☐ Preliminary Planned Unit Development (PUD)
- ☒ Final PUD
- ☐ Amended PUD
- ☐ Administrative PUD Amendment
- ☐ Special Review Use (SRU)
- ☐ SRU Amendment
- ☐ SRU Administrative Review
- ☐ Temporary Use Permit: _____
- ☐ CMRS Facility: _____
- ☐ Other: (easement / right-of-way; floodplain; variance; vested right; 1041 permit; oil / gas production permit)

I hereby request the public hearing(s) on this application be scheduled to be conducted by Electronic Participation in accordance with the attached Resolution No. 30, Series 2020, as adopted by the City Council on April 7, 2020, and in accordance with Resolution No. 38, Series 2020, as adopted by City Council on June 2, 2020 if such hearing(s) can be scheduled during a time period when in-person meetings are not being held due to a health epidemic or pandemic. I acknowledge that holding a quasi-judicial hearing by Electronic Participation may present certain legal risks and involves an area of legal uncertainty, and that having this application heard at a meeting held by Electronic Participation is optional and undertaken at my own risk. I also understand that in-person meetings are preferred for quasi-judicial hearings, and that even if electronic hearing(s) are scheduled, this application will be heard at an in-person meeting if in person meetings have resumed by the scheduled hearing date(s). I further agree to defend and indemnify the City of Louisville in any action that may arise out of, or in connection with, conducting the hearing by Electronic Participation.

SIGNATURES & DATE

Applicant: _____
Print: _____
Owner: _____
Print: _____
Representative: _____
Print: _____

CITY STAFF USE ONLY

- ☐ Electronic Hearing Approved: _____
- ☐ Date(s) of Hearing(s): _____

WARE MALCOMB

ARCHITECTURE	CIVIL ENGINEERING
PLANNING	BRANDING
INTERIORS	BUILDING MEASUREMENT

March 14, 2025

Attention: Rob Zuccaro
Director of Planning and Building Safety
City of Louisville
749 Main Street
Louisville, Colorado 880027

Re: Redtail Ridge PUD-1 South – Project Narrative

Dear Mr. Zuccaro,

Sterling Bay (Developer/Applicant) is proposing to develop PUD-1 South of the greater Redtail Ridge Property into two Class A Industrial/ Warehouse Buildings. This PUD is proposed to include Industrial Building A at approximately 95,377sf and Industrial Building B at approximately 143,705 sf.

Both Buildings will have a clear height of 28' from finish floor to bottom of structure and be constructed using tilt up concrete with punched openings for aluminum storefront windows, and steel framed accent framing identifying future tenant entries. The colors and finishes are designed to work cohesively with other buildings in the Redtail Ridge Development. Variations and articulation in the form and finish of the concrete wall panels is provided with a variety of colors and finishes including clear coat raw concrete and corrugated concrete form liner. Large expanses of glass and varied materials set these buildings apart from similar developments in the surrounding area. The purpose and use of the buildings is to support storage, office and manufacturing needs for national and regional users. This PUD will also include pedestrian connections and outdoor amenity patios for future tenant use. We are also referencing this PUD as PUD-1 South in our master plan.

It is proposed to comply with the Redtail Ridge Subdivision Improvements and Development Agreement (SIA).

SIA Exhibit H - Sustainability

We request that the sustainability reports be provided at building permit submission and not part of the PUD submission, the current design is only at a schematic level and MEP systems are still in design, so it is too early to be providing a full sustainability report, as we are currently designed at a cold shell and core level.

We appreciate your time and effort in reviewing our PUD package and we look forward to discussing the project with you further.

Sincerely,

Isaac Sawatzky
Project Manager, Ware Malcomb

REDTAIL RIDGE PUD1 SOUTH

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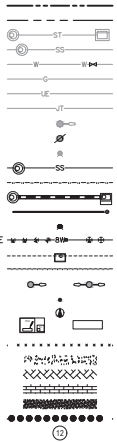
-



© 2016 Fries, M.J. e-legend: keymap-south, p base-F1, phase-2, p base-irnd, phase-puff-south, p base-puck, p base-F1, p base-F2, p base-irnd, phase-puff-south, p udd-F1, p udd-F2, p udd-irnd, phase-puff-south, pub-legend
 Accepted: 04/05/2016 11:05:25 (GMT+05:15) By: Tine Gerling



PROPERTY BOUNDARY
RIGHT-OF-WAY
EXISTING STW SERVICE W/ MH AND INLET
EXISTING SANITARY SERVICE W/ MH
EXISTING WATER LINE W/ VALVE
EXISTING GAS LINE
EXISTING UNDERGROUND ELECTRIC
EXISTING JOINT TRENCH
EXISTING STREET LIGHT
EXISTING TELEPHONE POLE
EXISTING FIRE HYDRANT
PROPOSED SANITARY SERVICE W/ MH
PROPOSED SANITARY SERVICE W/ CLEAN OUT
PROPOSED STORM SERVICE W/ MH AND INLET
PROPOSED LANDSCAPE DRAIN W/ INLET
PROPOSED FIRE HYDRANT
PROPOSED 8" WATER MAIN W/ BENDS, VALVE,
PROPOSED WATER SERVICE W/ METER
PROPOSED FIRE SERVICE
PROPOSED STREET LIGHT
PROPOSED PEDESTRIAN LIGHT
PROPOSED BUILDING ENTRANCE
PROPOSED TRANSFORMER AND GENERATOR
ABANDON EXISTING UTILITY LINE
PROPOSED CONCRETE
PROPOSED CONCRETE PAVERS
PROPOSED PORCELAIN PAVERS
PROPOSED CRUSHER FINES
ACCESSIBLE ROUTE
PARKING COUNT



ABBREVIATIONS	
BLOG	BUILDING
CAC	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
DUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
FH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HIGHWAY
MH	MANHOLE
N	NORTH, NORTHING
PED	PEDESTRIAN
PL	PROPERTY LINE
PRO	PROPOSED
RME	RIGHT-OF-WAY
SOW	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



REDTAIL RIDGE PUD1 SOUTH

PROJECT #: 221236

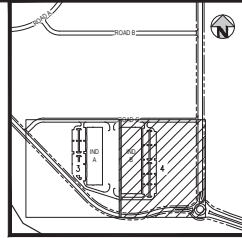
NO CHANGES ARE TO BE MADE TO THIS DRAWING SINCE IT IS THE PROPERTY OF THE CLIENT AND NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE CLIENT.

THIS DRAWING IS THE PROPERTY OF THE CLIENT AND NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE CLIENT. IT IS THE PROPERTY OF THE CLIENT AND NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE CLIENT.

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



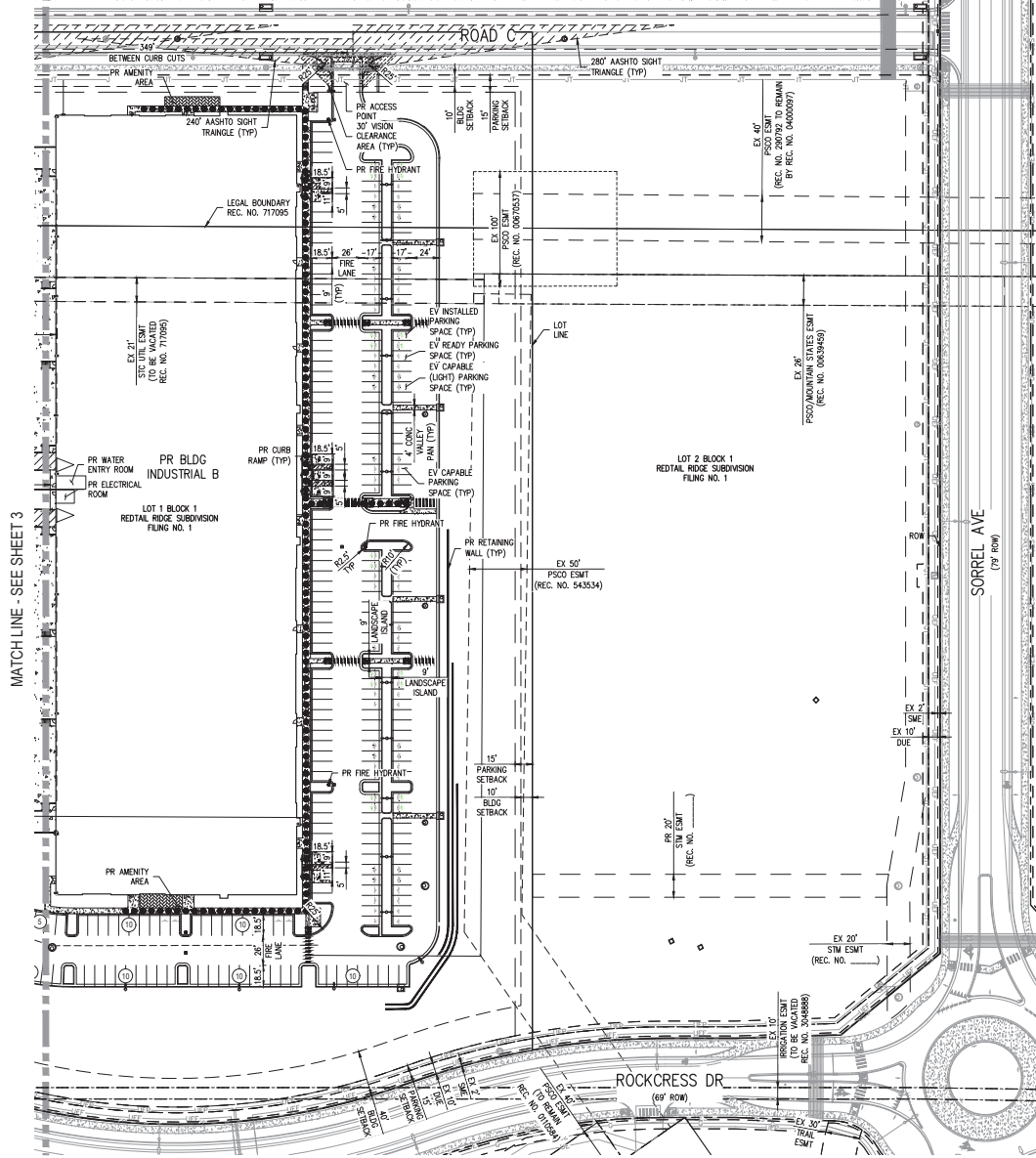
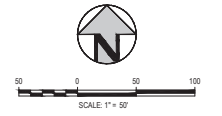
KEY MAP
SCALE: 1" = 600'

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES
- ACCESSIBLE ROUTE
- PARKING COUNT

ABBREVIATIONS

BUILD	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
DUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH
PE	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



MATCH LINE - SEE SHEET 3

REVISION DATE: #

ISSUE DATE: 03-14-2025

SHEET 4 OF 24

REDTAIL RIDGE PUD1 SOUTH

PROJECT # 22725

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.



Figure 1: Schematic representation of the organization of the human 5S rRNA gene. The diagram shows the organization of the 5S rRNA gene on a chromosome, including the 5S rRNA gene, the 5S rRNA gene cluster, and the 5S rRNA gene cluster. It also shows the organization of the 5S rRNA gene on a chromosome, including the 5S rRNA gene, the 5S rRNA gene cluster, and the 5S rRNA gene cluster.

REDTAIL RIDGE PUD1 SOUTH

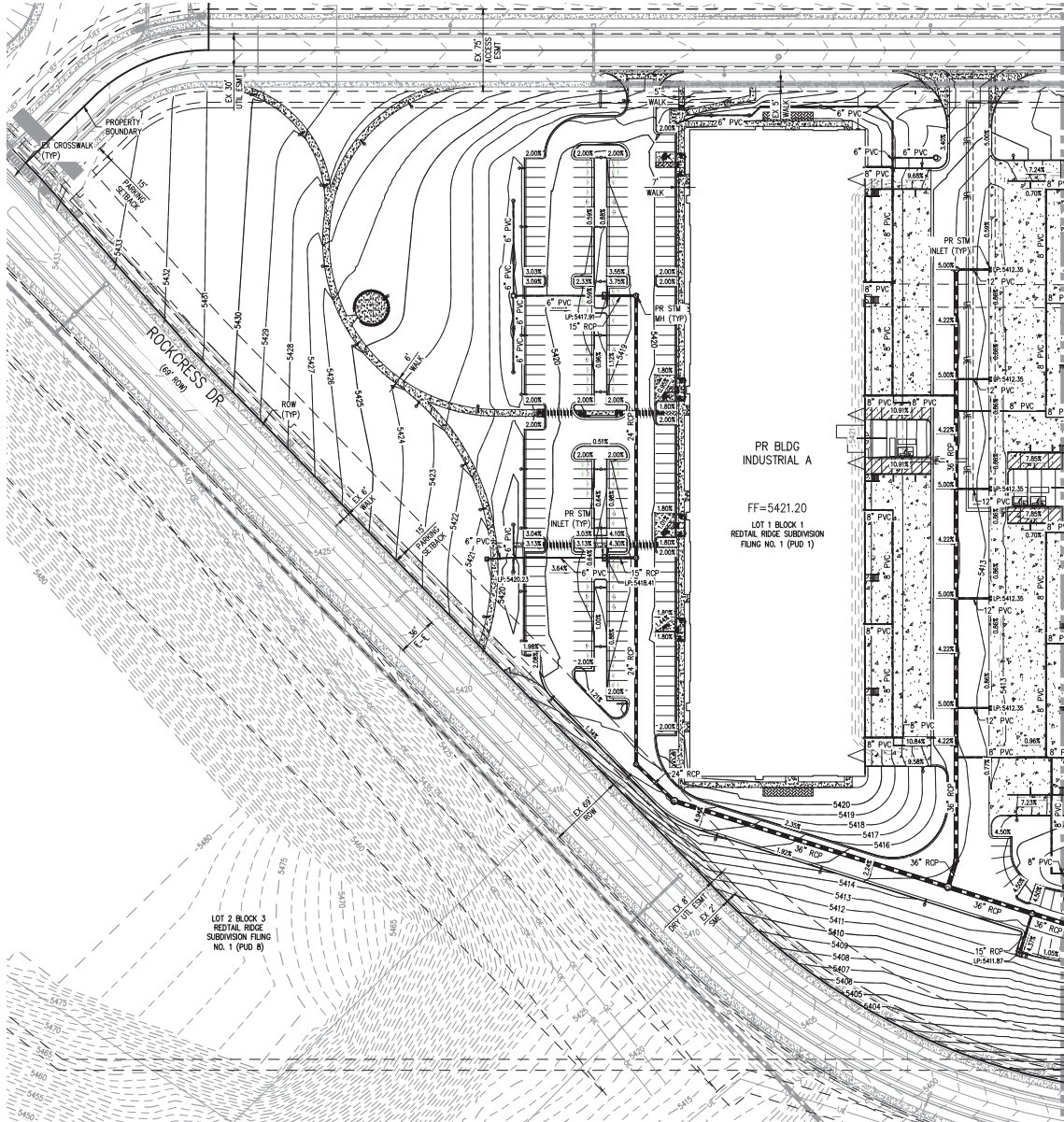
NO CHANGES ARE TO BE MADE TO THE DIMENSIONS AND SPACING OF THE UTILITY LINES.

PROJECT: REDTAIL RIDGE FILING NO. 1 (PUD 1) SUBDIVISION FILING NO. 1 (PUD 1) SOUTH
SHEET: 8 OF 24
DATE: 03-14-2025
ISSUED BY: [Signature]
CHECKED BY: [Signature]
DESIGNED BY: [Signature]
PROJECT NO: 227295

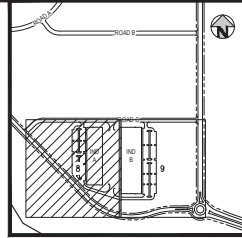
REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



MATCH LINE - SEE SHEET 9



KEY MAP
SCALE: 1" = 600'

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES

NOTES:

- ALL ACCESSIBLE PARKING SPACES SHALL BE GRADED AT 2% MAXIMUM IN ALL DIRECTIONS.
- THE ACCESSIBLE ROUTES TO BUILDINGS SHALL HAVE A MAXIMUM CROSS SLOPE OF 2% AND A MAXIMUM LONGITUDINAL SLOPE OF 5%.
- ALL PROPOSED PIPING IS PRIVATELY OWNED AND MAINTAINED UNLESS OTHERWISE NOTED.

ABBREVIATIONS

BLDG	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
QUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
EBMT	EASEMENT
EA	EXISTING
FF	FINISHED FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH
PE	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



SCALE: 1" = 30'

REVISION DATE:

ISSUE DATE: 03-14-2025

GRADING PLAN
SHEET 8 OF 24

REDTAIL RIDGE PUD1 SOUTH

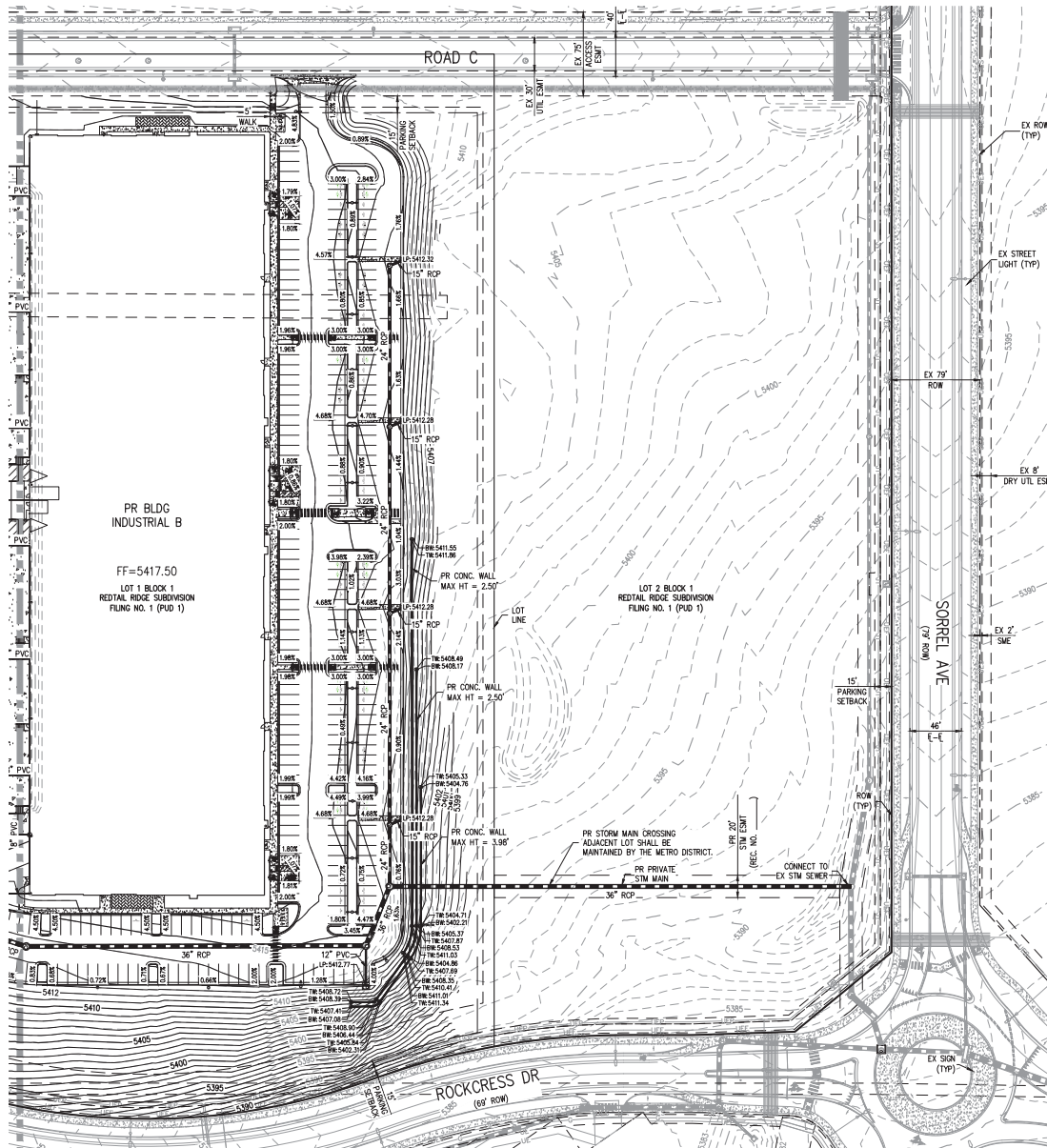
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- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/HH AND INLET
- EXISTING SANITARY SEWER W/HH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/HH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ HH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 8" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CURB/RAIN FINES

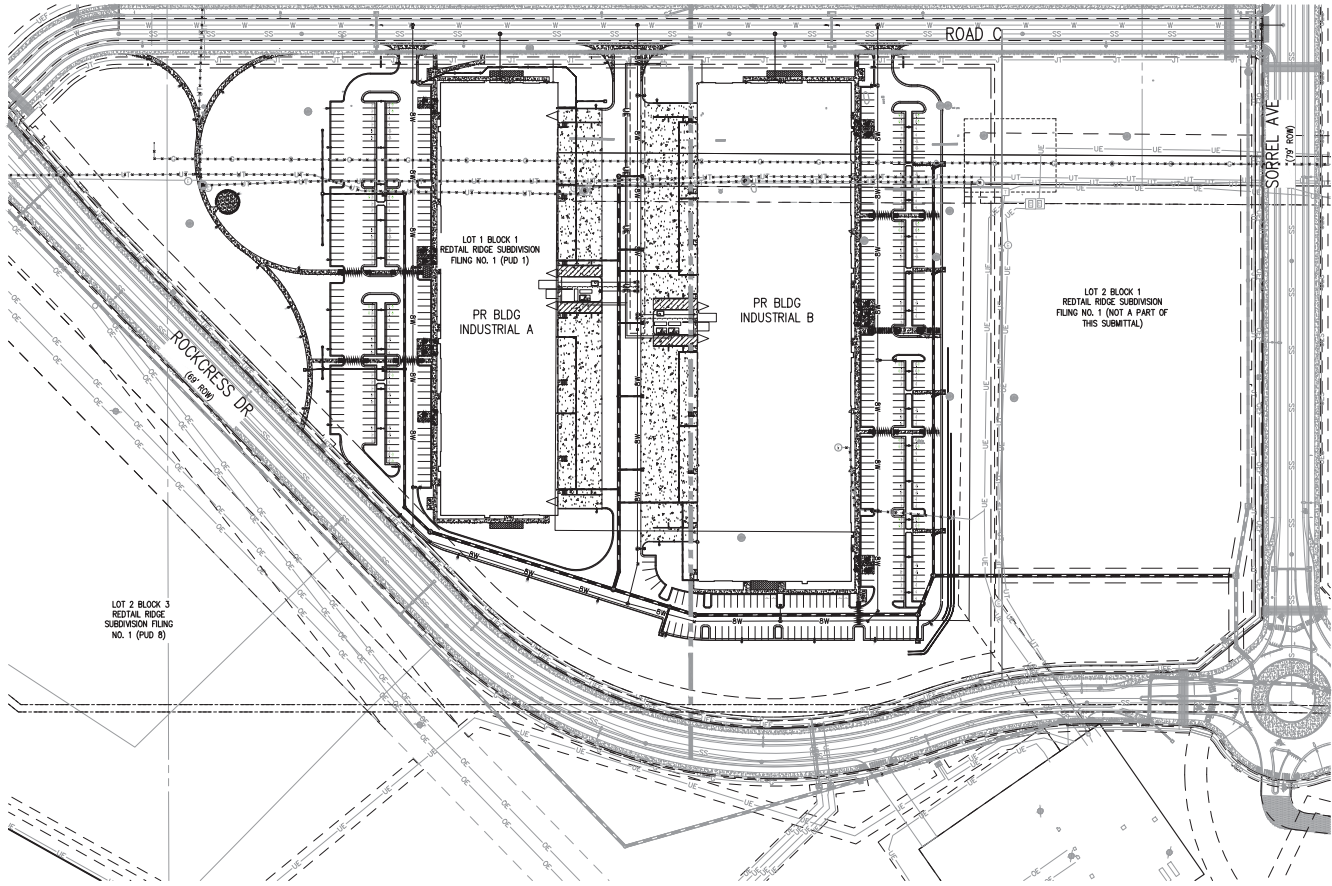
GRADING PLAN
SHEET 9 OF 24

REDTAIL RIDGE PUD1 SOUTH

MATCH LINE - SEE SHEET 8



REDTAIL RIDGE FILING NO. 1
PLANNED UNIT DEVELOPMENT
LOT 1 BLOCK 1



INDUSTRIAL A FIRE FLOW DATA:

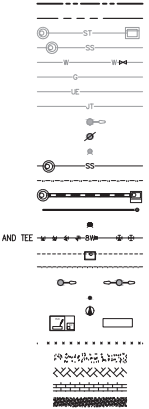
THE TOTAL FIRE FLOW REQUIRED FOR THIS SITE IS 2,125 GPM MINIMUM @ 20 PSI RESIDUAL PRESSURE.
THIS FLOW MUST BE PROVIDED FROM A MINIMUM OF 2 FIRE HYDRANTS.
EACH FIRE HYDRANT MUST SUPPLY A MINIMUM OF 2,125 GPM @ 20 PSI RESIDUAL PRESSURE AT THE HYDRANT OUTLET TO BE ACCEPTABLE.
CODE USED FOR ANALYSIS: 2018 IFC AND 2018 AMENDMENTS.
CONSTRUCTION TYPE: III-A
FIRE FLOW CALCULATION AREA: 83,200 SF
THIS BUILDING IS FULLY SPRINKLERED

INDUSTRIAL B FIRE FLOW DATA:

THE TOTAL FIRE FLOW REQUIRED FOR THIS SITE IS 2,875 GPM MINIMUM @ 20 PSI RESIDUAL PRESSURE.
THIS FLOW MUST BE PROVIDED FROM A MINIMUM OF 3 FIRE HYDRANTS.
EACH FIRE HYDRANT MUST SUPPLY A MINIMUM OF 2,875 GPM @ 20 PSI RESIDUAL PRESSURE AT THE HYDRANT OUTLET TO BE ACCEPTABLE.
CODE USED FOR ANALYSIS: 2018 IFC AND 2018 AMENDMENTS.
CONSTRUCTION TYPE: III-A
FIRE FLOW CALCULATION AREA: 154,350 SF
THIS BUILDING IS FULLY SPRINKLERED

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING JOINT TRENCH
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES



ABBREVIATIONS

BLDG	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
DUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EA	EXISTING
FF	FIRE FLOW
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH
PE	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
R/W	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
STM	STORM
SS	SANITARY SEWER
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER

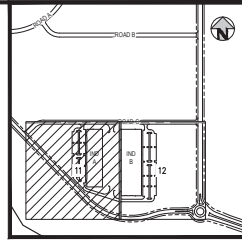


SCALE 1" = 80'

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



KEY MAP
SCALE: 1" = 600'

LEGEND:

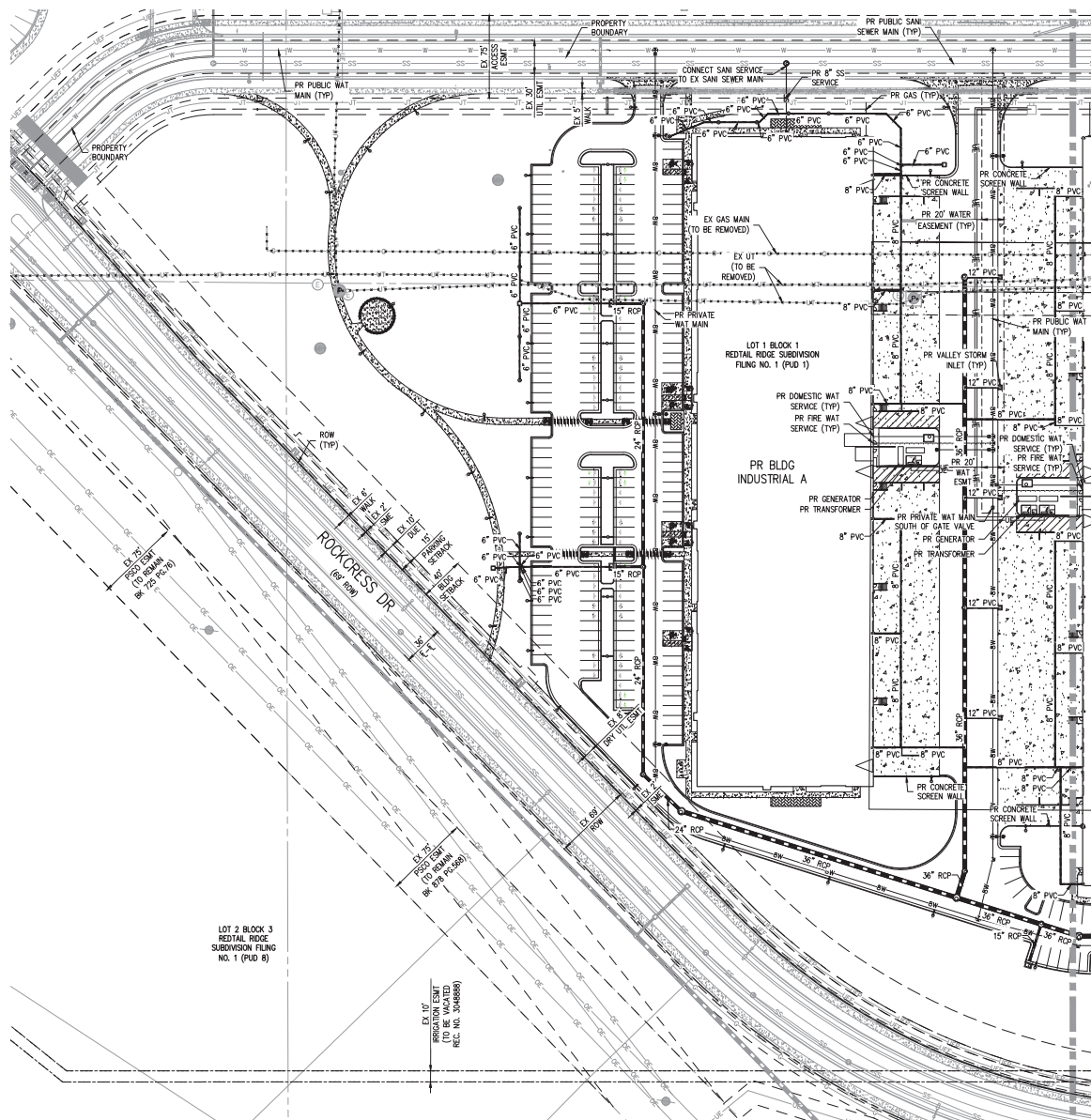
- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES

ABBREVIATIONS

BUILD	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
QUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
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PH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH NORTHING
PE	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



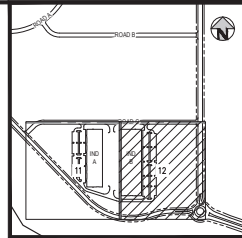
50 0 50 100
SCALE: 1" = 30'



MATCH LINE - SEE SHEET 12

1. DESIGN BY: [Firm Name] 2. DESIGN DATE: [Date] 3. DESIGNER: [Name] 4. CHECKED BY: [Name] 5. APPROVED BY: [Name] 6. SCALE: 1" = 30' 7. SHEET: 11 OF 24 8. PROJECT: [Project Name] 9. LOCATION: [Location] 10. NOTES: [Notes]

REDTAIL RIDGE FILING NO. 1
PLANNED UNIT DEVELOPMENT
LOT 1 BLOCK 1



KEY MAP
SCALE: 1" = 600'

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES

ABBREVIATIONS

BLDG	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
EUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
CV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH, NORTHING
PE	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



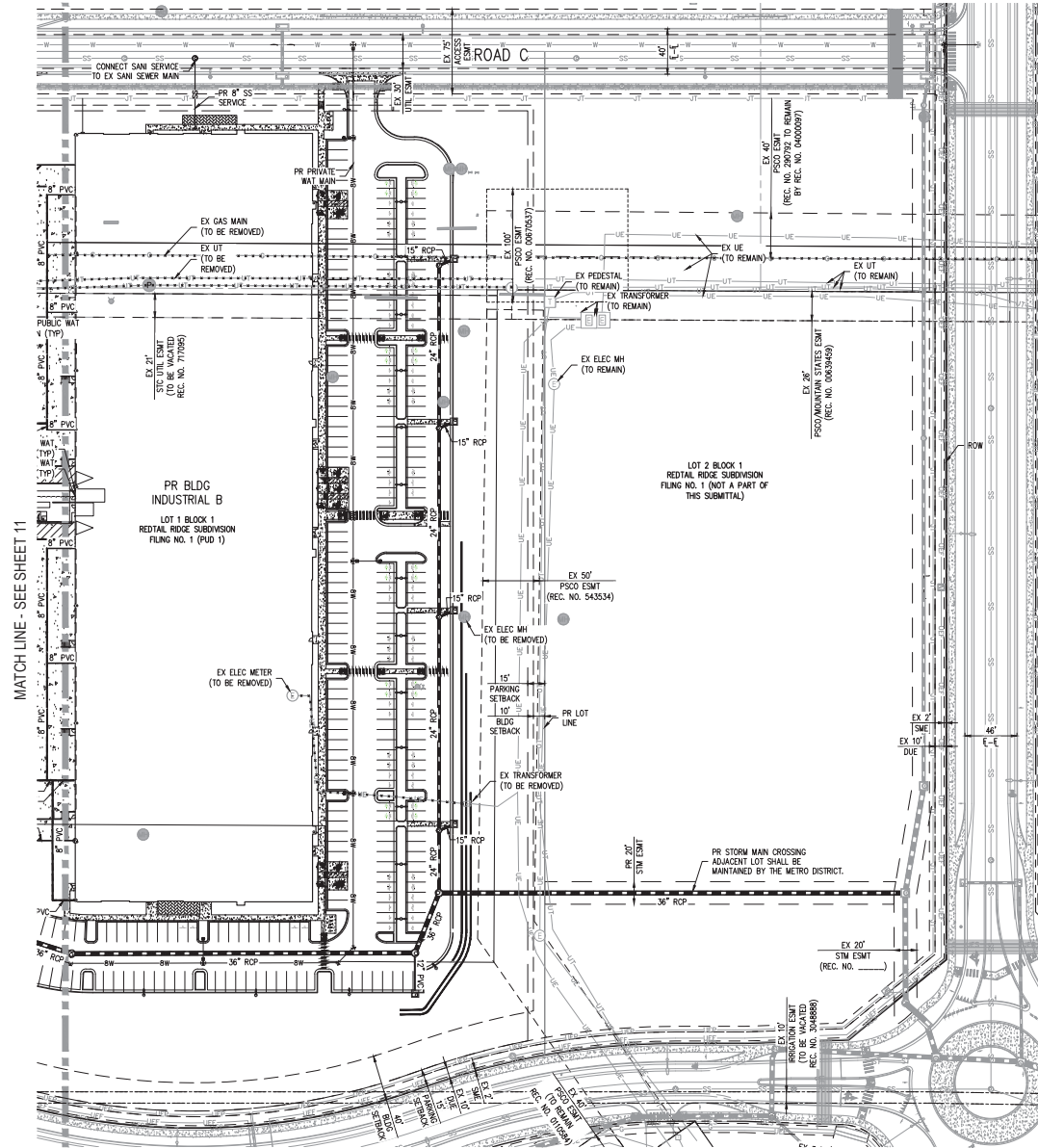
SCALE 1" = 30'

REVISION DATE: #

ISSUE DATE: 03-14-2025

UTILITY PLAN
SHEET 12 OF 24

REDTAIL RIDGE PUD1 SOUTH



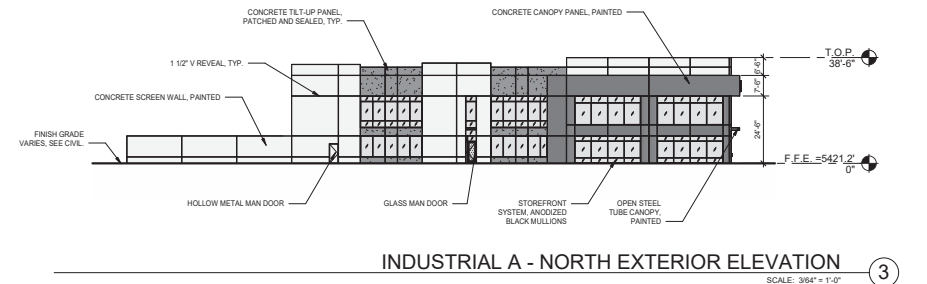
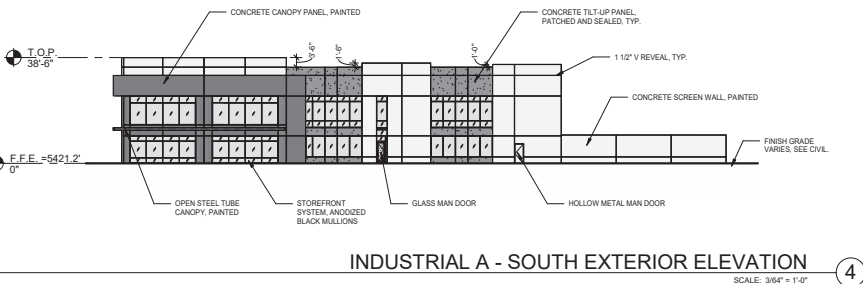
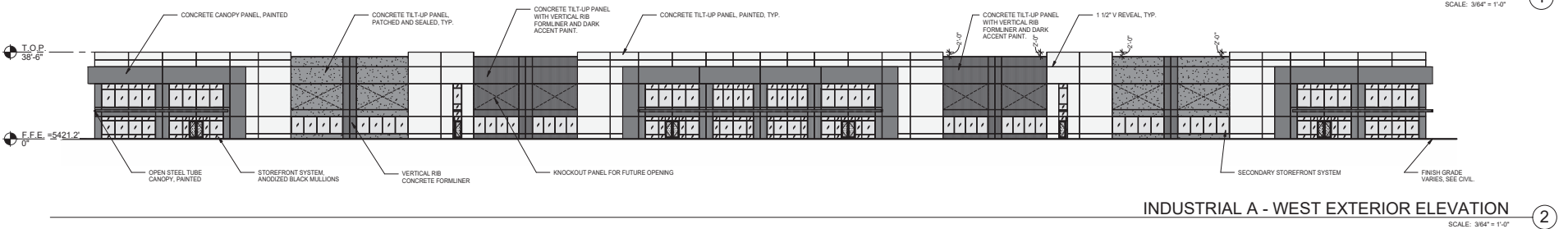
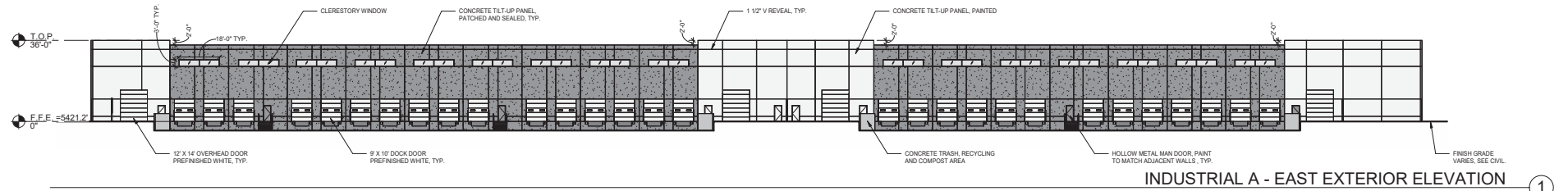
MATCH LINE - SEE SHEET 11

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REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



LEGEND

COLORS:

	BASE COLOR: PURE WHITE SW 7005
	SECONDARY COLOR: SEALED CONCRETE FINISH
	ACCENT COLOR: GRIZZLE GREY SW 7098
	CORRUGATED FORMLINER ACCENT COLOR: WOVEN WICKER SW 9104

GLASS:

GREY TINT

	VISION GLASS
	SPANDREL GLASS
	TEMPERED GLASS

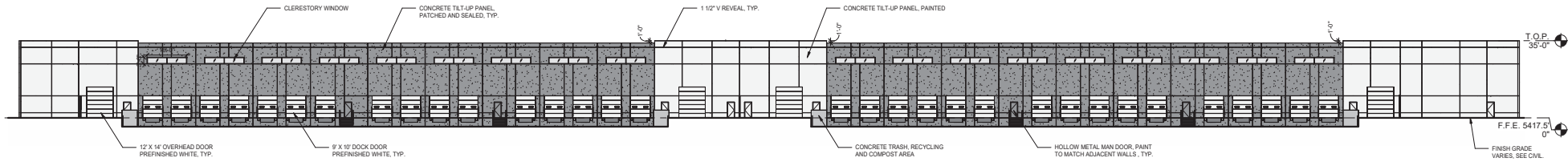
ABBREVIATIONS:

T.O.P. - TOP OF PANEL
F.F.E. - FINISH FLOOR ELEVATION

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

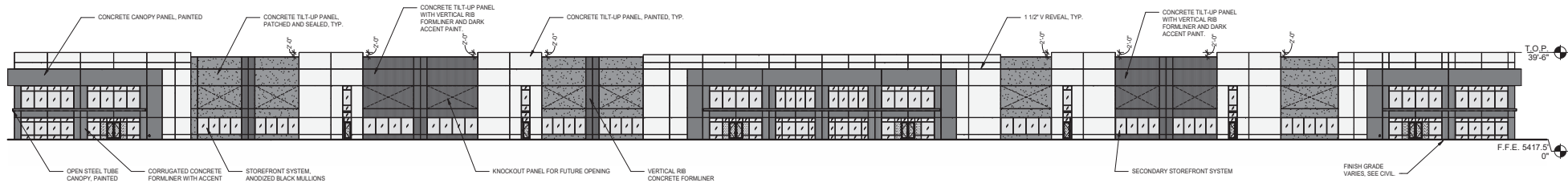
LOT 1 BLOCK 1



INDUSTRIAL B - WEST EXTERIOR ELEVATION

SCALE: 3/8" = 1'-0"

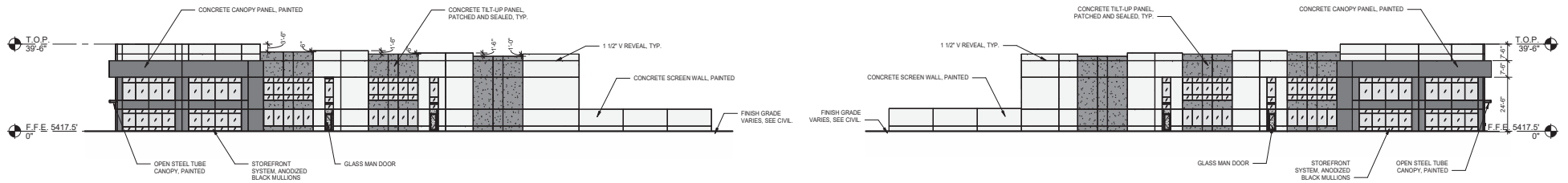
①



INDUSTRIAL B - EAST EXTERIOR ELEVATION

SCALE: 3/8" = 1'-0"

②



INDUSTRIAL B - NORTH EXTERIOR ELEVATION

SCALE: 3/8" = 1'-0"

④

INDUSTRIAL B - SOUTH EXTERIOR ELEVATION

SCALE: 3/8" = 1'-0"

③

LEGEND

COLORS:

	BASE COLOR: PURE WHITE SW 7005
	SECONDARY COLOR: SEALED CONCRETE FINISH
	ACCENT COLOR: GRIZZLE GREY SW 7068
	CORRUGATED FORMLINER ACCENT COLOR: WOVEN WICKER SW 9104

GLASS:

GREY TINT

	VISION GLASS
	SPANDREL GLASS
	TEMPERED GLASS

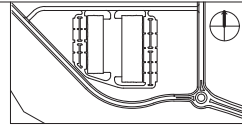
ABBREVIATIONS:

T.O.P.	- TOP OF PANEL
F.F.E.	- FINISH FLOOR ELEVATION

REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

Sheet Index	
SHEET NUMBER	SHEET NAME
03 LANDSCAPE	
13 OF 24	OVERALL LANDSCAPE PLAN
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20 OF 24	SITE FURNISHING DETAILS
21 OF 24	PLANTING DETAILS
22 OF 24	PLANTING SCHEDULE



KEY MAP
1" = 800'

ABBREVIATIONS LEGEND

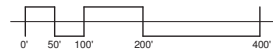
ABBREVIATIONS WHEN USED IN COMPOSITION MAY INCLUDE PERIODS FOR CLARIFICATION

AFT	ABOVE FINISHED FLOOR	HP	HIGH POINT
ADJ	ADJACENT	HORIZ	HORIZONTAL
ADA	AMERICANS WITH DISABILITIES ACT	HB	HOSE BIBB
APPROX	APPROXIMATE	INCL	INCLUDED, INCLUDING
ARCH	ARCHITECTURAL	ID	INSIDE DIAMETER
AD	AREA DRAIN	INT	INTERIOR
BT	BOTTOM OF	LTG	LIGHTING
CB	CATCH BASIN	LP	LINEAR FOOT (LINEAR FEET)
CL	CENTERLINE	LP	LOW POINT
C/C	CENTER TO CENTER	MAINT	MAINTENANCE
CLW	CLEANOUT	MN	MANHOLE
COL	COLUMN	MFR	MANUFACTURER
COMM	COMMUNICATION	MATL	MATERIAL
CONC	CONCRETE	MECH	MECHANICAL
CONC	CONCRETE	MAX	MAXIMUM
CONC	CONCRETE MASONRY UNIT	MIN	MINIMUM
CONT	CONTINUOUS	MTL	METAL
CJ	CONTROL JOINT	MN	MISCELLANEOUS
CUBIC	CUBIC	MISC	MISCELLANEOUS
DEG	DEGREE	NOM	NOMINAL
DEMOL	DEMOLITION	NIC	NOT IN CONTRACT
DEPT	DEPARTMENT DEPT	NTS	NOT TO SCALE
DIA	DIAMETER	OC	ON CENTER
DIA	DIAMETER	OPP	OPPOSITE
DM	DIMENSION	OD	OUTSIDE DIAMETER
DS	DOWNSPOUT	PERP	PERPENDICULAR
DF	DRINKING FOUNTAIN	PSI	POUNDS PER SQUARE INCH
EA	EACH	PRELIM	PRELIMINARY
ELEC	ELECTRICAL	PROP	PROPERTY
ELEV	ELEVATION	R	RADIUS
ENCL	ENCLOSURE	REF	REFERENCE
EQ	EQUIPMENT	REIN	REINFORCE REINFORCING
EQUIP	EQUIPMENT	REQ	REQUIRED
EXIST	EXISTING	REIN	REINFORCED
EXP	EXPANDED JOINT	ROW	RIGHT OF WAY
EXT	EXTERIOR	RM	ROOM
F	FACE OF	RM	ROOM
FEET	FEET	SF	SQUARE FOOT (SQUARE FEET)
FIN	FINISHED	SST	STAINLESS STEEL
FOC	FIRE DEPARTMENT CONNECTION	STRUCT	STRUCTURE, STRUCTURAL
PH	FIRE HYDRANT	SYS	SYSTEM
FTG	FOOTING	TEL	TELEPHONE
FOUND	FOUNDATION	TEMP	TEMPORARY
FURN	FURNISH, FURNITURE	TI	TOP OF
GA	GAUGE	TOPO	TOPOGRAPHY, TOPOGRAPHIC
GALV	GALVANIZED	TYP	TYPICAL
GEN	GENERAL	UNO	UNLESS NOTED OTHERWISE
GL	GLASS	VF	VERIFY IN FIELD
HVAC	HEATING, VENTILATION, AIR CONDITIONING	VERT	VERTICAL
		W/O	WITHOUT
		WP	WORKING POINT

GENERAL NOTES

- NOTES APPEAR ON VARIOUS DRAWINGS FOR DIFFERENT SYSTEMS AND MATERIALS. REVIEW ALL SHEETS AND APPLY NOTES TO RELATED BUILDING COMPONENTS.
- REFER TO COMPLETE SET OF ISSUED CONTRACT DOCUMENTS FOR OTHER APPLICABLE NOTES, ABBREVIATIONS, AND SYMBOLS.
- WHERE MATERIALS ARE APPLIED TO, OR ARE IN DIRECT CONTACT WITH WORK INSTALLED BY ANOTHER SUBCONTRACTOR, COMMENCEMENT OF WORK IMPLIES ACCEPTANCE OF THE SUBSTRATE AS SUITABLE FOR THE APPLICATION INTENDED.
- ISOLATE DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
- DO NOT SCALE THE DRAWINGS.
- FIELD MEASURE AND CONFIRM DIMENSIONS FOR OWNER PROVIDED EQUIPMENT AND FURNISHINGS.
- EXCAVATION OF 4 FEET AND TESTING AND COMPACTED SOILS AT PEDESTRIAN PAVEMENTS.
- BEFORE SPREADING PLANTING SOIL OVER THE SITE, PERFORM SOIL COMPACTION TESTING BY CHECKING SOIL COMPACTION USING A TENSOMETER (PENTOMETER) ON A 30 FOOT BY 30 FOOT GRID ON ALL GRADED SUBSOIL AREAS TO BE PLANTED GREATER THAN ONE ACRE OR A 30 FOOT BY 30 FOOT GRID FOR AREAS LESS THAN ONE ACRE. IF MORE THAN 10 PERCENT OF THE READINGS IN A GIVEN PLANTING AREA ARE GREATER THAN 80 PSI, THEN THE SITE SHALL UNDERGO SITE SUBGRADE MITIGATION MEASURES DESCRIBED BELOW IMMEDIATELY PRIOR TO PLACING PLANTING SOIL. THE ENTIRE SUBGRADE SHALL BE LOOSENEED TO A MINIMUM DEPTH OF 6 INCHES USING THE TEETH OF A BACKHOE OR OTHER SUITABLE EQUIPMENT. THEN RE COMPACTED WITH THE TRACKS OF SMALL CONSTRUCTION EQUIPMENT. THE BUCKET OF A BACKHOE OR OTHER APPROVED EQUIPMENT. VIBRATORY COMPACTION OF SUBGRADE IN PLANTED AREAS IS PROHIBITED AFTER THE SUBGRADE SOILS HAVE BEEN LOOSENEED, RE-COMPRESSED AND INSPECTED. PLANTING SOIL MAY BE SPREAD BY USING A WIDE TRACK BULLDOZER SIZE 4 OR SMALLER OR MAY BE DUMPED AND SPREAD WITH THE BUCKET OF A BACKHOE FROM THE EDGE OF THE LOOSENEED AREA. NO RUBBER-TIRED EQUIPMENT OR HEAVY EQUIPMENT EXCEPT FOR A SMALL BULLDOZER SHALL PASS OVER THE SUBSOILS (SUBGRADE) AFTER THEY HAVE BEEN LOOSENEED AND RECOMPRESSED.

LANDSCAPE REQUIREMENTS		
TOTAL LOT SIZE		945,775.48
TOTAL AREA COVERED BY BUILDING, OR VEHICULAR PAVEMENT AREA		555,801.49
TOTAL LANDSCAPE AREA (38%)		360,907.16
TOTAL PEDESTRIAN HARDSCAPE AREA		29,066.35
	REQUIRED	PROPOSED
ROCKCRESS ROAD NUMBER OF PERIMETER TREES	41	41
ROCKCRESS ROAD NUMBER OF PERIMETER SHRUBS	327	327
RICHMOND ROAD NUMBER OF PERIMETER TREES	34	34
RICHMOND ROAD NUMBER OF PERIMETER SHRUBS	270	270
TOTAL NUMBER OF PARKING LOT TREES	57	72
TOTAL NUMBER OF PARKING LOT SHRUBS	264	360



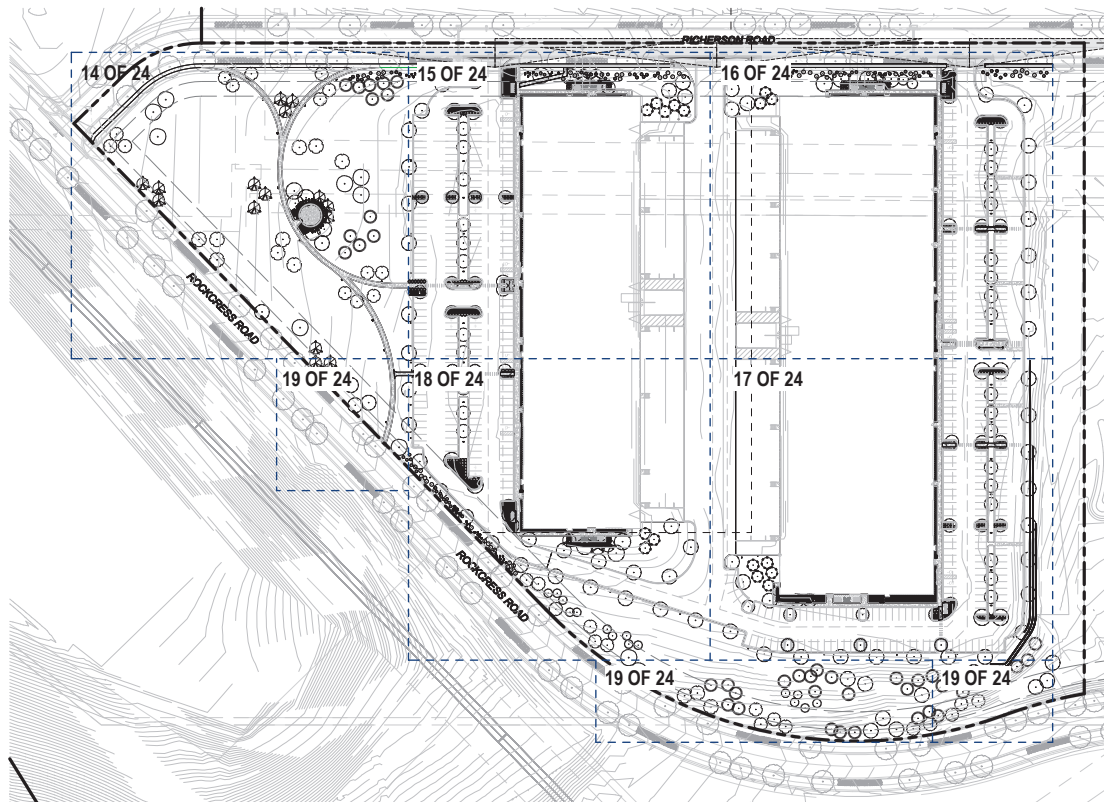
OVERALL
LANDSCAPE PLAN

REVISION DATE:

ISSUE DATE: 09/10/2025

SHEET 13 OF 24

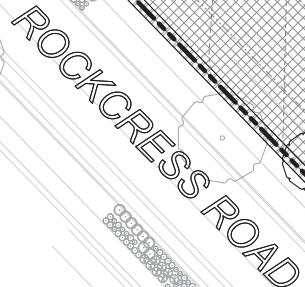
REDTAIL RIDGE PUD1 SOUTH



1 OVERALL LANDSCAPE PLAN
1" = 80'-0"

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,



SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1 - A	BENCH
	FS2 - B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4 - A	LOUNGE CHAIR
	FS4 - B	DINING CHAIR
	FS5	BIKE RACK
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT



ISSUE DATE: 09/10/2025



PROJECT # 221236

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
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"CASE #: PUPL-XXXX-2023"

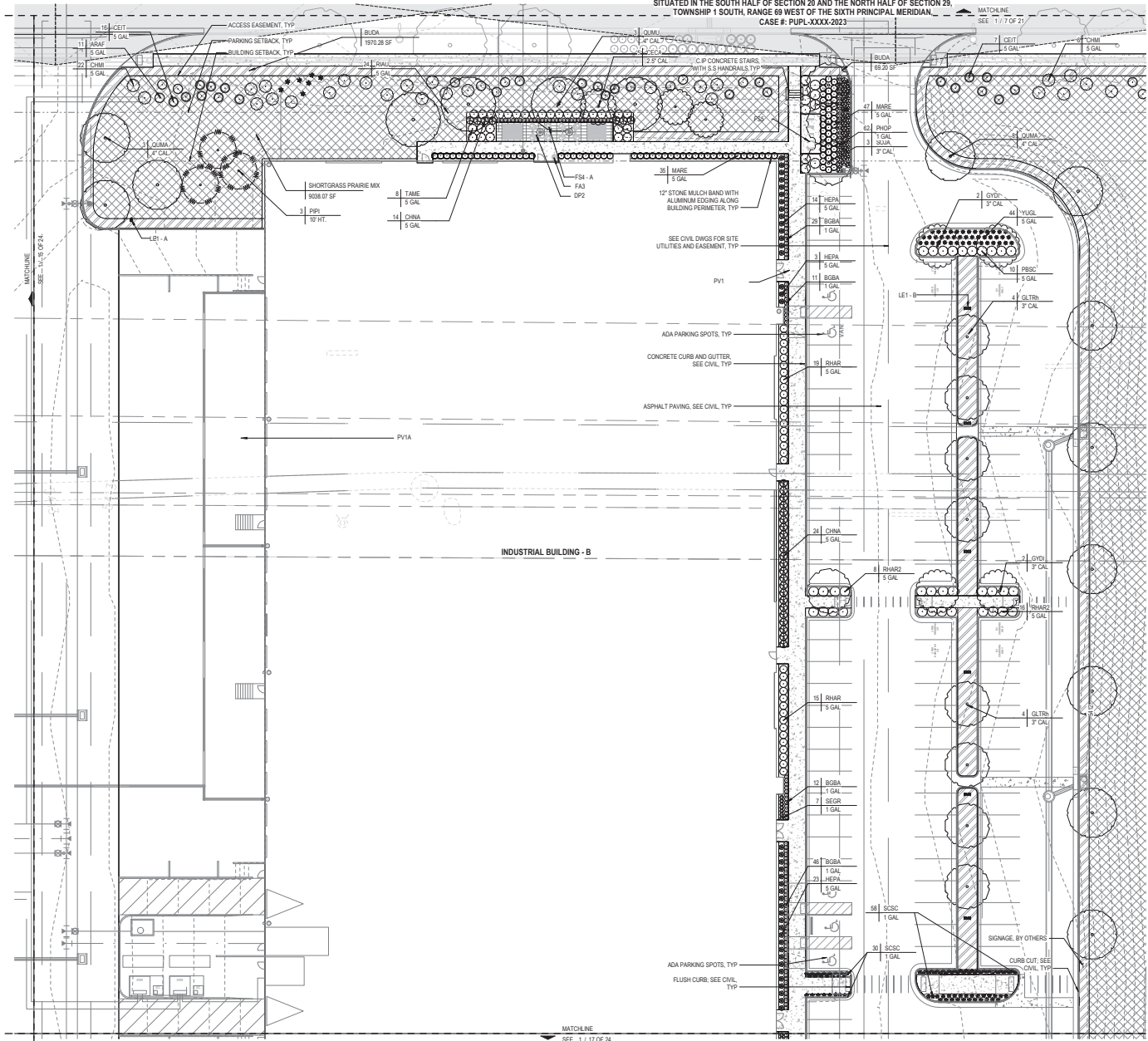


KEY MAP
1" = 600'

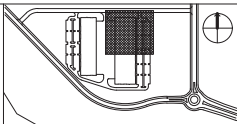


REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
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CASE #: PUPL-XXXX-2023



MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	MM1	DECOMPOSED GRANITE
	PV1	PEDESTRIAN RATED CIP CONCRETE



KEY MAP
1" = 600'

SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	PS1 - A	BENCH
	PS2 - B	PICNIC TABLE SET 2
	PS3	DINING TABLE
	PS4 - A	LOUNGE CHAIR
	PS4 - B	DINING CHAIR
	PS5	BIKE RACK
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT



REVISION DATE:

ISSUE DATE: 09/10/2025



MATERIAL AND
PLANTING PLAN -
C

SHEET 16 OF 24

REDTAIL RIDGE PUD1 SOUTH

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
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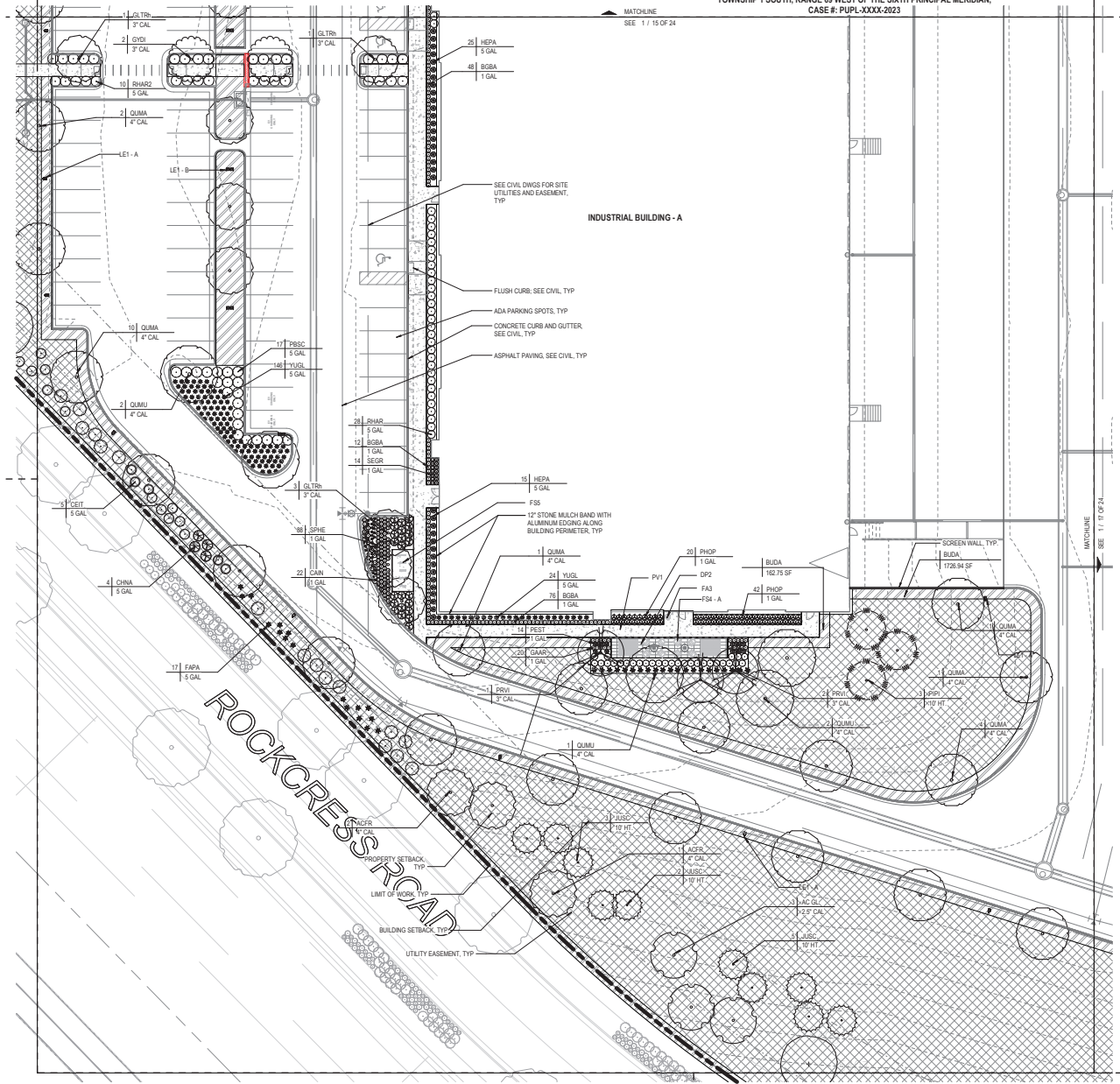


SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1 - A	BENCH
	FS2 - B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4 - A	LOUNGE CHAIR
	FS4 - B	DINING CHAIR
	FS5	BIKE RACK
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT

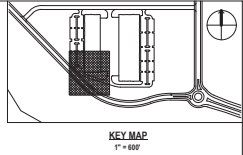


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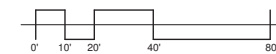
PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
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MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	MM1	DECOMPOSED GRANITE
	PV1	PEDESTRIAN RATED C/P CONCRETE



SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1 - A	BENCH
	FS2 - B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4 - A	LOUNGE CHAIR
	FS4 - B	DINING CHAIR
	FS5	BIKE RACK
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT



REVISION DATE:

ISSUE DATE: 09/10/2025



MATERIAL AND
PLANTING PLAN - E

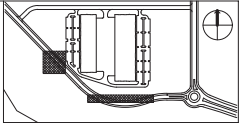
SHEET 18 OF 24

REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

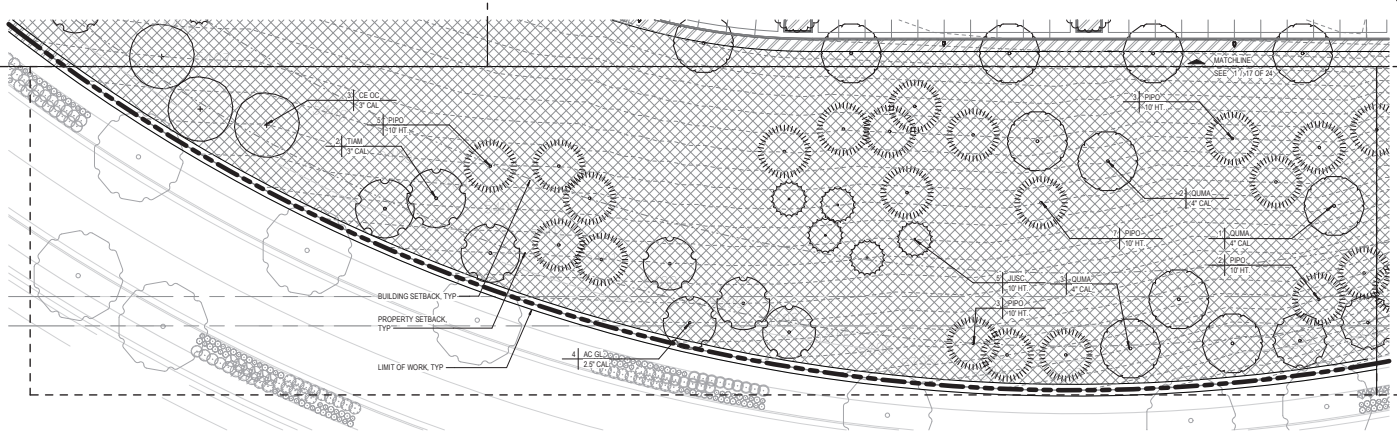
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MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	DM1	DECOMPOSED GRANITE
	PN1	PEDESTRIAN RATED CP CONCRETE

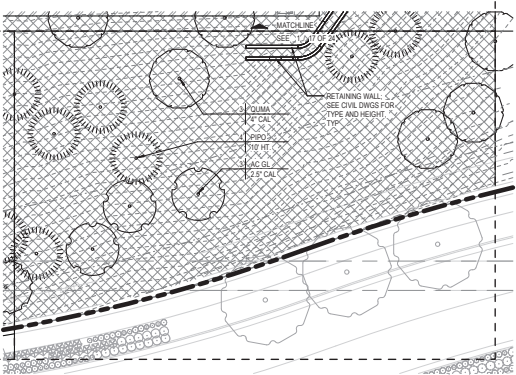


KEY MAP
1" = 800'

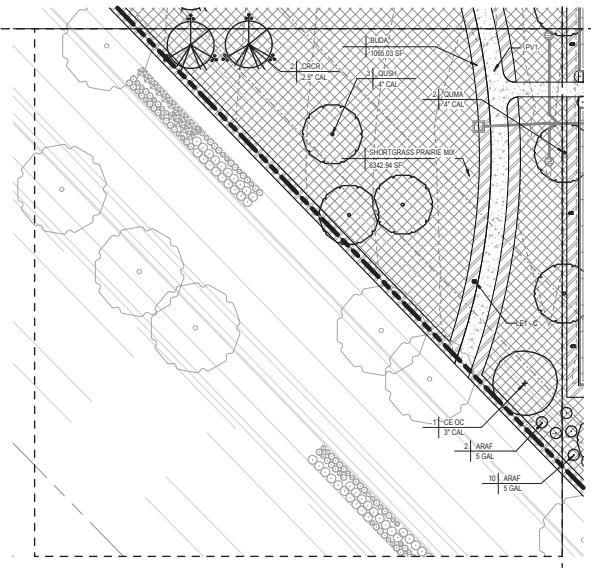
SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1-A	BENCH
	FS2-B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4-A	LOUNGE CHAIR
	FS4-B	DINING CHAIR
	FS5	BIKE RACK
	LE1-A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1-B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1-C	PEDESTRIAN POLE LIGHT



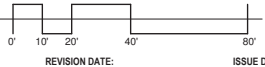
3 MATERIAL AND PLANTING PLAN - G
1" = 20'-0"



2 MATERIAL AND PLANTING PLAN - H
1" = 20'-0"



1 MATERIAL AND PLANTING PLAN - F
1" = 20'-0"



REVISION DATE:

ISSUE DATE: 09/10/2025



MATERIAL AND
PLANTING PLAN -
F, G & H

SHEET 19 OF 24

REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

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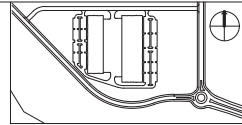


9 COUNCIL RING RENDERING
NTS

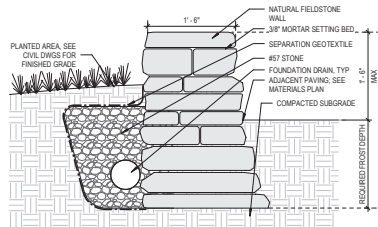


8 SE RETAINING WALLS
NTS

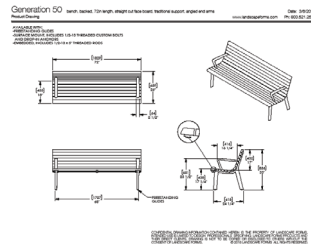
SITE FURNITURE & LIGHTING SCHEDULE			
	QUANTITY	TAG	TYPE
	5	FA3	LITTER RECEPTACLE
	1	FS1 - A	BENCH
	9	FS2 - B	PICNIC TABLE SET 2
	9	FS3	DINING TABLE
	29	FS4 - A	LOUNGE CHAIR
	34	FS4 - B	DINING CHAIR
	21	FS5	BIKE RACK
	27	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	24	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	15	LE1 - C	PEDESTRIAN POLE LIGHT



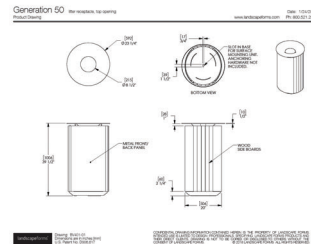
KEY MAP
1" = 800'



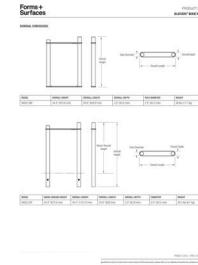
7 NATURAL FIELDSTONE SEAT WALL
1" = 1'-0"



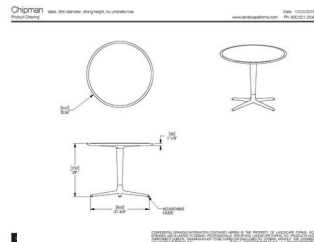
6 BENCH - FS1 - A
1/2" = 1'-0"



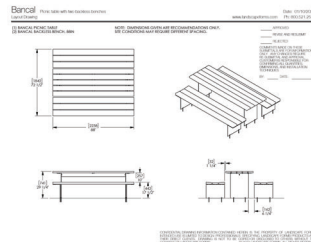
5 LITTER RECEPTACLE - FA3
1/2" = 1'-0"



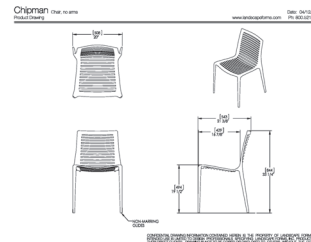
4 BIKE RACK - FS5
1/2" = 1'-0"



3 DINING TABLE - FS3
1/2" = 1'-0"



2 PICNIC TABLE SET 2 - FS2 - B
1/2" = 1'-0"



1 DINING CHAIR - FS4 - B
1/2" = 1'-0"



SITE FURNISHING
DETAILS

REVISION DATE:

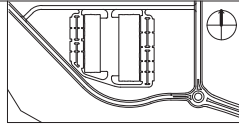
ISSUE DATE: 09/10/2025

SHEET 20 OF 24

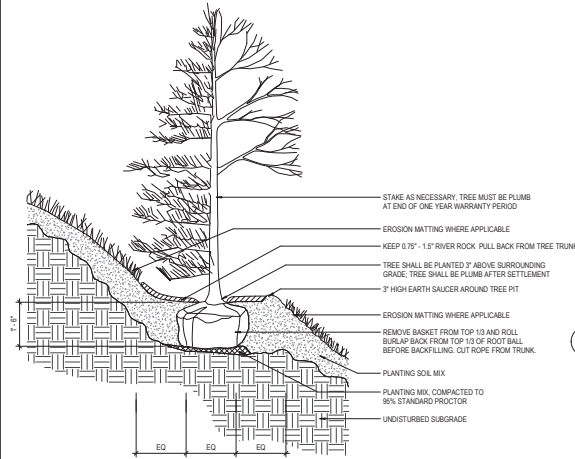
REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

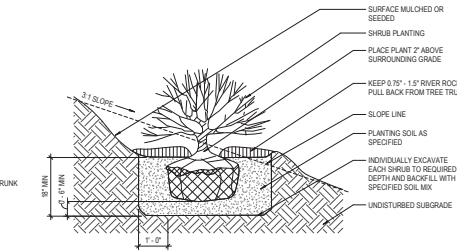
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CASE #: PUPL-XXXX-2023



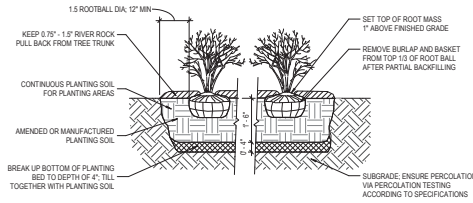
KEY MAP
1" = 600'



7 TREE PLANTING ON SLOPE
1/2" = 1'-0"



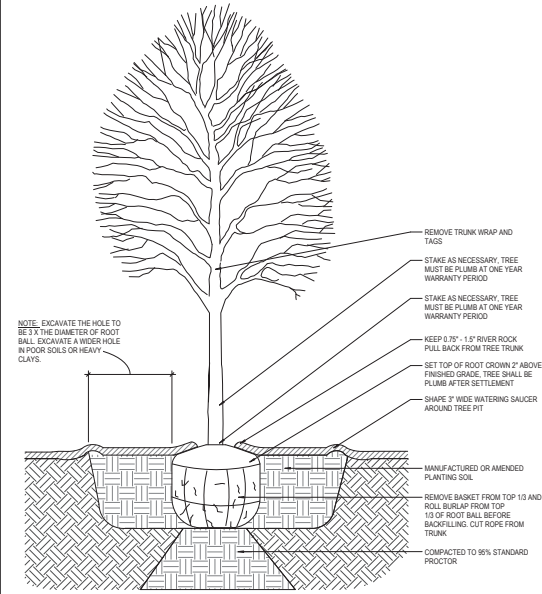
11 SHRUB PLANTING ON SLOPE
1/2" = 1'-0"



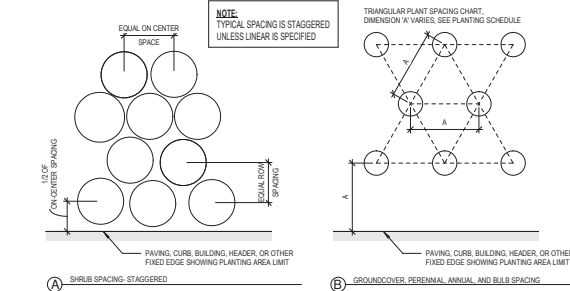
9 TYPICAL SHRUB PLANTING AT GRADE
1/2" = 1'-0"



8 TYPICAL GROUNDCOVER PLANTING
1/2" = 1'-0"



10 TYPICAL TREE PLANTING AT GRADE
1/2" = 1'-0"



3 PLANT SPACING
1/2" = 1'-0"

CLEAN AND MULCH NOTES:

1. THE CONTRACTOR SHALL CLEAR AND GRUB ALL WEEDS, DEAD TREES, TREES ONE (1) INCH CALIPER OR LESS AND OTHER SELECT TREES UP TO FOUR (4) INCH CALIPER AS DETERMINED IN THE FIELD IN THE TREE SAVE AREAS INDICATED ON THE DRAWINGS.
2. A THREE (3) INCH MINIMUM LAYER OF MULCH SHALL BE SPREAD OVER THE ENTIRE CLEARED AREA.
3. THE CONTRACTOR WILL NOTIFY THE ARCHITECT PRIOR TO START OF THE CLEAN AND MULCH WORK.
4. THE ARCHITECT WILL VERIFY SCOPE OF WORK IN FIELD WITH THE CONTRACTOR PRIOR TO THE START OF WORK.
5. THE CONTRACTOR IS RESPONSIBLE FOR THE REMOVAL AND LEGAL DISPOSAL OF ALL DEBRIS FROM CLEAN-UP OPERATIONS FROM THE SITE.

GENERAL PLANTING NOTES:

1. ALL PLANTS MUST BE HEALTHY, VIGOROUS MATERIAL, FREE OF PESTS & DISEASES.
2. ALL PLANTS MUST BE CONTAINER-GROWN (CONT.) OR BALLED AND BURLAPPED (BAB) AS INDICATED IN PLANT LIST.
3. ALL TREES MUST BE STRAIGHT TRUNKED, FULL HEADED, & MEET ALL REQUIREMENTS SPECIFIED.
4. ALL PLANTS ARE SUBJECT TO THE APPROVAL OF THE ARCHITECT & THE OWNER BEFORE, DURING & AFTER INSTALLATION.
5. ALL TREES MUST BE GUDED OR STAKED AS SHOWN IN THE DETAILS.
6. ALL PLANTS AND PLANTING AREAS MUST BE COMPLETELY MULCHED AS SPECIFIED.
7. PRIOR TO CONSTRUCTION, THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES & SHALL AVOID DAMAGE TO ALL UTILITIES DURING THE COURSE OF THE WORK. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY & ALL DAMAGE TO UTILITIES, STRUCTURES, SITE APPURTENANCES, ETC. WHICH OCCUR AS A RESULT OF THE LANDSCAPE CONSTRUCTION.
8. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL QUANTITIES SHOWN ON THESE PLANS BEFORE PRICING THE WORK.
9. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR FULLY MAINTAINING ALL PLANTING (INCLUDED BUT NOT LIMITED TO: WATERING, SPRAYING, MULCHING, FERTILIZING, ETC.) OF ALL PLANTING AND LAWN AREAS UNTIL THE WORK IS ACCEPTED IN TOTAL BY THE ARCHITECT AND OWNER.
10. THE LANDSCAPE CONTRACTOR SHALL COMPLETELY GUARANTEE ALL PLANT MATERIAL FOR A PERIOD OF ONE (1) YEAR BEGINNING AT THE DATE OF SUBSTANTIAL COMPLETION. THE LANDSCAPE CONTRACTOR SHALL PROMPTLY MAKE ALL REPLACEMENTS BEFORE OR AT THE END GUARANTEE PERIOD (AS DIRECTED BY THE OWNER).
11. THE ARCHITECT WILL APPROVE THE STAKED LOCATION OF ALL PLANT MATERIAL PRIOR TO INSTALLATION.



PLANTING DETAILS

REVISION DATE:

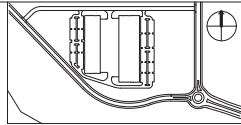
ISSUE DATE: 09/10/2025

SHEET 21 OF 24

REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

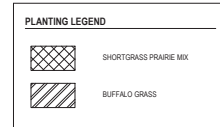


KEY MAP
1" = 600'

TREE & SHRUB PLANTING SCHEDULE							
QTY	CODE	SCIENTIFIC NAME	COMMON NAME	SIZE	ROOT	SPACING	COMMENTS
SHRUB							
28	ACLA	ACHILLEA LANULOSA	MOUNTAIN YARROW	1 GAL	B&B	18"	FULL, WELL BRANCHED
43	ARAF	ARTEMESIA FILIFOLIA	SAND SAGE	5 GAL	B&B	48"	FULL, WELL BRANCHED
10	ASAC	ASTER ASCENDENS	WESTERN ASTER	1 GAL	B&B	18"	FULL, WELL BRANCHED
18	ASTU	ASCLEPIA TUBEROSA	BUTTERFLY WEED	1 GAL	B&B	18"	FULL, WELL BRANCHED
541	BGBA	BOUTELOUA GRACILIS 'BLOND AMBITION BLUE'	GRAMA GRASS	1 GAL	B&B	18"	FULL, WELL BRANCHED
21	CAIN	CALLIRHOE INVOLUCRATA	POPPY MALLOW	1 GAL	B&B	18"	FULL, WELL BRANCHED
50	CEIT	CERCOCARPUS ITRICATA	LITTLELEAF MOUNTAIN MAHOGANY	5 GAL	B&B	48"	
69	CHMI	CHAMAEBATIARIA MILLEFOLIUM	FERNBUSH	5 GAL	B&B	5"	FULL, WELL BRANCHED
133	CHNA	CHRYSOETHAMNUS NAUSEOSUS VAR NAUSEOSUS	DWARF RABBITBRUSH	5 GAL	B&B	<varies>	<varies>
16	ENPE	ENGELLMANIA PERSISTENA	ENGELLMAN DAISY	1 GAL	B&B	18"	FULL, WELL BRANCHED
44	FAPA	FALLUGIA PARADOXA	APACHE PLUME	5 GAL	B&B	36"	
57	FEPA	FELLUGIA PARADOXA	APACHE PLUME	5 GAL	B&B	36"	FULL, WELL BRANCHED
37	GAAR	GAILLARDIA ARISTATA	BLANKET FLOWER	1 GAL	B&B	18"	FULL, WELL BRANCHED
221	HEPA	HESPERALOE PARVIFLORA	RED YUCCA	5 GAL	B&B	36"	FULL, WELL BRANCHED
5	LILG	LIATRIS LIGULISTYLUS	ROCKY MOUNTAIN GAYFEATHER	1 GAL	B&B	18"	FULL, WELL BRANCHED
224	MARE	MAHONIA REPENS	CREeping GRAPE HOLLY	5 GAL	B&B	30"	FULL, WELL BRANCHED
30	MURE	MUHLENBERGIA REVERCHONII 'UNDAUNTED'	UNDAUNTED RUBY MUHLY GRASS	3 GAL	B&B	30"	FULL, WELL BRANCHED
16	OEMA	OENOTHERA MACROCARPA	EVENING PRIMROSE	1 GAL	B&B	18"	FULL, WELL BRANCHED
118	PBSC	PRUNUS BESSEYI 'PAWNEE BUTTES'	PAWNEE BUTTES SAND CHERRY	5 GAL	B&B	48"	FULL, WELL BRANCHED
9	PESR	PENSTEMON STRICTUS	ROCKY MOUNTAIN PENSTEMON	1 GAL	B&B	18"	FULL, WELL BRANCHED
15	PEST	PENSTEMON BARBARATUS	SCARLET BUGLAR	1 GAL	B&B	18"	FULL, WELL BRANCHED
188	PHOP	PHYSOCARPUS OPULIFOLIUS 'NANA'	DWARF NINEBARK	1 GAL	B&B	24"	FULL, WELL BRANCHED
7	RACO	RATIBIDA COLUMNIFERA	PRAIRIE CONEFLOWER	1 GAL	B&B	18"	FULL, WELL BRANCHED
147	RHAR	RHUS AROMATICA 'GRO-LOW'	GRO-LOW SUMAC	5 GAL	B&B	36"	FULL, WELL BRANCHED
132	RHAR2	RHUS AROMATICA 'GRO-LOW'	GRO-LOW SUMAC	5 GAL	B&B	48"	FULL, WELL BRANCHED
35	RIAU	RIBES AUREUM	GOLDEN CURRANT	5 GAL	B&B	42"	FULL, WELL BRANCHED
66	RUHI	RUIDECKIA HIRTA	BLACK EYED SUSAN	1 GAL	B&B	18"	FULL, WELL BRANCHED
247	SCSC	SCHIZACYRIUM SCOPARIUM 'THE BLUES'	THE BLUES LITTLE BLUESTEM GRASS	1 GAL	B&B	18"	FULL, WELL BRANCHED
50	SEGR	SALVIA GREGGI 'FURMAN'S RED'	AUTUMN SAGE	1 GAL	B&B	18"	FULL, WELL BRANCHED
263	SPHE	SPOROBOLUS HETEROLEPSIS	PRAIRIE DROPSEED	1 GAL	B&B	18"	FULL, WELL BRANCHED
1	SPHE2	SPOROBOLUS HETEROLEPSIS	PRAIRIE DROPSEED	1 GAL	B&B	24"	FULL, WELL BRANCHED
18	TAME	TAXUS X MEDIA 'DENSIFORMIS'	DENSIFORMIS YEW	5 GAL	B&B	42"	FULL, WELL BRANCHED
486	YUGL	YUCCA GLAUCA	SOAPWEED	5 GAL	B&B	30"	FULL, WELL BRANCHED

TREE							
21	AC GL	ACER GLABRUM	ROCKY MOUNTAIN MAPLE	2.5" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
8	ACFR	ACER FREMANII 'AUTUMN BLAZE'	AUTUMN BLAZE MAPLE	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
11	CE OC	CELTIS OCCIDENTALIS 'PRAIRIE PRIDE'	PRAIRIE PRIDE HACKBERRY	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
3	CECA	CERCIS CANADENSIS	REDBUD	2.5" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
15	CRCR	CRATAEGUS CRUS-GALLI 'INERMIS'	INERMIS COCKSPUR HAWTHORN	2.5" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED, MIN. 4' CLEAR TRUNK
40	GLTRh	GLEDITSIA TRIACANTHOS INERMIS 'HARVEST TM'	NORTHERN ACCLAIM HONEYLOCUST	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
25	GYDI	GYMNOCLADUS DIOICUS	KENTUCKY COFFEE TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
15	JJUSC	JUNIPERUS SCOPULORUM	ROCKY MOUNTAIN JUNIPER	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
2	KOPA	KOELREUTERIA PANICULATA	GOLDEN RAIN TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
16	PIPI	PINUS EDULIS	PINION PINE	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
6	PIPO	PINUS PONDEROSA	PONDEROSA PINE	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
6	PRVI	PRUNUS VIRGINIANA	CHOCOECHERRY	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
74	QUMA	QUERCUS MACROCARPA	BURR OAK	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
20	QUMU	QUERCUS MUEHLENBERGII	CHINKAPIN OAK	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
4	QUSH	QUERCUS SHUMARDII	SHUMARD OAK	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
5	SOJA	SOPHORA JAPONICA	JAPANESE PAGODA TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED, 5' CLEAR TRUNK
12	TIAM	TILIA AMERICANA	BASSWOOD	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED

SHRUB & GROUND COVER PLANTING SCHEDULE				
Area	CODE	SCIENTIFIC NAME	COMMON NAME	COMMENTS
GRASS/FORB				
203653.55 SF	BUDA	BUCHLOE DACTYLOIDES	BUFFALOGRASS	SOD
17902.27 SF	SHORTGRASS PRAIRIE MIX	BUCHLOE DACTYLOIDES	BUFFALOGRASS	SOD
2454.80 SF	BUDA			
505317.28 SF	SHORTGRASS PRAIRIE MIX			<varies>
15855.74 SF	SHRUBS			



PLANTING
SCHEDULE

REVISION DATE:

ISSUE DATE: 09/10/2025

SHEET 22 OF 24

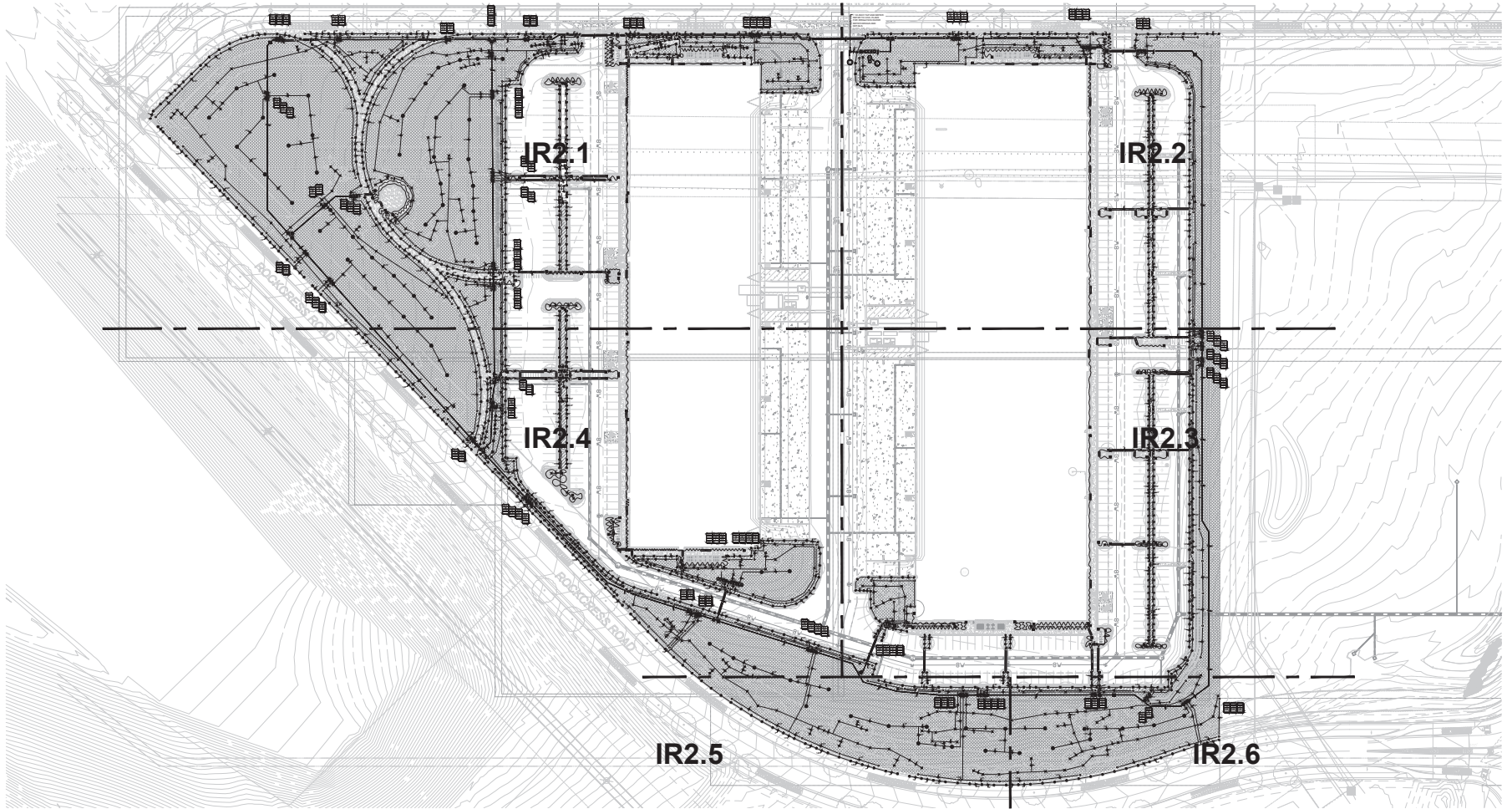
REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO. 1

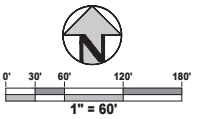
PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION
29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUD-00547-2025



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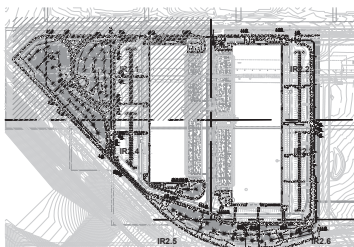
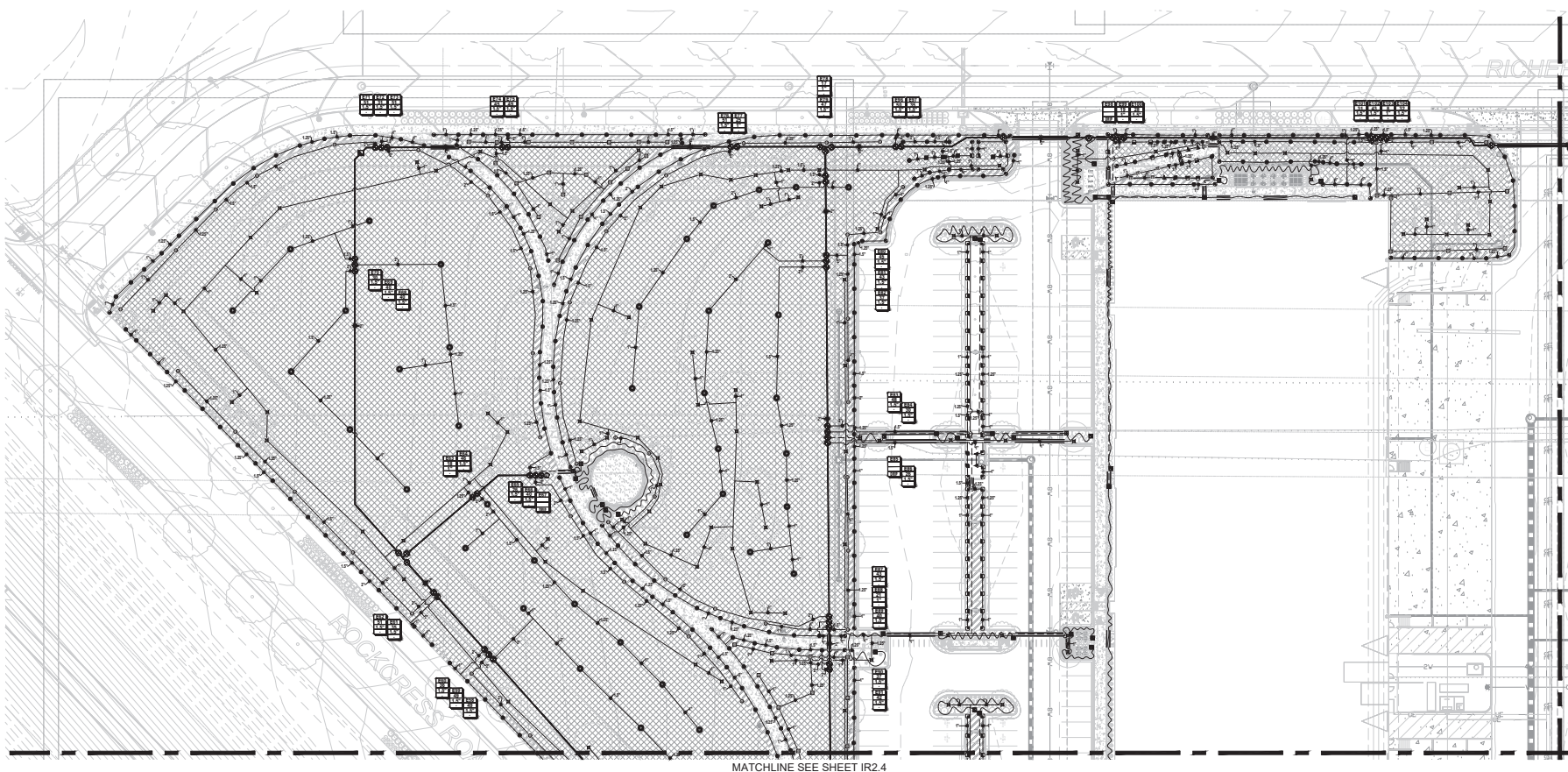
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ISSUE DATE: 11/26/2025

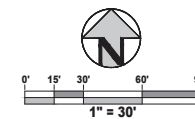
SHEET # OF ##

IRRIGATION PLAN OVERVIEW
REDTAIL RIDGE PUD1 SOUTH

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION
29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
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IRRIGATION PLAN IR2.1
1/26/2025 SHEET # OF ##
REDTAIL RIDGE PUD1 SO

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SHEET # OF ##

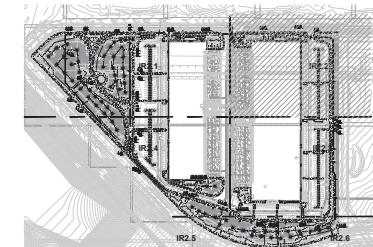
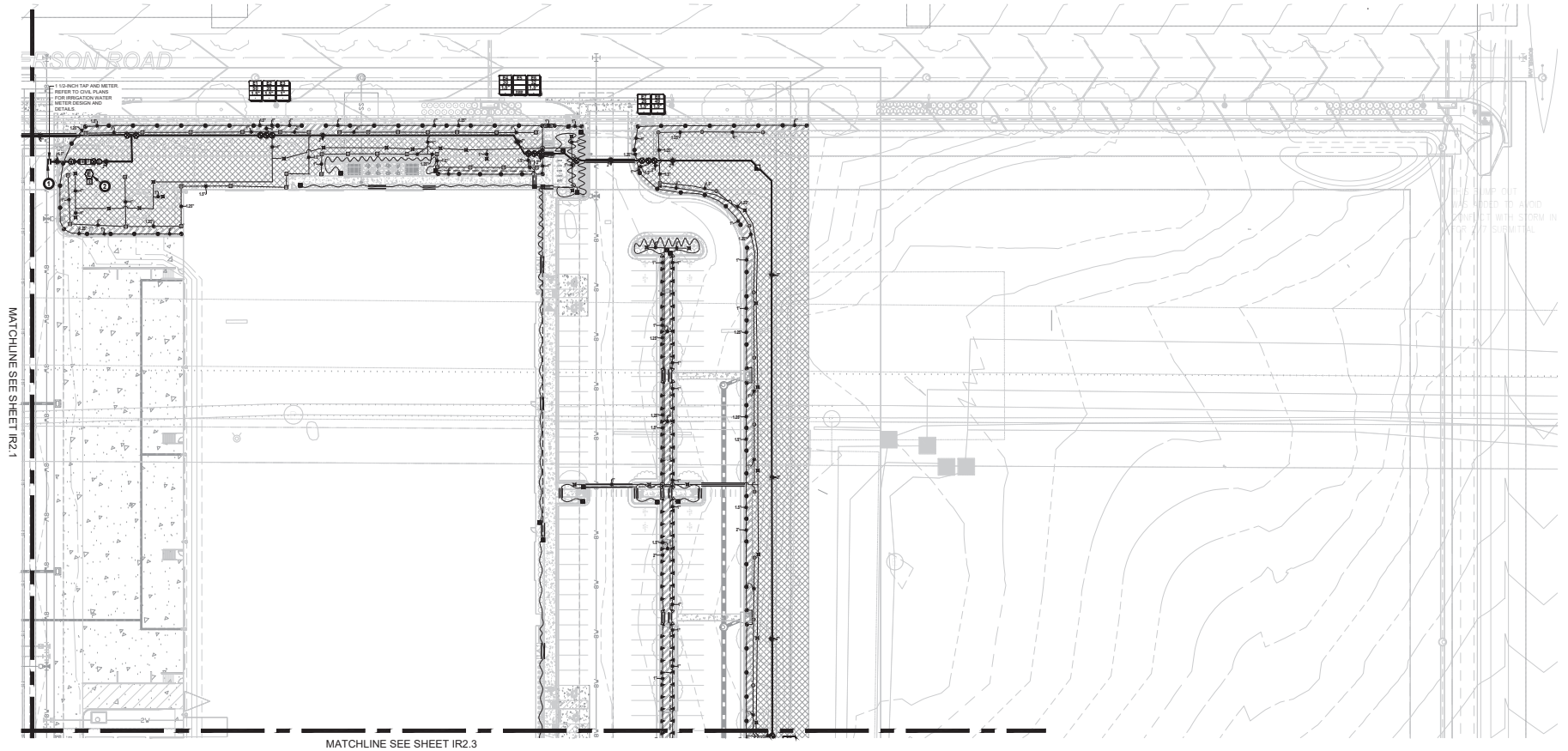
REDTAIL RIDGE PUD1 SOUTH

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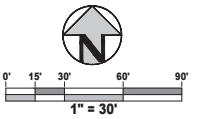
PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION
29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUD-00547-2025



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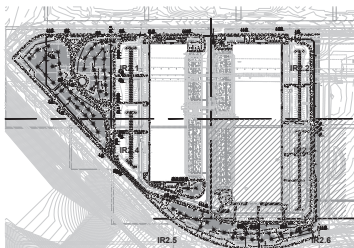
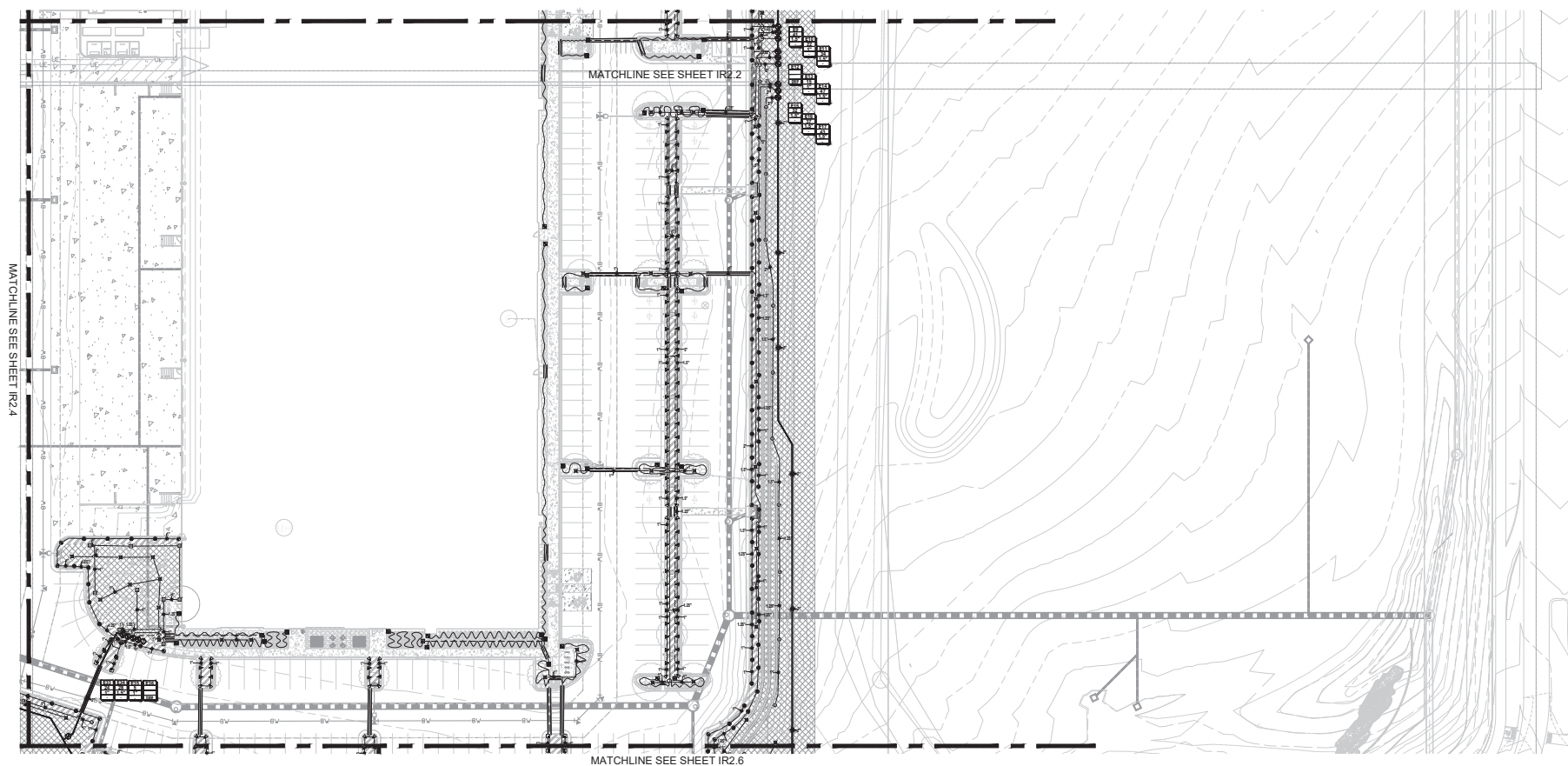
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ISSUE DATE: 11/26/2025

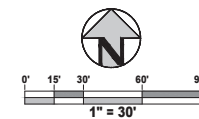
IRRIGATION PLAN IR2.2
SHEET # OF ##

REDTAIL RIDGE PUD1 SOUTH

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION
29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUD-00547-2025



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IRRIGATION PLAN IR2.3
1/26/2025 SHEET # OF ##
REDTAIL RIDGE PUD1 SO

REVISION DATE: #####

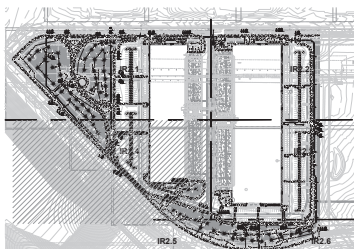
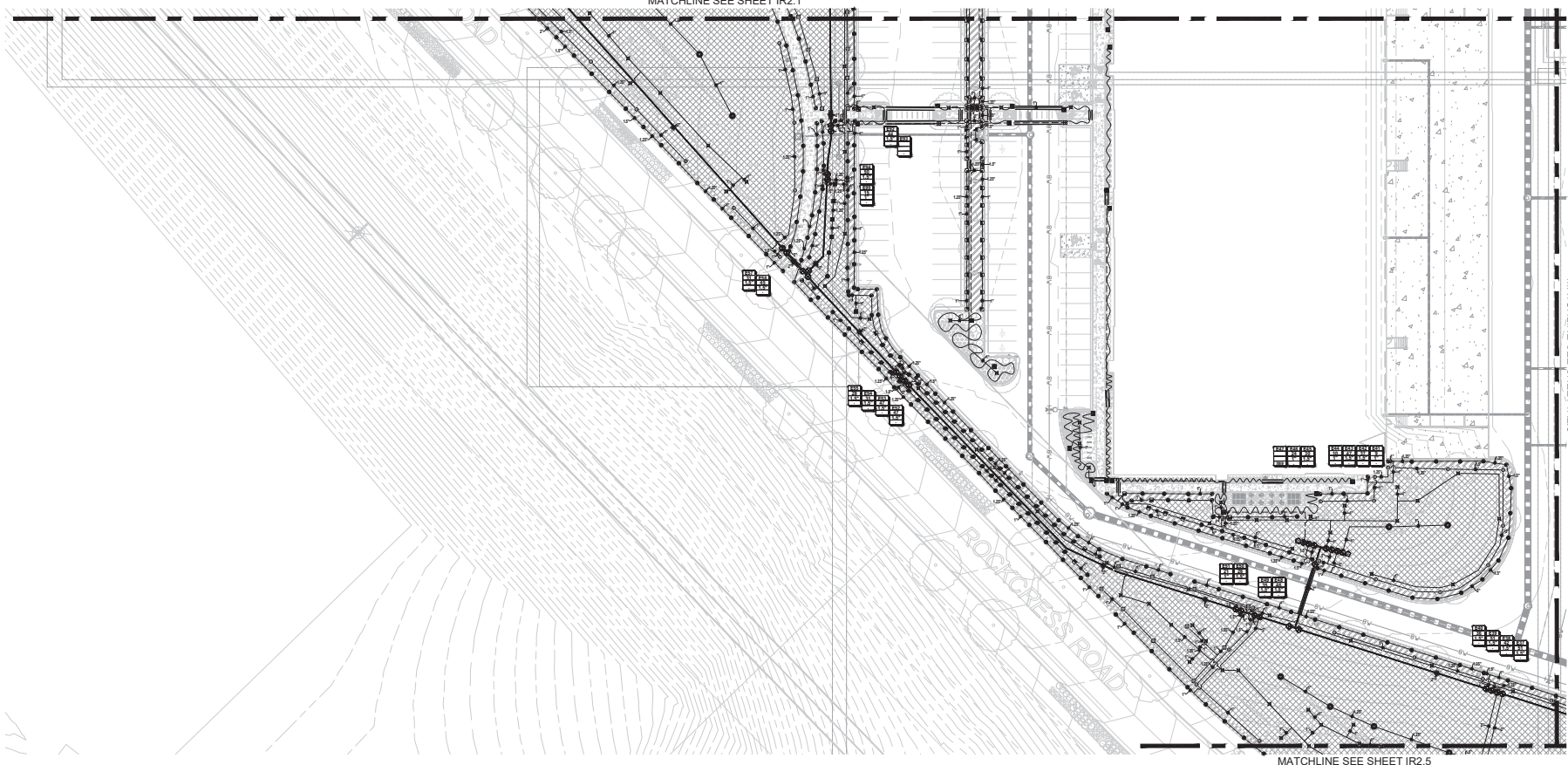
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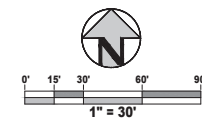
REDTAIL RIDGE PUD1 SOUTH

apathy: OHSREDTAL-ROGEBUD_1UPREDTAL_RIDGE.PUD_1.DWG Layout: R2.3
 Created: TUE 11/25/25 2:20:43P BY: Linda R Berger

MATCHLINE SEE SHEET IR2.1



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IRRIGATION PLAN IR2.4
1/26/2025 SHEET # OF ##

REDTAIL RIDGE PUD1 SOUTH

REVISION DATE: #####

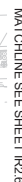
ISSUE DATE: 11/26/2025

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REDTAIL RIDGE PUD1 SOUTH

apathy: OHSREDTAL-ROG@PUD_1UP-REDTAL_RIDGE.PUD_1DWS Layout: R2.4
 Printed: TUE 11/25/25 2:30:20P BY: Leslie Berger

CASE #: PUD-00547-2025



IRRIGATION PLAN IR2.5
/26/2025 SHEET # OF ##
REDTAIL RIDGE PUD1 SO

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REDTAIL RIDGE PUD1 SOUTH

CASE #: PUD-00547-2025



REDTAIL RIDGE PUD1 SOUTH

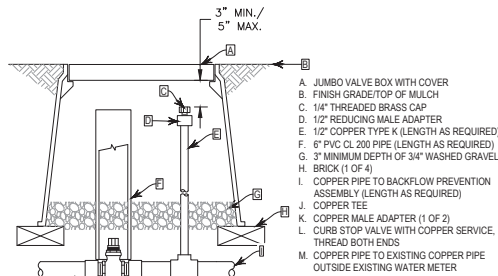
REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,

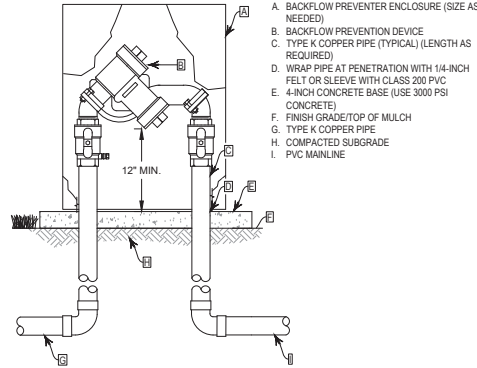
CASE #: PUD-00547-2025



- NOTE:
1. FURNISH NOMINAL PIPE AND FITTING SIZES IDENTICAL WITH NOMINAL TAP SIZE UNLESS OTHERWISE NOTED.
2. THIS ASSEMBLY IS INTENDED TO BE USED FOR WINTERIZATION OF BACKFLOW PREVENTION ASSEMBLY, FLOW SENSOR, HYDROMETER AND MASTER VALVE ONLY.

1 WINTERIZATION ASSEMBLY

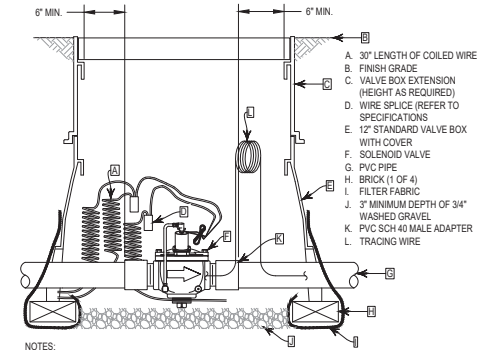
N.T.S.



- NOTE:
1. FURNISH FITTINGS AND PIPING SIZED IDENTICALLY WITH NOMINAL BACKFLOW PREVENTION DEVICE.

2 BACKFLOW PREVENTION ASSEMBLY

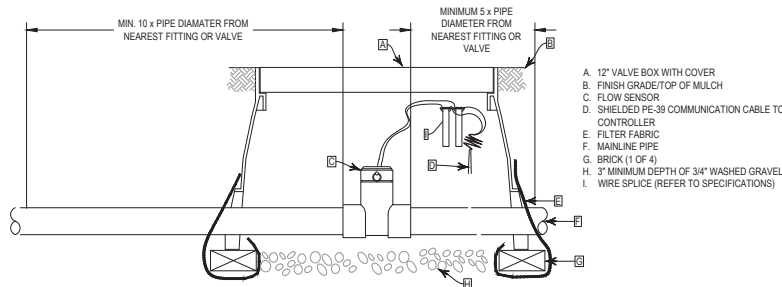
N.T.S.



- NOTES:
1. USE VALVE BOX EXTENSION AS NECESSARY TO ACHIEVE MINIMUM DIMENSIONS ABOVE ASSEMBLY.
2. NOMINAL SIZE OF ALL COMPONENTS ARE TO BE THE SAME NOMINAL SIZE AS THE SOLENOID VALVE (SIZED AS SHOWN).
3. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.
4. DO NOT CUT OUT ENDS OF VALVE BOX UNNECESSARILY.
5. POSITION VALVE BOX OVER VALVE TO ALLOW ACCESS TO SOLENOID.
6. INSTALL SO THAT GRAVEL IS ONLY IN CONTACT WITH BOTTOM OF VALVE ASSEMBLY.

3 MASTER VALVE ASSEMBLY

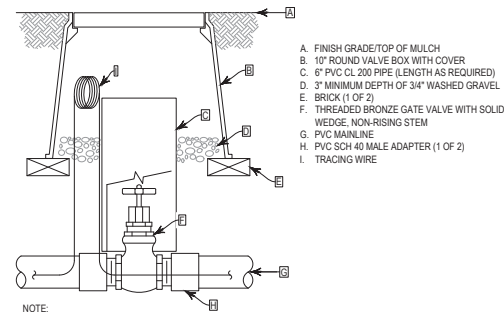
N.T.S.



- NOTES:
1. ALLOW 10 PIPE DIAMETERS UPSTREAM AND 5 PIPE DIAMETERS DOWNSTREAM OF STRAIGHT RUN OF PIPE TO ACHIEVE PROPER FLOW REGIME.
2. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.
3. DO NOT CUT OUT ENDS OF VALVE BOX UNNECESSARILY.
4. INSTALL SO THAT GRAVEL IS ONLY IN CONTACT WITH BOTTOM OF SENSOR ASSEMBLY.

4 FLOW SENSOR ASSEMBLY

N.T.S.



- NOTE:
1. NOMINAL SIZE OF GATE VALVE TO MATCH NOMINAL MAINLINE SIZE.

5 ISOLATION GATE VALVE ASSEMBLY

N.T.S.

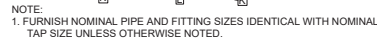


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IRRIGATION DETAILS

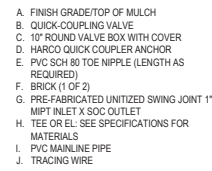
REVISION DATE: ##### ISSUE DATE: 11/26/2025 SHEET # OF ##

REDTAIL RIDGE PUD1 SOUTH

CASE #: PUD-00547-2025



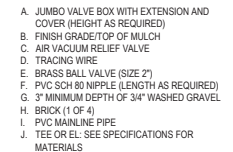
N.T.S.



NOTES:

1. FURNISH FITTINGS AND PIPING NOMINALLY SIZED IDENTICAL TO NOMINAL QUICK COUPLER VALVE INLET SIZE.
2. INSTALLATION HEIGHT OF QUICK COUPLER VALVE IN VALVE BOX MUST ASSURE PROPER OPERATION OF QUICK COUPLER KEY.
3. INSTALL SWING JOINT LAY ARM BETWEEN 30° AND 45° OF LATERAL PIPE IN ORDER TO ABSORB DOWNWARD IMPACT.

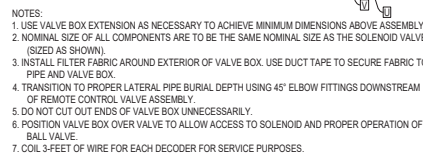
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NOTES:

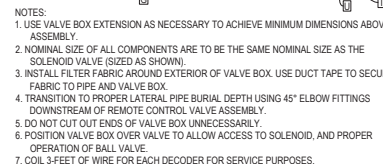
1. OPEN BALL VALVE IN ASSEMBLY 1/4 TURN UNTIL IRRIGATION SYSTEM IS FULLY CHARGED WITH WATER.
2. CLOSE VALVE DURING WINTERIZATION AND OPEN 1/2 TURN AFTER WINTERIZATION OF SYSTEM TO PROTECT VALVE DURING FREEZING WEATHER.

N.T.S.



- A. DECODER
- B. WIRE FROM DECODER TO VALVE SEE SPECIFICATIONS
- C. PVC BALL VALVE
- D. REMOTE CONTROL VALVE
- E. WIRE SPURCE FROM 20' WIRE CABLE TO DECODER (1' OF 2 REFER TO SPECIFICATIONS)
- F. CHRISTY ID TAG
- G. FINISH GRADE
- H. PVC SCH 80 CLOSE NIPPLE
- I. WIRE CONNECTOR FROM DECODER TO SOLENOID VALVE (1' OF 2)
- J. PVC SCH 80 NIPPLE
- K. 1/2" STANDARD VALVE BOX WITH COVER
- L. PVC LATERAL PIPE
- M. FILTER FABRIC
- N. PVC SCH 80 TE NIPPLE (LENGTH AS REQUIRED)
- O. PVC SCH 40 EL
- P. PVC SCH 40 PIPE (LENGTH AS REQUIRED)
- Q. BRICK (1' X 4")
- R. PVC MANLINE
- S. TWO WIRE CABLE
- T. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
- U. TEE OR EL. SEE SPECIFICATIONS FOR MATERIALS
- V. PVC SCH 80 TE NIPPLE (LENGTH AS REQUIRED)
- W. HIDE AND PVC SCH 40
- X. PVC SCH40 FEMALE ADAPTER

NTS



- A. DECODER
- B. WIRE CONNECTOR FROM TWO-WIRE CABLE TO DECODER (1 OF 2)
- C. WIRE END DECODER TO VALVE SEE SPECIFICATIONS
- D. FINISH GRADE/TOP OF MULCH
- E. JUMBO VALVE BOX WITH COVER
- F. WIRE FROM DECK DECODER TO SOLENOID VALVE (1 OF 2; REFER TO SPECIFICATIONS)
- G. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
- H. PVC BALL VALVE
- I. CHRISTY LTD. T45
- J. FILTRATION AND PRESSURE REGULATING DEVICE
- K. REMOTE CONTROL VALVE
- L. PVC SCH 80 TEE NIPPLE
- M. PVC SCH 40 EL
- N. PVC SCH 80 PIPE (TYPICAL) (LENGTH AS REQUIRED)
- O. PVC SCH 40 FEMALE ADAPTER
- P. FILTER FABRIC
- Q. BRICK (1 OF 4)
- R. PVC MANLINE
- S. TWO-WIRE CABLE
- T. TEE OR EL- SEE SPECIFICATIONS FOR MATERIALS
- U. PVC SCH 80 TEE NIPPLE (LENGTH AS REQUIRED)
- V. HDPE 4" AND PVC SCH 40 EL
- W. PVC SCH 80 NIPPLE (1 OF 2)

N.T.

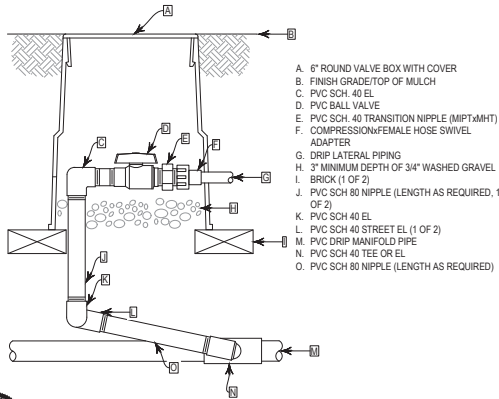
REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

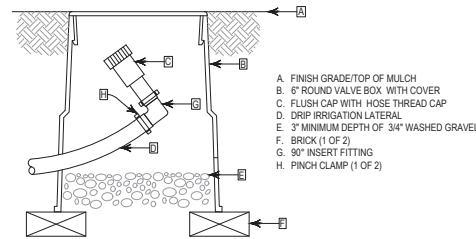
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,

CASE #: PUD-00547-2025



1 ZONE CONTROL VALVE ASSEMBLY

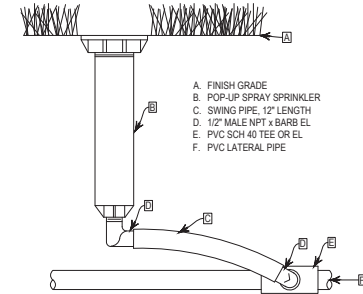
N.T.S.



NOTE:
1. INSTALL FLUSH CAP ASSEMBLY AT THE END OF EACH DRIP LATERAL SEGMENT.

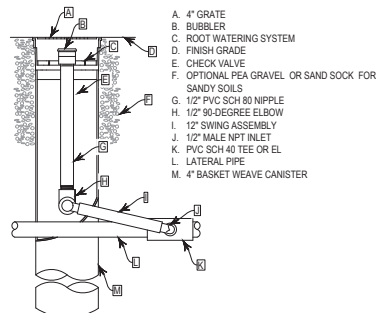
2 FLUSH CAP ASSEMBLY

N.T.S.



3 POP-UP SPRAY SPRINKLER ASSEMBLY

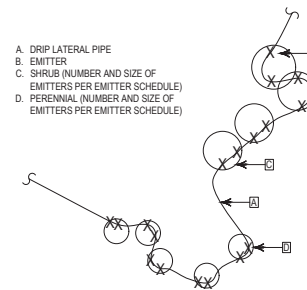
N.T.S.



NOTE:
1. INSTALL ASSEMBLY ON OUTER BOUNDARY OF PLANT (IE. TREE OR SHRUB) ROOT BALL.

4 TREE ROOT WATERING SYSTEM DETAIL

N.T.S.



5 EMITTER PLACEMENT DETAIL

N.T.S.

EMITTER SCHEDULE

PLANT TYPE	EMITTERS PER PLANT	GPH PER OUTLET	TOTAL GPH PER PLANT
5 GAL. LOW SHRUBS	2 SINGLE	1 GPH	2 GPH
1 GAL. LOW SHRUBS	2 SINGLE	1/2 GPH	1 GPH
1 GAL. LOW GROUND COVER/PERENNIAL	2 SINGLE	1/2 GPH	1 GPH
5 GAL. MEDIUM SHRUBS	2 SINGLE	2 GPH	4 GPH
1 GAL. MEDIUM SHRUBS	2 SINGLE	1 GPH	2 GPH
1 GAL. MEDIUM GROUND COVER/PERENNIAL	2 SINGLE	1 GPH	2 GPH

NOTE:
1. ALL EMISSION POINTS TO BE LOCATED ON THE UPHILL SIDE OF PLANT MATERIAL.
2. PLACE EMITTERS AT A LOCATION TO NOT SATURATE PLANT ROOTS. LOCATE EMITTERS JUST OFF THE EDGE OF THE ROOT BALL.
3. REVIEW PLANT MATERIAL HEALTH 1 MONTH AFTER INSTALLATION AND ADJUST EMITTER SIZE AND QUANTITY PER CITY FORESTRY DIRECTION.



90% PRELIMINARY DESIGN
NOT FOR CONSTRUCTION
IRRIGATION DETAILS

REVISION DATE: ##### ISSUE DATE: 11/26/2025 SHEET # OF ##

REDTAIL RIDGE PUD1 SOUTH

CASE #: PUD-00547-2025



SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION
29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUD-00547-2025



1 TRENCHING DETAIL

NTS



2 SLEEVING DETAIL

NTS

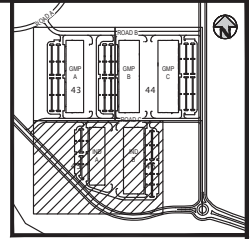
REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

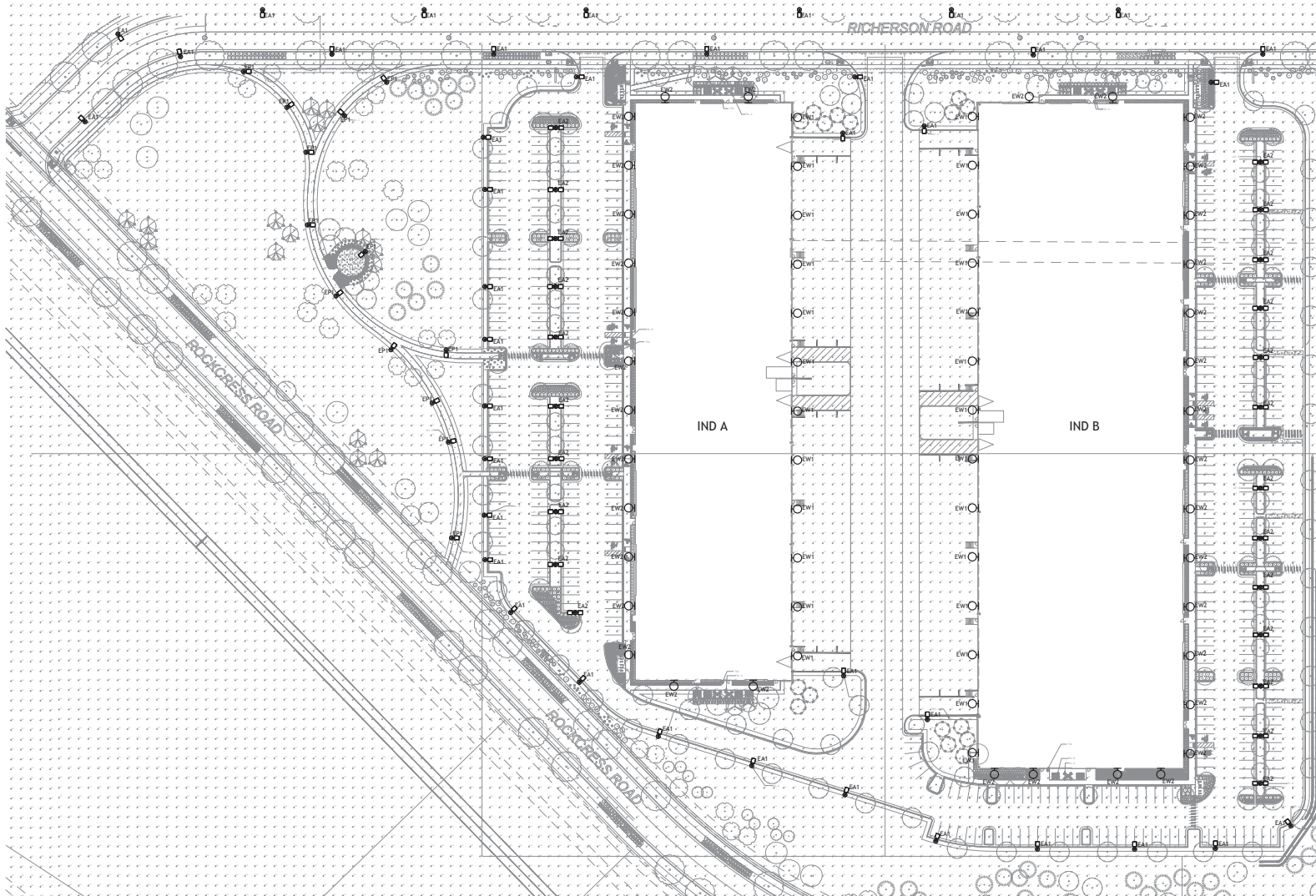
LOT 1 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

AEDESIGN
Integrated Lighting and Electrical Solutions
1900 W. 19th Street, Suite 100, Denver, CO 80202 | 303.296.3034
aedesigninc.com | Project # 174777-00



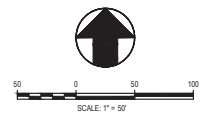
KEY MAP
SCALE: 1" = 60'



- GENERAL NOTES**
- ALL SITE LIGHTING RELATED TO WORK AND MATERIALS SHALL COMPLY WITH CITY, COUNTY AND OTHER APPLICABLE GOVERNING AUTHORITY REQUIREMENTS.
 - PER LOUISVILLE MUNICIPAL CODE ALL STREET LIGHTS SHALL NOT EXCEED 20'-0" TOTAL POLE HEIGHT.
 - ALL BUILDING-MOUNTED AND POLE-MOUNTED LIGHTING SHALL BE DIRECTED DOWNWARD AND IS FULL CUTOFF. ALL LIGHT SOURCES SHALL BE FULLY SHIELDED SO THE LIGHT SOURCE IS NOT VISIBLE FROM ADJACENT PROPERTIES AND PUBLIC RIGHTS-OF-WAY AND TO PREVENT GLARE. ALL LIGHT FIXTURES ARE DARK SKY COMPLIANT AND MEET LED EULAS RATING REQUIREMENT AS DEFINED IN IES TM-5-11 OF NO MORE THAN 85-90-60.
 - REFER TO LIGHTING FIXTURE SCHEDULE FOR ADDITIONAL LIGHTING FIXTURE MOUNTING HEIGHTS AND OVERALL FIXTURE HEIGHTS.
 - PER IES HANDBOOK STREET LIGHTING DESIGN CRITERIA THIS SITE IS CONSIDERED A LOCAL STREET WITH LOW PEDESTRIAN ACTIVITY.
 - IN LOCAL LOW ACTIVITY THE LIGHTING SHALL PROVIDE AT LEAST A 0.3 FC AVG LUMINANCE PER THE IES HANDBOOK FOR STREET LIGHTING.
 - PER LOUISVILLE MUNICIPAL CODE PARKING LOTS SHALL HAVE A MAX LIGHT LEVEL OF 45 FOOT-CANDELES.
 - PER LOUISVILLE MUNICIPAL CODE PEDESTRIAN WALKWAYS SHALL HAVE A MAX LIGHT LEVEL OF 3.0 FOOT-CANDELES.
 - PER LOUISVILLE MUNICIPAL CODE DRIVES SHALL HAVE A MAX LIGHT LEVEL OF 3 FOOT-CANDELES.

- LIGHTING FIXTURES**
- HALL MOUNTED LUMINAIRE
 - EXTERIOR AREA LIGHT

Description	Symbol	Avg	Max	Min	MaxMin	AvgMin
HALL MOUNTED LUMINAIRE	⊙	1.75	34.25	0.00	0.00	0.00
EXTERIOR AREA LIGHT	⊙	1.18	1.75	0.00	0.00	0.00
EXTERIOR AREA LIGHT	⊙	1.18	1.75	0.00	0.00	0.00
EXTERIOR AREA LIGHT	⊙	1.18	1.75	0.00	0.00	0.00



1 | PHOTOMETRIC PLAN - SOUTHWEST
SCALE: 1" = 50'-0"

REVISION DATE: 11/25/2025 ISSUE DATE: 03/14/2025

PHOTOMETRIC PLAN
SHEET 23 OF 24
REDTAIL RIDGE PUD1 SOUTH

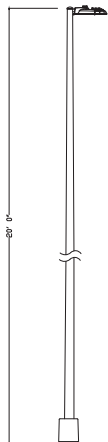
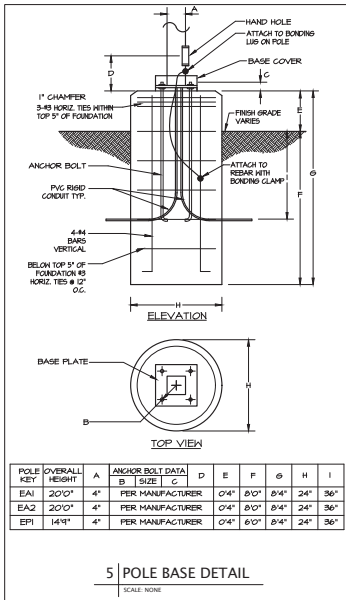
REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

AE DESIGN
Integrated Lighting and Electrical Solutions
1900 W. 10th Street, Suite 100 | Denver, CO 80202 | 303.296.3034
www.aedesign.com | Project: 19-007-00



LIGHTING FIXTURE SCHEDULE													
TYPE	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	VOLTAGE	LAMP (WATT)	SOURCE TYPE	CCT (CRI)	MAX WATTS	LUMEN OUTPUT	ESNA CUTOFF	BUG RATING	FIXTURE FINISH	MOUNTING INFORMATION
EA1	20'-0" LED DOUBLE HEAD POLE TOP TYPE II DISTRIBUTION	EXO	ASL1-80L-39-SK7-3-UNV-A	277	2	76	LED	3000K	76	9000	FULL CUTOFF	BLACK	EXTERIOR POLE 20'-0" AFF
EA2	20'-0" LED SINGLE HEAD POLE TOP TYPE II DISTRIBUTION	EXO	ASL1-80L-25-SK7-3-UNV-A	277	1	38	LED	3000K	38	4500	FULL CUTOFF	BLACK	EXTERIOR POLE 20'-0" AFF
EP1	20'-0" LED SINGLE HEAD POLE TOP TYPE II DISTRIBUTION AT PEDESTRIAN LEVEL POLE HEIGHT	EXO	ASL1-80L-25-SK7-3-UNV-A	277	1	38	LED	3000K	38	4500	FULL CUTOFF	BLACK	EXTERIOR WALL 14'-7.5" AFF
EW1	WALL MOUNTED AREA LED WITH ASYMMETRIC FLAT BEAM LIGHT DISTRIBUTION	ILP	VWM-14L-U-30-T4	277	1	100	LED	3000K	100	14000	FULL CUTOFF	BLACK	EXTERIOR WALL 20'-0" AFF
EW2	WALL MOUNTED AREA LED WITH ASYMMETRIC FLAT BEAM LIGHT DISTRIBUTION	ILP	VWM-8L-U-30-T3	277	1	40	LED	3000K	40	5000	FULL CUTOFF	BLACK	EXTERIOR WALL 14'-7.5" AFF

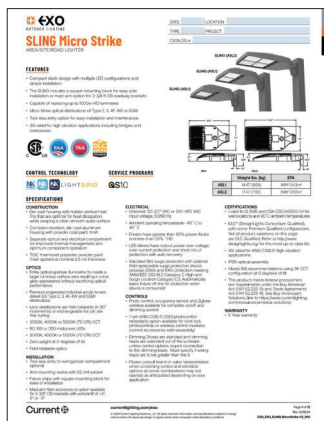
ABBREVIATIONS: BOP - BOTTOM OF FIXTURE, RFD - RECESSED FIXTURE DEPTH, OFH - OVERALL FIXTURE HEIGHT, AFF (AFG) - ABOVE FINISHED FLOOR (GRADE), WFD - WALL FIXTURE DEPTH

GENERAL NOTES:

- A. ALL LED LAMPS AND/OR FIXTURES SHALL BE 3000K COLOR TEMPERATURE AND A MINIMUM OF 82CRI UON.
- B. ALL REFLECTOR LAMPS SHALL BE PROVIDED AS WIDE FLOOD DISTRIBUTION, UON.
- C. PROVIDE LUMINAIRES SHOWN AS SHARED WITH FACTORY INSTALLED 90 MINUTE EMERGENCY BATTERY OR OTHER REMOTE POWER SOURCE, UON. EMERGENCY LUMINAIRES SHALL SENSE UN-SWITCHED POWER TO THE SPACE AND OPERATE AUTOMATICALLY UPON LOSS OF NORMAL POWER. ALL EMERGENCY LUMINAIRES SHALL HAVE AN INTEGRAL TEST SWITCH AND VISIBLE INDICATOR LIGHT. CONNECT THE EMERGENCY BATTERY TO THE UN-SWITCHED LEG OF THE LIGHTING CIRCUIT INDICATED.
- D. LUMENS LISTED ARE DELIVERED LUMENS, NOT INITIAL.
- E. FOR ALL SPECIFIED LUMINAIRES, THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL MOUNTING HARDWARE, ACCESSORIES, COMPONENTS, LEADER/JUMPER CABLES, WIRE FEED, CONNECTORS, END CAPS, REMOTE POWER SUPPLIES, AND ANY OTHER NECESSARY COMPONENT AS REQUIRED FOR INSTALLING A SECURE AND FULLY FUNCTIONAL SYSTEM.
- F. THE CONTRACTOR SHALL VERIFY THE CEILING TYPE BEFORE ORDERING LIGHT FIXTURES TO ENSURE COMPATIBILITY WITH SPECIFIED FIXTURES. NOTIFY SPECIFIER OF ANY DISCREPANCIES.
- G. ALL FINISH SELECTIONS SHALL BE VERIFIED BY ARCHITECT/INTERIOR DESIGNER/OWNER AS PART OF THE SUBMITTAL PROCESS. UNLESS OTHERWISE NOTED, EC SHALL ASSUME STANDARD LUMINAIRE FINISH OPTION FOR FINISH.
- H. EC SHALL VERIFY ALL FIXTURE MOUNTING HEIGHTS WITH ARCHITECTURAL ELEVATIONS PRIOR TO ANY ROUGH-IN.
- I. TYPE FOR ALL LIGHT FIXTURES WITH DESIGNATION STARTING WITH "M" FIXTURES ARE SHOWN FOR REFERENCE ONLY. FIXTURE SELECTIONS AND SPECIFICATIONS SHALL BE PROVIDED BY THE ARCHITECT AND/OR INTERIOR DESIGNER. EC SHALL COORDINATE EXACT MOUNTING LOCATION, MOUNTING HEIGHT, WATTAGE, AND DIMMING PROTOCOL WITH ARCHITECT / INTERIOR DESIGNER, LIGHTING CONSULTANT, AND/OR ELECTRICAL ENGINEER PRIOR TO INSTALL.
- J. REMOTE DRIVER(S)/TRANSFORMER(S) SHALL BE LOCATED IN A CONCEALED, ACCESSIBLE, AND VENTILATED LOCATION AS PROPOSED BY THE EC AND APPROVED BY THE ARCHITECT. REFER TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR MINIMUM REQUIRED CLEARANCES FROM ADJACENT MATERIALS, AND WIRING REQUIREMENTS TO PREVENT VOLTAGE DROP. DO NOT EXCEED MANUFACTURER'S RECOMMENDATIONS REGARDING WIRE GAGE AND MAXIMUM WIRE RUN LENGTHS.
- K. FOR LUMINAIRES SPECIFIED WITH 0-10V DIMMING, 0-10V DIMMING DRIVERS) REQUIRE ADDITIONAL LOW VOLTAGE CONTROL WIRES IN ADDITION TO STANDARD WIRING FOR POWER.
- L. EXTERIOR LUMINAIRES SHALL BE COLD WEATHER RATED FOR 0 DEG F - 18 DEG C, AND RATED FOR OUTDOOR USE.

SPECIFIC NOTES:

- 1.





Drainage Report: Redtail Ridge PUD 1 South

Address:

Lot 1 Block 1, Redtail Ridge Filing No. 1
Louisville, CO 80020

Prepared:

November 25, 2025

Prepared for:

Sterling Bay
5910 Pacific Center Blvd,
Suite 200,
San Diego, CA 92121
858.736.7114

Prepared by:

Jarrett Grant, PE
Harris Kocher Smith
303.623.6300

Harris Kocher Smith Project No. 221236
City of Louisville No. PUD-00547-2025

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I. CERTIFICATION STATEMENT

I hereby certify that this report [plan] for the preliminary drainage design of Redtail Ridge PUD1 South was prepared by me (or under my direct supervision) in accordance with the provisions of City of Louisville Storm Drainage Design and Technical Criteria for the owners thereof.

By: Jarrett C. Grant, P.E.

Licensed Professional Engineer

State of Colorado

No. 59839

On behalf of Harris Kocher Smith

II. GENERAL LOCATION AND DESCRIPTION

A. Site Location

Redtail Ridge PUD 1 South (Site) is located in the City of Louisville, County of Boulder, State of Colorado. The Site is located in Section 29, Township 1 South, Range 69 West. PUD 1 is part of the Redtail Ridge Master Drainage Plan, included in Appendix D, and includes lots 1 and 2 of block 1, Redtail Ridge Filing No. 1. PUD 1 has been split into “PUD 1 South” and “PUD 1 North”, PUD 1 South lies within lot 1 block 1 and in Basin B-2 of the Redtail Ridge Master Drainage Plan. A portion of PUD 1 North (within lot 2 block 1) is included in the calculations and conformance letter due to its connection to the proposed storm system in PUD 1 South. The PUD 1 North conformance letter will need to confirm against this letter.

B. Site Description

The sub-basins for PUD 1 South (18.93 acres) and PUD1 North (8.41 acres) included in this letter total 27.34 acres, all 27.34 acres are included in the drainage analyses of Basins B-1 and B-2 apart of the Master Drainage Plan. The Site will be overlotted graded with the master development of the Redtail Ridge. The groundcover currently consists of grass, some trees, roadway, and building pads which will all be removed during the master development grading. The soils on Site are Hydrologic Soil Group Type C and D. There are no existing major drainage channels on site. The Site generally flows from the east to the southwest and has a total fall of 48.85' at an average slope of 3.2%.

III. HISTORIC DRAINAGE

A. Major Basin Description

Basin B-2 in the Redtail Ridge Master Drainage Plan is 30.37 acres, which includes all of PUD1 South, south of Road C and the portion of PUD1 North south of Road C. Per the Redtail Ridge Master Drainage Plan, Basin B-2 is proposed to have a watershed imperviousness of 85.00%. Flows from Basin B-2 will be conveyed southeast by on-site stormwater infrastructure to Pond C-2 (see Pond C-2 location on Master Drainage Plan in Appendix F).

B. Sub-Basin Description

Please see the attached exhibit which shows the basin delineation between the Master Drainage Plan and PUD 1 South (see Appendix D). In the overlotted grading condition, runoff from PUD 1 South is collected by storm infrastructure within adjacent roadways and then conveyed in storm mains surrounding the site, which discharge to a regional water quality and detention pond C-2 as is described in the Master Drainage Plan. B-2 is anticipated to have a 2-year storm runoff of 33.22 CFS, a 10-year storm runoff rate of 59.73 CFS, and a 100-year storm runoff rate of 123.28 CFS.

IV. DRAINAGE DESIGN CRITERIA

A. Regulations

The Site will comply with the City's and Mile High Flood District's requirements. The Site will comply with current City and MHFD criteria, including runoff reduction, water quality capture volume, stabilizing drainageways and source control BMPs, as applicable. The Site will also comply with the Louisville OSP as it relates to the extents of the Site.

B. Development Criteria Reference and Constraints

The development of the Site follows the design that was outlined in the Redtail Ridge Final Master Drainage Report. The existing basins, as detailed in the Redtail Ridge Final Master Drainage Report, encompass the entirety of the Site and represent the previous drainage study the Site will be conforming to. The Master Drainage Report accounted for development of this Site by an assumed imperviousness percentage. The Master Drainage Report ensures conveyance, water quality treatment, and detention capacity for flows from the proposed Site. See Appendix D for the Master Drainage Plans.

C. Hydrological Criteria

All hydrological design criteria for the Site aligns with the Master Drainage Report. The design rainfall data is from the NOAA Atlas 14, Volume 8, Version 2. The 5-year storm and the 100-year storm 1-hour rainfall are 1.08 inches and 2.49 inches respectively. The minor storm is the 5-year storm and the major storm is the 100-year storm. Runoff rates for the Site were calculated using the rational method. The Site is not proposing any detention or water quality treatment ponds; volumes and discharge rates of the detention and water quality ponds have been outlined in the Redtail Ridge Final Master Drainage Report.

D. Hydraulic Criteria

All hydraulic design criteria for the Site aligns with the Master Drainage Report. Storm sewer pipes and inlets were sized for the 100-year storm. Pipes were sized for the 100-year storm by utilizing StormCAD and ensuring that flows will be at least 1-foot below grade. The detention and water quality outlet has been designed by the Master Drainage Report.

V. DRAINAGE FACILITY DESIGN

A. General Concept

The Site generally flows to inlets onsite that will be conveyed to the east where they will discharge into the south flowing storm sewer adjacent to Sorrel Ave. Flows will then be routed west in Rockcross Drive where they will then outfall into Pond C-2 of the Redtail Ridge master drainage report. There are not anticipated to be offsite flows onto the Site. Hydrological plans and calculations can be found in Appendix B. Hydraulic plans and calculations can be found in Appendix C.

B. Specific Details

Please see the attached exhibit which shows the basin delineation between the Master Drainage Plan and PUD 1 South (see Appendix B). Runoff from PUD 1 South is collected on-site by private storm infrastructure and then conveyed to storm mains in the roadways surrounding the site, which discharge to a regional water quality and detention pond. PUD 1 South development is compliant with the current submitted Master Drainage Report. PUD 1 South will not contribute any additional runoff that has not been accounted for to the existing off-site water quality and detention facilities. The basins analyzed in this conformance letter have a total effective imperviousness of 46.11%. Basin B-2 has an effective watershed imperviousness of 65.70%, Basin B-1 has an effective watershed imperviousness of 13.85% and are both in compliance with the Master Drainage Report (Refer to Summary tables below).

PUD1 South (Pond C-2)

Basin O (0.25 acres, 15.97% impervious) consists of landscaping. The peak runoff from basin O is 0.07 cfs for the minor storm event and 0.43 cfs for the major storm event. Basin O will drain to landscape drains

where it will be conveyed by storm sewer where it will be routed to Pond C-2 in the Master Drainage Report.

Basin P (0.31 acres, 12.84% impervious) consists of landscaping. The peak runoff from basin P is 0.06 cfs for the minor storm event and 0.48 cfs for the major storm event. Basin P will drain overland to Road C where it will be conveyed by curb and gutter into a Type R storm inlet located at the south half of Road C and be routed to Pond C-2 in the Master Drainage Report.

Basin Q (2.17 acres, 90.00% impervious) consists of roofs. The peak runoff from basin Q is 5.05 cfs for the minor storm event and 12.57 cfs for the major storm event. Basin Q will drain via downspouts to an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin R (3.28 acres, 90.00% impervious) consists of roofs. The peak runoff from basin R is 7.63 cfs for the minor storm event and 18.99 cfs for the major storm event. Basin R will drain via downspouts to an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S1 (1.24 acres, 8.99% impervious) consists of landscaping and walks. The peak runoff from basin S1 is 0.12 cfs for the minor storm event and 1.26 cfs for the major storm event. Basin S1 will drain to landscape drains and a Type C inlet where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S2 (0.97 acres, 77.72% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin S2 is 1.86 cfs for the minor storm event and 4.93 cfs for the major storm event. Basin S2 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S3 (0.90 acres, 77.25% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin S3 is 1.72 cfs for the minor storm event and 4.56 cfs for the major storm event. Basin S3 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S4 (1.84 acres, 3.48% impervious) consists of landscaping and walks. The peak runoff from basin S4 is 0.06 cfs for the minor storm event and 1.48 cfs for the major storm event. Basin S4 will drain to landscape drains and a Type C inlet where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T1 (0.71 acres, 90.00% impervious) consists of drives and loading areas. The peak runoff from basin T1 is 1.63 cfs for the minor storm event and 4.06 cfs for the major storm event. Basin T1 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T2 (0.44 acres, 87.52% impervious) consists of drives and loading areas. The peak runoff from basin T2 is 1.02 cfs for the minor storm event and 2.58 cfs for the major storm event. Basin T2 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T3 (0.44 acres, 76.38% impervious) consists of drives and loading areas. The peak runoff from basin T3 is 0.83 cfs for the minor storm event and 2.21 cfs for the major storm event. Basin T3 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T4 (0.44 acres, 90.00% impervious) consists of drives and loading areas. The peak runoff from basin T4 is 1.14 cfs for the minor storm event and 2.85 cfs for the major storm event. Basin T4 will drain to inlets

within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T5 (0.80 acres, 73.31% impervious) consists of drives and loading areas. The peak runoff from basin T5 is 1.49 cfs for the minor storm event and 4.05 cfs for the major storm event. Basin T5 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U1 (0.52 acres, 80.63% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U1 is 1.02 cfs for the minor storm event and 2.66 cfs for the major storm event. Basin U1 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U2 (0.55 acres, 80.77% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U2 is 1.12 cfs for the minor storm event and 2.93 cfs for the major storm event. Basin U2 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U3 (0.30 acres, 78.28% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U3 is 0.61 cfs for the minor storm event and 1.61 cfs for the major storm event. Basin U3 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U4 (0.59 acres, 79.52% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U4 is 1.23 cfs for the minor storm event and 3.23 cfs for the major storm event. Basin U4 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V1 (1.59 acres, 7.38% impervious) consists of landscaping and walks. The peak runoff from basin V1 is 0.13 cfs for the minor storm event and 1.58 cfs for the major storm event. Basin V1 will drain to a Type C inlet where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V2 (1.07 acres, 18.86% impervious) consists of landscaping and walks. The peak runoff from basin V2 is 0.27 cfs for the minor storm event and 1.56 cfs for the major storm event. Basin V2 will drain to a Type C inlet where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V3 (2.03 acres, 12.95% impervious) consists of landscaping and walks. The peak runoff from basin V3 is 0.32 cfs for the minor storm event and 2.47 cfs for the major storm event. Basin V3 will drain to a Type C inlet where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V4 (0.10 acres, 2.00% impervious) consists of landscaping and walks. The peak runoff from basin V4 is 0.002 cfs for the minor storm event and 0.08 cfs for the major storm event. Basin V4 will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V5 (2.73 acres, 18.17% impervious) consists of landscaping and walks. The peak runoff from basin V5 is 0.67 cfs for the minor storm event and 3.98 cfs for the major storm event. Basin V5 will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V6 (0.90 acres, 9.58% impervious) consists of landscaping and walks. The peak runoff from basin V6 is 0.11 cfs for the minor storm event and 1.07 cfs for the major storm event. Basin V6 will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin W1 (1.07 acres, 67.69% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin W1 is 1.36 cfs for the minor storm event and 3.83 cfs for the major storm event. Basin

W1 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin W2 (0.19 acres, 78.42% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin W2 is 0.41 cfs for the minor storm event and 1.09 cfs for the major storm event. Basin W2 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin X (1.93 acres, 3.25% impervious) consists of landscaping. The peak runoff from basin X is 0.06 cfs for the minor storm event and 1.77 cfs for the major storm event. Basin X will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

VI. CONCLUSIONS

A. Compliance with Standards

Design of the Site complies with all applicable design standards including but not limited to the Storm Drainage Design and Technical Criteria Manual, the Basinwide Major Drainageway Planning Study, the Lafayette-Louisville Boundary Outfall System Plan, the City of Louisville Subdivision Regulations, the Urban Storm Drainage Criteria Manual, and the Redtail Ridge Master Drainage Report. The intent of this Drainage Report is to act as a drainage report in compliance with the Final Master Drainage Report.

B. Drainage Concept

All stormwater runoff from PUD 1 South will be conveyed by the storm sewer system proposed in the Redtail Ridge Master Drainage plan and is in conformance with the City of Louisville Wastewater standards and Mile High Flood District criteria. All flows from the site will be routed to Pond C-2 of the Redtail Master Drainage Report which has been designed to detain and release flows in the rates required by the City of Louisville and the MHFD. Sterling Bay - West will be responsible for maintaining the storm infrastructure that is part of PUD 1 South.

VII. LIST OF REFERENCES

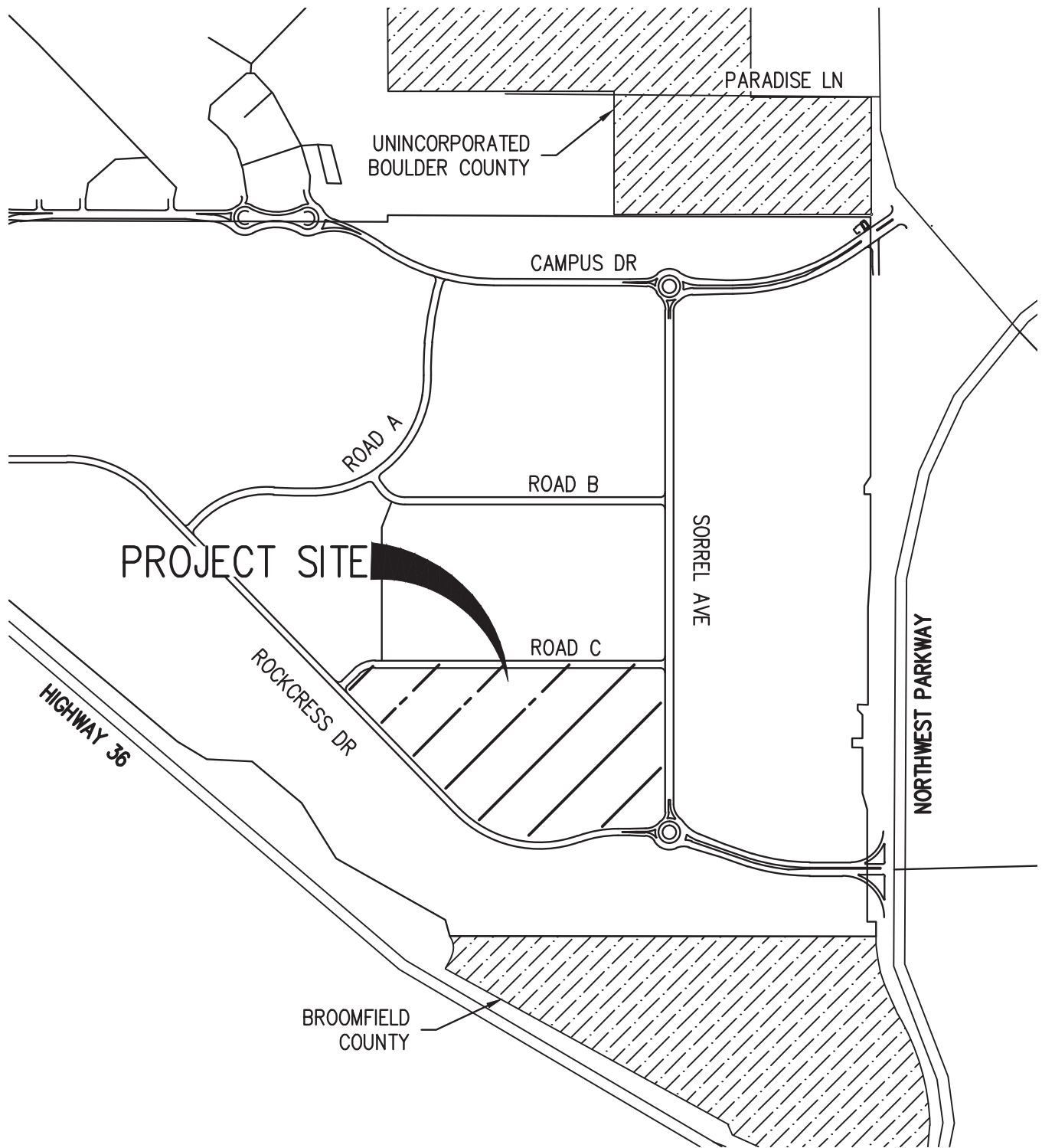
References

1. Urban Storm Drainage Criteria Manual, Vol. 1, 2 and 3, January, 2016, Urban Drainage and Flood Control District.
2. Storm Drainage Design & Technical Criteria Manual, City of Louisville, August 2013
3. Redtail Ridge Final Master Drainage Report, July, 2024, Harris Kocher Smith
4. Phase I Environmental Site Assessment Former Conoco Philips Site, February 2019, CTL|Thompson

VIII. APPENDICES

APPENDIX A – VICINITY MAP, FIRM MAP, AND NRCS SOILS REPORT

Plotted: FRI 03/07/25 12:07:09P By: Owen Van Lehman Filepath: p:\2022\221236\engineering\drainage\vicinity map-south.dwg Layout: layout1

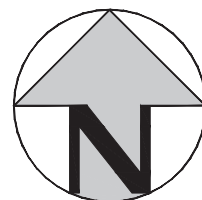


REDTAIL RIDGE - PUD 1 SOUTH VICINITY MAP

SCALE: 1"=800'



1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

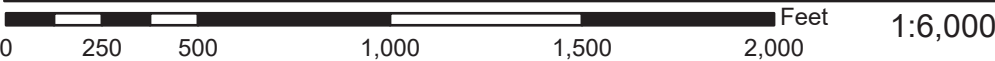


SCALE: 1" = 800'

National Flood Hazard Layer FIRMette



105°8'25"W 39°56'51"N



105°7'48"W 39°56'23"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS

Without Base Flood Elevation (BFE)
Zone A, V, A99

With BFE or Depth Zone AE, AO, AH, VE, AR

Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X

Future Conditions 1% Annual Chance Flood Hazard Zone X

Area with Reduced Flood Risk due to Levee. See Notes. Zone X

Area with Flood Risk due to Levee Zone D

OTHER AREAS

NO SCREEN Area of Minimal Flood Hazard Zone X

Effective LOMRs

Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

OTHER FEATURES

20.2 Cross Sections with 1% Annual Chance Water Surface Elevation

17.5 Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

MAP PANELS

Digital Data Available

No Digital Data Available

Unmapped

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/16/2025 at 7:07 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Boulder County Area, Colorado**



September 16, 2025

Custom Soil Resource Report Soil Map



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Boulder County Area, Colorado
Survey Area Data: Version 21, Sep 6, 2024

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

Date(s) aerial images were photographed: Jul 1, 2020—Jul 2, 2020

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

Custom Soil Resource Report

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties—Boulder County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
CoC—Colby silty clay loam, 3 to 5 percent slopes														
Colby	90	C	0-12	Silty clay loam	ML	A-4, A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	30-38-45	5-10-15
			12-43	Silty clay loam	ML	A-4, A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	30-38-45	5-10-15
			43-60	Clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	70-75-80	30-33-35	10-13-15
KuD—Kutch clay loam, 3 to 9 percent slopes														
Kutch	85	D	0-7	Clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	70-75-80	30-35-40	10-15-20
			7-22	Clay	CL	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	75-85-95	40-45-50	20-23-25
			22-30	Clay	CL	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	75-85-95	40-45-50	15-20-25
			30-34	Unweathered bedrock	—	—	—	—	—	—	—	—	—	—

Custom Soil Resource Report

Engineering Properties—Boulder County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
NuB—Nunn clay loam, 1 to 3 percent slopes														
Nunn	85	C	0-9	Clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	91-94-98	62-68-74	39-44-52	18-21-27
			9-13	Clay loam, clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	69-76-82	47-51-59	24-27-33
			13-25	Clay loam, clay	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	69-76-82	45-49-57	24-27-33
			25-38	Sandy clay loam, loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	86-94-100	57-69-85	29-39-44	12-19-23
			38-80	Sandy clay loam, sandy loam, loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	84-94-100	53-69-77	25-40-44	9-20-23
NuC—Nunn clay loam, 3 to 5 percent slopes														
Nunn	90	C	0-6	Clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	91-94-98	62-68-74	39-44-52	18-21-27
			6-18	Clay loam, clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-96-100	69-78-84	47-54-59	24-29-33
			18-30	Clay loam, clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-96-100	69-78-84	45-53-57	24-30-33
			30-47	Sandy clay loam, loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	86-94-100	57-69-85	29-39-44	12-19-23
			47-80	Sandy clay loam, sandy loam, loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	84-94-100	53-69-77	25-40-44	9-20-23

Custom Soil Resource Report

Engineering Properties—Boulder County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
VcC—Valmont cobbly clay loam, 1 to 5 percent slopes														
Valmont	100	C	0-8	Cobbly clay loam	CL	A-6	0- 0- 0	15-20-25	75-83-90	70-78-85	65-75-85	50-60-70	30-35-40	10-15-20
			8-22	Clay, clay loam	CL	A-6, A-7	0- 0- 0	0- 3- 5	85-93-100	80-90-100	75-88-100	60-78-95	35-43-50	15-20-25
			22-60	Very gravelly loam, very gravelly sandy loam	GW-GM, GM, GC-GM, GC	A-1, A-2, A-4	0- 3- 5	10-13-15	35-45-55	30-40-50	20-35-50	10-25-40	20-25-30	NP-5-10

APPENDIX B – HYDROLOGIC PLANS AND COMPUTATIONS

Project Name: Redtail Ridge - PUD1
Composite C-Value Computations
Post-Development
Project No: 221236
Date: 03/03/25
Revised:
Design by: ODV
Checked by: TJS
Hydrologic Soil Group: C

BASIN	TOTAL AREA (ACRES)	ROOFS (90%)	SINGLE FAMILY LOTS (45%)	DRIVES & WALKS (90%)	GARAGE & STREETS (100%)	LANDSCAPE AREA (2%)	PERCENT IMPERVIOUS	C ₂ =	C ₅ =	C ₁₀ =	C ₁₀₀ =
O	0.25	0.00	0.00	0.04	0.00	0.21	15.97%	0.08	0.08	0.09	0.23
P	0.31	0.00	0.00	0.04	0.00	0.27	12.84%	0.06	0.06	0.07	0.21
Q	2.17	2.17	0.00	0.00	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
R	3.28	3.28	0.00	0.00	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
S1	1.24	0.00	0.00	0.10	0.00	1.14	8.99%	0.04	0.04	0.04	0.18
S2	0.97	0.00	0.00	0.83	0.00	0.14	77.72%	0.60	0.62	0.64	0.72
S3	0.90	0.00	0.00	0.77	0.00	0.13	77.25%	0.60	0.62	0.63	0.71
S4	1.84	0.00	0.00	0.03	0.00	1.81	3.48%	0.01	0.01	0.01	0.14
T1	0.71	0.00	0.00	0.71	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
T2	0.44	0.00	0.00	0.42	0.00	0.01	87.52%	0.71	0.73	0.74	0.79
T3	0.44	0.00	0.00	0.37	0.00	0.07	76.38%	0.59	0.61	0.62	0.71
T4	0.44	0.00	0.00	0.44	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
T5	0.80	0.00	0.00	0.65	0.00	0.15	73.31%	0.56	0.58	0.59	0.68
U1	0.52	0.00	0.00	0.46	0.00	0.05	80.63%	0.63	0.65	0.67	0.74
U2	0.55	0.00	0.00	0.49	0.00	0.06	80.77%	0.64	0.65	0.67	0.74
U3	0.30	0.00	0.00	0.26	0.00	0.04	77.28%	0.60	0.62	0.63	0.71
U4	0.59	0.00	0.00	0.52	0.00	0.07	79.52%	0.62	0.64	0.66	0.73
V1	1.59	0.00	0.00	0.10	0.00	1.49	7.38%	0.03	0.03	0.04	0.17
V2	1.07	0.00	0.00	0.20	0.00	0.86	18.86%	0.10	0.10	0.11	0.26
V3	2.03	0.05	0.00	0.21	0.00	1.78	12.95%	0.06	0.06	0.07	0.21
V4	0.10	0.00	0.00	0.00	0.00	0.10	2.00%	0.01	0.01	0.01	0.13
V5	2.73	0.00	0.00	0.50	0.00	2.22	18.17%	0.09	0.10	0.11	0.25
V6	0.90	0.00	0.00	0.08	0.00	0.82	9.58%	0.04	0.04	0.05	0.18
W1	1.07	0.00	0.00	0.80	0.00	0.27	67.69%	0.51	0.52	0.54	0.64
W2	0.19	0.00	0.00	0.17	0.00	0.03	78.42%	0.61	0.63	0.64	0.72
X	1.93	0.00	0.00	0.03	0.00	1.91	3.25%	0.01	0.01	0.01	0.14

Pond C-2 (Basin B-2) 27.34 5.50 0.00 8.21 0.00 13.64 46.11%

Project Name: Redtail Ridge - PUD1
 Project No: 221236
 Date: 3/3/2025

STANDARD FORM SF-2 **TIME OF CONCENTRATION**

Designed By: ODV
 Checked By: TJS

Revised: _____

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Ti)					Tc CHECK (URBANIZED BASINS)			FINAL	REMARKS
BASIN	AREA (AC)	C _s	LENGTH (FT)	SLOPE %	Ti (MIN)	LENGTH (FT)	SLOPE %	C _v	VELOCITY (FPS)	Tt (MIN)	COMPOS. Tc (MIN)	TOTAL LENGTH	Tc = (L/180) + 10 (MIN)	Tc (MIN)	
O	0.25	0.08	50	5.00	7.71	0	2.00	15.00	2.12	0.00	7.71	50	10.28	7.71	
P	0.31	0.06	50	5.00	7.86	0	2.00	15.00	2.12	0.00	7.86	50	10.28	7.86	
Q	2.17	0.75	250	2.00	8.01	100	2.00	20.00	2.83	0.59	8.60	350	11.94	8.60	
R	3.28	0.75	250	2.00	8.01	100	2.00	20.00	2.83	0.59	8.60	350	11.94	8.60	
S1	1.24	0.04	400	3.00	26.96	525	2.00	15.00	2.12	4.12	31.08	925	15.14	15.14	
S2	0.97	0.62	100	3.00	6.06	450	2.00	20.00	2.83	2.65	8.71	550	13.06	8.71	
S3	0.90	0.62	150	3.00	7.49	200	2.00	20.00	2.83	1.18	8.67	350	11.94	8.67	
S4	1.84	0.01	400	3.00	27.67	300	2.00	15.00	2.12	2.36	30.02	700	13.89	13.89	
T1	0.71	0.75	150	3.00	5.42	575	2.00	20.00	2.83	3.39	8.81	725	14.03	8.81	
T2	0.44	0.73	100	3.00	4.76	475	2.00	20.00	2.83	2.80	7.56	575	13.19	7.56	
T3	0.44	0.61	100	3.00	6.23	375	2.00	20.00	2.83	2.21	8.44	475	12.64	8.44	
T4	0.44	0.75	100	3.00	4.43	265	2.00	20.00	2.83	1.56	5.99	365	12.03	5.99	
T5	0.80	0.58	100	3.00	6.63	175	2.00	20.00	2.83	1.03	7.66	275	11.53	7.66	
U1	0.52	0.65	100	3.00	5.68	575	2.00	20.00	2.83	3.39	9.07	675	13.75	9.07	
U2	0.55	0.65	100	3.00	5.66	430	2.00	20.00	2.83	2.53	8.19	530	12.94	8.19	
U3	0.30	0.62	100	3.00	6.11	260	2.00	20.00	2.83	1.53	7.65	360	12.00	7.65	
U4	0.59	0.64	150	3.00	7.13	75	2.00	20.00	2.83	0.44	7.57	225	11.25	7.57	
V1	1.59	0.03	400	4.00	24.70	225	5.00	15.00	3.35	1.12	25.81	625	13.47	13.47	
V2	1.07	0.10	625	4.00	28.81	225	5.00	15.00	3.35	1.12	29.92	850	14.72	14.72	
V3	2.03	0.06	575	4.00	28.71	230	6.00	15.00	3.67	1.04	29.75	805	14.47	14.47	
V4	0.10	0.01	100	4.00	12.64	0	2.00	15.00	2.12	0.00	12.64	100	10.56	10.56	
V5	2.73	0.10	750	4.00	31.71	0	2.00	15.00	2.12	0.00	31.71	750	14.17	14.17	
V6	0.90	0.04	200	4.00	17.26	0	2.00	15.00	2.12	0.00	17.26	200	11.11	11.11	
W1	1.07	0.52	500	3.00	16.41	450	2.00	20.00	2.83	2.65	19.06	950	15.28	15.28	
W2	0.19	0.63	100	3.00	5.97	95	2.00	20.00	2.83	0.56	6.53	195	11.08	6.53	
X	1.93	0.01	150	15.00	9.92	0	2.00	15.00	2.12	0.00	9.92	150	10.83	9.92	

1-HR Rainfall

<u>Return</u> <u>Interval (YR)</u>	<u>1-hour</u> <u>Rainfall</u>
WQ	0.6
2	0.801
5	1.08
10	1.35
100	2.49

tc	WQ	2yr	5yr	5yr	100yr
5	2.0351	2.717	3.663	4.579	8.446
6	1.934	2.582	3.482	4.353	8.028
7	1.844	2.462	3.320	4.150	7.654
8	1.763	2.354	3.174	3.968	7.318
9	1.690	2.256	3.042	3.803	7.014
10	1.623	2.167	2.922	3.652	6.737
11	1.562	2.086	2.812	3.515	6.483
12	1.506	2.011	2.711	3.389	6.250
13	1.454	1.942	2.618	3.272	6.036
14	1.407	1.878	2.532	3.165	5.837
15	1.362	1.818	2.452	3.065	5.653
16	1.321	1.763	2.377	2.972	5.481
17	1.282	1.712	2.308	2.885	5.321
18	1.246	1.663	2.243	2.804	5.171
19	1.212	1.618	2.182	2.727	5.030
20	1.180	1.576	2.124	2.656	4.898

Project Name: Redtail Ridge - PUD1
Project No: 221236
Date: 03/03/25
Revised: 01/00/00

STANDARD FORM SF-2
Post-Development
Rational Method Procedure

Designed By: ODV
Checked By: TJS
Design Storm: 5 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					REMARKS
		AREA (AC)	RUNOFF COEFF	T _c (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	T _c (MAX)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	
O	-	0.25	0.08	7.71	0.02	3.21	0.07										
P	-	0.31	0.06	7.86	0.02	3.19	0.06										
Q	-	2.17	0.75	8.60	1.63	3.09	5.047										
R	2	3.28	0.75	8.60	2.47	3.09	7.63										
S1	4	1.24	0.04	15.14	0.05	2.44	0.12										
S2	4	0.97	0.62	8.71	0.60	3.08	1.86										
S3	-	0.90	0.62	8.67	0.56	3.08	1.72										
S4	1	1.84	0.01	13.89	0.02	2.54	0.06										
T1	1	0.71	0.75	8.81	0.53	3.07	1.63										
T2	1	0.44	0.73	7.56	0.32	3.24	1.02										
T3	1	0.44	0.61	8.44	0.27	3.11	0.83										
T4	2	0.44	0.75	5.99	0.33	3.48	1.14										
T5	2	0.80	0.58	7.66	0.46	3.22	1.49										
U1	2	0.52	0.65	9.07	0.34	3.03	1.02										
U2	2	0.55	0.65	8.19	0.36	3.15	1.12										
U3	3	0.30	0.62	7.65	0.19	3.22	0.61										
U4	3	0.59	0.64	7.57	0.38	3.23	1.23										
V1	3	1.59	0.03	13.47	0.05	2.58	0.13										
V2	3	1.07	0.10	14.72	0.11	2.47	0.27										
V3	3	2.03	0.06	14.47	0.13	2.49	0.32										
V4	4	0.10	0.01	10.56	0.00	2.86	0.00										
V5	4	2.73	0.10	14.17	0.27	2.52	0.67										
V6	4	0.90	0.04	11.11	0.04	2.80	0.11										
W1	4	1.07	0.52	15.28	0.56	2.43	1.36										
W2	4	0.19	0.63	6.53	0.12	3.39	0.41										
X	4	1.93	0.01	9.92	0.02	2.93	0.06										

Project Name: Redtail Ridge - PUD1
 Project No: 221236
 Date: 03/03/25
 Revised: 01/00/00

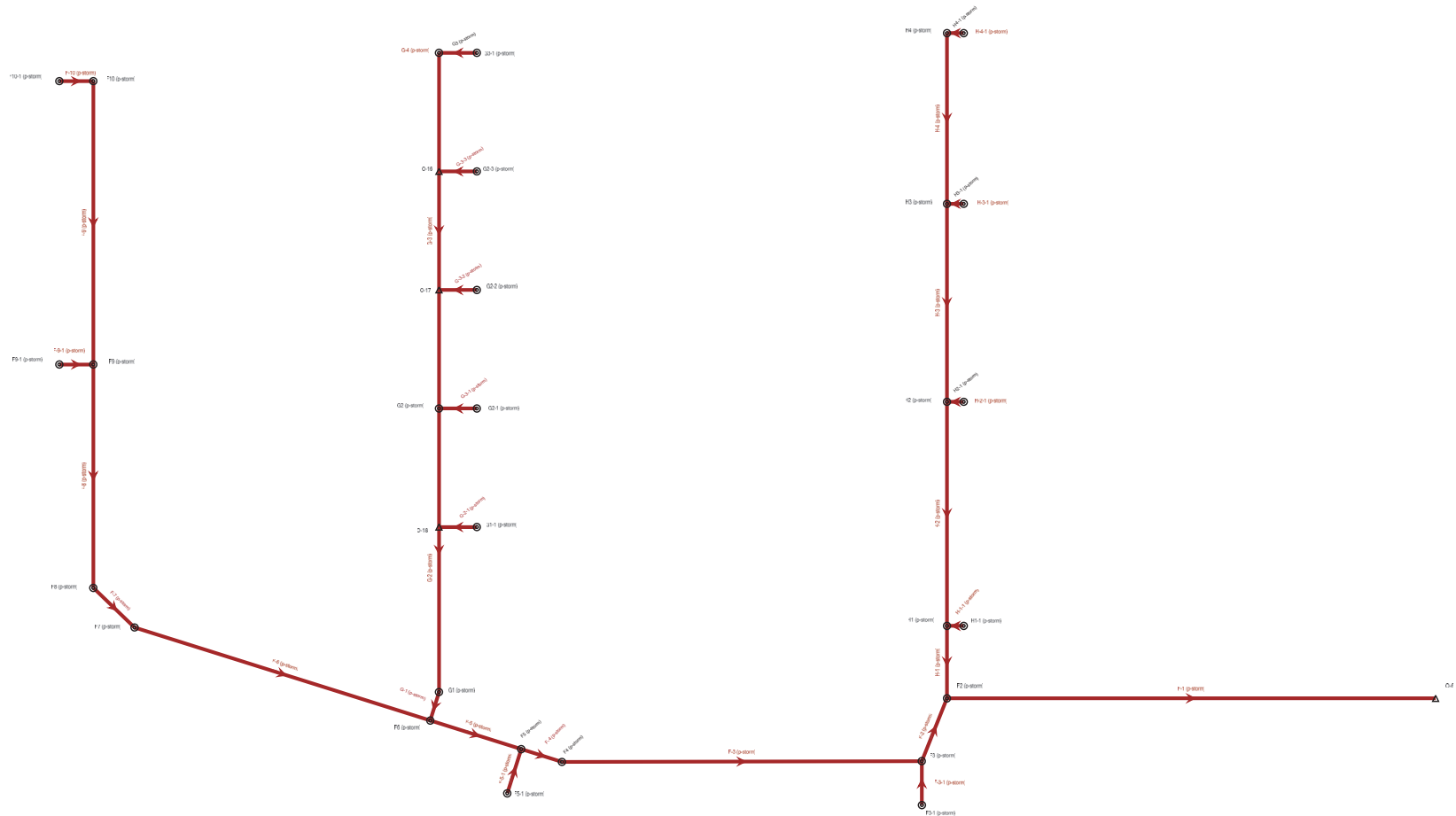
STANDARD FORM SF-2
Post-Development
Rational Method Procedure

Designed By: ODV
 Checked By: TJS
 Design Storm: 100 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					REMARKS
		AREA (AC)	RUNOFF COEFF	T _c (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	T _c (MAX)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	
O	-	0.25	0.23	7.71	0.06	7.41	0.43										
P	-	0.31	0.21	7.86	0.07	7.36	0.48										
Q	-	2.17	0.81	8.60	1.76	7.13	12.57										
R	2	3.28	0.81	8.60	2.66	7.13	18.99										
S1	4	1.24	0.18	15.14	0.22	5.63	1.26										
S2	4	0.97	0.72	8.71	0.69	7.10	4.93										
S3	-	0.90	0.71	8.67	0.64	7.11	4.56										
S4	1	1.84	0.14	13.89	0.25	5.86	1.48										
T1	1	0.71	0.81	8.81	0.57	7.07	4.06										
T2	1	0.44	0.79	7.56	0.35	7.46	2.58										
T3	1	0.44	0.71	8.44	0.31	7.18	2.21										
T4	2	0.44	0.81	5.99	0.35	8.03	2.85										
T5	2	0.80	0.68	7.66	0.54	7.43	4.05										
U1	2	0.52	0.74	9.07	0.38	6.99	2.66										
U2	2	0.55	0.74	8.19	0.40	7.26	2.93										
U3	3	0.30	0.71	7.65	0.22	7.43	1.61										
U4	3	0.59	0.73	7.57	0.43	7.46	3.23										
V1	3	1.59	0.17	13.47	0.27	5.94	1.58										
V2	3	1.07	0.26	14.72	0.27	5.70	1.56										
V3	3	2.03	0.21	14.47	0.43	5.75	2.47										
V4	4	0.10	0.13	10.56	0.01	6.59	0.08										
V5	4	2.73	0.25	14.17	0.69	5.81	3.98										
V6	4	0.90	0.18	11.11	0.17	6.46	1.07										
W1	4	1.07	0.64	15.28	0.68	5.60	3.83										
W2	4	0.19	0.72	6.53	0.14	7.83	1.09										
X	4	1.93	0.14	9.92	0.26	6.76	1.77										

RUNOFF SUMMARY TABLE			
BASIN	AREA (AC)	Q5 (CFS)	Q100 (CFS)
O	0.25	0.07	0.43
P	0.31	0.06	0.48
Q	2.17	5.05	12.57
R	3.28	7.63	18.99
S1	1.24	0.12	1.26
S2	0.97	1.86	4.93
S3	0.90	1.72	4.56
S4	1.84	0.06	1.48
T1	0.71	1.63	4.06
T2	0.44	1.02	2.58
T3	0.44	0.83	2.21
T4	0.44	1.14	2.85
T5	0.80	1.49	4.05
U1	0.52	1.02	2.66
U2	0.55	1.12	2.93
U3	0.30	0.61	1.61
U4	0.59	1.23	3.23
V1	1.59	0.13	1.58
V2	1.07	0.27	1.56
V3	2.03	0.32	2.47
V4	0.10	0.00	0.08
V5	2.73	0.67	3.98
V6	0.90	0.11	1.07
W1	1.07	1.36	3.83
W2	0.19	0.41	1.09
X	1.93	0.06	1.77

APPENDIX C – HYDRAULIC PLANS AND COMPUTATIONS

Scenario: 100-YR

FlexTable: Conduit Table

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	System Known Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
F-1 (p-storm)	F2 (p-storm)	O-6	413.0	36.0	0.013	5,392.51	5,374.15	0.044	15.68	29.09	140.62	5,394.26	5,375.08
F-2 (p-storm)	F3 (p-storm)	F2 (p-storm)	57.1	36.0	0.013	5,399.57	5,397.51	0.036	13.84	24.38	126.63	5,401.16	5,398.49
F-3 (p-storm)	F4 (p-storm)	F3 (p-storm)	303.9	36.0	0.013	5,404.33	5,399.77	0.015	10.04	23.97	81.69	5,405.91	5,400.88
F-3-1 (p-storm)	F3-1 (p-storm)	F3 (p-storm)	37.1	12.0	0.013	5,407.04	5,406.67	0.010	3.02	0.41	3.56	5,407.30	5,406.90
F-4 (p-storm)	F5 (p-storm)	F4 (p-storm)	36.1	36.0	0.013	5,404.71	5,404.53	0.005	6.69	23.97	47.10	5,406.29	5,406.05
F-5 (p-storm)	F6 (p-storm)	F5 (p-storm)	80.5	36.0	0.013	5,405.31	5,404.91	0.005	6.59	22.61	47.02	5,406.84	5,406.38
F-5-1 (p-storm)	F5-1 (p-storm)	F5 (p-storm)	39.1	15.0	0.013	5,408.20	5,407.44	0.019	5.29	1.36	9.01	5,408.66	5,407.77
F-6 (p-storm)	F7 (p-storm)	F6 (p-storm)	261.8	36.0	0.013	5,411.28	5,405.51	0.022	6.72	3.75	99.01	5,411.88	5,406.85
F-7 (p-storm)	F8 (p-storm)	F7 (p-storm)	48.3	24.0	0.013	5,412.52	5,412.28	0.005	4.15	3.75	15.95	5,413.20	5,412.94
F-8 (p-storm)	F9 (p-storm)	F8 (p-storm)	188.4	24.0	0.013	5,413.20	5,412.62	0.003	3.49	3.75	12.55	5,413.95	5,413.30
F-9 (p-storm)	F10 (p-storm)	F9 (p-storm)	239.0	24.0	0.013	5,414.49	5,413.30	0.005	3.46	1.98	15.96	5,414.98	5,413.95
F-9-1 (p-storm)	F9-1 (p-storm)	F9 (p-storm)	28.7	12.0	0.013	5,415.32	5,415.03	0.010	4.55	1.77	3.58	5,415.89	5,415.53
F-10 (p-storm)	F10-1 (p-storm)	F10 (p-storm)	28.7	12.0	0.013	5,415.17	5,415.03	0.005	3.52	1.98	2.49	5,415.84	5,415.63
G-1 (p-storm)	G1 (p-storm)	F6 (p-storm)	25.1	36.0	0.013	5,405.54	5,405.41	0.005	6.38	18.86	47.98	5,406.93	5,406.88
G-2 (p-storm)	G2 (p-storm)	G1 (p-storm)	239.2	36.0	0.013	5,406.84	5,405.64	0.005	6.31	18.86	47.24	5,408.23	5,406.96
G-2-1 (p-storm)	G1-1 (p-storm)	O-18	32.0	12.0	0.013	5,408.21	5,408.06	0.005	3.26	1.49	2.44	5,408.77	5,408.58
G-3 (p-storm)	G3 (p-storm)	G2 (p-storm)	300.0	36.0	0.013	5,408.63	5,407.13	0.005	6.05	16.23	47.16	5,409.92	5,408.34
G-3-1 (p-storm)	G2-1 (p-storm)	G2 (p-storm)	32.0	12.0	0.013	5,409.51	5,408.86	0.020	5.21	1.14	5.08	5,409.96	5,409.18
G-3-2 (p-storm)	G2-2 (p-storm)	O-17	32.0	12.0	0.013	5,409.68	5,409.04	0.020	4.74	0.83	5.04	5,410.06	5,409.31
G-3-3 (p-storm)	G2-3 (p-storm)	O-16	32.0	12.0	0.013	5,410.04	5,409.52	0.016	4.66	1.02	4.54	5,410.46	5,409.84
G-4 (p-storm)	G3-1 (p-storm)	G3 (p-storm)	32.0	12.0	0.013	5,409.95	5,409.79	0.005	3.41	1.63	2.52	5,410.54	5,410.33
H-1 (p-storm)	H1 (p-storm)	F2 (p-storm)	61.1	24.0	0.013	5,402.60	5,402.01	0.010	5.35	3.98	22.22	5,403.30	5,402.58
H-1-1 (p-storm)	H1-1 (p-storm)	H1 (p-storm)	14.2	12.0	0.013	5,408.78	5,408.64	0.010	4.10	1.23	3.54	5,409.25	5,409.05
H-2 (p-storm)	H2 (p-storm)	H1 (p-storm)	189.0	24.0	0.013	5,404.43	5,402.60	0.010	4.82	2.75	22.26	5,405.01	5,403.30
H-2-1 (p-storm)	H2-1 (p-storm)	H2 (p-storm)	14.2	12.0	0.013	5,408.75	5,408.61	0.010	3.37	0.61	3.54	5,409.07	5,408.89
H-3 (p-storm)	H3 (p-storm)	H2 (p-storm)	167.0	24.0	0.013	5,406.05	5,404.43	0.010	4.48	2.14	22.28	5,406.56	5,405.01
H-3-1 (p-storm)	H3-1 (p-storm)	H3 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	4.00	1.12	3.54	5,409.21	5,409.01
H-4 (p-storm)	H4 (p-storm)	H3 (p-storm)	144.0	24.0	0.013	5,407.45	5,406.05	0.010	3.60	1.02	22.30	5,407.80	5,406.56
H-4-1 (p-storm)	H4-1 (p-storm)	H4 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	3.89	1.02	3.54	5,409.18	5,408.99

FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Known) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)
F2 (p-storm)	5,413.63	5,413.63	5,392.51	29.09	5,394.31	5,394.26	5,396.63	5,394.98	29.09	1.75
F3 (p-storm)	5,414.01	5,414.01	5,399.57	0.00	5,401.19	5,401.16	5,402.75	5,401.80	24.38	1.59
F3-1 (p-storm)	5,412.74	5,412.74	5,407.04	0.41	5,407.42	5,407.30	5,407.52	5,407.40	0.41	0.26
F4 (p-storm)	5,413.60	5,413.60	5,404.33	0.00	5,405.93	5,405.91	5,406.62	5,406.54	23.97	1.58
F5 (p-storm)	5,413.61	5,413.61	5,404.71	0.00	5,406.29	5,406.29	5,406.97	5,406.92	23.97	1.58
F5-1 (p-storm)	5,412.17	5,412.17	5,408.20	1.36	5,408.87	5,408.66	5,409.04	5,408.83	1.36	0.46
F6 (p-storm)	5,413.78	5,413.78	5,405.31	0.00	5,406.85	5,406.84	5,406.88	5,407.44	22.61	1.53
F7 (p-storm)	5,418.08	5,418.08	5,411.28	0.00	5,411.89	5,411.88	5,412.16	5,412.10	3.75	0.60
F8 (p-storm)	5,418.56	5,418.56	5,412.52	0.00	5,413.21	5,413.20	5,413.46	5,413.45	3.75	0.68
F9 (p-storm)	5,419.23	5,419.23	5,413.20	0.00	5,413.95	5,413.95	5,414.03	5,414.14	3.75	0.75
F9-1 (p-storm)	5,418.51	5,418.51	5,415.32	1.77	5,415.89	5,415.89	5,416.12	5,416.12	1.77	0.57
F10 (p-storm)	5,419.25	5,419.25	5,414.49	0.00	5,414.99	5,414.98	5,415.24	5,415.15	1.98	0.49
F10-1 (p-storm)	5,418.51	5,418.51	5,415.17	1.98	5,415.84	5,415.84	5,416.03	5,416.03	1.98	0.67
G1 (p-storm)	5,414.02	5,414.02	5,405.54	0.00	5,406.95	5,406.93	5,407.56	5,407.47	18.86	1.39
G1-1 (p-storm)	5,412.36	5,412.36	5,408.21	1.49	5,408.98	5,408.77	5,409.15	5,408.94	1.49	0.56
G2 (p-storm)	5,413.96	5,413.96	5,406.84	18.86	5,408.24	5,408.23	5,408.81	5,408.77	18.86	1.39
G2-1 (p-storm)	5,412.36	5,412.36	5,409.51	1.14	5,410.17	5,409.96	5,410.35	5,410.13	1.14	0.45
G2-2 (p-storm)	5,412.36	5,412.36	5,409.68	0.83	5,410.24	5,410.06	5,410.38	5,410.20	0.83	0.38
G2-3 (p-storm)	5,412.36	5,412.36	5,410.04	1.02	5,410.67	5,410.46	5,410.83	5,410.62	1.02	0.42
G3 (p-storm)	5,414.80	5,414.80	5,408.63	16.23	5,409.95	5,409.92	5,410.17	5,410.40	16.23	1.29
G3-1 (p-storm)	5,412.36	5,412.36	5,409.95	1.63	5,410.76	5,410.54	5,410.94	5,410.72	1.63	0.59
H1 (p-storm)	5,412.74	5,412.74	5,402.60	0.00	5,403.30	5,403.30	5,403.42	5,403.56	3.98	0.70
H1-1 (p-storm)	5,412.39	5,412.39	5,408.78	1.23	5,409.47	5,409.25	5,409.66	5,409.43	1.23	0.47
H2 (p-storm)	5,412.74	5,412.74	5,404.43	0.00	5,405.01	5,405.01	5,405.13	5,405.22	2.75	0.58
H2-1 (p-storm)	5,412.39	5,412.39	5,408.75	0.61	5,409.22	5,409.07	5,409.34	5,409.19	0.61	0.32
H3 (p-storm)	5,412.74	5,412.74	5,406.05	0.00	5,406.56	5,406.56	5,406.60	5,406.74	2.14	0.51
H3-1 (p-storm)	5,412.17	5,412.17	5,408.76	1.12	5,409.42	5,409.21	5,409.59	5,409.38	1.12	0.45
H4 (p-storm)	5,412.78	5,412.78	5,407.45	0.00	5,407.80	5,407.80	5,408.03	5,407.92	1.02	0.35
H4-1 (p-storm)	5,412.47	5,412.47	5,408.76	1.02	5,409.39	5,409.18	5,409.55	5,409.34	1.02	0.42

FlexTable: Conduit Table

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	System Known Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
F-1 (p-storm)	F2 (p-storm)	O-6	413.0	36.0	0.013	5,392.51	5,374.15	0.044	20.59	80.93	140.62	5,395.29	5,375.78
F-2 (p-storm)	F3 (p-storm)	F2 (p-storm)	57.1	36.0	0.013	5,399.57	5,397.51	0.036	18.02	64.89	126.63	5,402.15	5,399.28
F-3 (p-storm)	F4 (p-storm)	F3 (p-storm)	303.9	36.0	0.013	5,404.33	5,399.77	0.015	12.78	63.80	81.69	5,406.90	5,402.37
F-3-1 (p-storm)	F3-1 (p-storm)	F3 (p-storm)	37.1	12.0	0.013	5,407.04	5,406.67	0.010	3.99	1.09	3.56	5,407.48	5,407.05
F-4 (p-storm)	F5 (p-storm)	F4 (p-storm)	36.1	36.0	0.013	5,404.71	5,404.53	0.005	9.03	63.80	47.10	5,407.63	5,407.10
F-5 (p-storm)	F6 (p-storm)	F5 (p-storm)	80.5	36.0	0.013	5,405.31	5,404.91	0.005	8.48	59.97	47.02	5,408.33	5,407.64
F-5-1 (p-storm)	F5-1 (p-storm)	F5 (p-storm)	39.1	15.0	0.013	5,408.20	5,407.44	0.019	7.04	3.83	9.01	5,408.99	5,408.02
F-6 (p-storm)	F7 (p-storm)	F6 (p-storm)	261.8	36.0	0.013	5,411.28	5,405.51	0.022	9.52	12.23	99.01	5,412.39	5,408.37
F-7 (p-storm)	F8 (p-storm)	F7 (p-storm)	48.3	24.0	0.013	5,412.52	5,412.28	0.005	5.60	12.23	15.95	5,413.83	5,413.54
F-8 (p-storm)	F9 (p-storm)	F8 (p-storm)	188.4	24.0	0.013	5,413.20	5,412.62	0.003	4.55	12.23	12.55	5,414.76	5,413.88
F-9 (p-storm)	F10 (p-storm)	F9 (p-storm)	239.0	24.0	0.013	5,414.49	5,413.30	0.005	4.76	6.19	15.96	5,415.37	5,414.76
F-9-1 (p-storm)	F9-1 (p-storm)	F9 (p-storm)	28.7	12.0	0.013	5,415.32	5,415.03	0.010	7.69	6.04	3.58	5,416.84	5,415.99
F-10 (p-storm)	F10-1 (p-storm)	F10 (p-storm)	28.7	12.0	0.013	5,415.17	5,415.03	0.005	7.88	6.19	2.49	5,416.88	5,415.99
G-1 (p-storm)	G1 (p-storm)	F6 (p-storm)	25.1	36.0	0.013	5,405.54	5,405.41	0.005	6.75	47.74	47.98	5,408.56	5,408.43
G-2 (p-storm)	G2 (p-storm)	G1 (p-storm)	239.2	36.0	0.013	5,406.84	5,405.64	0.005	7.62	47.74	47.24	5,409.61	5,408.58
G-2-1 (p-storm)	G1-1 (p-storm)	O-18	32.0	12.0	0.013	5,408.21	5,408.06	0.005	5.16	4.05	2.44	5,409.91	5,409.50
G-3 (p-storm)	G3 (p-storm)	G2 (p-storm)	300.0	36.0	0.013	5,408.63	5,407.13	0.005	7.51	40.85	47.16	5,410.79	5,409.62
G-3-1 (p-storm)	G2-1 (p-storm)	G2 (p-storm)	32.0	12.0	0.013	5,409.51	5,408.86	0.020	6.65	2.85	5.08	5,410.23	5,409.69
G-3-2 (p-storm)	G2-2 (p-storm)	O-17	32.0	12.0	0.013	5,409.68	5,409.04	0.020	6.21	2.21	5.04	5,410.32	5,410.20
G-3-3 (p-storm)	G2-3 (p-storm)	O-16	32.0	12.0	0.013	5,410.04	5,409.52	0.016	5.97	2.58	4.54	5,410.73	5,410.50
G-4 (p-storm)	G3-1 (p-storm)	G3 (p-storm)	32.0	12.0	0.013	5,409.95	5,409.79	0.005	5.17	4.06	2.52	5,411.28	5,410.87
H-1 (p-storm)	H1 (p-storm)	F2 (p-storm)	61.1	24.0	0.013	5,402.60	5,402.01	0.010	6.96	10.43	22.22	5,403.76	5,402.98
H-1-1 (p-storm)	H1-1 (p-storm)	H1 (p-storm)	14.2	12.0	0.013	5,408.78	5,408.64	0.010	5.11	3.23	3.54	5,409.55	5,409.39
H-2 (p-storm)	H2 (p-storm)	H1 (p-storm)	189.0	24.0	0.013	5,404.43	5,402.60	0.010	6.32	7.20	22.26	5,405.38	5,403.77
H-2-1 (p-storm)	H2-1 (p-storm)	H2 (p-storm)	14.2	12.0	0.013	5,408.75	5,408.61	0.010	4.40	1.61	3.54	5,409.29	5,409.09
H-3 (p-storm)	H3 (p-storm)	H2 (p-storm)	167.0	24.0	0.013	5,406.05	5,404.43	0.010	5.90	5.59	22.28	5,406.88	5,405.39
H-3-1 (p-storm)	H3-1 (p-storm)	H3 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	5.04	2.93	3.54	5,409.49	5,409.31
H-4 (p-storm)	H4 (p-storm)	H3 (p-storm)	144.0	24.0	0.013	5,407.45	5,406.05	0.010	4.78	2.66	22.30	5,408.02	5,406.89
H-4-1 (p-storm)	H4-1 (p-storm)	H4 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	4.95	2.66	3.54	5,409.46	5,409.27

FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Known) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)
F2 (p-storm)	5,413.63	5,413.63	5,392.51	80.93	5,395.52	5,395.29	5,399.00	5,397.47	80.93	2.78
F3 (p-storm)	5,414.01	5,414.01	5,399.57	0.00	5,402.23	5,402.15	5,403.72	5,403.71	64.89	2.58
F3-1 (p-storm)	5,412.74	5,412.74	5,407.04	1.09	5,407.69	5,407.48	5,407.86	5,407.65	1.09	0.44
F4 (p-storm)	5,413.60	5,413.60	5,404.33	0.00	5,406.96	5,406.90	5,408.49	5,408.42	63.80	2.57
F5 (p-storm)	5,413.61	5,413.61	5,404.71	0.00	5,407.64	5,407.63	5,408.87	5,408.91	63.80	2.91
F5-1 (p-storm)	5,412.17	5,412.17	5,408.20	3.83	5,409.42	5,408.99	5,409.76	5,409.33	3.83	0.79
F6 (p-storm)	5,413.78	5,413.78	5,405.31	0.00	5,408.37	5,408.33	5,408.41	5,409.45	59.97	3.02
F7 (p-storm)	5,418.08	5,418.08	5,411.28	0.00	5,412.40	5,412.39	5,412.94	5,412.80	12.23	1.11
F8 (p-storm)	5,418.56	5,418.56	5,412.52	0.00	5,413.87	5,413.83	5,414.40	5,414.32	12.23	1.31
F9 (p-storm)	5,419.23	5,419.23	5,413.20	0.00	5,414.76	5,414.76	5,414.86	5,415.09	12.23	1.56
F9-1 (p-storm)	5,418.51	5,418.51	5,415.32	6.04	5,416.84	5,416.84	5,417.76	5,417.76	6.04	1.52
F10 (p-storm)	5,419.25	5,419.25	5,414.49	0.00	5,415.39	5,415.37	5,416.39	5,415.71	6.19	0.88
F10-1 (p-storm)	5,418.51	5,418.51	5,415.17	6.19	5,416.88	5,416.88	5,417.85	5,417.85	6.19	1.71
G1 (p-storm)	5,414.02	5,414.02	5,405.54	0.00	5,408.58	5,408.56	5,409.30	5,409.26	47.74	3.02
G1-1 (p-storm)	5,412.36	5,412.36	5,408.21	4.05	5,410.43	5,409.91	5,410.84	5,410.33	4.05	1.70
G2 (p-storm)	5,413.96	5,413.96	5,406.84	47.74	5,409.62	5,409.61	5,410.28	5,410.37	47.74	2.77
G2-1 (p-storm)	5,412.36	5,412.36	5,409.51	2.85	5,410.66	5,410.23	5,411.00	5,410.57	2.85	0.72
G2-2 (p-storm)	5,412.36	5,412.36	5,409.68	2.21	5,410.66	5,410.32	5,410.93	5,410.59	2.21	0.64
G2-3 (p-storm)	5,412.36	5,412.36	5,410.04	2.58	5,411.12	5,410.73	5,411.43	5,411.04	2.58	0.69
G3 (p-storm)	5,414.80	5,414.80	5,408.63	40.85	5,410.87	5,410.79	5,411.28	5,411.66	40.85	2.16
G3-1 (p-storm)	5,412.36	5,412.36	5,409.95	4.06	5,411.80	5,411.28	5,412.22	5,411.70	4.06	1.33
H1 (p-storm)	5,412.74	5,412.74	5,402.60	0.00	5,403.77	5,403.76	5,403.99	5,404.23	10.43	1.16
H1-1 (p-storm)	5,412.39	5,412.39	5,408.78	3.23	5,410.03	5,409.55	5,410.42	5,409.93	3.23	0.77
H2 (p-storm)	5,412.74	5,412.74	5,404.43	0.00	5,405.39	5,405.38	5,405.61	5,405.75	7.20	0.95
H2-1 (p-storm)	5,412.39	5,412.39	5,408.75	1.61	5,409.56	5,409.29	5,409.78	5,409.51	1.61	0.54
H3 (p-storm)	5,412.74	5,412.74	5,406.05	0.00	5,406.89	5,406.88	5,406.96	5,407.20	5.59	0.83
H3-1 (p-storm)	5,412.17	5,412.17	5,408.76	2.93	5,409.93	5,409.49	5,410.28	5,409.84	2.93	0.73
H4 (p-storm)	5,412.78	5,412.78	5,407.45	0.00	5,408.03	5,408.02	5,408.41	5,408.22	2.66	0.57
H4-1 (p-storm)	5,412.47	5,412.47	5,408.76	2.66	5,409.86	5,409.46	5,410.18	5,409.78	2.66	0.70

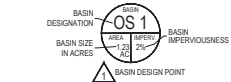
APPENDIX D – EXCERPTS FROM PREVIOUSLY ACCEPTED DRAINAGE STUDIES

NO CHANGES ARE TO BE MADE TO THIS DRAINAGE PLAN UNTIL THE MASTER DRAINAGE PLAN IS APPROVED BY THE CITY AND COUNTY OF DENVER.



LEGEND:

- BASIN BOUNDARY
- OFF-SITE BASIN
- GOODHUE IRRIGATION DITCH
- TRIBUTARY I FLOODING LIMITS
- 10-YEAR EVENT
- 100-YEAR EVENT
- PR PEDESTRIAN TRAIL
- PROPOSED STORM SEWER SYSTEM
- DRAINAGE FLOW
- EMERGENCY OVERFLOW
- PROPOSED CONTOURS
- EXISTING CONTOURS
- CONSTRUCTION PHASING DELINEATIONS
- PHASE 1
- PHASE 2
- INTERNAL ROADS



MAJOR BASIN SUMMARY AND RUNOFF TABLE:

MAJOR DRAINAGE BASIN	CONTRIBUTING AREA (AC)	Q2 (CFS)	Q10 (CFS)	Q100 (CFS)	TRIBUTARY TO
A-1	37.99	0.24	6.87	37.40	TRIBUTARY I
A-2-1	22.67	0.14	4.07	22.08	TRIBUTARY I
A-2-2	25.02	0.16	38.59	82.62	POND B
A-3	0.62	0.24	0.46	1.09	TRIBUTARY I
B-1	79.46	82.92	145.97	309.97	POND B
B-2	30.37	33.22	59.73	123.28	POND C-2
C-1	53.23	45.87	83.88	183.61	POND C-1
C-2	19.63	22.10	41.84	88.58	POND C-2
C-3	14.17	5.22	9.54	22.53	POND C-1
C-4	2.78	1.69	3.20	7.26	TRIBUTARY I
C-5	13.09	3.09	7.83	19.54	POND C-2
C-6	1.82	1.23	2.31	5.22	POND C-2
D-1	14.55	9.47	18.36	42.76	POND C-2
D-2	7.88	0.09	2.70	13.35	OFFSITE
D-3	11.26	7.58	14.67	34.11	POND C-2
D-4	8.37	0.17	5.17	23.33	OFFSITE
D-5	2.01	0.02	0.73	3.55	TRIBUTARY I
E	34.11	28.44	53.09	119.31	POND E
F	17.05	0.11	3.06	16.59	TRIBUTARY I

POND SUMMARY TABLE:

POND	CONTRIBUTING BASINS	WATERSHED AREA (ac)	MAX 100-YR DEPTH (ft)	WATERSHED IMPERVIOUSNESS (%)	WQCV (ac-ft)	EIRV (ac-ft)	REQUIRED VOLUME (ac-ft)			PROVIDED VOLUME (ac-ft)	ALLOWABLE RELEASE RATE (cfs)			DESIGN RELEASE RATE (cfs)		
							2-YR	10-YR	100-YR		2-YR	10-YR	100-YR	2-YR	10-YR	100-YR
B (PHASE 1)	A-2-2, B-1	104.48	5.83	85.00%	3.16	8.78	5.37	9.56	14.15	19.89	N/A	30.69	159.03	4.88	7.14	84.26
C-1 (PHASE 1)	C-1, C-3	67.38	3.61	79.84%	1.86	5.31	3.23	5.79	8.68	9.62	N/A	9.09	52.74	2.38	4.69	47.40
C-2 (PHASE 1)	B-2, C-2, C-5, C-6-1, C-6-2, D-1, D-3	90.38	8.57	77.04%	2.35	6.82	4.15	7.44	11.30	12.76	N/A	20.70	109.44	1.40	12.59	74.78
E (PUD 8)	E	34.11	8.10	75.00%	0.86	2.51	1.52	2.75	4.18	6.17	N/A	8.64	45.45	0.47	3.60	39.86

- NOTES:
- Q100 VALUES USED IN DIRECT RUNOFF TABLE. ROUTED Q100/SMM RESULTS ARE INCLUDED WITH FILING NO. 1 AND FILING NO. 2 FINAL DRAINAGE REPORTS.
 - MPD-RETENTION SOFTWARE USED TO CALCULATE POND SUMMARY TABLE VALUES. REFER TO FINAL MASTER DRAINAGE REPORT FOR FULL RESULTS.
 - ALLOWABLE RELEASE RATE IS BASED ON THE PREDEVELOPMENT 100-YR PEAK RUNOFF RATE PER MPD USDM CRITERIA.
 - DESIGN POINTS AND DETAILED RUNOFF CALCULATIONS PROVIDED WITH FILING NO. 1 AND FILING NO. 2 FINAL DRAINAGE REPORTS.
 - CUMULATIVE DIRECT RUNOFF VALUES FROM SUBBASINS DELINEATED WITH FILING NO. 1 AND FILING NO. 2 MAY EXCEED DISCHARGE RATES FOR THE MAJOR BASINS SHOWN HEREIN.
 - OFF-SITE FLOWS FROM BVSND AND 88TH STREET REFERENCED FROM BVSND LOUISVILLE CAMPUS PUD DRAINAGE REPORT. REFER TO APPENDIX B OF FINAL MASTER DRAINAGE REPORT FOR EXCERPTS.
 - FINAL DESIGN FOR POND E SHALL BE COMPLETED WITH PUD 8.
 - A PORTION OF BASIN C-6, IDENTIFIED AS SUBBASIN C-6-3 IN FILING NO. 1 AND FILING NO. 2, FLOWS OFFSITE TO NORTHWEST PARKWAY.
 - ROCK CREEK TRIBUTARY I IS NOT A FEMA REGULATED DRAINAGEWAY. FLOOD LIMITS SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY AND DO NOT REFLECT ANY EXISTING OR PROPOSED REGULATORY FLOODPLAIN BOUNDARY.



Know what's below.
Call before you dig.

DESIGNED BY: SDW
CHECKED BY: MWW
DRAWN BY: SDW

ISSUE DATE: 11-15-2019

DATE	REVISION COMMENTS
04-17-2020	SECOND SUBMITTAL PER CITY COMMENTS
04-20-2020	POST SUBMITTAL NEW PROGRAM
10-22-2021	SECOND SUBMITTAL NEW PROGRAM PER CITY COMMENTS
03-24-2022	THIRD SUBMITTAL NEW PROGRAM
07-07-2024	RESUBMITTAL POST PRELIMINARY PLAT



STERLING BAY

RETAIL RIDGE
MASTER DRAINAGE PLAN

PRELIMINARY
NOT FOR
CONSTRUCTION

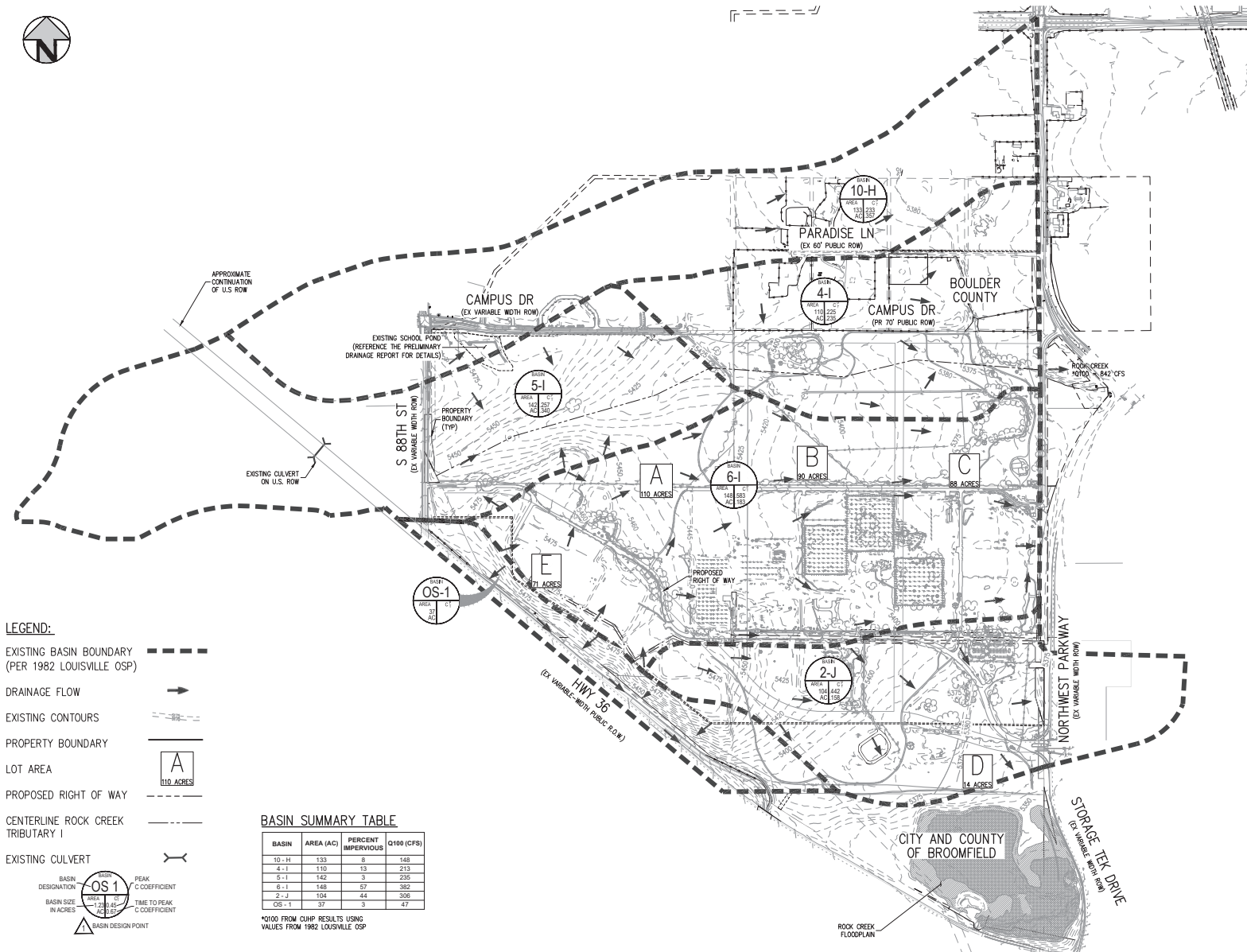
PROJECT #: 190108

SHEET NUMBER

1

1 OF 2

NO CHANGES ARE TO BE MADE TO THIS DRAINAGE PLAN WITHOUT THE SIGNATURE OF HARRIS KOCHER SMITH



- LEGEND:**
- EXISTING BASIN BOUNDARY (PER 1982 LOUISVILLE OSP)
 - DRAINAGE FLOW
 - EXISTING CONTOURS
 - PROPERTY BOUNDARY
 - LOT AREA
 - PROPOSED RIGHT OF WAY
 - CENTERLINE ROCK CREEK TRIBUTARY I
 - EXISTING CULVERT
 - BASIN DESIGNATION
 - BASIN SIZE IN ACRES
 - PEAK FLOW COEFFICIENT
 - TIME TO PEAK
 - C COEFFICIENT
 - BASIN DESIGN POINT

BASIN SUMMARY TABLE

BASIN	AREA (AC)	PERCENT IMPERVIOUS	Q100 (CFS)
10-H	133	8	148
4-I	110	13	213
5-I	142	3	235
6-I	148	67	382
2-J	104	44	306
OS-1	37	3	47

*Q100 FROM CHMP RESULTS USING
VALUES FROM 1982 LOUISVILLE OSP



ISSUE DATE: 11-15-2019

DATE	REVISION COMMENTS
04-17-2019	SECOND SUBMITTAL PER CITY COMMENTS
04-23-2019	POST SUBMITTAL NEW PROGRAM
05-23-2019	SECOND SUBMITTAL NEW PROGRAM PER CITY COMMENTS
06-25-2019	THIRD SUBMITTAL NEW PROGRAM
07-07-2019	RESUBMITTAL POST PRELIMINARY PLAT

HKS HARRIS KOCHER SMITH

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Denver, Colorado 80203
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HarrisKocherSmith.com

STERLING BAY

RETAIL RIDGE
EXISTING DRAINAGE PLAN

PRELIMINARY
NOT FOR
CONSTRUCTION

PROJECT # 190108
SHEET NUMBER
2
2 OF 2

basins. Minor subbasins for each major basin will be described in full detail with the Filing No. 1 and Filing No. 2 drainage reports.

Calculations for all proposed Ponds as well as their respective outlet structure design can also be found in Appendix C.

Basin A (86.3 acres, 26% imperviousness) is in the northwest corner of the Site located to the north of Rockcress Drive, to the east of South 88th Street, and to the south of Campus Drive. Tributary I splits the parcel, carrying historic flows from southwest to northeast. The basin consists of four sub-basins: A-1, A-2-1, A-2-2, and A-3. Approximately 60 acres are proposed as open or undeveloped space with the remainder being mixed-use development and roadway infrastructure. Runoff from Basin A shall be conveyed to Tributary I, with water quality treatment provided as necessary for any hardscaping or impervious areas.

In the pre-developed condition, the Health Park subdivision and the S. 88th Street roadway west of Basin A contribute 84 cfs to the School Pond at the northwest corner of Basin A. The School Pond then releases up to a maximum of 56 cfs north into the school site through a 30-inch RCP storm sewer pipe north to the Bus Loop Pond, as shown on the BVSD Drainage plan provided in Appendix B. With the development of Campus Drive, the school pond will be removed, and these flows are proposed to be captured at the 88th and Campus Drive intersection and will then route to the proposed storm sewer in Campus Drive. A 30-inch RCP will outlet from a manhole in the proposed Campus Drive storm sewer and release flows at an equivalent rate as the existing culvert into the Bus Loop Pond. The balance of flow not released to the Bus Loop Pond will overtop the 30-inch RCP in the manhole and continue east through the proposed Campus Drive storm sewer system to Pond C-1.

In the existing condition, flows from the offsite School Site Basin contribute 1.9 cfs in the 10-year event and 4.2 cfs in the 100-year event to Sub-Basin A-1. The School Site Detention Pond D releases 1.1 cfs in the 10-year event and 4.8 cfs in the 100-year event into subbasin A-1 as well. With the construction of Campus Drive, these flows will be collected by the proposed storm sewer main in Campus Drive. These flows will be routed to the storm sewer in Campus drive beginning at the existing flared end section at the northwest corner of the parcel and be released into Pond C-1.

Basin B (109.83 acres, 85% imperviousness) is in the central portion of the Site located to the north of Rockcress Drive, to the east of Basin A, to the south of Campus Drive, and to the west of Sorrel Avenue. A natural ridge in the southern portion of the parcel splits the basin into two sub-basins, B-1 and B-2. Runoff associated with Sub-Basin B will be conveyed to full-spectrum detention facility, Pond B. Flows from Sub-Basin B-2 are conveyed to Pond C-2.

Basin C (104.7 acres, 78% imperviousness) is generally in the eastern portion of the Site, lying east of Sorrel Avenue and west of S. 96th Street. It consists of roadways

Basin OS-3 (19.51 acres, 5% imperviousness) is located north of the intersection of Campus Drive and S 96th Street consisting of open space, roadways, and residential land. Basin OS-3 will be unchanged to drain as it historically has from west to east. Runoff is to be captured by a proposed 53" x 34" HERCP culvert running south under the east section of Campus Drive where it is outlet into Tributary I.

Basins OS-4-1, OS-4-2, OS-7-1, OS-7-2, OS-7-3, and OS-7-4 are located northeast of the Site, within S. 96th Ave. These basins represent improvements to be completed off-site to that roadway in conjunction with the Project. Full details on these basins may be found in the Redtail Ridge Off-Site Roadway Improvements documents, submitted separately.

Basin OS-15 (1.64 acres, 15% imperviousness) is a portion of developable land at the southeast corner of Campus Drive and South 88th Street. Runoff currently shallow flows to the northeast. A swale is proposed which will convey runoff in the interim condition, outfalling to Tributary I. Once developed this basin will outfall into the Campus Drive sewer system, however no site plan was available at the time this report was completed, thus no stub is able to be provided.

Table 1 below summarizes the basin and direct runoff information for both Phase 1 and Phase 2.

Table 1: Basin and Direct Runoff Summary Table

MAJOR DRAINAGE BASIN	CONTRIBUTING AREA (AC)	IMPERV	Q2 (CFS)	Q10 (CFS)	Q100 (CFS)	TRIBUTARY TO
A-1	37.99	2%	0.24	6.87	37.40	TRIBUTARY I
A-2-1	22.67	2%	0.14	4.07	22.08	TRIBUTARY I
A-2-2	25.02	85%	21.67	38.59	82.62	POND B
A-3	0.62	75%	0.24	0.46	1.09	TRIBUTARY I
B-1	79.46	85%	82.92	145.97	309.97	POND B
B-2	30.37	85%	33.22	59.73	123.28	POND C-2
C-1	53.21	80%	45.87	83.88	183.61	POND C-1
C-2	19.63	80%	22.10	41.84	88.58	POND C-2
C-3	14.17	79%	5.22	9.54	22.53	POND C-1
C-4	2.78	75%	1.69	3.20	7.26	TRIBUTARY I
C-5	13.09	70%	3.09	7.83	19.54	POND C-2
C-6	1.82	75%	1.23	2.31	5.22	POND C-2
D-1	14.55	70%	9.47	18.36	42.76	POND C-2
D-2	7.88	2%	0.09	2.70	13.35	OFFSITE
D-3	11.26	70%	7.58	14.67	34.11	POND C-2
D-4	8.37	2%	0.17	5.17	23.33	OFFSITE
D-5	2.01	2%	0.02	0.73	3.55	TRIBUTARY I
E	34.11	75%	28.44	53.09	119.31	POND E

includes the 88th Street Culvert, West BVSD Culvert, and the BVSD Pond Bypass. Refer to the Off-Site Flows section of this report for more information pertaining to the BVSD and 88th Street culvert flows. An impervious value of 79.84% was calculated for the 67.38 acres of contributing area as design parameters for Pond C-1. Aqua Engineering performed hydrologic calculations estimating the peak summertime evaporation rates and the required flowrate to replenish the pond to the permanent water surface elevations within a given time frame. In addition to designing the domestic water tap system detailing the tap size, system function, and how the shutoff functioning operates. For detailed information about the domestic water tap system to replenish Pond B, refer to the Aqua Engineering Report. Pond C-1 will outfall through a storm sewer to Tributary I, just upstream of the location of the proposed culvert under S. 96th Street. The emergency spillway is located at the northeast end of the detention pond where any volume greater than the 100-year runoff will discharge into Tributary I.

Pond C-2 is designed as a full spectrum EDB per the Criteria of the District Manual Volume 3. Pond C-2 will capture runoff from Basins B-2 (PUD 1), C-2, C-5, C-6-1, C-6-2, and D-1. Conservative estimates were made in the design process for Pond C-2, assuming 80% imperviousness for the 87.99 acres of contributing area to ensure the pond provides adequate storage while PUD 1's design is finalized. Pond C-2 will outfall through an existing 48" HDPE storm sewer under Northwest Parkway that flows to the Via Varra subdivision east of the Site. The emergency spillway is located at the east side of the detention pond where any volume greater than the 100-year runoff will discharge towards Northwest Parkway.

Pond E is designed as a full spectrum EDB per the Criteria of the District Manual Volume 3. Pond E will capture runoff from Basin E. Design for Pond E will be finalized with PUD 8. Conservative estimates were made in the design process for Pond E, assuming 75% imperviousness for the 34.11 acres of contributing area to ensure the pond provides adequate storage while PUD 8's design is finalized. Pond E will outlet into the storm sewer within Rockcress Drive that is proposed to be constructed in Phase 2. The runoff from Pond E ultimately travels to Pond C-2 where it is detained before discharging into an existing 48" HDPE under Northwest Parkway to outlet into the Via Varra subdivision east of the Site. The design for Pond E will be finalized with the submittal of the PUD-8 Conformance Drainage Report.

Tables 2 below summarizes the contributing basins and the release rates from each pond. Per MHFD USDCM, the allowable release was set at 90% of the predeveloped runoff rate. Note that since the MHFD USDCM defines full spectrum detention between the 5-year and the 100-year event, the 2-year predeveloped rate was not considered. Table 3 below summarizes the volumes provided by each facility.

Table 2: Site Detention Release Rate Summary

POND	TRIBUTARY BASINS	CONTRIBUTING AREA (AC)	IMPERV	RELEASE RATES (CFS)					
				ALLOWABLE			DESIGN		
				2-YR	10-YR	100-YR	2-YR	10-YR	100-YR
B	A-2-2, B-1	104.48	85.00%	N/A	30.69	159.03	4.88	7.14	84.26
C-1	C-1, C-3	67.38	79.84%	N/A	9.09	52.74	2.38	4.69	47.40
C-2	B-2, C-2, C-5, C-6-1, C-6-2, D-1, D-3	90.38	77.04%	N/A	20.70	109.44	1.40	12.59	74.78
E	E	34.11	75.00%	N/A	8.64	45.45	0.47	3.60	39.86

Table 3: Site Detention Volume Summary

POND	MAX 100-YR DEPTH (FT)	WQCV (AC-FT)	EURV (AC-FT)	REQUIRED VOLUME			PROVIDED VOLUME (AC-FT)
				2-YR	10-YR	100-YR	
B	5.83	3.16	8.78	5.37	9.56	14.15	19.89
C-1	3.61	1.86	5.31	3.23	5.79	8.68	9.62
C-2	8.57	2.35	6.82	4.15	7.44	11.10	12.76
E	8.10	0.86	2.51	1.52	2.75	4.18	6.17

There are a total of two proposed ADS Barracuda water quality devices to provide water quality treatment for surface runoff that is not routed to a detention facility prior to releasing into Tributary I. Design details will be provided for each system in the Filing No. 1 and Filing No. 2 final Drainage Reports.

To further the MHFD goal of watershed level runoff control, this Final Master Drainage Report encourages the implementation of Low Impact Development practices and alternative water quality features per the District Manual Volume 3, Chapter 4, for development within the Site parcels.

The WQCV treatment system and release rate will be designed in accordance with Volume 3 of the District Manual and Chapter 6 of Louisville Criteria. The Full Spectrum Detention Facilities are designed as permanent, post-construction Best Management Practice (BMP) to treat the WQCV in accordance with Louisville Criteria for each of the facilities' tributary areas. An Operations and Maintenance (O&M) manual for the facilities is included in Appendix F.

Off-site Flows

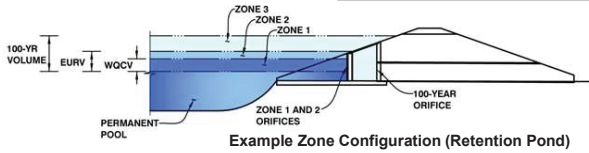
Runoff from developed or otherwise improved areas on-site is either routed to a detention facility or treated for water quality within an ADS Barracuda Hydrodynamic Separator unit. The only exception is Sub-Basin C-6-3, a small portion of street which discharges to an existing 36" HDPE sewer, which ultimately outfalling to Via Varra Road.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: Redtail Ridge - On-Site Improvements

Basin ID: Pond C-2



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.08	2.340	Orifice Plate
Zone 2 (EURV)	6.36	4.479	Orifice Plate
Zone 3 (100-year)	8.21	4.277	Weir&Pipe (Restrict)
Total (all zones)		11.096	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = 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	2.10	4.20					
Orifice Area (sq. inches)	8.51	8.51	8.51					

	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)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Gate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Gate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Height of Gate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Gate Open Area / 100-yr Orifice Area =
Overflow Gate Open Area w/o Debris = ft²
Overflow Gate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

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

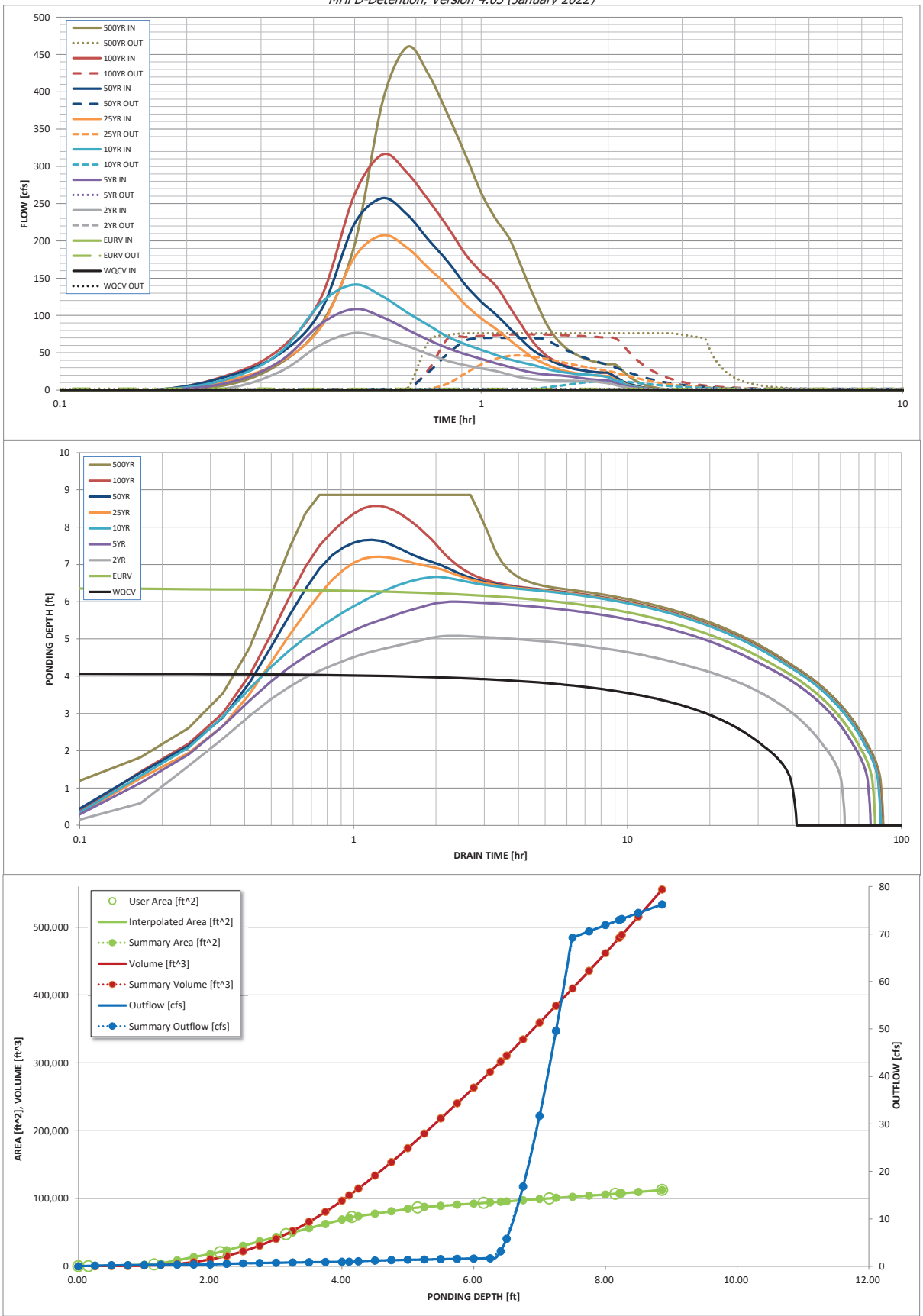
Routed Hydrograph Results

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	0.80	1.08	1.34	1.76	2.11	2.49	3.52
One-Hour Rainfall Depth (in) =	N/A	N/A	0.80	1.08	1.34	1.76	2.11	2.49	3.52
CUHP Runoff Volume (acre-ft) =	2.340	6.819	4.377	6.307	8.275	11.750	14.572	17.762	26.146
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.377	6.307	8.275	11.750	14.572	17.762	26.146
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.82	7.0	23.0	62.7	89.0	121.6	199.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.08	0.25	0.69	0.98	1.35	2.21
Peak Inflow Q (cfs) =	N/A	N/A	76.5	108.8	141.5	207.6	257.3	316.0	460.2
Peak Outflow Q (cfs) =	0.974	2.082	1.399	1.640	12.592	46.263	70.067	74.779	76.218
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.5	0.7	0.8	0.6	0.4
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	N/A
Max Velocity through Gate 1 (fps) =	N/A	0.01	N/A	N/A	0.2	0.9	1.3	1.4	1.5
Max Velocity through Gate 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) =	38	73	57	70	75	73	71	70	66
Time to Drain 99% of Inflow Volume (hours) =	40	77	60	74	81	80	79	78	77
Maximum Ponding Depth (ft) =	4.08	6.36	5.08	6.00	6.67	7.21	7.66	8.57	8.86
Area at Maximum Ponding Depth (acres) =	1.63	2.18	1.97	2.12	2.23	2.31	2.38	2.53	2.58
Maximum Volume Stored (acre-ft) =	2.351	6.821	4.138	6.026	7.482	8.706	9.761	11.990	12.758

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)



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

MEMORANDUM

To: City of Louisville, Public Works Department

From: Cassie Slade, P.E., PTOE

Date: August 29, 2025

Project: Redtail Ridge

Subject: PUD 1 South Traffic Conformance Letter

The Fox Tuttle Transportation Group has prepared this traffic conformance letter for the proposed development of industrial use located in the Industrial District of the Redtail Ridge development in Louisville, Colorado. The site is located northwest of the intersection of Rockcross Drive and Sorrel Avenue, as shown on **Figure 1** at the end of this memorandum. PUD 1 South of Redtail Ridge plans to include two (2) industrial buildings for a total of 239,082 square feet (sf) of industrial space. Concurrent with PUD 1 South, Rockcross Drive will be built from Northwest Parkway west to Road C, as well as Sorrel Avenue north to Road B, and Road C west from Sorrel Avenue to Rockcross Drive. It is understood that there will be three (3) full movement accesses on Road C to support mobility and accessibility to PUD 1 South buildings.

The purpose of this "traffic conformance letter" is to determine if the proposed use of PUD 1 South is significantly different than the trip generation assumptions for this site as analyzed in the "Master" study and to identify if additional traffic analysis is necessary.

Comparison to Master Traffic Study

A **"Master" Transportation Study**¹ (MTS) was previously prepared for the entire Redtail Ridge development that will include a mix of industrial, GMP, life science, office, research and development, retail, hospital and medical office uses. The two (2) buildings within PUD 1 South were assumed to be industrial uses in the MTS. Development staging in the MTS was done in phases by horizon years rather than specific PUD lots, and PUD 1 South was included within Phase 1 of the MTS. Phase 1 of the MTS assumed a total development of 509,260 sf of industrial, 300,000 sf of life science and

¹ Redtail Ridge Traffic and Mobility Study¹. Fox Tuttle Transportation Group, LLC. July 2024 (updated).

598,940 sf of GMP space by Year 2025. The proposed PUD 1 South uses are consistent with uses assumed in Phase 1 of the MTS with additional development anticipated beyond PUD 1 South in Phase 1. **The plan for PUD 1 South is consistent with the land uses and roadway needs in the MTS.**

Trip Generation

To establish the volume of trips associated with the proposed project, the data contained in the *Institute of Transportation Engineers (ITE) Trip Generation Manual*² for the appropriate uses was applied. The proposed land use is estimated to mostly be new trips, known as ‘primary trips’, which is discussed below:

Primary Trips. These trips are made specifically to visit the site and are considered “new” trips. Primary trips would not have been made if the proposed project did not exist. Therefore, this is the only trip type that increases the number of trips made on a regional basis.

Non-Auto Trips. These trips are those that are completed by walking, biking, or transit. The existing transit service will provide employees the opportunity to travel to/from work by bus rather than a personal vehicle. The planned bicycle network throughout Redtail Ridge will provide high-comfort bicycle connections to bicycle facilities near the site. The development plans to use transportation demand management (TDM) to encourage carpooling and other modes to reduce the number of single-occupant vehicle (SOV) commute trips. A non-SOV reduction of 12% was applied for all uses within Redtail Ridge.

Multi-Use (Internal) Trips. These trips are internal from one land use or building to another within the site boundaries. For example, an office patron may also use a retail store or restaurant in one vehicle trip to the site. Multi-use or multi-purpose trips typically do not affect the exterior site access points, nor add any additional traffic volumes to the adjacent street network. For this project it is projected that the small retail uses on the site will be focused on serving the office and industrial employees of the project and most (75% estimated) of the trips accessing them will be on-site or internal trips. The other end of these internal trips were attributed to the office and industrial employees and resulted in a 3% reduction for those uses. Based on this approach, the multi-use factors applied for this project were assumed to be 3% for industrial and office uses and 75% for the retail uses.

Table 1 summarizes and compares the trip generation estimated for these buildings of the MTS and the PUD 1 South site plan for weekday daily, weekday AM and weekday PM peak periods.

² *Trip Generation Manual*. 11th Edition. Institute of Transportation Engineers. Washington, DC. 2021.

Redtail Ridge: PUD 1 South

Traffic Conformance Letter

August 29, 2025

Table 1. Trip Generation Summary and Comparison for PUD 1 South Site

	Land Use	Size	Unit	Non-SOV	Internal Capture	Net Reduction Factor	Average Weekday Trips		Weekday AM Peak Hour Trips				Weekday PM Peak Hour Trips			
							Rate	Total	Rate	Total	In	Out	Rate	Total	In	Out
MTS	#130 Industrial Park	198.00	KSF	12%	3%	85%	*	1,143	0.4	68	55	13	0.4	68	14	54
		198.00	KSF			Subtotal		1,143		68	55	13		68	14	54
PUD 1 South	#130 Industrial Park	237.2	KSF	12%	3%	85%	*	1,256	0.4	81	66	15	0.4	81	17	64
		237.20	KSF			Subtotal		1,256		81	66	15		81	17	64
Difference in Trips (PUD 1 vs. MTS)								113		13	11	2		13	3	10

* ITE Equation: $EXP(0.52 \cdot LN(X)) + 4.45$

PUD 1 South is estimated to generate slightly more trips for that space as expected in the MTS, with an increase of 13 trips in the AM and PM peak hours. Land uses and trip generation of PUD 1 South are aligned with the assumed use in the MTS, with an increase in square footage (19.8% difference) for these two buildings. It should be noted that the overall square footage in Phase 1 under the current proposal is actually slightly less than shown in the MTS. The capacity analysis in the MTS indicated the study intersections would operate acceptably (LOS D or better) with the full Phase 1 development and associated roadway improvements. The updated PUD 1 South volume adds 9 or fewer trips to any individual movement, so therefore it is expected that the study intersections will operate acceptably with the PUD 1 South trips.

A comparison of total trips for all of Redtail Ridge as planned in the MTS and revised for known PUDs (PUD 1 and PUD 5) is shown in **Table 2**. The increase in trips from PUD 1 is a less than 2% increase in Phase 1 trips in the MTS and approximately 0.5% increase in total trips in the MTS.

Table 2. Overall Trip Generation Summary and Comparison

	Average Weekday Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
		Total	In	Out	Total	In	Out
MTS	20,902	1,908	1,523	385	2,149	525	1,624
PUD 1 Difference	113 +0.5%	13 +0.7%	11 +0.7%	2 +0.5%	13 +0.6%	3 +0.6%	10 +0.6%
PUD 5 Difference	198 +0.9%	15 +0.8%	12 +0.0.8%	3 +0.8%	15 +0.7%	7 +1.3%	8 +0.5%
Total Difference	311 +1.5%	28 +1.5%	23 +1.5%	5 +1.3%	28 +1.3%	10 +1.9%	18 +1.1%

Proposed Access

With the construction of PUD 1 South, internal roadways will be constructed as planned for Phase 1 of the MTS:

- Rockcress Drive: built west from Northwest Parkway to Road A.
- Sorrel Avenue: built from Rockcress Drive to Campus Drive.
- Road C: built from Rockcress Drive to Sorrel Avenue.
- Road B: built from Road A to Sorrel Avenue.
- Road A: built from Rockcress Drive to Campus Drive.

Access from the PUD 1 South buildings will be provided exclusively to Road C. Three (3) full movement side-street stop-controlled access intersections are planned on Road C. The proposed site plan including access locations is shown in **Figure 2** at the end of this memorandum.

An estimate of traffic entering and exiting the accesses was performed, based on the site plan, truck and vehicle distribution was assigned to an access point based on the building use and square footage accessible from each access. Vehicle distribution through the street network used the same distribution assumption for external trip origins and destinations that were used in the MTS.

The added trips generated by PUD 1 South at public street intersections are shown in **Figure 3**. The trips generated by PUD 1 South in the MTS are shown in **Figure 4**. Comparing **Figure 3** and **Figure 4**, PUD 1 South is expected to generate slightly more trips as are expected from that space in the MTS. The trips generated by PUD 1 South are fewer than the trips generated by the total expected in Phase 1, and therefore are expected to be accommodated by the planned roadway network found to function acceptably with the complete traffic volume anticipated for Phase 1.

Travel Demand Management

Some physical infrastructure components of the project travel demand management (TDM) are being implemented with PUD 1 South. Pedestrian connections will be built to PUD 1 South from the surrounding roadways and facilities, including paths to internal parks both east and west of the two industrial buildings in PUD 1 South. This network will provide a comfortable connection between the PUD 1 South buildings and multimodal amenities such as the circulator shuttle stops and showers and changing facilities for bicycle commuters.

**Redtail Ridge: PUD 1 South
Traffic Conformance Letter**

August 29, 2025

Conclusions

The plan for PUD 1 South of Redtail Ridge is consistent with the land use assumptions of the MTS for the parcel with a 19.8% increase in industrial use. PUD 1 South is expected to generate 113 more daily trips and 13 more trips in the AM and PM peak hours as expected from that space in the MTS. This reflects an increase of less than 2% in total Phase 1 trips and approximately 0.5% in total trips from the MTS. Access points to PUD 1 South are similar to the planned roadways and access in the MTS and are expected to distribute traffic to public streets consistent with the assumptions in the MTS. **It is anticipated that the planned roadway network and intersections can accommodate PUD 1 South trips without the need for additional analysis or mitigation measures since it is consistent with the MTS.**

Hopefully the contents of this memorandum are helpful. If you have any questions, please give me a call.

Sincerely,

FOX TUTTLE TRANSPORTATION GROUP, LLC



Cassie Slade, P.E.,PTOE
Principal





PUD 1 Area



LIFE SCIENCE DISTRICT WEST

Tot. Life Sciences Building Area (SF) 274,135

Total Parking Stalls 825
Avg. Parking Ratio per 1K GSF 3

GMP / INDUSTRIAL DISTRICT

GMP Building Area (SF) 462,804
Industrial Building Area (SF) 612,400
Total District Building Area (SF) 1,075,204
Total Parking Stalls 2,220
Avg. Parking Ratio per 1K GSF 2.09

LIFE SCIENCE DISTRICT EAST

Tot. Life Sciences Building Area (SF) 165,000

Total Parking Stalls 492
Avg. Parking Ratio per 1K GSF 3

R&D DISTRICT

Tot. R&D Building Area (SF) 117,820

Total Parking Stalls 390
Avg. Parking Ratio per 1K GSF 3.3

OFFICE DISTRICT

Total Office Building Area (SF) 342,484
Total Parking Stalls 1,435
Avg. Parking Ratio per 1K GSF 4

AMENITY/ LIFE SCIENCES

Life Science Building Area (SF) 102,621
Amenity Building Area (SF) 15,540
Total District Building Area (SF) 118,161

Total Parking Stalls 398
Avg. Parking Ratio per 1K GSF 3.36

HOSPITAL

Total Building Area 435,600

TOTAL SITE DEVELOPMENT

Total Building Area (SF) 2,542,387



Perkins&Will

TRYBA ARCHITECTS



FOX TUTTLE

TRANSPORTATION GROUP

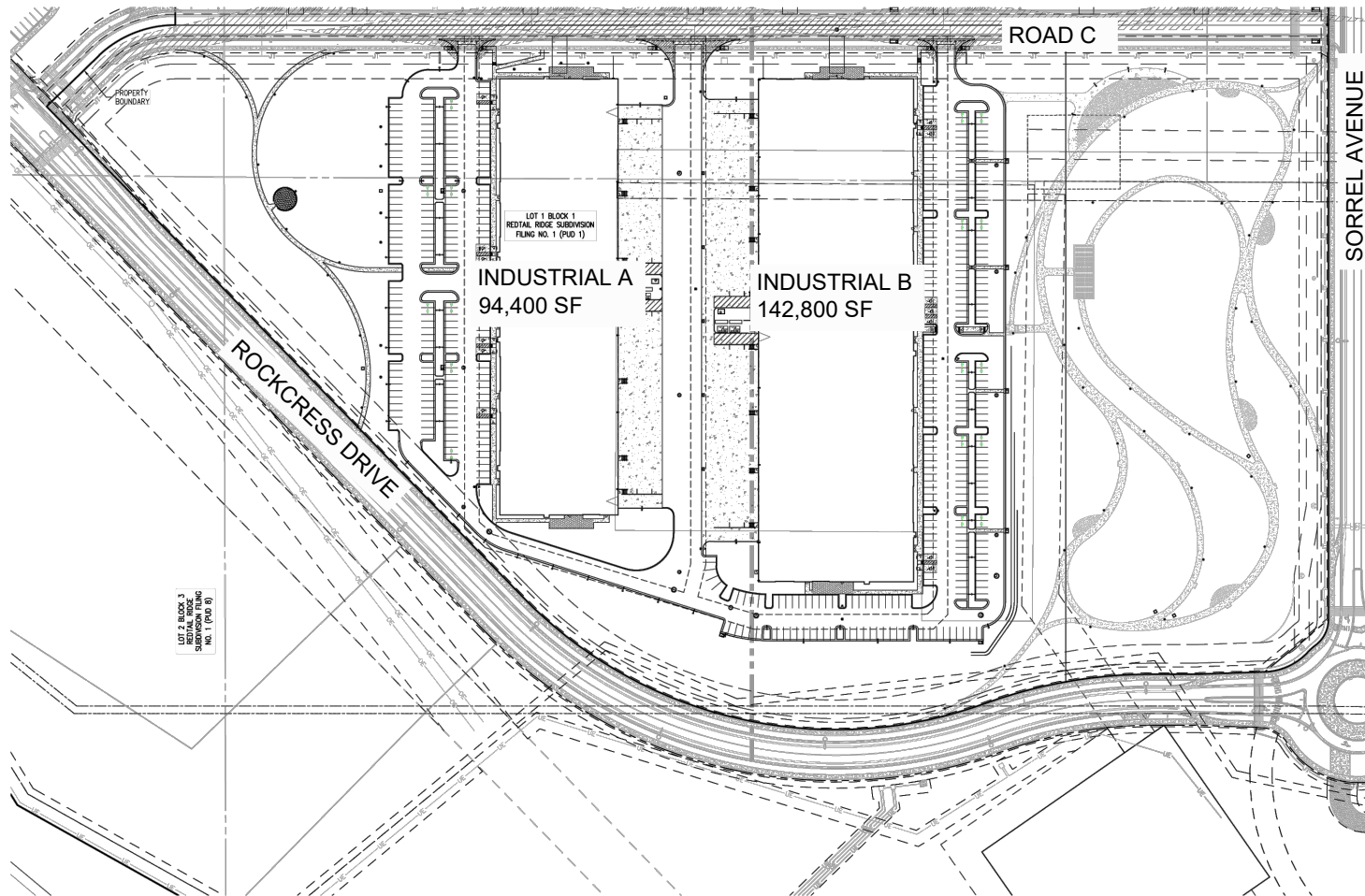
REDTAIL RIDGE PUD 1 SOUTH CONFORMANCE
PUD 1 SOUTH AREA

FT Project #	19055	Original Scale	NTS	Date	3/13/2025	Drawn by	SKK	Figure #	1
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REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1 & LOT 2 BLOCK 1



LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STW SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ WH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 8" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES

ABBREVIATIONS

BLDG	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DOB	DOWNPOUT
DU	DRY UTILITY LANE/MENT
ELC	ELECTRIC
EMT	EMBANKMENT
EX	EXISTING
FF	FINISHED FLOOR
FI	FIRE HYDRANT
FL	FLOW LINE
GV	GAS VALVE
HT	HEIGHT
IMP	IMPROVEMENT
N	NORTH NORTHING
PE	PEDESTRIAN
PL	PROPOSED
ROW	RIGHT OF WAY
S&M	SHOULDER MAINTENANCE LANE/MENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



SCALE: 1" = 100'

REVISION DATE:

ISSUE DATE: ##-##-202#

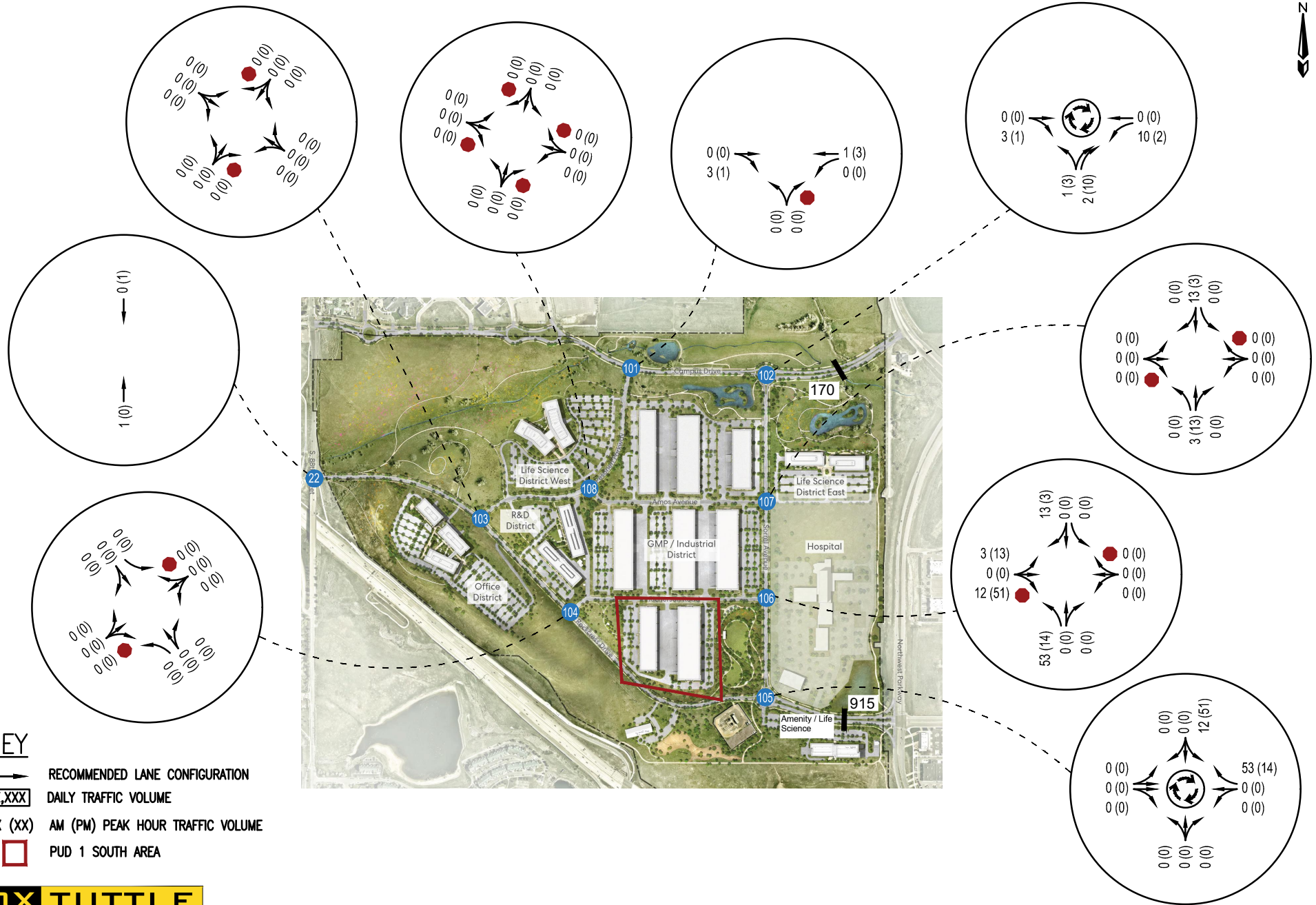
OVERALL SITE PLAN
SHEET 2 OF 36

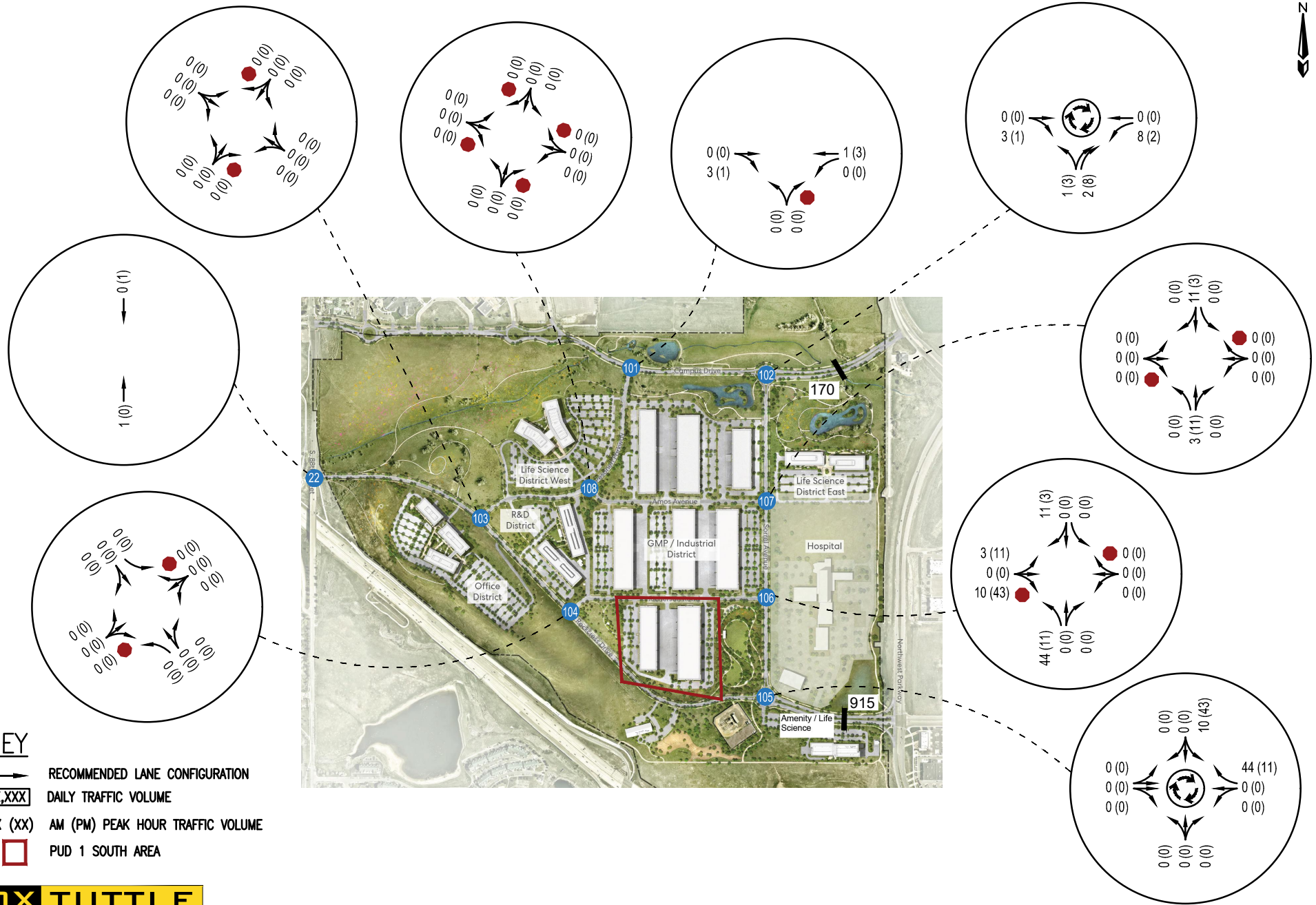
REDTAIL RIDGE PUD1 SOUTH

FOX TUTTLE
TRANSPORTATION GROUP

REDTAIL RIDGE PUD 1 SOUTH CONFORMANCE
PUD 1 SOUTH SITE PLAN

FT Project #	19055	Original Scale	NTS	Date	3/13/2025	Drawn by	SKK	Figure #	2
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KEY

- RECOMMENDED LANE CONFIGURATION
- [X,XXX] DAILY TRAFFIC VOLUME
- XX (XX) AM (PM) PEAK HOUR TRAFFIC VOLUME
- PUD 1 SOUTH AREA



REDTAIL RIDGE PUD 1 SOUTH CONFORMANCE
MTS - PUD 1 SOUTH AREA GENERATED TRIPS

FT Project #	19055	Original Scale	NTS	Date	3/13/2025	Drawn by	SKK	Figure #	4
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CONOCOPHILLIPS CAMPUS

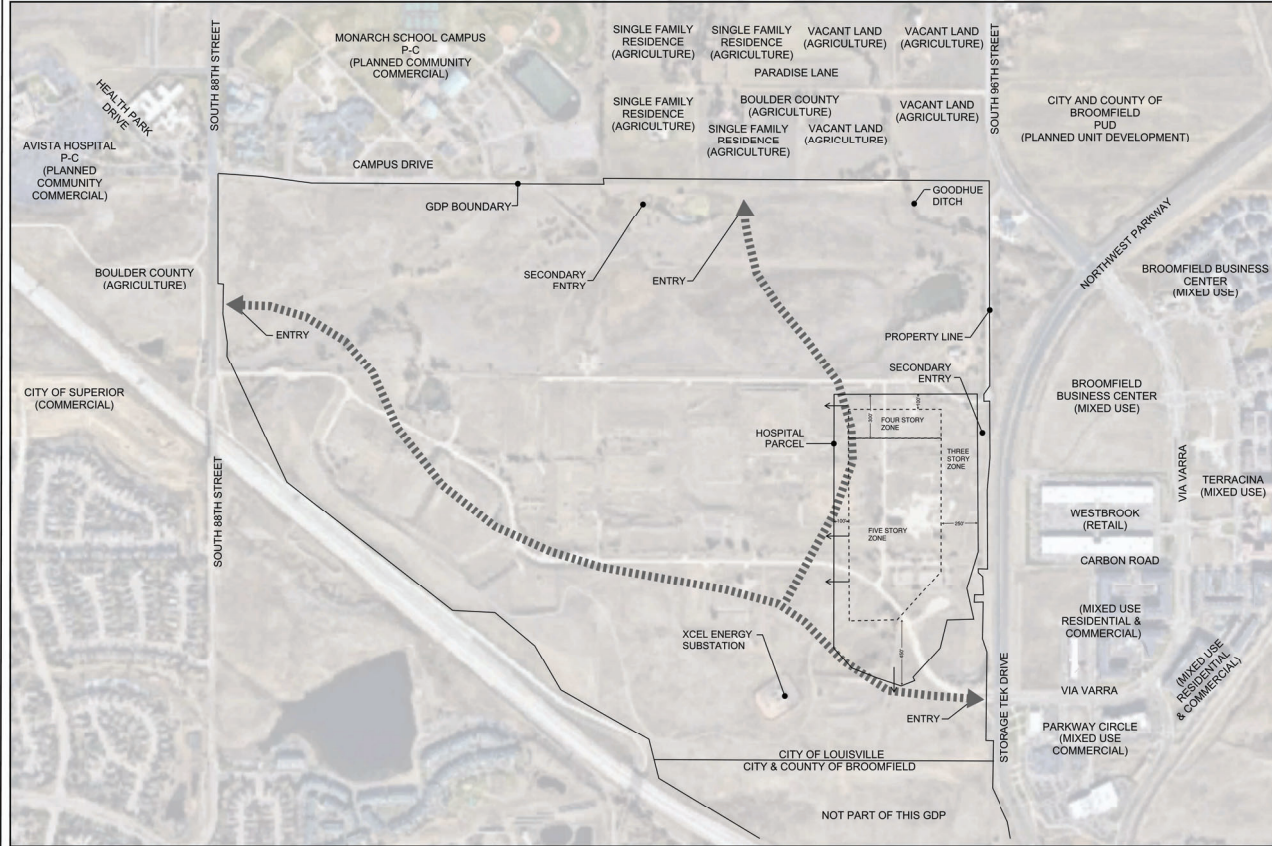
GENERAL DEVELOPMENT PLAN AMENDMENT 1

A PART OF THE SOUTH HALF OF SECTION 20, THE NORTH HALF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE 6TH P.M.
SHEET 1 OF 1

AMENDMENT CHANGES

THE PURPOSE OF THIS AMENDMENT IS SPECIFICALLY FOR THE HOSPITAL PARCEL AND THE REST OF THE REDTAL DEVELOPMENT REMAINS UNCHANGED.

- 1) Additional note for the allowable square footage transfer from the Avista Adventist Hospital 2002 GDP.
- 2) Addition of hospital and medical office building uses to the "Permitted Uses" for better clarity on specific uses.
- 3) Updated yard and bulk requirements to include the allowable height for the hospital parcel only.
- 4) Updated aerial graphic
- 5) Added Hospital Parcel and density zoning to graphic
- 6) Added Hospital Parcel building massing design parameters



GENERAL DEVELOPMENT PLAN

RECEPTION NUMBER

CERTIFICATIONS/SIGNATURE BLOCKS

CITY COUNCIL CERTIFICATION:

APPROVED THIS _____ DAY OF _____, 20____ BY THE CITY COUNCIL OF THE CITY OF LOUISVILLE, COLORADO.
RESOLUTION NO. _____ SERIES _____

MAYOR SIGNATURE

PLANNING COMMISSION CERTIFICATION:

APPROVED THIS _____ DAY OF _____, 20____ BY THE PLANNING COMMISSION OF THE CITY OF LOUISVILLE, COLORADO.
RESOLUTION NO. _____ SERIES _____

OWNERSHIP SIGNATURE BLOCK:

BY SIGNING THIS GDP, THE OWNER ACKNOWLEDGES AND ACCEPTS ALL THE REQUIREMENTS AND INTENT SET FORTH IN THIS GDP. WITNESS OUR HANDS AND SEALS

THIS _____ DAY OF _____, 20____

OWNER
PORTERKANE ADVENTIST HEALTH SYSTEM
A CITY OF LOUISVILLE CORPORATION

BY: SIGNATURE

TITLE

NOTARY NAME AND SIGNATURE

MY COMMISSION EXPIRES _____

GENERAL NOTES:

1. DEVELOPMENT SHALL CONFORM AND BE CONSISTENT WITH THE LOUISVILLE MUNICIPAL CODE AND THE COMMERCIAL DEVELOPMENT DESIGN STANDARDS AND GUIDELINES UNLESS OTHERWISE WAIVED OR MODIFIED BY THE CITY COUNCIL THROUGH THE PUD DEVELOPMENT PLAN PROCESS.
2. THE CAMPUS SECURITY BOUNDARY WILL NOT EXTEND OUTSIDE THE SITE BOUNDARY.
3. TRAFFIC CIRCULATION PATTERNS PERFECTED WITHIN AND AROUND LOT 4 NORBERT INTERNAL PRIVATE DRIVES AND ARE CONCEPTUAL ONLY AND SUBJECT TO MODIFICATION.
4. EXISTING FREE STANDING CARP FACILITIES WITHIN LOT 4 SHALL CONSTITUTE A PERMISSIBLE NON-CONFORMING USE.
5. PUBLIC LAND DEDICATION OF AT LEAST 12% WILL COMPLY WITH SECTION 16.16.060.B OF THE LOUISVILLE MUNICIPAL CODE.

SITE INFORMATION

GROSS DEVELOPABLE AREA (PUD BOUNDARY)	391.719 ACRES (MINIMUM 0.15 P.A.R. 1*)
ZONING:	PLANNED COMMUNITY ZONED DISTRICT (PCDZ) - COMMERCIAL WITH PUD-C OVERLAY
PLANNED ACCESS:	NORTHWEST PARKWAY, CAMPUS DRIVE, SOUTH BETH STREET

*THE P.A.R. APPLIES TO THE GROSS AREA OF THE ENTIRE DEVELOPMENT AND IS NOT PARCEL SPECIFIC. THIS GDP ACKNOWLEDGES AN ADDITIONAL 364,400 SF ALLOCATED TO THE HOSPITAL PARCEL, ON TOP OF THE ALLOCATED DEVELOPMENT SQUARE FOOTAGE THE 364,400 SF IS IN CONSIDERATION WITH A DENSITY GROUP FROM HEALTHY PLANNING.

PERMITTED USES

PERMITTED USE	COMMENTS / REMARKS	PARKING REQUIREMENTS
PROFESSIONAL, BUSINESS, AND ADMINISTRATIVE OFFICES	-	4 / 1,000 S.F.
EDUCATIONAL AND TRAINING FACILITIES	MEETING ROOMS AND SOCIAL SPACE FOR EMPLOYEES AND VISITORS	0.5 / 1,000 S.F.
PRIVATE SHORT TERM LODGING FOR CONOCOPHILLIPS EMPLOYEES AND GUESTS	OVERNIGHT ACCOMMODATIONS FOR EMPLOYEES/VISITORS	0.5 / ROOM
PEDESTRIAN PLAZAS AND PEDESTRIAN WAYS	-	-
PRIVATE, NONCOMMERCIAL RECREATIONAL AND SOCIAL FACILITIES	-	1 / 1,000 S.F.
PARKING LOTS AND PARKING BUILDINGS	SURFACE AND STRUCTURED PARKING	-
CAMPUS ORIENTED CHILDCARE CENTER	PRIVATE CHILDCARE FOR EMPLOYEES	1.5 SPACES PER TEACHER PLUS ONE SPACE PER ADMINISTRATIVE EMPLOYEE
RESEARCH OFFICE AND CORPORATE USES AND FACILITIES FOR THE RESEARCH OR DEVELOPMENT, MANUFACTURING, FABRICATION, PROCESSING, OR ASSEMBLY OF SCIENTIFIC OR TECHNICAL PRODUCTS, OR OTHER PRODUCTS	-	1.25 / 1,000 S.F.
BUILDING MOUNTED CARP FACILITIES	-	-
CAMPUS ORIENTED FOOD SERVICE	RESTAURANTS, CAFETERIAS, OR CAFES FOR USE BY EMPLOYEES/VISITORS INTEGRATED THROUGHOUT THE CAMPUS	-
COMMERCIAL USES, INCLUDING BUT NOT LIMITED TO BUILDING CONTRACTORS EQUIPMENT TRUCKS, TRANSPORTATION CENTERS AND SERVICES, WAREHOUSES AND STORAGE FACILITIES	STORAGE OF MATERIALS IN SUPPORT OF THE CAMPUS RESEARCH AND DEVELOPMENT FACILITY, HELIPAD (SPECIAL USE ONLY), HOSPITAL MEDICAL OFFICE BUILDINGS	1 / 1,000 S.F.
PRIVATE UTILITY USES	TO ALLOW THE EXISTING SANITARY LIFT STATION, POTENTIAL SUBSURFACE GEO EXCHANGE FIELD, SOLAR PANELS, BUILDING MOUNTED WIND POWERED ELECTRICAL GENERATOR FACILITIES, AND CENTRAL MECHANICAL, ELECTRICAL, AND PLUMBING FACILITY	-
OTHER USES AS ESTABLISHED BY THE CITY COUNCIL AS FOUND TO BE SPECIFICALLY COMPATIBLE FOR COMMERCIAL AND OFFICE PLANNING AREAS	-	-

YARD AND BULK REQUIREMENTS

1. OTHER THAN FOR THE HOSPITAL PARCEL, MINIMUM BUILDING HEIGHTS SHALL BE BASED ON THE CONOCOPHILLIPS CAMPUS GDP (RECEPTION NO. 030879). STANDARDS FOR THE HOSPITAL PARCEL ARE NOTED BELOW.

MINIMUM BUILDING SETBACKS (FOR BUILDING FOOTPRINTS LESS THAN OR EQUAL TO 30,000 GROSS SQUARE FEET)

STREET K.O.W. LINE:	
ARTERIAL STREET	30 FT.
COLLECTOR STREET	20 FT.
INTERNAL/PRIVATE DRIVE	10 FT.

(FOR BUILDING FOOTPRINTS GREATER THAN OR EQUAL TO 30,000 GROSS SQUARE FEET)

STREET R.O.W. LINE:	
ARTERIAL STREET	50 FT.
COLLECTOR STREET	40 FT.
INTERNAL/PRIVATE DRIVE	10 FT.

MINIMUM PARKING SETBACKS (FROM ALL PERIMETER PROPERTY LINE OR RIGHTS-OF-WAYS)

PROPERTY LINE ADJACENT TO U.S. 36	40 FT.
ARTERIAL STREET R.O.W.	25 FT.
COLLECTOR STREET R.O.W.	15 FT.
INTERNAL/COMMON PROPERTY BOUNDARY	10 FT.

HOSPITAL PARCEL
FOR THE HOSPITAL PARCEL, LOT 1, BULK BUILDING HEIGHTS ARE EXPECTED TO RANGE FROM THREE TO FIVE OCCUPABLE STORIES, RANGING IN HEIGHT FROM 50 TO 80 FEET. UNOCCUPIED MECHANICAL SCREENINGS OF UP TO 20 FEET WOULD BE ABOVE THE 5 STORIES. THE HOSPITAL PARCEL WILL BE ZONED TO SUPPORT LOWER THREE STORY BUILDING HEIGHTS TOWARDS THE NORTH, EAST, AND WEST PROPERTY BOUNDARIES CONCENTRATING THE 5-STORY STRUCTURES CENTRALLY WITHIN THE SITE. REFER TO THE GRAPHING FOR PARCEL HEIGHT ZONES.

BUILDING HEIGHT ZONING:

THREE STORY ZONE:

40' 0" MAXIMUM BUILDING HEIGHT

50' 0" MAXIMUM HEIGHT

80' 0" MECHANICAL PENTHOUSE HEIGHT*

FOUR STORY ZONE:

60' 0" MAXIMUM BUILDING HEIGHT

80' 0" MAXIMUM HEIGHT

80' 0" MECHANICAL PENTHOUSE HEIGHT*

FIVE STORY ZONE:

80' 0" MAXIMUM BUILDING HEIGHT

90' 0" MAXIMUM HEIGHT

100' 0" MECHANICAL PENTHOUSE HEIGHT*

*ROOF ACCESS AND ELEVATOR OVERLAP IS EXCLUDED FROM THE BUILDING HEIGHT

BUILDING MASSING DESIGN PARAMETERS
FOR BUILDING FACIES EXCEEDING 150 FEET IN LENGTH AND MORE THAN 45 FT IN HEIGHT, A RELIEF IN THE BUILDING MASSING IS REQUIRED TO REDUCE VISUAL MONOTONY AND ENHANCE ARCHITECTURAL INTEREST.
A MAXIMUM ELEVATOR OF 45 FEET IS PERMITTED BEFORE A MINIMUM HORIZONTAL SETBACK OF 15 FEET IS REQUIRED FROM THE PRIMARY BUILDING FACE.
A PROJECTED RELIEF ELEMENT MAY EXTEND OUTWARD FROM THE MAIN BUILDING MASS BY A MINIMUM OF 2 FEET. PROVIDED IT CONTRIBUTES TO THE VISUAL ATTILATION AND DESIGN OF THE FACIES.
THE FOOTPRINT OF EACH FLOOR ABOVE 45 FEET SHALL NOT EXCEED 50% OF THE FOOTPRINT OF THE BUILDING AT OR BELOW 45 FEET.
ANY ROOFTOP ENCLOSURE (E.G., MECHANICAL, PENTHOUSES) MUST BE SET BACK A MINIMUM OF 15 FEET FROM THE EDGE OF THE BUILDING MASS, UNLESS IT IS ARCHITECTURALLY INTEGRATED INTO THE BUILDING MASS.
EXCEPTION: A DEFENDING ARCHITECTURAL ELEMENT OR DISTINCT BUILDING FORM WITH A TOTAL WIDTH OF LESS THAN 100 FEET IS EXEMPT FROM THE ABOVE SETBACK AND RELIEF REQUIREMENTS. A MINIMUM FOOTPRINT OVERLAP FROM THE ADJACENT PRIMARY FACIES PLANE MUST STILL BE PROVIDED TO ENSURE VISUAL ATTILATION.
DEFENDING ARCHITECTURAL ELEMENTS MAY INCLUDE, BUT ARE NOT LIMITED TO:
VERTICAL CIRCULATION TOWERS (E.G., STAIR OR ELEVATOR CORES)
ENTRY PATIOLAS OR LOBBIES
ARCHITECTURAL ELEVATORS OR ROOF OVERHANGS
ADJACENT TO SOLID PLURAL, FACIES FEATURES
CORNER ELEMENTS OR TURRETS
ATTACH COLUMNS OR LOFT HELLS
DISTINCTIVE ROOF FORMS

SMITHGROUP

1675 LOGAN ST.
SUITE 500
DENVER, COLORADO 80202
303.832.3272
smithgroup.com

Kimley»Horn

1125 17TH ST
SUITE 1400
DENVER, CO 80202
303.228.2300
kimley-horn.com

CONOCOPHILLIPS CAMPUS

2270 SO 88TH STREET
LOUISVILLE, CO

GENERAL DEVELOPMENT PLAN

DRAWN	TEAM
CHECK	TEAM
FILED	TEAM

SHEET NUMBER:

1 OF 1

A development agreement is required for this PUD. All public infrastructure must be secured and be part of the agreement (cash or LOC). Submit cost estimate with next submittal. Staff will draft agreement for review once the estimate is submitted.

Show bicycle parking spaces. Bike parking requirements encourage the use of shelters.

easements? Should

Screen wall shown on the elevations?

Show all EV spaces, capable, ready, light. see comments on cover sheet.

What is the plan for Lot 2? If included on this PUD, improvements must be depicted.

Conceptual plans showed this as a park-like space with landscaping and trails. At an absolute minimum, a seeding and landscape plan needs to be provided for this lot.

LOT 2 BLOCK 3
RETAIL RIDGE
SUBDIVISION FILING
NO. 1 (PUD 8)

Callout building setbacks

PROPERTY BOUNDARY
RIGHT-OF-WAY
EXISTING STM SEWER W/4H AND INLET
EXISTING SANITARY SEWER W/4H
EXISTING WATER LINE W/ VALVE
EXISTING GAS LINE
EXISTING UNDERGROUND ELECTRIC
EXISTING JOINT FRENCH
EXISTING STREET LIGHT
EXISTING TELEPHONE POLE
EXISTING FIRE HYDRANT
PROPOSED SANITARY SEWER W/4H
PROPOSED SANITARY SERVICE W/CLEAN OUT
PROPOSED STORM SEWER W/ 4H AND INLET
PROPOSED LANDSCAPE DRAIN W/ INLET
PROPOSED FIRE HYDRANT
PROPOSED 8" WATER MAIN W/ BENDS, VALVE,
PROPOSED WATER SERVICE W/METER
PROPOSED FIRE SERVICE
PROPOSED STREET LIGHT
PROPOSED PEDESTRIAN TRAIL
PROPOSED BUILDING ENTRANCE
PROPOSED TRANSFORMER AND GENERATOR
ABANDON EXISTING UTILITY LINE
PROPOSED CONCRETE
PROPOSED CONCRETE PAVERS
PROPOSED PORCELAIN PAVERS
PROPOSED CRUSHER FINES

ABBREVIATIONS	
BLOC	BUILDINGS
CAG	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
DUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
EMT	EASEMENT
EXIST	EXISTING
FF	FINISHED FLOOR
FH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH, NORTHING
PED	PEDESTRIAN
PR	PROPERTY LINE
PRO	PROPOSED
R/W	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



ISSUE DATE: 03-14-2025

3-14-2025 OVERALL SITE PLAN
SHEET 2 OF 24
REDTAIL RIDGE PUD1 SOUTH

PROJECT N: 221236

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NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH



PROPERTY BOUNDARY
RIGHT-OF-WAY
EXISTING STW SEWER W/ MH AND INLET
EXISTING SANITARY SEWER W/ MH
EXISTING WATER LINE W/ VALVE
EXISTING GAS LINE
EXISTING UNDERGROUND ELECTRIC
EXISTING JOINT TRENCH
EXISTING STREET LIGHT
EXISTING TELEPHONE POLE
EXISTING FIRE HYDRANT
PROPOSED SANITARY SEWER W/ MH
PROPOSED SANITARY SERVICE W/ CLEAN OUT
PROPOSED STORM SEWER W/ MH AND INLET
PROPOSED SLOPE/ DRAIN W/ INLET
PROPOSED FIRE HYDRANT
PROPOSED 8" WATER MAIN W/ BENDS, VALVE,
PROPOSED WATER SERVICE W/ METER
PROPOSED FIRE SERVICE
PROPOSED STREET LIGHT
PROPOSED PEDESTRIAN LIGHT
PROPOSED BUILDING ENTRANCE
PROPOSED TRANSFORMER AND GENERATOR
ABANDON EXISTING UTILITY LINE
PROPOSED CONCRETE
PROPOSED CONCRETE PAVERS
PROPOSED PORCELAIN FAINES
PROPOSED CRUSHER FINES
ACCESSIBLE ROUTE
PARKING COUNT

REDTAIL RIDGE PUD1 SOUTH

PROJECT #: 221236

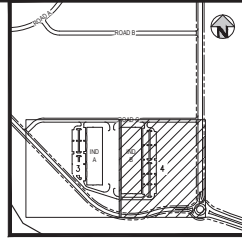
NO CHANGES ARE TO BE MADE TO THE DRAINAGE PATTERN SHOWN UNLESS SPECIFICALLY NOTED OTHERWISE.

1. DESIGN: P. J. JACOBI ASSOCIATES, INC. 2. SITE: REDTAIL RIDGE, LOT 1 BLOCK 1, FILING NO. 1. 3. SCALE: 1" = 60' 4. DATE: 03/14/2025 5. SHEET: 4 OF 24 6. PROJECT: REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



KEY MAP

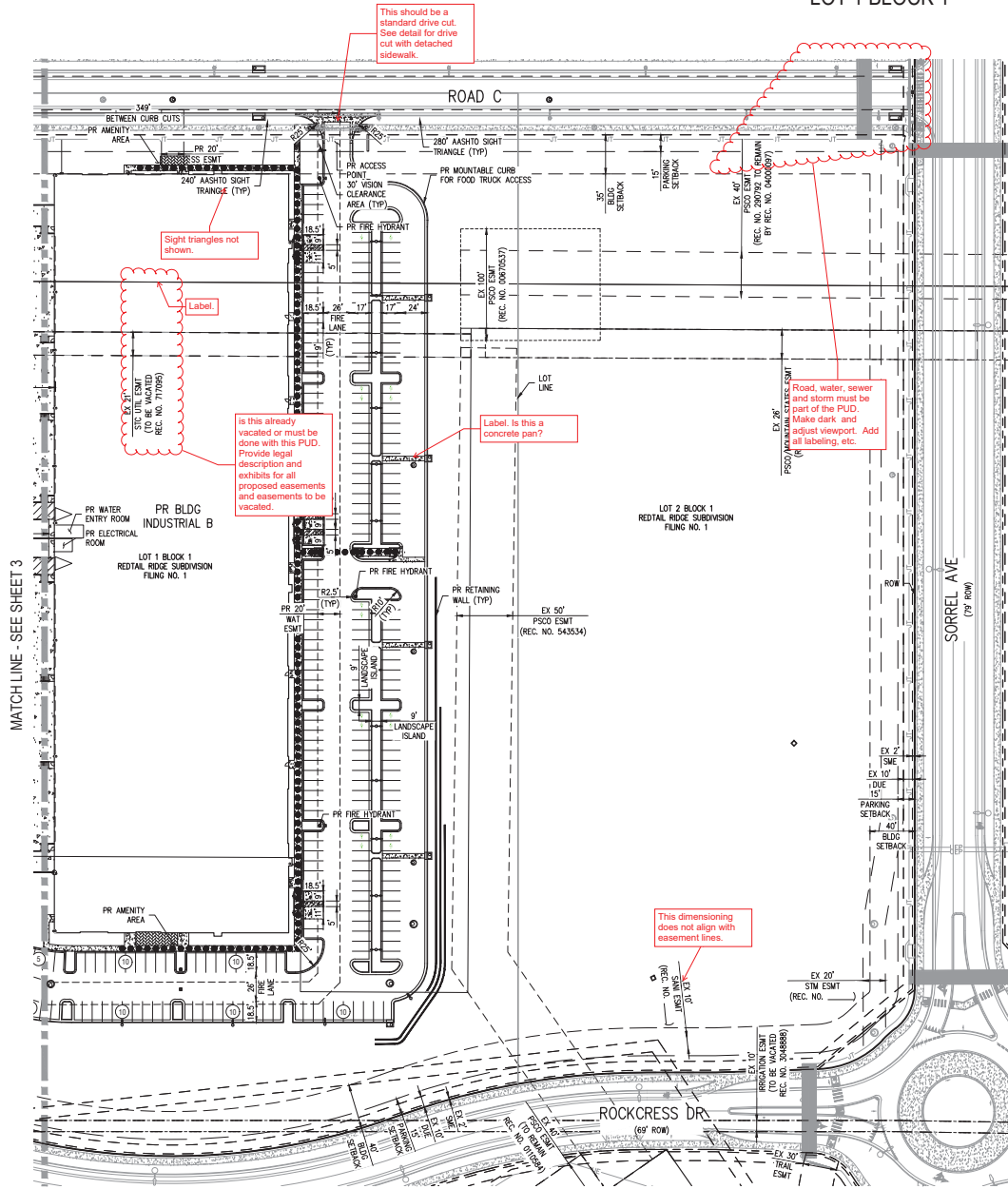
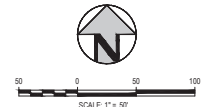
SCALE: 1" = 600'

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES
- ACCESSIBLE ROUTE
- PARKING COUNT

ABBREVIATIONS

BUILD	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
DUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH
PE	PEDESTRIAN
PL	PROPERTY LINE
PRO	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



MATCH LINE - SEE SHEET 3

REVISION DATE:

ISSUE DATE: 03-14-2025

SHEET 4 OF 24

REDTAIL RIDGE PUD1 SOUTH

SITE PLAN

REDTAIL RIDGE FILING NO. 1

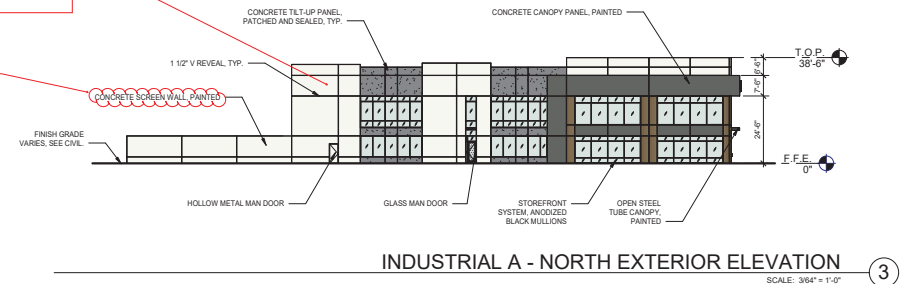
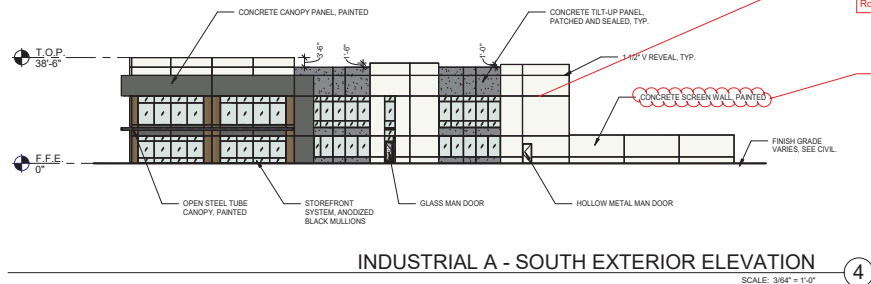
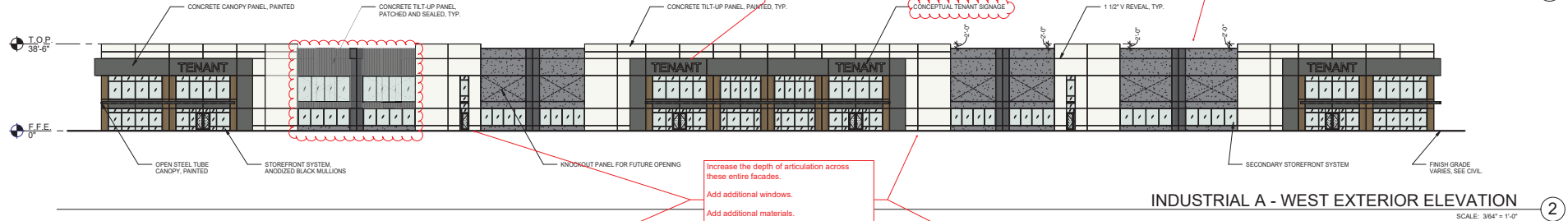
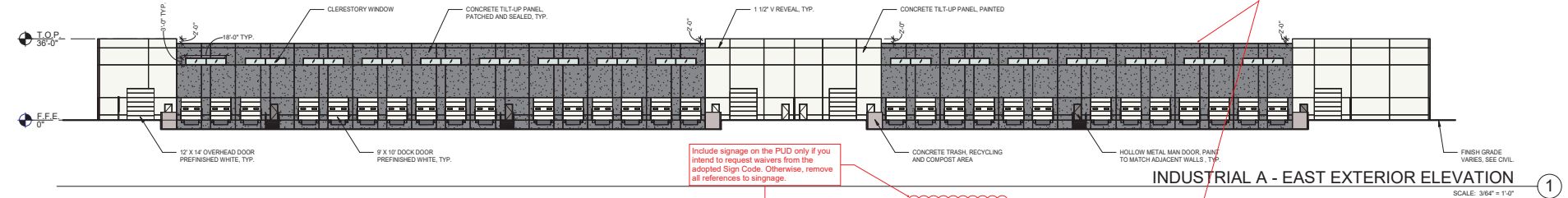
PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1 & LOT 2 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN, CASE #: PUPL-XXXX-2023

All elevations shall be in gray-scale. Include a separate attachment with color renderings.
Building height is measured from the average of the natural grade at the highest and lowest exterior corners of the structure. On the site plan or grading plan, provide the at-grade elevation at all four building corners (per the approved over lot grading plan). Take the highest and lowest elevations and find the average. Show the average elevation as a line on building elevations and depict the building height from the line.

Show mechanical equipment or mechanical screens. All mechanical equipment shall be screened with an architecturally compatible screening material and is limited to 42 feet in height as measured from average grade.



LEGEND

COLORS:

	BASE COLOR: PURE WHITE SW 7005
	SECONDARY COLOR: SEALED CONCRETE FINISH
	ACCENT COLOR: GRIZZLE GREY SW 7098
	CORRUGATED FORMLINER ACCENT COLOR: WOVEN WICKER SW 9104

GLASS:

GREY TINT

	VISION GLASS
	SPANDREL GLASS
	TEMPERED GLASS

ABBREVIATIONS:

T.O.P. - TOP OF PANEL
F.F.E. - FINISH FLOOR ELEVATION

REVISION DATE: -

ARCHITECTURAL ELEVATIONS
ISSUE DATE: 03/14/2025 SHEET 5 OF 24
REDTAIL RIDGE PUD1 SOUTH

PROJECT: L12622-001-01

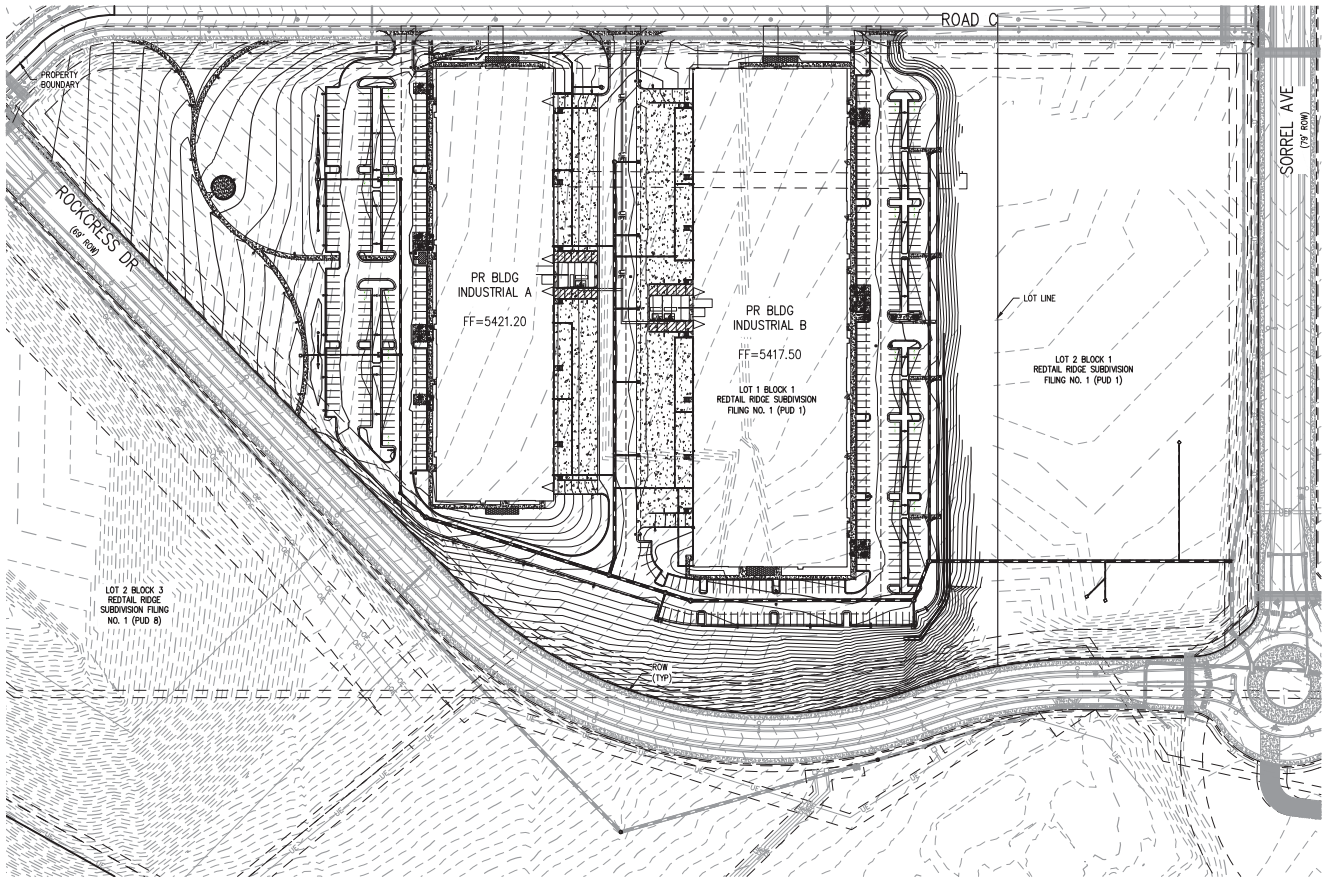
PROJECT #: DEN22-0097-01

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

Provide labels for
existing and
proposed
contours, at least
5' increments.



LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
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- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
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ABBREVIATIONS

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PH	FIRE HYDRANT
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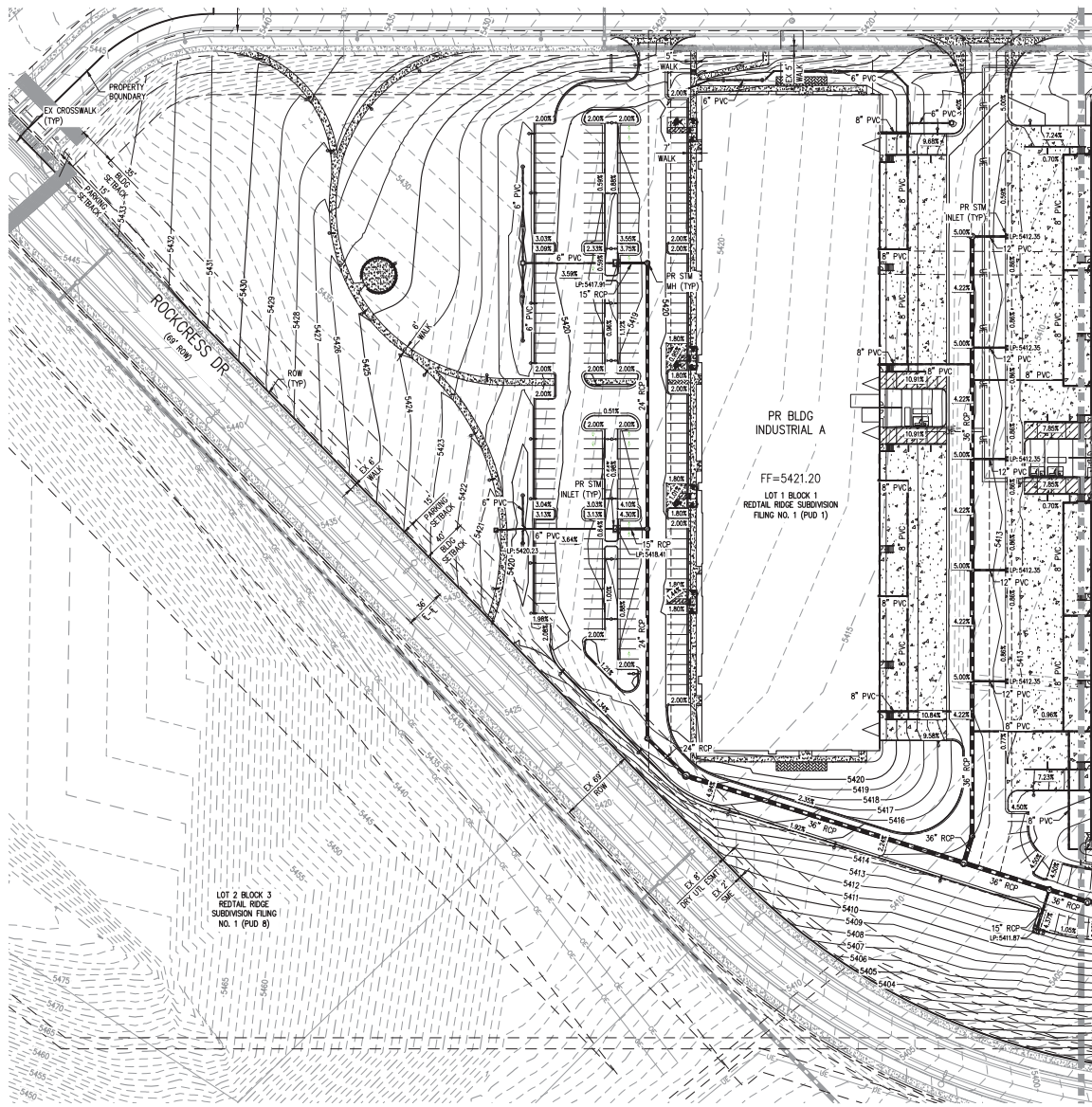
NO CHANGES ARE TO BE MADE TO THE DIMENSIONS OF ANY STRUCTURE SHOWN ON THESE PLANS.

DESIGNED BY: J. J. JENSEN, INC. ENGINEER: J. J. JENSEN, INC. PROJECT NO. 2020-001. DATE: 03/14/2025. SCALE: 1" = 30'. SHEET 8 OF 24.

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



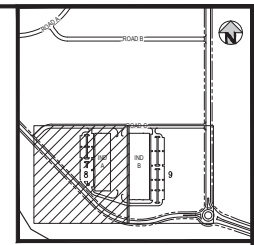
MATCH LINE - SEE SHEET 9

add notes

All accessible parking spaces shall be graded at 2% maximum in all directions.

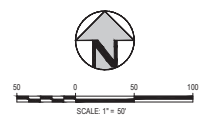
The accessible routes to building shall have a maximum cross slope of 2% and maximum longitudinal slope of 5%.

All proposed piping is privately owned and maintained unless otherwise noted.



- LEGEND:**
- PROPERTY BOUNDARY
 - RIGHT-OF-WAY
 - EXISTING STM SEWER W/WH AND INLET
 - EXISTING SANITARY SEWER W/WH
 - EXISTING WATER LINE W/ VALVE
 - EXISTING GAS LINE
 - EXISTING UNDERGROUND ELECTRIC
 - EXISTING JOINT TRENCH
 - EXISTING STREET LIGHT
 - EXISTING TELEPHONE POLE
 - EXISTING FIRE HYDRANT
 - PROPOSED SANITARY SEWER W/WH
 - PROPOSED SANITARY SERVICE W/CLEAN OUT
 - PROPOSED STORM SEWER W/ MH AND INLET
 - PROPOSED LANDSCAPE DRAIN W/ INLET
 - PROPOSED FIRE HYDRANT
 - PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
 - PROPOSED WATER SERVICE W/METER
 - PROPOSED FIRE SERVICE
 - PROPOSED STREET LIGHT
 - PROPOSED PEDESTRIAN LIGHT
 - PROPOSED BUILDING ENTRANCE
 - PROPOSED TRANSFORMER AND GENERATOR
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 - PROPOSED CONCRETE
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PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRY KOCHER SMITH



LEGEND:

-

ABBREVIATIONS



REDTAIL RIDGE PUD1 SOUTH

ISSUE DATE: 03-14-2025

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MATCH LINE - SEE SHEET 8

PR BLDG
INDUSTRIAL B
FF=5417.50
LOT 1 BLOCK 1
EDTAL RIDGE SUBDIVISION
FILING NO. 1 (BUD 1)

ROAD C

— ROCKCRESS DR.
(69' ROW)

3:1 max slope. 4:1 preferred.

Missing contours

If Lot 2 is included within this PUD package, then it needs to be landscaped accordingly. Please show landscaping/seed mix on a landscape sheet for Lot 2 Block 1

Are these new inlets? Label. Doesn't appear that they'll be capturing much flow with existing grading.

who will maintain all this piping? shared? clarify on the plans ownership and maintenance of piping once it leaves the property.

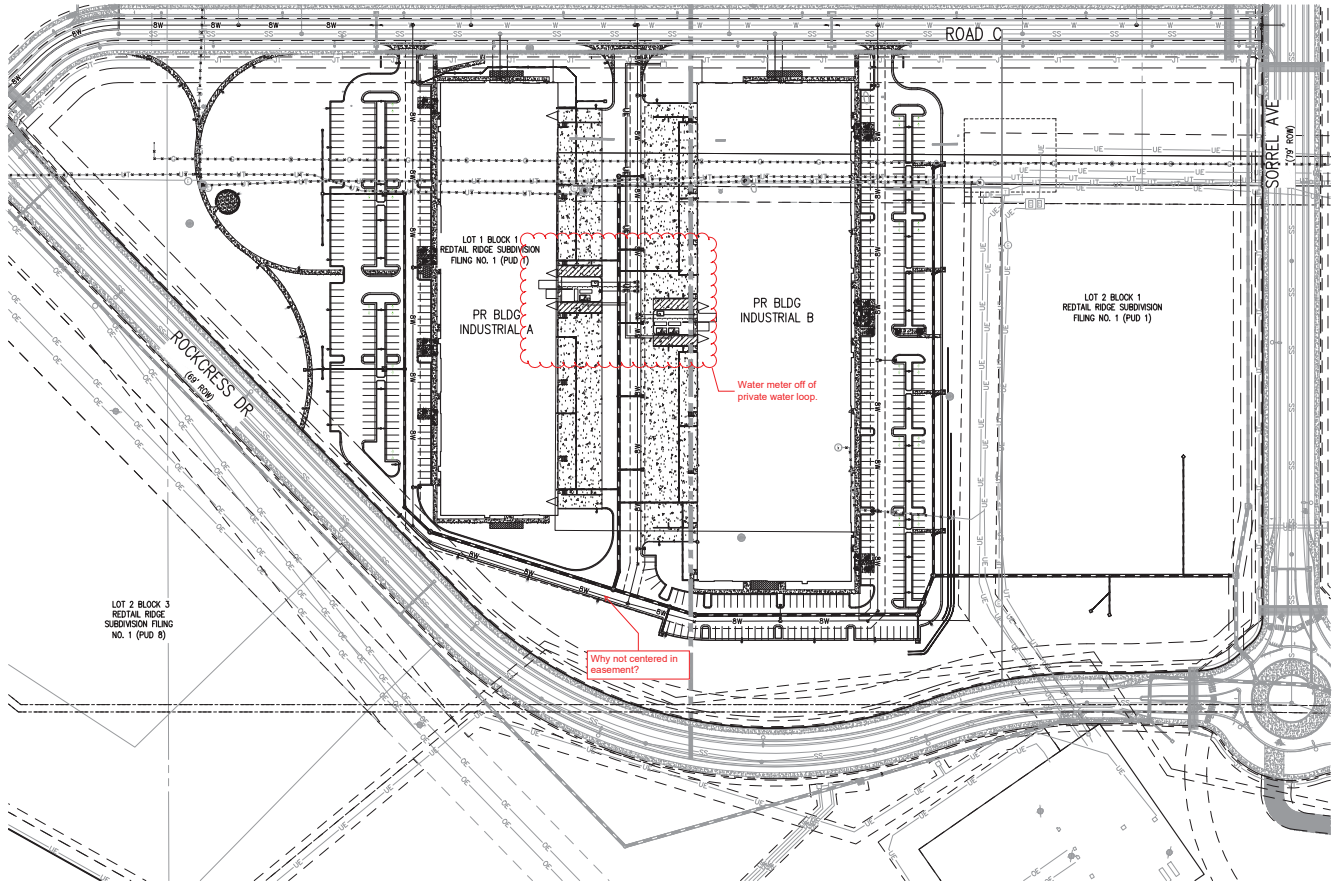
How will lots up here drain? Do they need to go south or will they go east to Sorrel? Clarify and provide stubs to the property if drainage will need to go through other lots.

Easements needed - submit exhibits and legal descriptions with next submittal. These will be private easements to allow flow and pipe across another property.

Add note: "Connect to...."

This pipe must be constructed. Dont think its part of the subdivision plans. Show as dark and construct.

REDTAIL RIDGE FILING NO. 1
PLANNED UNIT DEVELOPMENT
LOT 1 BLOCK 1



INDUSTRIAL A FIRE FLOW DATA:

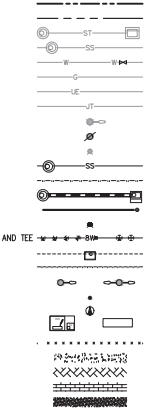
THE TOTAL FIRE FLOW REQUIRED FOR THIS SITE IS 2,125 GPM MINIMUM @ 20 PSI RESIDUAL PRESSURE.
THIS FLOW MUST BE PROVIDED FROM A MINIMUM OF 2 FIRE HYDRANTS.
EACH FIRE HYDRANT MUST SUPPLY A MINIMUM OF 2,125 GPM @ 20 PSI RESIDUAL PRESSURE AT THE HYDRANT OUTLET TO BE ACCEPTABLE.
CODE USED FOR ANALYSIS: 2018 IFC AND 2018 AMENDMENTS.
CONSTRUCTION TYPE: III-A
FIRE FLOW CALCULATION AREA: 83,200 SF
THIS BUILDING IS FULLY SPRINKLERED

INDUSTRIAL B FIRE FLOW DATA:

THE TOTAL FIRE FLOW REQUIRED FOR THIS SITE IS 2,875 GPM MINIMUM @ 20 PSI RESIDUAL PRESSURE.
THIS FLOW MUST BE PROVIDED FROM A MINIMUM OF 3 FIRE HYDRANTS.
EACH FIRE HYDRANT MUST SUPPLY A MINIMUM OF 2,875 GPM @ 20 PSI RESIDUAL PRESSURE AT THE HYDRANT OUTLET TO BE ACCEPTABLE.
CODE USED FOR ANALYSIS: 2018 IFC AND 2018 AMENDMENTS.
CONSTRUCTION TYPE: III-A
FIRE FLOW CALCULATION AREA: 154,350 SF
THIS BUILDING IS FULLY SPRINKLERED

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- PROPOSED BUILDING ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES



ABBREVIATIONS

BLDG	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
QUE	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FIRE FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
CV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH
RED	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT THE SIGNATURE OF THE DESIGNER. ANY CHANGES TO THIS DRAWING MUST BE MADE IN THE MARGINS OF THIS DRAWING. ANY CHANGES TO THIS DRAWING MUST BE MADE IN THE MARGINS OF THIS DRAWING. ANY CHANGES TO THIS DRAWING MUST BE MADE IN THE MARGINS OF THIS DRAWING.

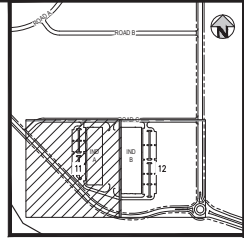
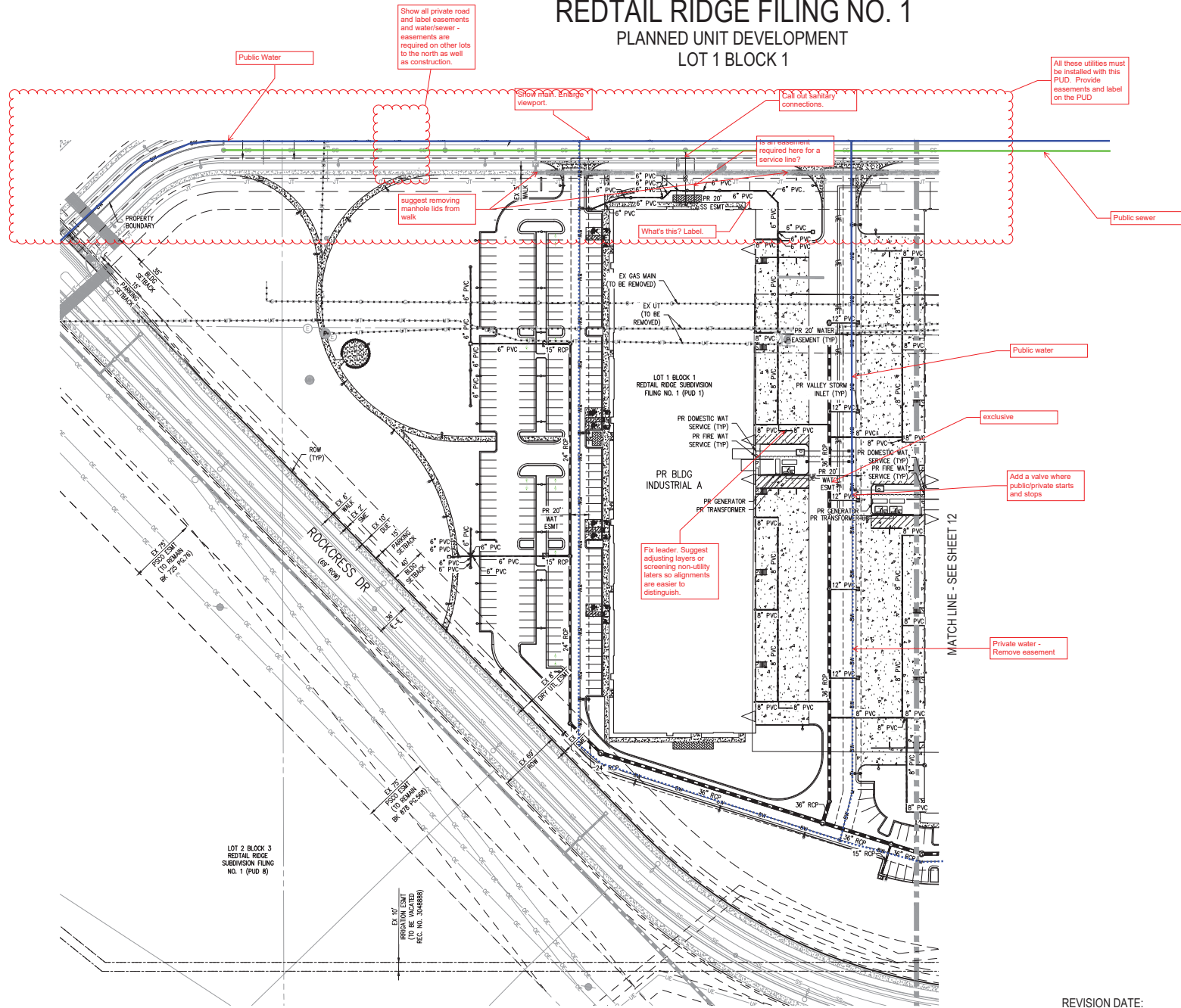
NO CHANGES ARE TO BE MADE TO THE DIMENSIONS OF ANY UTILITY SHOWN ON THIS PLAN.

THIS PLAN IS THE PROPERTY OF THE ENGINEER. IT IS NOT TO BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE ENGINEER. THE ENGINEER ASSUMES NO LIABILITY FOR ANY DAMAGE TO PERSONS OR PROPERTY ARISING FROM THE USE OF THIS PLAN.

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1



KEY MAP
SCALE: 1" = 600'

LEGEND:

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SEWER W/WH AND INLET
- EXISTING SANITARY SEWER W/WH
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING JOINT TRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SEWER W/WH
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SEWER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 6" WATER MAIN W/ BENDS, VALVE, AND TEE
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED PEDESTRIAN ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES

ABBREVIATIONS

BLDG	BUILDING
C&G	CURB & GUTTER
CONC	CONCRETE
DS	DOWNSPOUT
DU	DRY UTILITY EASEMENT
ELEC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MH	MANHOLE
N	NORTH
PE	PEDESTRIAN
PL	PROPERTY LINE
PR	PROPOSED
ROW	RIGHT-OF-WAY
SME	SURFACE MAINTENANCE EASEMENT
SS	SANITARY SEWER
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



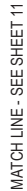
SCALE: 1" = 30'

REVISION DATE:

ISSUE DATE: 03-14-2025

UTILITY PLAN
SHEET 11 OF 24

REDTAIL RIDGE PUD1 SOUTH

[illegible]

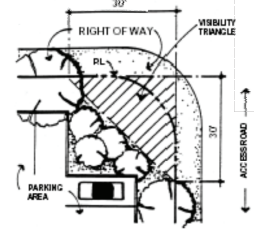
- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- EXISTING STM SENER W/4M AND INLET
- EXISTING SANITARY SENER W/4M
- EXISTING WATER LINE W/ VALVE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING JOINT FRENCH
- EXISTING STREET LIGHT
- EXISTING TELEPHONE POLE
- EXISTING FIRE HYDRANT
- PROPOSED SANITARY SENER W/4M
- PROPOSED SANITARY SERVICE W/CLEAN OUT
- PROPOSED STORM SENER W/ MH AND INLET
- PROPOSED LANDSCAPE DRAIN W/ INLET
- PROPOSED FIRE HYDRANT
- PROPOSED 8" WATER MAIN W/ BENDS, VALVE, A
- PROPOSED WATER SERVICE W/METER
- PROPOSED FIRE SERVICE
- PROPOSED STREET LIGHT
- PROPOSED RECREATION LIGHT
- PROPOSED PEDESTRIAN ENTRANCE
- PROPOSED TRANSFORMER AND GENERATOR
- ABANDON EXISTING UTILITY LINE
- PROPOSED CONCRETE
- PROPOSED CONCRETE PAVERS
- PROPOSED PORCELAIN PAVERS
- PROPOSED CRUSHER FINES

50 0 50 100

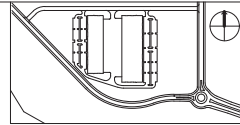
SCALE: 1" = 50'

REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1
SITUATED IN THE SOUTH HALF OF SECTION 20 &
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF 11
CASE #: PUPL-000



Sheet Index	
SHEET NUMBER	SHEET NAME
PE	OVERALL LANDSCAPE PLAN
	MATERIAL AND PLANTING PLAN - A
	MATERIAL AND PLANTING PLAN - B
	MATERIAL AND PLANTING PLAN - C
	MATERIAL AND PLANTING PLAN - D
	MATERIAL AND PLANTING PLAN - E
	MATERIAL AND PLANTING PLAN - F, G & H
	SITE FURNISHING DETAILS
	PLANTING DETAILS
	PLANTING SCHEDULE



KEY MAP
1" = 800'

ABBREVIATIONS LEGEND

ABBREVIATIONS WHEN USED IN COMPOSITION MAY INCLUDE PERIODS FOR CLARIFICATION

AFF	ABOVE FINISHED FLOOR	HP	HIGH POINT
ADJ	ADJACENT	HORIZ	HORIZONTAL
ADA	AMERICANS WITH DISABILITIES ACT	HOSE BIB	HOSE BIB
APPROX	APPROXIMATE	INCL	INCLUDED, INCLUDING
ARCH	ARCHITECTURAL	ID	INSIDE DIAMETER
AREA	AREA	INT	INTERIOR
B/	BOTTOM OF	LITG	LIGHTING
CB	CATCH BASIN	LP	LINEAR FOOT (LINEAR FEET)
CL	CENTERLINE	LP	LOW POINT
COC	CENTER TO CENTER	MAINT	MAINTENANCE
CLEANOUT	CLEANOUT	MAN	MANHOLE
COL	COLUMN	MFR	MANUFACTURER
COMM	COMMUNICATION	MATL	MATERIAL
CONC	CONCRETE	MECH	MECHANICAL
CONC	CONCRETE	MAX	MAXIMUM
CONC	CONCRETE MASONRY UNIT	MIN	MINIMUM
CONT	CONTINUOUS	MTL	METAL
CONT	CONTROL JOINT	MIS	MISCELLANEOUS
CUBIC	CUBIC	NOM	NOMINAL
DEG	DEGREE	NOT IN CONTRACT	NOT IN CONTRACT
DEMOL	DEMOLITION	NTS	NOT TO SCALE
DEPT	DEPARTMENT DEPT	OC	ON CENTER
DIA	DIAMETER	OPP	OPPOSITE
DIAG	DIAGONAL	OD	OUTSIDE DIAMETER
DM	DIMENSION	PERP	PERPENDICULAR
DS	DOWNSPOUT	PSI	POUNDS PER SQUARE INCH
DF	DRINKING FOUNTAIN	PRELIM	PRELIMINARY
EACH	EACH	PROP	PROPERTY
ELEV	ELEVATION	R	RADIUS
ELEC	ELECTRICAL	REF	REFERENCE
ENCLOSURE	ENCLOSURE	REIN	REINFORCE REINFORCING
EQ	EQUAL	REQ	REQUIRED
EQUIP	EQUIPMENT	REINFORCED	REINFORCED
EXIST	EXISTING	ROW	RIGHT OF WAY
EXP	EXPANDED JOINT	ROW	RIGHT OF WAY
EXP	EXPOSED	ROW	RIGHT OF WAY
FIN	FINISHED	ROW	RIGHT OF WAY
FIN	FINISHED	ROW	RIGHT OF WAY
FOC	FIRE DEPARTMENT CONNECTION	ROW	RIGHT OF WAY
PH	FIRE HYDRANT	ROW	RIGHT OF WAY
FTG	FOOTING	ROW	RIGHT OF WAY
FOUN	FOUNDATION	ROW	RIGHT OF WAY
FURN	FURNISH FURNITURE	ROW	RIGHT OF WAY
GA	GAUGE	ROW	RIGHT OF WAY
GALV	GALVANIZED	ROW	RIGHT OF WAY
GEN	GENERAL	ROW	RIGHT OF WAY
GL	GLASS	ROW	RIGHT OF WAY
HVAC	HEATING, VENTILATION, AIR CONDITIONING	ROW	RIGHT OF WAY

GENERAL NOTES

- NOTES APPEAR ON VARIOUS DRAWINGS FOR DIFFERENT SYSTEMS AND MATERIALS. REVIEW ALL SHEETS AND APPLY NOTES TO RELATED BUILDING COMPONENTS.
- REFER TO COMPLETE SET OF ISSUED CONTRACT DOCUMENTS FOR OTHER APPLICABLE NOTES, ABBREVIATIONS, AND SYMBOLS.
- WHERE MATERIALS ARE APPLIED TO, OR ARE IN DIRECT CONTACT WITH WORK INSTALLED BY ANOTHER SUBCONTRACTOR, COMMENCEMENT OF WORK IMPLIES ACCEPTANCE OF THE SUBSTRATE AS SUITABLE FOR THE APPLICATION INTENDED.
- ISOLATE DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
- DO NOT SCALE THE DRAWINGS.
- FIELD MEASURE AND CONFIRM DIMENSIONS FOR OWNER PROVIDED EQUIPMENT AND FURNISHINGS.
- EXCAVATION OF 4 FEET AND TESTING AND COMPACTED SOILS AT PEDESTRIAN PAVEMENTS.
- BEFORE SPREADING PLANTING SOIL OVER THE SITE, PERFORM SOIL COMPACTION TESTING BY CHECKING SOIL COMPACTION USING A TENSOMETER (PENTOMETER) ON A 90 FOOT BY 90 FOOT GRID ON ALL GRADED SUBGRADE AREAS TO BE PLANTED GREATER THAN ONE ACRE OR A 30 FOOT BY 30 FOOT GRID FOR AREAS LESS THAN ONE ACRE. IF MORE THAN 10 PERCENT OF THE READINGS IN A GIVEN PLANTING AREA ARE GREATER THAN 80 PSI, THEN THE SITE SHALL UNDERGO SITE SUBGRADE MITIGATION MEASURES DESCRIBED BELOW IMMEDIATELY PRIOR TO PLACING PLANTING SOIL. THE ENTIRE SUBGRADE SHALL BE LOOSENEED TO A MINIMUM DEPTH OF 6 INCHES USING THE TEETH OF A BACKHOE OR OTHER SUITABLE EQUIPMENT. THEN RE-COMPACT WITH THE TRACKS OF SMALL CONSTRUCTION EQUIPMENT. THE BUCKETS OF A BACKHOE OR OTHER EXCAVATION EQUIPMENT OR OTHER VIBRATORY COMPACTION OF SUBGRADE IN PLANTED AREAS IS PROHIBITED AFTER THE SUBGRADE SOILS HAVE BEEN LOOSENEED, RE-COMPACTED AND INSPECTED. PLANTING SOIL MAY BE SPREAD BY USING A WIDE TRACK BULLDOZER SIZE 4 OR SMALLER OR MAY BE DUMPED AND SPREAD WITH THE BACKS OF A BACKHOE FROM THE EDGE OF THE AREA. NO RUBBER-TIRED EQUIPMENT OR HEAVY EQUIPMENT EXCEPT FOR A SMALL BULLDOZER SHALL PASS OVER THE SUBSOLS (SUBGRADE) AFTER THEY HAVE BEEN LOOSENEED AND RE-COMPACTED.

LANDSCAPE REQUIREMENTS	
TOTAL LOT SIZE	945,775.48
TOTAL AREA COVERED BY BUILDING/VEHICULAR PAVEMENT AREA	555,801.49
TOTAL LANDSCAPE AREA (38%)	360,907.16
TOTAL PEDESTRIAN HARDSCAPE AREA	29,066.35
	REQUIRED PROPOSED
TOTAL NUMBER OF PERIMETER TREES	77 77
TOTAL NUMBER OF PERIMETER SHRUBS	0 0
TOTAL NUMBER OF PARKING LOT TREES	57 111
TOTAL NUMBER OF PARKING LOT SHRUBS	264 736



REVISION DATE:

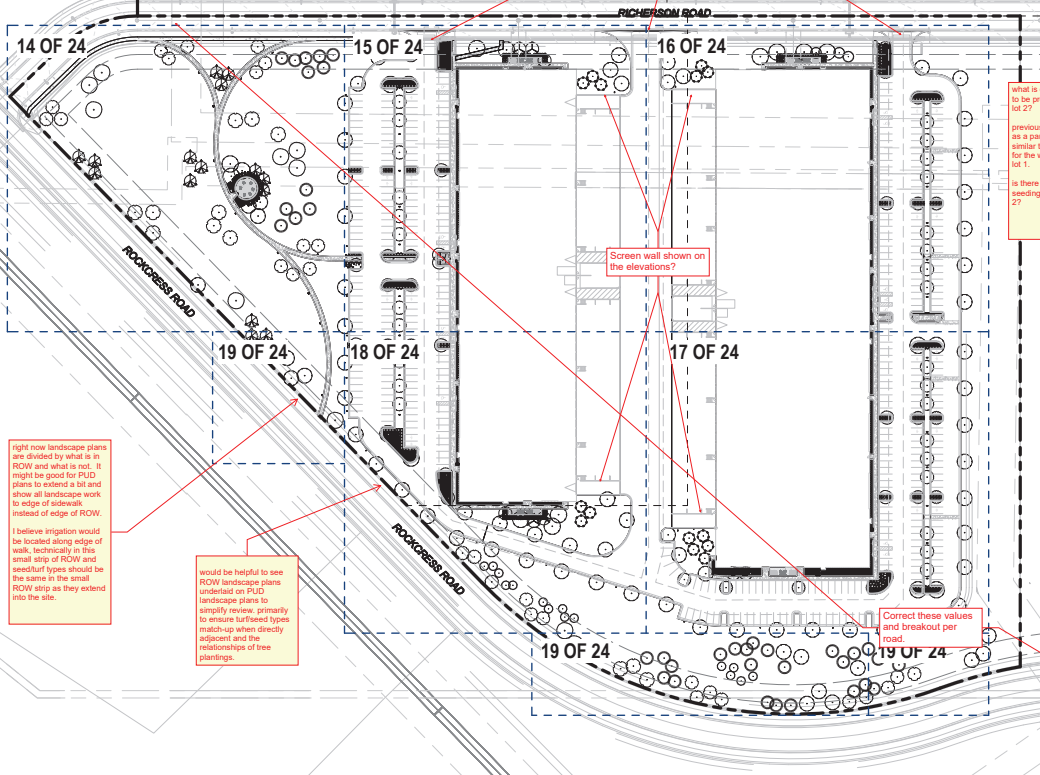
ISSUE DATE: 03/14/2025



OVERALL
LANDSCAPE PLAN

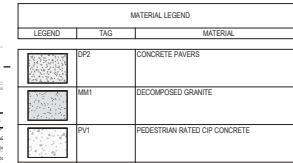
SHEET 13 OF 24

REDTAIL RIDGE PUD1 SOUTH



1 OVERALL LANDSCAPE PLAN
1" = 80'-0"

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023 1 / 9 OF 21



SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FS3	LITTER RECEPTACLE
	FS1 - A	BENCH
	FS2 - B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4 - A	LOUNGE CHAIR
	FS4 - B	DINING CHAIR
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT

These chairs are not fixed to the ground. Is that a good idea?



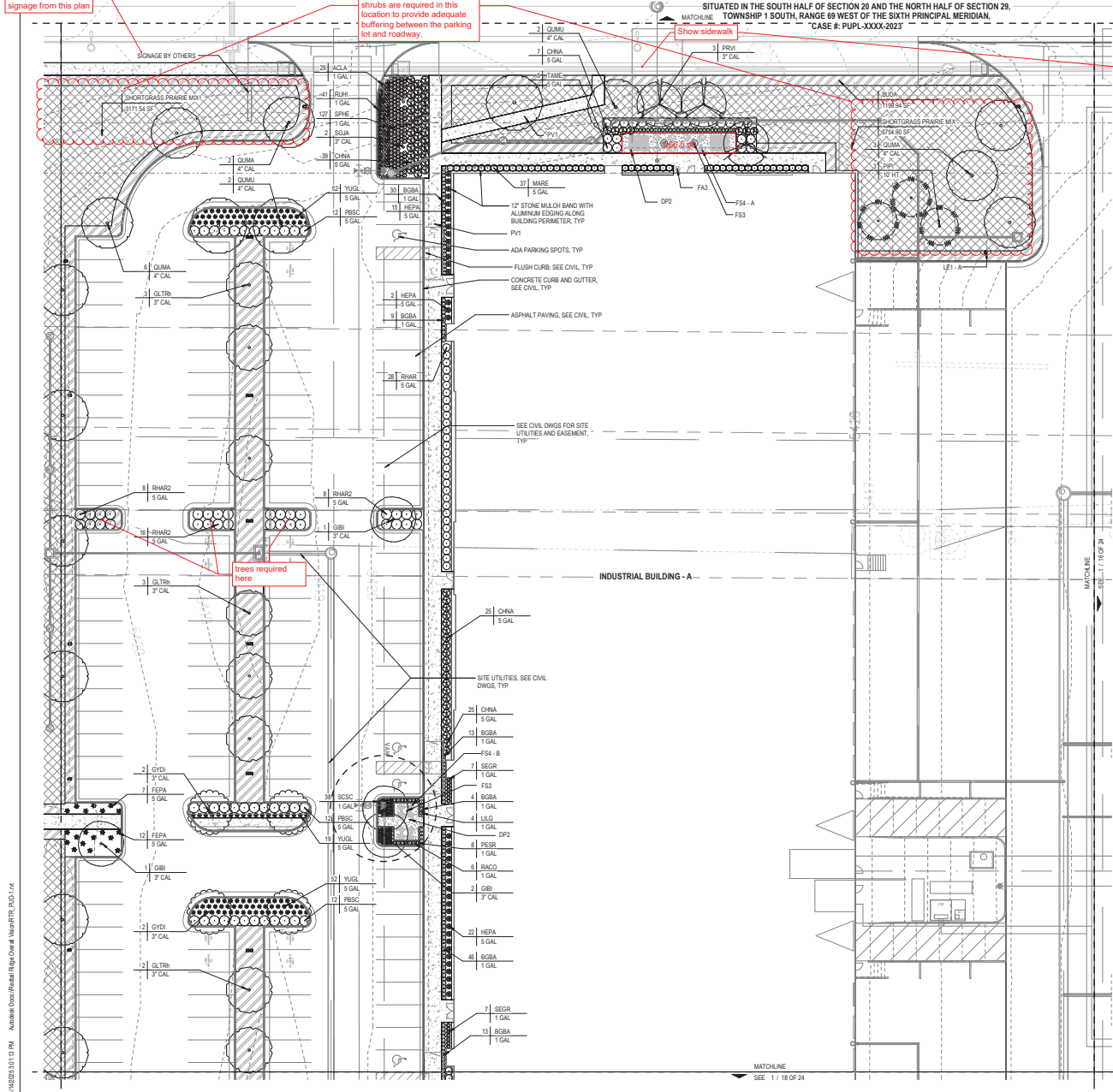
REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
"CASE #: PUPL-XXXX-2023"

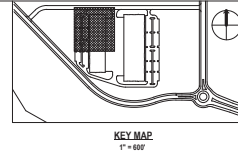
unless requesting
waivers from the sign
code, remove
signage from this plan

All parking lots shall be
visually buffered from
perimeter roadways. Additional
shrubs are required in this
location to provide adequate
buffering between the parking
lot and roadway.

Show sidewalk



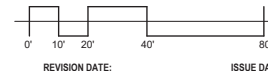
MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	MM1	DECOMPOSED GRANITE
	PV1	PEDESTRIAN RATED C/P CONCRETE



SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1 - A	BENCH
	FS2 - B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4 - A	LOUNGE CHAIR
	FS4 - B	DINING CHAIR
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT

3/14/2023 3:03:13 PM Autodesk Docs Redtail Ridge Cover of Main.dwg, PLOT1.dwg

MATCHLINE
SEE 1 / 18 OF 24



MATERIAL AND
PLANTING PLAN -
B

SHEET 15 OF 24

REDTAIL RIDGE PUD1 SOUTH

PROJECT #: 22128

REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN
CASE #: PUDL-XXXX-2023

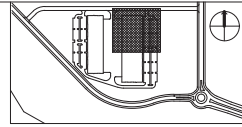
All parking lots shall be visually buffered from perimeter roadways. Additional shrubs are required in this location to provide adequate buffering between the parking lot and roadway.

show sidewalk

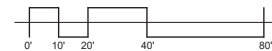
MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	MM1	DECOMPOSED GRANITE
	PV1	PEDESTRIAN RATED CIP CONCRETE

unless requesting waivers from the sign code, remove signage from this plan

SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	PS1 - A	BENCH
	PS2 - B	PICNIC TABLE SET 2
	PS3	DINING TABLE
	PS4 - A	LOUNGE CHAIR
	PS4 - B	DINING CHAIR
	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1 - C	PEDESTRIAN POLE LIGHT

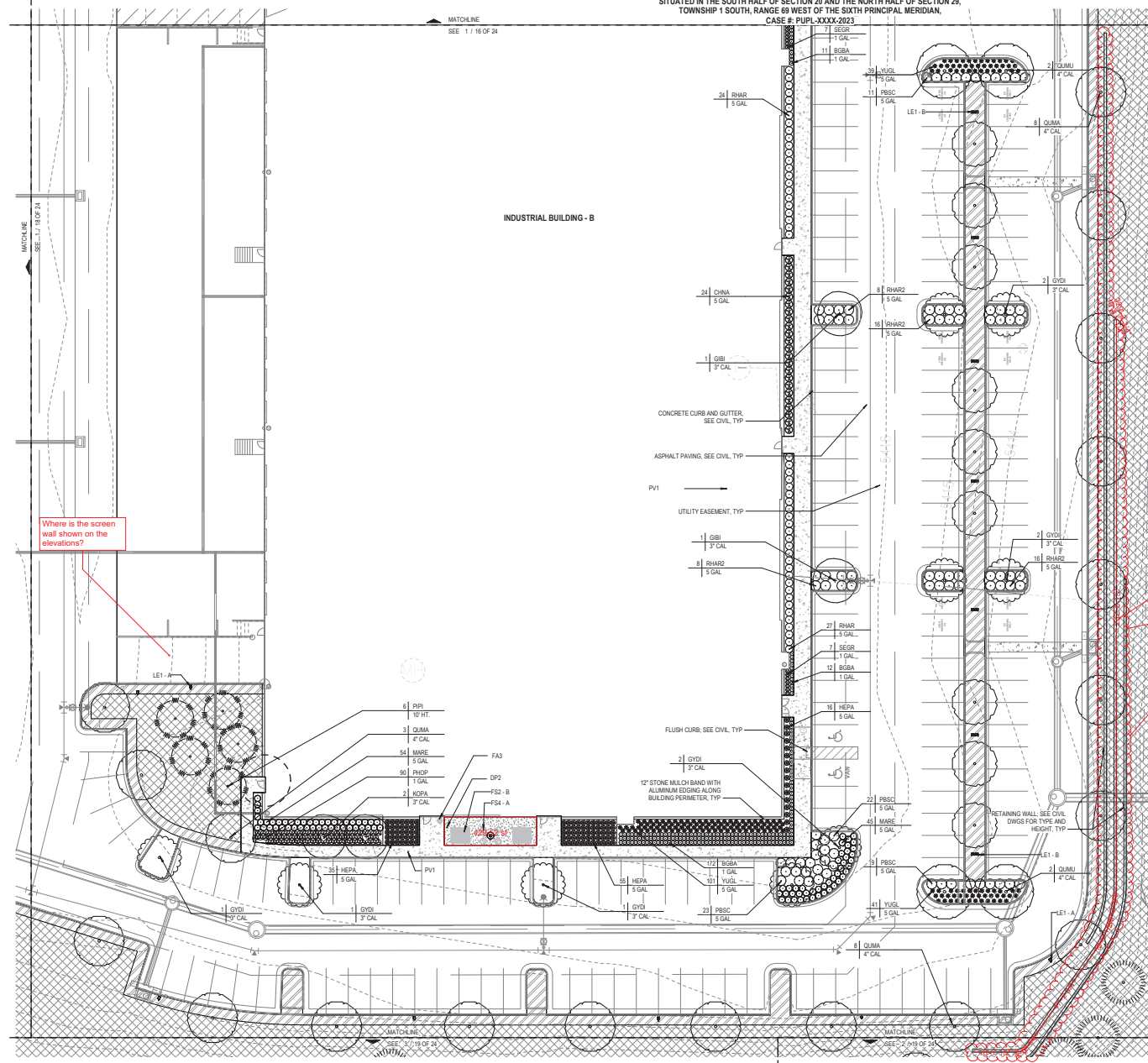


KEY MAP
1" = 600'



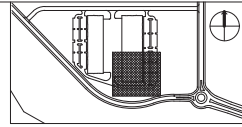
REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023



MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	MM1	DECOMPOSED GRANITE
	PV1	PEDESTRIAN RATED CP CONCRETE

SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1-A	BENCH
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	FS3	DINING TABLE
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	LE1-A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1-B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1-C	PEDESTRIAN POLE LIGHT

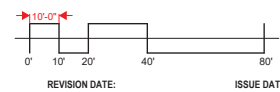
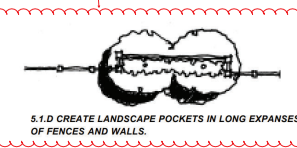
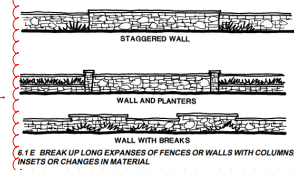


Where is the screen wall shown on the elevations?

Landscaping should be incorporated within terraces to soften the appearance

Provide an elevation of the proposed wall material. walls shall be constructed of stone, brick, or metal.

Walls that are greater than 50 feet in length shall include structural offsets, insets, and landscape pockets at various points along the length of the wall to reduce monotony and increase visual interest.

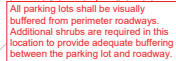


MATERIAL AND PLANTING PLAN - D

SHEET 17 OF 24

REDTAIL RIDGE PUD1 SOUTH

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
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CASE #: PUPL-XXXX-2023



This technical drawing shows a cross-section of a mechanical assembly. It features two vertical cylindrical components, possibly pistons or valves, within a housing. A diagonal line on the left indicates a section cut. A circular detail on the right shows a cross-section of a bolt or fastener. The drawing is a black and white line drawing with hatching for the sectioned area.

KEY MAP
1" = 600'

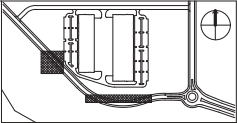
SHEET 18 OF 24

REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

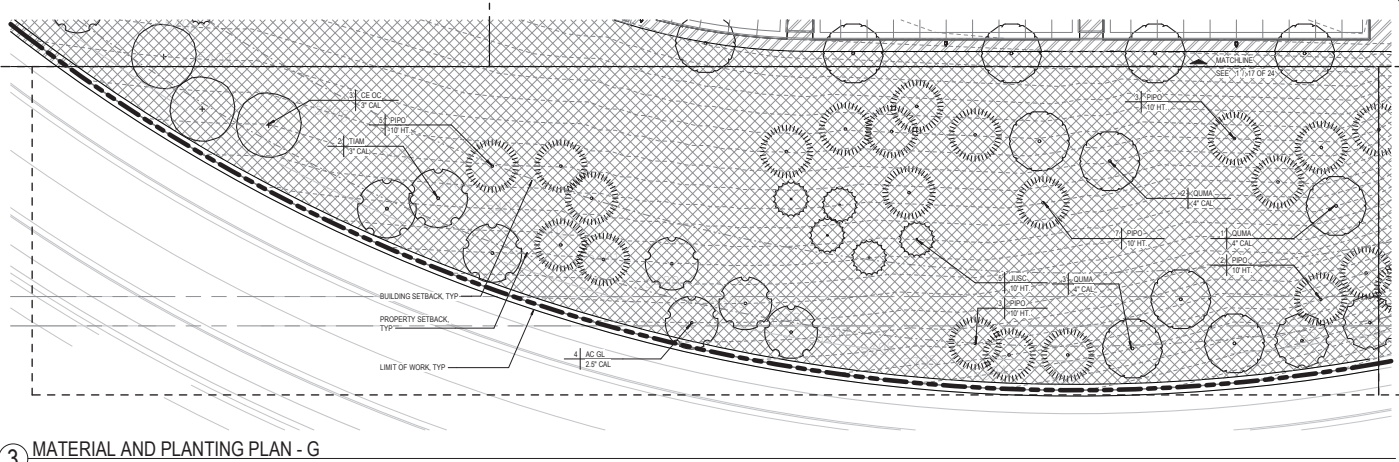
PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

MATERIAL LEGEND		
LEGEND	TAG	MATERIAL
	DP2	CONCRETE PAVERS
	DM1	DECOMPOSED GRANITE
	PN1	PEDESTRIAN RATED C/P CONCRETE

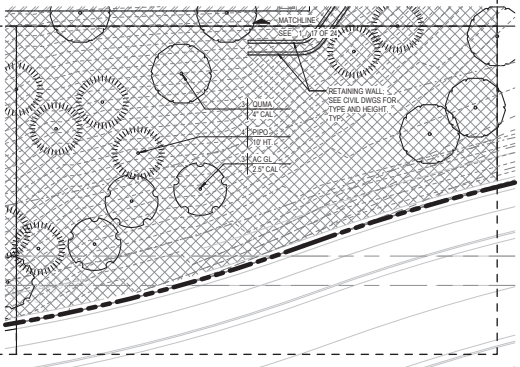


KEY MAP
1" = 800'

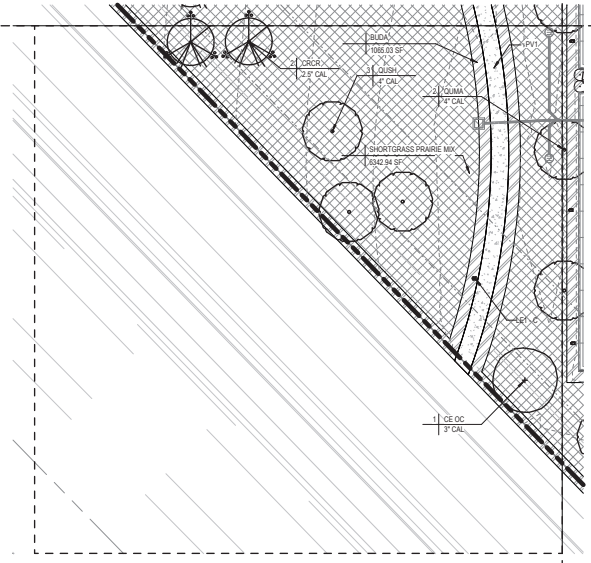
SITE FURNITURE & LIGHTING LEGEND		
LEGEND	TAG	TYPE
	FA3	LITTER RECEPTACLE
	FS1-A	BENCH
	FS2-B	PICNIC TABLE SET 2
	FS3	DINING TABLE
	FS4-A	LOUNGE CHAIR
	FS4-B	DINING CHAIR
	LE1-A	SINGLE SIDED VEHICULAR POLE LIGHT
	LE1-B	DOUBLE SIDED VEHICULAR POLE LIGHT
	LE1-C	PEDESTRIAN POLE LIGHT



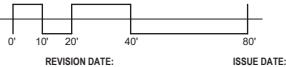
③ MATERIAL AND PLANTING PLAN - G
1" = 20'-0"



② MATERIAL AND PLANTING PLAN - H
1" = 20'-0"



① MATERIAL AND PLANTING PLAN - F
1" = 20'-0"

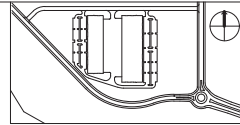


MATERIAL AND
PLANTING PLAN -
F, G & H

SHEET 19 OF 24

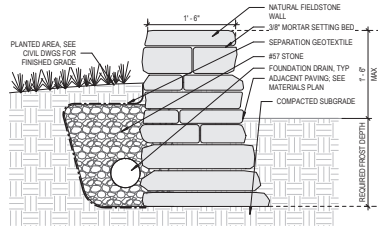
REDTAIL RIDGE FILING NO.1

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SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
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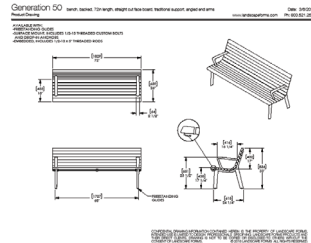


KEY MAP
1" = 600'

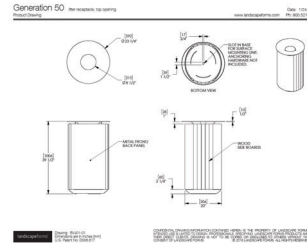
SITE FURNITURE & LIGHTING SCHEDULE			
LEGEND	QUANTITY	TAG	TYPE
	5	FA3	LITTER RECEPTACLE
	1	FS1 - A	BENCH
	9	FS2 - B	PICNIC TABLE SET 2
	9	FS3	DINING TABLE
	35	FS4 - A	LOUNGE CHAIR
	33	FS4 - B	DINING CHAIR
	26	LE1 - A	SINGLE SIDED VEHICULAR POLE LIGHT
	23	LE1 - B	DOUBLE SIDED VEHICULAR POLE LIGHT
	14	LE1 - C	PEDESTRIAN POLE LIGHT



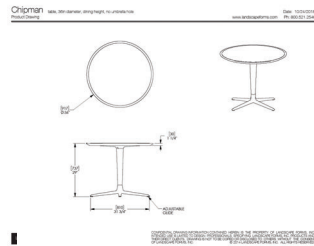
10 NATURAL FIELDSTONE SEAT WALL
1" = 1'-0"



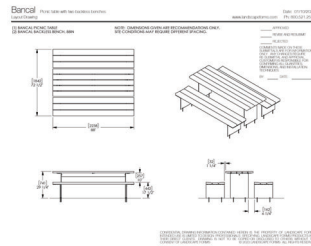
9 BENCH - FS1 - A
1/2" = 1'-0"



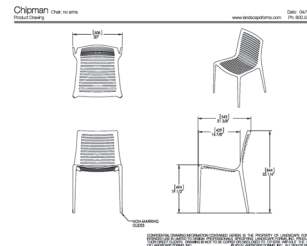
8 LITTER RECEPTACLE - FA3
1/2" = 1'-0"



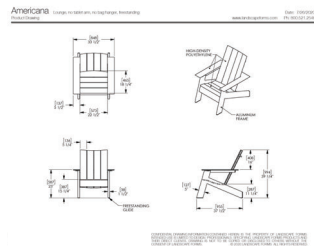
7 DINING TABLE - FS3
1/2" = 1'-0"



6 PICNIC TABLE SET 2 - FS2 - B
1/2" = 1'-0"



5 DINING CHAIR - FS4 - B
1/2" = 1'-0"



4 LOUNGE CHAIR - FS4 - A
1/2" = 1'-0"



3 PEDESTRIAN POLE LIGHT - LE1 - C
1/2" = 1'-0"



2 VEHICULAR POLE LIGHT - LE1 - B
1/2" = 1'-0"



1 VEHICULAR POLE LIGHT - LE1 - A
1/2" = 1'-0"



SITE FURNISHING
DETAILS

REVISION DATE:

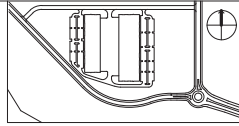
ISSUE DATE: 03/14/2025

SHEET 20 OF 24

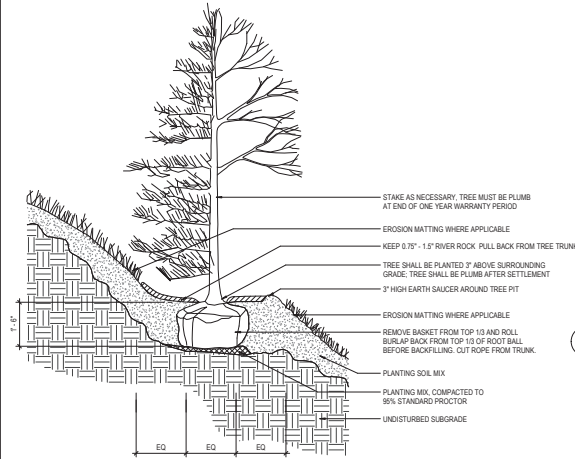
REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

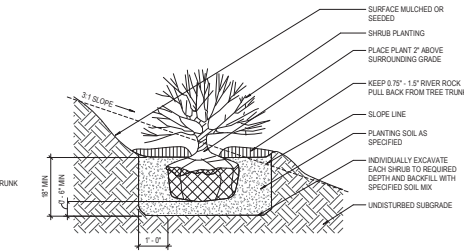
PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
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TOWNSHIP 1 SOUTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023



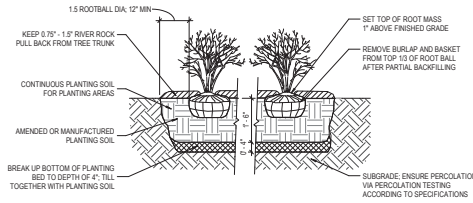
KEY MAP
1" = 600'



7 TREE PLANTING ON SLOPE
1/2" = 1'-0"



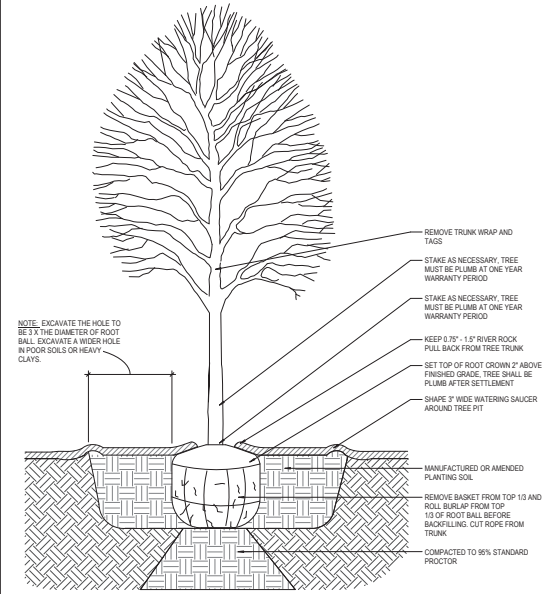
11 SHRUB PLANTING ON SLOPE
1/2" = 1'-0"



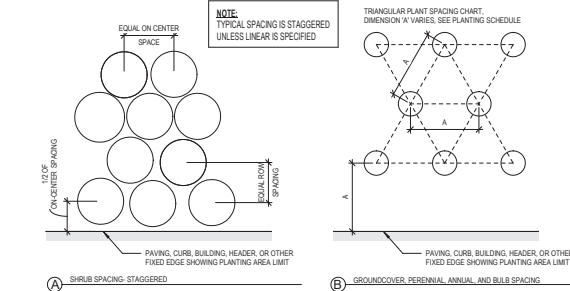
9 TYPICAL SHRUB PLANTING AT GRADE
1/2" = 1'-0"



8 TYPICAL GROUNDCOVER PLANTING
1/2" = 1'-0"



10 TYPICAL TREE PLANTING AT GRADE
1/2" = 1'-0"



3 PLANT SPACING
1/2" = 1'-0"

CLEAN AND MULCH NOTES:

1. THE CONTRACTOR SHALL CLEAR AND GRUB ALL WEEDS, DEAD TREES, TREES ONE (1) INCH CALIPER OR LESS AND OTHER SELECT TREES UP TO FOUR (4) INCH CALIPER AS DETERMINED IN THE FIELD IN THE TREE SAVE AREAS INDICATED ON THE DRAWINGS.
2. A THREE (3) INCH MINIMUM LAYER OF MULCH SHALL BE SPREAD OVER THE ENTIRE CLEARED AREA.
3. THE CONTRACTOR WILL NOTIFY THE ARCHITECT PRIOR TO START OF THE CLEAN AND MULCH WORK.
4. THE ARCHITECT WILL VERIFY SCOPE OF WORK IN FIELD WITH THE CONTRACTOR PRIOR TO THE START OF WORK.
5. THE CONTRACTOR IS RESPONSIBLE FOR THE REMOVAL AND LEGAL DISPOSAL OF ALL DEBRIS FROM CLEAN-UP OPERATIONS FROM THE SITE.

GENERAL PLANTING NOTES:

1. ALL PLANTS MUST BE HEALTHY, VIGOROUS MATERIAL, FREE OF PESTS & DISEASES.
2. ALL PLANTS MUST BE CONTAINER-GROWN (CONT.) OR BALLED AND BURLAPPED (BAB) AS INDICATED IN PLANT LIST.
3. ALL TREES MUST BE STRAIGHT TRUNKED, FULL HEADED, & MEET ALL REQUIREMENTS SPECIFIED.
4. ALL PLANTS ARE SUBJECT TO THE APPROVAL OF THE ARCHITECT & THE OWNER BEFORE, DURING & AFTER INSTALLATION.
5. ALL TREES MUST BE GUIED OR STAKED AS SHOWN IN THE DETAILS.
6. ALL PLANTS AND PLANTING AREAS MUST BE COMPLETELY MULCHED AS SPECIFIED.
7. PRIOR TO CONSTRUCTION, THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES & SHALL AVOID DAMAGE TO ALL UTILITIES DURING THE COURSE OF THE WORK. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY & ALL DAMAGE TO UTILITIES, STRUCTURES, SITE APPURTENANCES, ETC. WHICH OCCUR AS A RESULT OF THE LANDSCAPE CONSTRUCTION.
8. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL QUANTITIES SHOWN ON THESE PLANS BEFORE PRICING THE WORK.
9. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR FULLY MAINTAINING ALL PLANTING (INCLUDED BUT NOT LIMITED TO: WATERING, SPRAYING, MULCHING, FERTILIZING, ETC.) OF ALL PLANTING AND LAWN AREAS UNTIL THE WORK IS ACCEPTED IN TOTAL BY THE ARCHITECT AND OWNER.
10. THE LANDSCAPE CONTRACTOR SHALL COMPLETELY GUARANTEE ALL PLANT MATERIAL FOR A PERIOD OF ONE (1) YEAR BEGINNING AT THE DATE OF SUBSTANTIAL COMPLETION. THE LANDSCAPE CONTRACTOR SHALL PROMPTLY MAKE ALL REPLACEMENTS BEFORE OR AT THE END GUARANTEE PERIOD (AS DIRECTED BY THE OWNER).
11. THE ARCHITECT WILL APPROVE THE STAKED LOCATION OF ALL PLANT MATERIAL PRIOR TO INSTALLATION.



PLANTING DETAILS

REVISION DATE:

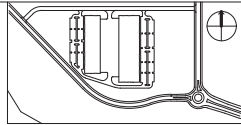
ISSUE DATE: 03/14/2025

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REDTAIL RIDGE PUD1 SOUTH

REDTAIL RIDGE FILING NO.1

PLANNED UNIT DEVELOPMENT, LOT 1 BLOCK 1 & LOT 2 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29,
TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023



KEY MAP
1" = 600'

City Horticulture OK with
red as submitted

TREE & SHRUB PLANTING SCHEDULE							
QTY	CODE	SCIENTIFIC NAME	COMMON NAME	SIZE	ROOT	SPACING	COMMENTS
SHRUB							
114	ACLA	ACHILLEA LANULOSA	MOUNTAIN YARROW	1 GAL	B&B	18"	FULL, WELL BRANCHED
25	ARAF	ARTEMESIA FILLIFOLIA	SAND SAGE	5 GAL	B&B	48"	FULL, WELL BRANCHED
10	ASAC	ASTER ASCENDENS	WESTERN ASTER	1 GAL	B&B	18"	FULL, WELL BRANCHED
165	ASTU	ASCLEPIA TUBEROSA	BUTTERFLY WEED	1 GAL	B&B	18"	FULL, WELL BRANCHED
1284	BGBA	BOUTELOUA GRACILIS 'BLOND AMBITION BLUE'	GRAMA GRASS	1 GAL	B&B	18"	FULL, WELL BRANCHED
187	CAIN	CALLIRHOE INVOLUCRATA	POPPY MALLOW	1 GAL	B&B	18"	FULL, WELL BRANCHED
31	CHMI	CHAMAEBATARIA MILLEFOLIUM	FERNBUSH	5 GAL	B	5'	FULL, WELL BRANCHED
825	CHNA	CHRYSOTHAMNUS NAUSEOSUS VAR NAUSEOSUS	DWARF RABBITBRUSH	5 GAL	B&B	36"	FULL, WELL BRANCHED
225	ENPE	ENGELMANNIA PERISTISTENA	ENGELMANN DAISSY	1 GAL	B&B	18"	FULL, WELL BRANCHED
199	FEPa	FELLUGIA PARADOXA	APACHE PLUME	5 GAL	B&B	36"	FULL, WELL BRANCHED
206	GAAR	GALLARDIA ARISTATA	BLANKET FLOWER	1 GAL	B&B	18"	FULL, WELL BRANCHED
391	HEPA	HESPERALOE PARVIFLORA	RED YUCCA	5 GAL	B&B	36"	FULL, WELL BRANCHED
29	LILG	LIATRIS LIGULISTYLUS	ROCKY MOUNTAIN GAYFEATHER	1 GAL	B&B	18"	FULL, WELL BRANCHED
370	MARE	MAHONIA REPENS	CREEPING GRAPE HOLLY	5 GAL	B&B	30"	FULL, WELL BRANCHED
166	MURE	MUHLENBERGIA REVERCHONII 'UNDAUNTED'	UNDAUNTED RUBY MUHLY GRASS	3 GAL	B&B	30"	FULL, WELL BRANCHED
16	OEMA	OENOTHERA MACROCARPA	EVENING PRIMROSE	1 GAL	B&B	18"	FULL, WELL BRANCHED
423	PBSC	PRUNUS BESSEYI 'PAWNEE BUTTES'	PAWNEE BUTTES SAND CHERRY	5 GAL	B&B	48"	FULL, WELL BRANCHED
37	PESR	PENSTEMON STRICTUS	ROCKY MOUNTAIN PENSTEMON	1 GAL	B&B	18"	FULL, WELL BRANCHED
146	PEST	PENSTEMON BARBARATUS	SCARLET BUGLAR	1 GAL	B&B	18"	FULL, WELL BRANCHED
267	PHOP	PHYSOCARPUS OPULIFOLIUS 'NANA'	DWARF NINEBARK	1 GAL	B&B	24"	FULL, WELL BRANCHED
84	RACO	RATIBIDA COLUMNIFERA	PRAIRIE CONEFLOWER	1 GAL	B&B	18"	FULL, WELL BRANCHED
456	RHAR	RHUS AROMATICA 'GRO-LOW'	GRO-LOW SUMAC	5 GAL	B&B	36"	FULL, WELL BRANCHED
387	RHAR2	RHUS AROMATICA 'GRO-LOW'	GRO-LOW SUMAC	5 GAL	B&B	48"	FULL, WELL BRANCHED
113	RIAU	RIBES AUREUM	GOLDEN CURRANT	5 GAL	B&B	42"	FULL, WELL BRANCHED
221	RUHI	RUDEBECKIA HIRTA	BLACK EYED SUSAN	1 GAL	B&B	18"	FULL, WELL BRANCHED
844	SCSC	SCHIZACRYIUM SCOPARIUM 'THE BLUES'	THE BLUES LITTLE BLUESTEM GRASS	1 GAL	B&B	18"	FULL, WELL BRANCHED
114	SEGR	SALVIA GREGGI 'FURMAN'S RED'	AUTUMN SAGE	1 GAL	B&B	18"	FULL, WELL BRANCHED
1389	SPHE	SPOROBOLUS HETEROLEPSIS	PRAIRIE DROPSEED	1 GAL	B&B	18"	FULL, WELL BRANCHED
61	SPHE2	SPOROBOLUS HETEROLEPSIS	PRAIRIE DROPSEED	1 GAL	B&B	24"	FULL, WELL BRANCHED
53	TAME	TAXUS X MEDIA 'DENSIFORMIS'	DENSIFORMIS YEW	5 GAL	B&B	42"	FULL, WELL BRANCHED
1491	YUGL	YUCCA GLAUCA	SOAPWEED	5 GAL	B&B	30"	FULL, WELL BRANCHED

TREE							
27	AC GL	ACER GLABRUM	ROCKY MOUNTAIN MAPLE	2.5" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
20	ACFR	ACER FREMANII 'AUTUMN BLAZE'	AUTUMN BLAZE MAPLE	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
17	AMGR	AMELANCHIER GRANDIFLORA X 'AUTUMN BRILLIANCE'	AUTUMN BRILLIANCE SERVICEBERRY	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
17	CE OC	CELTIS OCCIDENTALIS 'PRAIRIE PRIDE'	PRAIRIE PRIDE HACKBERRY	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
12	CECA	CERCIS CANADENSIS	REDBUD	2.5" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
57	CRCR	CRATAEGUS CRUS-GALLI 'INERMIS'	INERMIS COCKSPUR HAWTHORN	2.5" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED, MIN. 4" CLEAR TRUNK
23	GIBI	GINKGO BILOBA 'PRINCETON SENTRY'	PRINCETON SENTRY MAIDENHAIR TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
6	GLTR	GLEDITSIA TRIACANTHOSE	THORNLESS HONEY LOCUST	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
154	GLTRh	GLEDITSIA TRIACANTHOS INERMIS 'HARVEST TM'	NORTHERN ACCLAIM HONEYLOCUST	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
1	GLTRs	GLEDITSIA TRIACANTHOS F. INERMIS 'SKYLINE'	SKYLINE HONEYLOCUST	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
83	GYDI	GYMNOCLADUS DIOICUS	KENTUCKY COFFEE TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
15	JJUSC	JUNIPERUS SCOPULORUM	ROCKY MOUNTAIN JUNIPER	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
2	KOPA	KOELREUTERIA PANICULATA	GOLDEN RAIN TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
34	PIPI	PINUS EDULIS	PINION PINE	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
52	PIPO	PINUS PONDEROSA	PONDEROSA PINE	10' HT.	B&B	AS SHOWN	FULL, WELL BRANCHED
9	PRVI	PRUNUS VIRGINIANA	CHOKECHERRY	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
7	QUBI	QUERCUS BICOLOR	SWAMP WHITE OAK	6" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
156	QUJA	QUERCUS MACROCARPA	BURR OAK	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
86	QUJU	QUERCUS MUHLENBERGII	CHINKAPIN OAK	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
27	QUJH	QUERCUS SHUMARDII	SHUMARD OAK	4" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
3	QUJH-L	QUERCUS SHUMARDII	SHUMARD OAK	6" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED
24	SOJA	SOPHORA JAPONICA	JAPANESE PAGODA TREE	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED, 5' CLEAR TRUNK
23	TIAM	TILIA AMERICANA	BASSWOOD	3" CAL	B&B	AS SHOWN	FULL, WELL BRANCHED

what's this?

SHRUB & GROUND COVER PLANTING SCHEDULE				
Area	CODE	SCIENTIFIC NAME	COMMON NAME	COMMENTS
GRASS/FORB				
204930.56 SF	BUDA	BUCHLOE DACTYLOIDES	BUFFALOGRASS	SOD
18850.83 SF	SHORTGRASS PRAIRIE MIX	BUCHLOE DACTYLOIDES	BUFFALOGRASS	SOD
2454.80 SF	BUDA			
505800.41 SF	SHORTGRASS PRAIRIE MIX			<varies>
16139.16 SF	SHRUBS			

PLANTING LEGEND	
	SHORTGRASS PRAIRIE MIX
	BUFFALO GRASS



PLANTING
SCHEDULE

REVISION DATE:

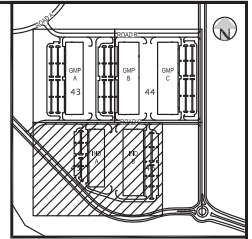
ISSUE DATE: 03/14/2025

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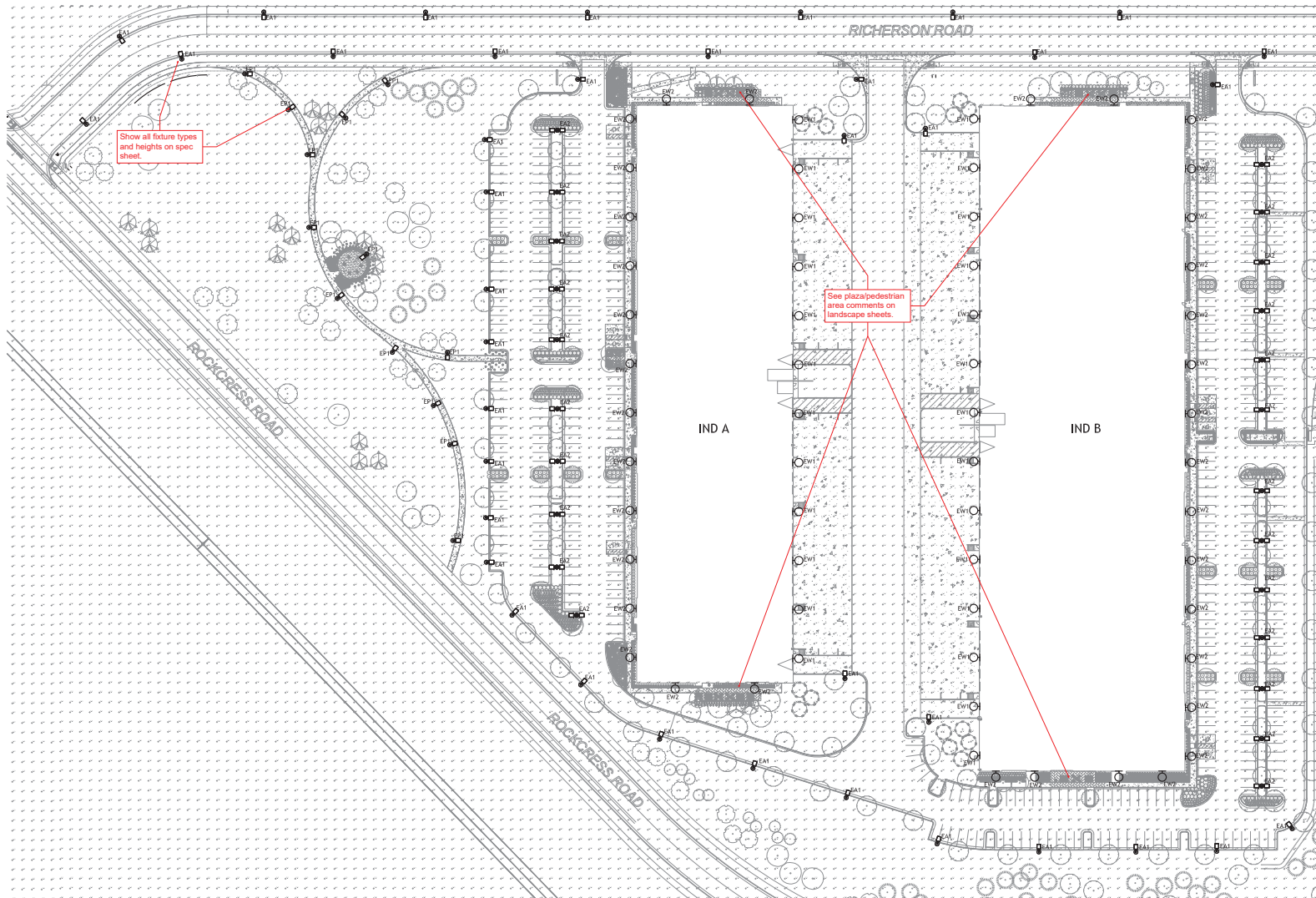
REDTAIL RIDGE PUD1 SOUTH

PLANNED UNIT DEVELOPMENT
LOT 1 BLOCK 1
SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION
29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

AE DESIGN
Integrated Lighting and Electrical Solutions
1900 Wazee Street #205 | Denver, CO 80202 | 303.296.3034
aedesign-inc.com Project #P-6077.00



KEY MAP
SCALE: 1" = 600'



GENERAL NOTES

- A. ALL LIGHTING RELATED TO HOME AND MATERIALS SHALL COMPLY WITH CITY, COUNTY AND STATE REQUIREMENTS REGARDING ACTIVATION AND DEACTIVATION.
- B. PER LOS ANGELES MUNICIPAL CODE, ALL STREET LIGHTS SHALL NOT EXCEED 20' TOTAL POLE HEIGHT.
- C. ALL BELLINGHOUS-MONTEREY AND POLE-MONTEREY LIGHTING SHALL BE 15' MAXIMUM HEIGHT. ALL STREET LIGHT SOURCES SHALL BE FULLY SHIELDED SO AS TO PREVENT ANY VISIBLE LIGHT FROM BEING OBSERVED BY PROPERTIES AND PUBLIC RIGHTS-OF-WAY. AID TO THE CITY OF LOS ANGELES SHALL BE REQUIRED TO OBTAIN COMPLIANT AND WELL LITTED BUDS FOR RATING. ASSISTANCE AS DEFINED IN THE 1948-49 OF SCHEDULE FOR ADDITIONAL LIGHTING.
- D. NOTED TO LIGHTING PROVIDER SOURCE FOR ADDITIONAL LIGHTING. PROVIDER SHALL MONITOR HEIGHTS AND OVERALL FUTURE HEIGHTS.
- E. PER LOS ANGELES STREET LIGHTING DESIGN CRITERIA (LDCR) 2013, ALL STREET LIGHTS SHALL COMPLY WITH LOS ANGELES MUNICIPAL ACTIVITY.
- F. ALL LOCAL LIGHTING THE LIGHTING SHALL PROVIDE THE SAME AS THE LOCAL LIGHTING FOR THE LOS ANGELES STREET LIGHTING.
- G. PER LOS ANGELES MUNICIPAL CODE PARKING LOTS SHALL HAVE A MAXIMUM LEVEL OF 3'0" TO 4'0" TO 5'0" TO 6'0" TO 7'0" TO 8'0" TO 9'0" TO 10'0" TO 11'0" TO 12'0" TO 13'0" TO 14'0" TO 15'0" TO 16'0" TO 17'0" TO 18'0" TO 19'0" TO 20'0" TO 21'0" TO 22'0" TO 23'0" TO 24'0" TO 25'0" TO 26'0" TO 27'0" TO 28'0" TO 29'0" TO 30'0" TO 31'0" TO 32'0" TO 33'0" TO 34'0" TO 35'0" TO 36'0" TO 37'0" TO 38'0" TO 39'0" TO 40'0" TO 41'0" TO 42'0" TO 43'0" TO 44'0" TO 45'0" TO 46'0" TO 47'0" TO 48'0" TO 49'0" TO 50'0" TO 51'0" TO 52'0" TO 53'0" TO 54'0" TO 55'0" TO 56'0" TO 57'0" TO 58'0" TO 59'0" TO 60'0" TO 61'0" TO 62'0" TO 63'0" TO 64'0" TO 65'0" TO 66'0" TO 67'0" TO 68'0" TO 69'0" TO 70'0" TO 71'0" TO 72'0" TO 73'0" TO 74'0" TO 75'0" TO 76'0" TO 77'0" TO 78'0" TO 79'0" TO 80'0" TO 81'0" TO 82'0" TO 83'0" TO 84'0" TO 85'0" TO 86'0" TO 87'0" TO 88'0" TO 89'0" TO 90'0" TO 91'0" TO 92'0" TO 93'0" TO 94'0" TO 95'0" TO 96'0" TO 97'0" TO 98'0" TO 99'0" TO 100'0" TO 101'0" TO 102'0" TO 103'0" TO 104'0" TO 105'0" TO 106'0" TO 107'0" TO 108'0" TO 109'0" TO 110'0" TO 111'0" TO 112'0" TO 113'0" TO 114'0" TO 115'0" TO 116'0" TO 117'0" TO 118'0" TO 119'0" TO 120'0" TO 121'0" TO 122'0" TO 123'0" TO 124'0" TO 125'0" TO 126'0" TO 127'0" TO 128'0" TO 129'0" TO 130'0" TO 131'0" TO 132'0" TO 133'0" TO 134'0" TO 135'0" TO 136'0" TO 137'0" TO 138'0" TO 139'0" TO 140'0" TO 141'0" TO 142'0" TO 143'0" TO 144'0" TO 145'0" TO 146'0" TO 147'0" TO 148'0" TO 149'0" TO 150'0" TO 151'0" TO 152'0" TO 153'0" TO 154'0" TO 155'0" TO 156'0" TO 157'0" TO 158'0" TO 159'0" TO 160'0" TO 161'0" TO 162'0" TO 163'0" TO 164'0" TO 165'0" TO 166'0" TO 167'0" TO 168'0" TO 169'0" TO 170'0" TO 171'0" TO 172'0" TO 173'0" TO 174'0" TO 175'0" TO 176'0" TO 177'0" TO 178'0" TO 179'0" TO 180'0" TO 181'0" TO 182'0" TO 183'0" TO 184'0" TO 185'0" TO 186'0" TO 187'0" TO 188'0" TO 189'0" TO 190'0" TO 191'0" TO 192'0" TO 193'0" TO 194'0" TO 195'0" TO 196'0" TO 197'0" TO 198'0" TO 199'0" TO 200'0" TO 201'0" TO 202'0" TO 203'0" TO 204'0" TO 205'0" TO 206'0" TO 207'0" TO 208'0" TO 209'0" TO 210'0" TO 211'0" TO 212'0" TO 213'0" TO 214'0" TO 215'0" TO 216'0" TO 217'0" TO 218'0" TO 219'0" TO 220'0" TO 221'0" TO 222'0" TO 223'0" TO 224'0" TO 225'0" TO 226'0" TO 227'0" TO 228'0" TO 229'0" TO 230'0" TO 231'0" TO 232'0" TO 233'0" TO 234'0" TO 235'0" TO 236'0" TO 237'0" TO 238'0" TO 239'0" TO 240'0" TO 241'0" TO 242'0" TO 243'0" TO 244'0" TO 245'0" TO 246'0" TO 247'0" TO 248'0" TO 249'0" TO 250'0" TO 251'0" TO 252'0" TO 253'0" TO 254'0" TO 255'0" TO 256'0" TO 257'0" TO 258'0" TO 259'0" TO 260'0" TO 261'0" TO 262'0" TO 263'0" TO 264'0" TO 265'0" TO 266'0" TO 267'0" TO 268'0" TO 269'0" TO 270'0" TO 271'0" TO 272'0" TO 273'0" TO 274'0" TO 275'0" TO 276'0" TO 277'0" TO 278'0" TO 279'0" TO 280'0" TO 281'0" TO 282'0" TO 283'0" TO 284'0" TO 285'0" TO 286'0" TO 287'0" TO 288'0" TO 289'0" TO 290'0" TO 291'0" TO 292'0" TO 293'0" TO 294'0" TO 295'0" TO 296'0" TO 297'0" TO 298'0" TO 299'0" TO 300'0" TO 301'0" TO 302'0" TO 303'0" TO 304'0" TO 305'0" TO 306'0" TO 307'0" TO 308'0" TO 309'0" TO 310'0" TO 311'0" TO 312'0" TO 313'0" TO 314'0" TO 315'0" TO 316'0" TO 317'0" TO 318'0" TO 319'0" TO 320'0" TO 321'0" TO 322'0" TO 323'0" TO 324'0" TO 325'0" TO 326'0" TO 327'0" TO 328'0" TO 329'0" TO 330'0" TO 331'0" TO 332'0" TO 333'0" TO 334'0" TO 335'0" TO 336'0" TO 337'0" TO 338'0" TO 339'0" TO 340'0" TO 341'0" TO 342'0" TO 343'0" TO 344'0" TO 345'0" TO 346'0" TO 347'0" TO 348'0" TO 349'0" TO 350'0" TO 351'0" TO 352'0" TO 353'0" TO 354'0" TO 355'0" TO 356'0" TO 357'0" TO 358'0" TO 359'0" TO 360'0" TO 361'0" TO 362'0" TO 363'0" TO 364'0" TO 365'0" TO 366'0" TO 367'0" TO 368'0" TO 369'0" TO 370'0" TO 371'0" TO 372'0" TO 373'0" TO 374'0" TO 375'0" TO 376'0" TO 377'0" TO 378'0" TO 379'0" TO 380'0" TO 381'0" TO 382'0" TO 383'0" TO 384'0" TO 385'0" TO 386'0" TO 387'0" TO 388'0" TO 389'0" TO 390'0" TO 391'0" TO 392'0" TO 393'0" TO 394'0" TO 395'0" TO 396'0" TO 397'0" TO 398'0" TO 399'0" TO 400'0" TO 401'0" TO 402'0" TO 403'0" TO 404'0" TO 405'0" TO 406'0" TO 407'0" TO 408'0" TO 409'0" TO 410'0" TO 411'0" TO 412'0" TO 413'0" TO 414'0" TO 415'0" TO 416'0" TO 417'0" TO 418'0" TO 419'0" TO 420'0" TO 421'0" TO 422'0" TO 423'0" TO 424'0" TO 425'0" TO 426'0" TO 427'0" TO 428'0" TO 429'0" TO 430'0" TO 431'0" TO 432'0" TO 433'0" TO 434'0" TO 435'0" TO 436'0" TO 437'0" TO 438'0" TO 439'0" TO 440'0" TO 441'0" TO 442'0" TO 443'0" TO 444'0" TO 445'0" TO 446'0" TO 447'0" TO 448'0" TO 449'0" TO 450'0" TO 451'0" TO 452'0" TO 453'0" TO 454'0" TO 455'0" TO 456'0" TO 457'0" TO 458'0" TO 459'0" TO 460'0" TO 461'0" TO 462'0" TO 463'0" TO 464'0" TO 465'0" TO 466'0" TO 467'0" TO 468'0" TO 469'0" TO 470'0" TO 471'0" TO 472'0" TO 473'0" TO 474'0" TO 475'0" TO 476'0" TO 477'0" TO 478'0" TO 479'0" TO 480'0" TO 481'0" TO 482'0" TO 483'0" TO 484'0" TO 485'0" TO

LIGHTING FIXTURES



Statistics						
Description	Symbol	Avg	Max	Mn	Max/Mn	Avg/Mn
IND A. PARALLEL LOT		1.7%	3.2%	0.6%	5.2x	2.8x
IND B. PARALLEL LOT		1.6%	3.2%	0.2%	16.0x	7.2x
INTERM. ROAD R		1.1%	1.7%	0.3%	5.7x	3.7x
COUNCIL. ROAD PAVING		1.4%	2.6%	0.4%	6.5x	3.5x



1 | PHOTOMETRIC PLAN – SOUTHWEST
45 | SCALE: 1" = 50'-0"

REVISION DATE:

ISSUE DATE: 03/14/2025

PHOTOMETRIC PLAN
3/14/2025 SHEET 23 OF 24
REDTAIL RIDGE PUD1 SOUTH

FROM THE JOURNAL OF THE AMERICAN COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS, Vol. 47, No. 4, July 1976, pp. 451-454. © 1976 by American College of Obstetricians and Gynecologists.

Depth: Y097720 - REDTAL RIDGE/ELECSITE PHOTOMETRIC097720 - SITE PHOTOMETRIC_PUD 1 SOUTH-LONG Layout: 23

REDTAIL RIDGE FILING NO. 1

PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1

SITUATED IN THE SOUTH HALF OF SECTION 20 AND THE NORTH HALF OF SECTION 29, TOWNSHIP 1 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CASE #: PUPL-XXXX-2023

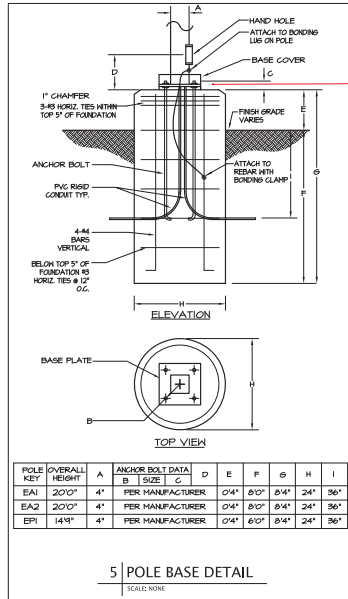
AE DESIGN
Integrated Lighting and Electrical Solutions
1900 Inshore Street, Suite 100 | Denver, CO 80202 | 303.296.3034
www.aedesign.com | Project: 19-0077-00

Ensure all types are shown

Update quantities

Provide a full elevation of the pole heights as measured from grade, maximum base height is 2 feet and is inclusive of overall height limits: 24 feet from grade in parking lots, 20 feet from grade in all other areas

Dark sky lighting required per the approved SIA.



LIGHTING FIXTURE SCHEDULE												
TYPE	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	VOLTAGE	QTY	HATT	SOURCE TYPE	CC/CCT	MAX. HATT	LUMEN OUTPUT	IESNA CUTOFF	FINISH
EAI	20'-0" LED DOUBLE HEAD POLE TOP TYPE II DISTRIBUTION	EXO	ASLI-BOL-34-SKT-3-UV-A	277	1	36	LED	3000K	36	4500	FULL CUTOFF	BLACK
EA2	20'-0" LED SINGLE HEAD POLE TOP TYPE II DISTRIBUTION	EXO	ASLI-BOL-34-SKT-3-UV-A	277	1	36	LED	3000K	36	4500	FULL CUTOFF	BLACK
EPI	20'-0" LED SINGLE HEAD POLE TOP TYPE II DISTRIBUTION AT PEDESTRIAN LEVEL, POLE HEIGHT 14'9"	EXO	ASLI-BOL-25-SKT-3-UV-A	277	1	36	LED	3000K	36	4500	FULL CUTOFF	BLACK
EA4	HALL MOUNTED AREA LED WITH ASYMMETRIC FLAT BEAM LIGHT DISTRIBUTION	ILP	VHM-HL-3-30-T4	277	1	100	LED	3000K	100	14000	FULL CUTOFF	BLACK
EA2	HALL MOUNTED AREA LED WITH ASYMMETRIC FLAT BEAM LIGHT DISTRIBUTION	ILP	VHM-HL-3-30-T3	277	1	40	LED	3000K	40	5000	FULL CUTOFF	BLACK

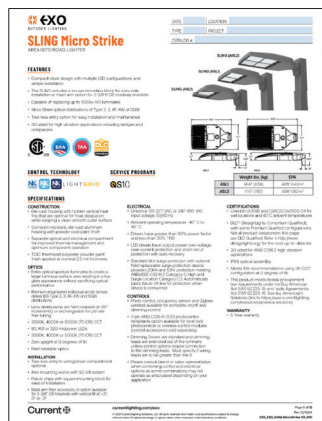
ABBREVIATIONS: TOP - TOP OF FIXTURE; HED - RECESSED FIXTURE DEPTH; CPH - OVERALL FIXTURE HEIGHT; AFFAHS - ABOVE FINISHED FLOOR (GRADE); HED - HALL FIXTURE DEPTH

GENERAL NOTES:

- ALL LED LAMPS AND/OR FIXTURES SHALL BE 3000K COLOR TEMPERATURE AND A MINIMUM OF 20,000 HOURS.
- ALL REFLECTOR LAMPS SHALL BE PROVIDED AS HIDE FLOOD DISTRIBUTION LUM.
- PROVIDE LUMINAIRE SHOWN AS GRADES WITH FACTORY INSTALLED 90 MINUTE EMERGENCY BATTERY OR OTHER REMOTE POWER SOURCE LUM. EMERGENCY LUMINAIRES SHALL SENSE UN-SWITCHED POWER TO THE SPACE AND OPERATE AUTOMATICALLY UPON LOSS OF NORMAL POWER. ALL EMERGENCY LUMINAIRES SHALL HAVE AN INTERNAL TEST SWITCH AND VISIBLE INDICATOR LIGHT. CONNECT THE EMERGENCY BATTERY TO THE UN-SWITCHED LUM OF THE LIGHTING CIRCUIT INDICATED.
- LUMENS LISTED ARE DELIVERED LUMENS, NOT INITIAL.
- FOR ALL SPECIFIED LUMINAIRES, THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL MOUNTING HARDWARE, ACCESSORIES, COMPONENTS, LEADERS/JUMPER CABLES, WIRE FEED, CONNECTORS, END CAPS, REMOTE POWER SUPPLIES, AND ANY OTHER NECESSARY COMPONENT AS REQUIRED FOR INSTALLING A SECURE AND FULLY FUNCTIONAL SYSTEM.
- THE CONTRACTOR SHALL VERIFY THE CEILING TYPE BEFORE ORDERING LIGHT FIXTURES TO ENSURE COMPATIBILITY WITH CEILING FIXTURES. NOTIFY SPECIFIER OF ANY DISCREPANCIES.
- ALL FINISH SELECTIONS SHALL BE VERIFIED BY ARCHITECT/INTERIOR DESIGNER/OWNER AS PART OF THE SUBMITTAL PROCESS, UNLESS OTHERWISE NOTED. EC SHALL ASSURE STANDARD LUMINAIRE FINISH OPTIONS FOR FINISH.
- EC SHALL VERIFY ALL FIXTURE MOUNTING HEIGHTS WITH ARCHITECTURAL ELEVATIONS PRIOR TO ANY ROUGH-IN.
- TYPICAL FOR ALL LIGHT FIXTURES WITH DESIGNATION STARTING WITH "H". FIXTURES ARE SHOWN FOR REFERENCE ONLY. FIXTURE SELECTIONS AND SPECIFICATIONS SHALL BE PROVIDED BY THE ARCHITECT AND/OR INTERIOR DESIGNER. EC SHALL COORDINATE EXACT MOUNTING LOCATION, MOUNTING HEIGHT, MATTAGE, AND DIMMING PROTOCOL WITH ARCHITECT / INTERIOR DESIGNER, LIGHTING CONSULTANT, AND/OR ELECTRICAL ENGINEER PRIOR TO INSTALL.
- REMOTE DRIVER/TRANSFORMERS SHALL BE LOCATED IN A CONCEALED, ACCESSIBLE AND VENTILATED LOCATION AS PROPOSED BY THE EC AND APPROVED BY THE ARCHITECT. REFER TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR MINIMUM REQUIRED CLEARANCES FROM ADJACENT MATERIALS, AND WIRING REQUIREMENTS TO PREVENT VOLTAGE DROP. DO NOT EXCEED MANUFACTURER'S RECOMMENDATIONS REGARDING WIRE GAGE AND MAXIMUM RUN LENGTHS.
- FOR LUMINAIRES SPECIFIED WITH 0-VOLV DIMMING, 0-VOLV DIMMING DRIVERS REQUIRE ADDITIONAL LOW VOLTAGE CONTROL WIRES IN ADDITION TO STANDARD WIRING FOR POWER.
- EXTERIOR LUMINAIRES SHALL BE GOLD HEATHER RATED FOR 0 DEB, 7 - 10 DEB, C, AND RATED FOR OUTDOOR USE.

SPECIFIC NOTES:

-



1 TYPE EAI / EA2 / EPI
SCALE: NTS

2 TYPE EW1
SCALE: NTS



DENVER • DALLAS/FORT WORTH

March 14, 2025

Attention:
City of Louisville
Department of Public Works
Engineering Division
749 Main St.
Louisville, CO 80027

Redtail Ridge PUD 1 – South
Drainage Conformance Letter
HKS Project No. 221236,

To whom it may concern,

The purpose of this letter is to serve as a formal recognition of compliance with the Redtail Ridge Master Drainage Report dated March 24th, 2021. This report outlined the overall project stormwater and drainage characteristics of the proposed Redtail Ridge development. Applicable excerpts of the Final Master Drainage Report are included in **Appendix F**. This letter analyzes sub-basins within PUD1 and the compliance of watershed imperviousness and proposed runoff of PUD1 South to the Redtail Ridge Master Drainage Report.

PUD 1 is part of the Redtail Ridge Master Drainage Plan (see attached Master Drainage Report for Redtail Ridge) and includes lots 1 and 2 of block 1, Redtail Ridge Filing No. 1. PUD 1 has been split into “PUD 1 South” and “PUD 1 North”, PUD 1 South lies within lot 1 block 1 and in Basin B-2 of the Redtail Ridge Master Drainage Plan. A portion of PUD 1 North (within lot 2 block 1) is included in the calculations and conformance letter due to its connection to the proposed storm system in PUD 1 South. The PUD 1 North conformance letter will need to confirm against this letter. The sub-basins for PUD 1 South (18.93 acres) and PUD1 North (8.41 acres) included in this letter total 27.34 acres, all 27.34 acres are included in the drainage analyses of Basins B-1 and B-2 apart of the Master Drainage Plan.

Basin B-2 in the Redtail Ridge Master Drainage Plan is 25.45 acres, which includes a most of PUD1 South, south of Road C. Per the Redtail Ridge Master Drainage Plan, Basin B-2 is proposed to have a watershed imperviousness of 85.00%. Flows from Basin B-2 will be conveyed southeast by on-site stormwater infrastructure to Pond C-2 (see Pond C-2 location on Master Drainage Plan in Appendix F).

Basin B-1 in the Redtail Ridge Master Drainage Plan is 71.01 acres, which includes a small portion of PUD 1 North and PUD 1 South, south of Road C. Per the Master Drainage Plan, Basin B-1 is proposed to have a watershed imperviousness of 85.00%. Flows from the small portion of Basin B-1 will be conveyed southeast by on-site stormwater infrastructure to Pond C-2 (see Pond C-2 location on Master Drainage Plan in Appendix F).

SUB-BASIN DESCRIPTION

PUD1 South (Pond C-2)

Basin O (0.25 acres, 15.97% impervious) consists of landscaping. The peak runoff from basin O is 0.07 cfs for the minor storm event and 0.43 cfs for the major storm event. Basin O will drain to landscape drains where it will be conveyed by storm sewer where it will be routed to Pond C-2 in the Master Drainage Report.

Basin P (0.31 acres, 12.84% impervious) consists of landscaping. The peak runoff from basin P is 0.06 cfs for the minor storm event and 0.48 cfs for the major storm event. Basin P will drain overland to Road C where it will be conveyed by curb and gutter into a Type R storm inlet located at the south half of Road C and be routed to Pond C-2 in the Master Drainage Report.

Basin Q (2.17 acres, 90.00% impervious) consists of roofs. The peak runoff from basin Q is 5.05 cfs for the minor storm event and 12.57 cfs for the major storm event. Basin Q will drain via downspouts to an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin R (3.28 acres, 90.00% impervious) consists of roofs. The peak runoff from basin R is 7.63 cfs for the minor storm event and 18.99 cfs for the major storm event. Basin R will drain via downspouts to an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S1 (1.24 acres, 8.99% impervious) consists of landscaping and walks. The peak runoff from basin S1 is 0.12 cfs for the minor storm event and 1.26 cfs for the major storm event. Basin S1 will drain to landscape drains and a Type C inlet where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S2 (0.97 acres, 77.72% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin S2 is 1.86 cfs for the minor storm event and 4.93 cfs for the major storm event. Basin S2 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S3 (0.90 acres, 77.25% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin S3 is 1.72 cfs for the minor storm event and 4.56 cfs for the major storm event. Basin S3 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin S4 (1.84 acres, 3.48% impervious) consists of landscaping and walks. The peak runoff from basin S4 is 0.06 cfs for the minor storm event and 1.48 cfs for the major storm event. Basin S4 will drain to landscape drains and a Type C inlet where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T1 (0.71 acres, 90.00% impervious) consists of drives and loading areas. The peak runoff from basin T1 is 1.63 cfs for the minor storm event and 4.06 cfs for the major storm event. Basin T1 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T2 (0.44 acres, 87.52% impervious) consists of drives and loading areas. The peak runoff from basin T2 is 1.02 cfs for the minor storm event and 2.58 cfs for the major storm event. Basin T2 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

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Basin T3 (0.44 acres, 76.38% impervious) consists of drives and loading areas. The peak runoff from basin T3 is 0.83 cfs for the minor storm event and 2.21 cfs for the major storm event. Basin T3 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T4 (0.44 acres, 90.00% impervious) consists of drives and loading areas. The peak runoff from basin T4 is 1.14 cfs for the minor storm event and 2.85 cfs for the major storm event. Basin T4 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin T5 (0.80 acres, 73.31% impervious) consists of drives and loading areas. The peak runoff from basin T5 is 1.49 cfs for the minor storm event and 4.05 cfs for the major storm event. Basin T5 will drain to inlets within the drive aisle where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U1 (0.52 acres, 80.63% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U1 is 1.02 cfs for the minor storm event and 2.66 cfs for the major storm event. Basin U1 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U2 (0.55 acres, 80.77% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U2 is 1.12 cfs for the minor storm event and 2.93 cfs for the major storm event. Basin U2 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U3 (0.30 acres, 78.28% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U3 is 0.61 cfs for the minor storm event and 1.61 cfs for the major storm event. Basin U3 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin U4 (0.59 acres, 79.52% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin U4 is 1.23 cfs for the minor storm event and 3.23 cfs for the major storm event. Basin U4 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V1 (1.59 acres, 7.38% impervious) consists of landscaping and walks. The peak runoff from basin V1 is 0.13 cfs for the minor storm event and 1.58 cfs for the major storm event. Basin V1 will drain to a Type C inlet where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V2 (1.07 acres, 18.86% impervious) consists of landscaping and walks. The peak runoff from basin V2 is 0.27 cfs for the minor storm event and 1.56 cfs for the major storm event. Basin V2 will drain to a Type C inlet where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V3 (2.03 acres, 12.95% impervious) consists of landscaping and walks. The peak runoff from basin V3 is 0.32 cfs for the minor storm event and 2.47 cfs for the major storm event. Basin V3 will drain to a Type C inlet where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V4 (0.10 acres, 2.00% impervious) consists of landscaping and walks. The peak runoff from basin V4 is 0.002 cfs for the minor storm event and 0.08 cfs for the major storm event. Basin V4 will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin V5 (2.73 acres, 18.17% impervious) consists of landscaping and walks. The peak runoff from basin V5 is 0.67 cfs for the minor storm event and 3.98 cfs for the major storm event. Basin V5 will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

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Basin V6 (0.90 acres, 9.58% impervious) consists of landscaping and walks. The peak runoff from basin V6 is 0.11 cfs for the minor storm event and 1.07 cfs for the major storm event. Basin V6 will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin W1 (1.07 acres, 67.69% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin W1 is 1.36 cfs for the minor storm event and 3.83 cfs for the major storm event. Basin W1 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin W2 (0.19 acres, 78.42% impervious) consists of parking areas, landscaping, and walks. The peak runoff from basin W2 is 0.41 cfs for the minor storm event and 1.09 cfs for the major storm event. Basin W2 will drain to a Type R inlet within the parking lot where it will be conveyed by an on-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Basin X (1.93 acres, 3.25% impervious) consists of landscaping. The peak runoff from basin X is 0.06 cfs for the minor storm event and 1.77 cfs for the major storm event. Basin X will drain overland into an off-site storm line where it will be conveyed to Pond C-2 in the Master Drainage Report.

Please see the attached exhibit which shows the basin delineation between the Master Drainage Plan and PUD 1 South (see Appendix D). Runoff from PUD 1 South is collected on-site by private storm infrastructure and then conveyed to storm mains in the roadways surrounding the site, which discharge to a regional water quality and detention pond. PUD 1 South development is compliant with the current submitted Master Drainage Report. PUD 1 South will not contribute any additional runoff that has not been accounted for to the existing off-site water quality and detention facilities. The basins analyzed in this conformance letter have a total effective imperviousness of 46.11%. Basin B-2 has an effective watershed imperviousness of 65.70%, Basin B-1 has an effective watershed imperviousness of 13.85% and are both in compliance with the Master Drainage Report (Refer to Summary tables below). All stormwater runoff from PUD 1 South will be conveyed by the storm sewer system proposed in the Redtail Ridge Master Drainage plan and is in conformance with the City of Louisville Wastewater standards and Mile High Flood District criteria. Sterling Bay - West will be responsible for maintaining the storm infrastructure apart of PUD 1 South.

Redtail Ridge PUD 1 - Pond C-2 Summary Table		
	B-2 (Master)	PUD 1 - South
Tributary Area (AC)	25.45	27.34
Imperviousness (%)	85.00	46.11
Q ₁₀₀ (CFS)	99.68	88.31

March 7, 2025

Please contact me if you have any questions or require additional information at jgrant@hkseng.com or 303-623-6300.

Sincerely,

HARRIS KOCHER SMITH

Jarrett Grant, PE
Project Manager

REFERENCES:

APPENDIX A – Vicinity Map

APPENDIX B – Hydrologic Computations

APPENDIX C – Hydraulic Computations

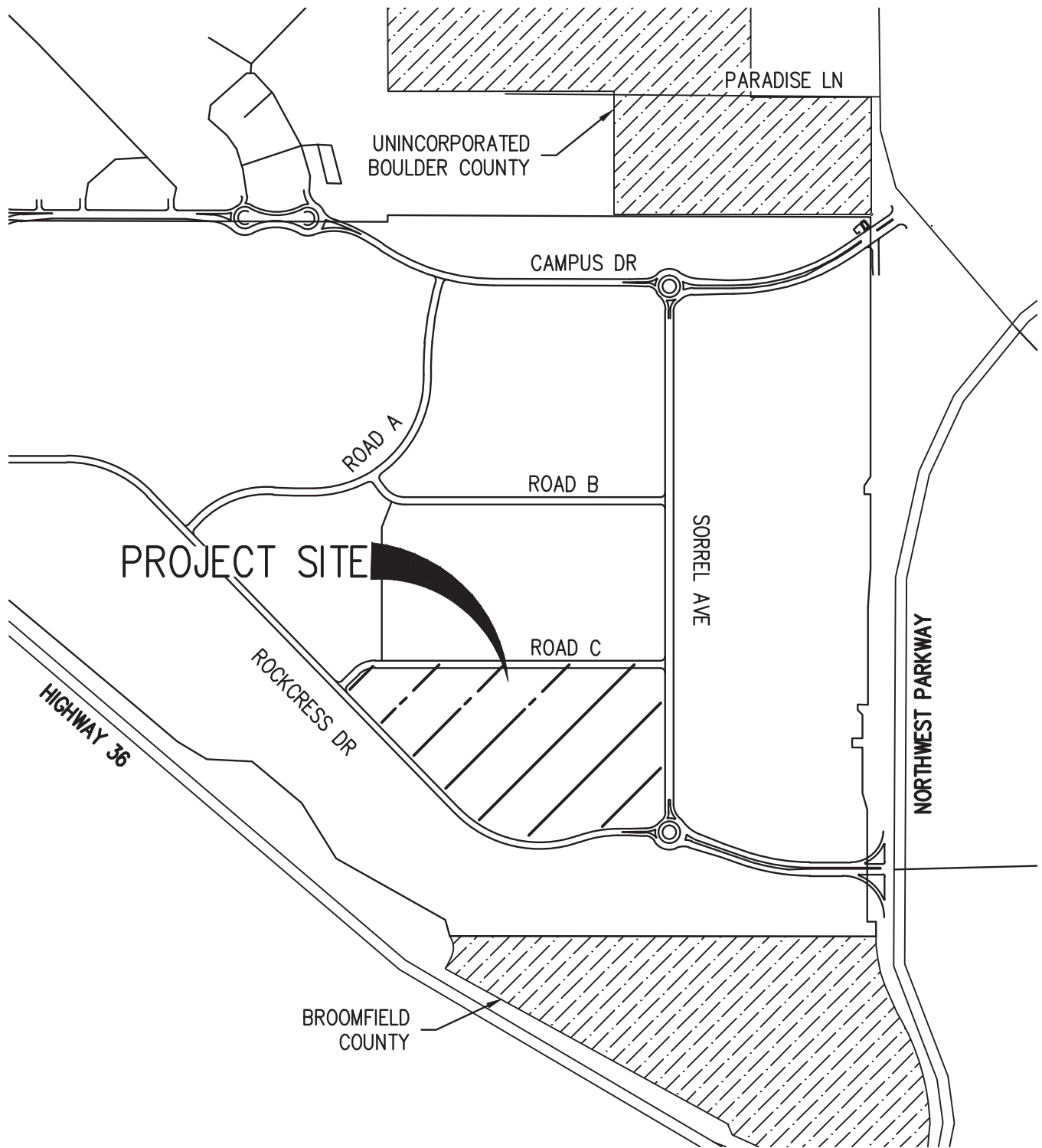
APPENDIX D – Final Drainage Plan

APPENDIX E – Master Drainage Report Plan Overlay

APPENDIX F – Master Drainage Report Documents

APPENDIX A – Vicinity Map

Plotted: FRI 03/07/25 12:07:09P By: Owen Van Lehman Filepath: p:\2022\221236\engineering\drainage\vicinity map-south.dwg Layout: layout1

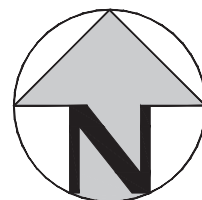


REDTAIL RIDGE - PUD 1 SOUTH VICINITY MAP

SCALE: 1"=800'



1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com



SCALE: 1" = 800'

APPENDIX B – Hydrologic Computations

Project Name: Redtail Ridge - PUD1

Composite C-Value Computations

Post-Development

Project No: 221236

Date: 03/03/25

Revised:

Design by: ODV

Checked by: TJS

Hydrologic Soil Group: C

BASIN	TOTAL AREA (ACRES)	ROOFS (90%)	SINGLE FAMILY LOTS (45%)	DRIVES & WALKS (90%)	GARAGE & STREETS (100%)	LANDSCAPE AREA (2%)	PERCENT IMPERVIOUS	C ₂ =	C ₅ =	C ₁₀ =	C ₁₀₀ =
O	0.25	0.00	0.00	0.04	0.00	0.21	15.97%	0.08	0.08	0.09	0.23
P	0.31	0.00	0.00	0.04	0.00	0.27	12.84%	0.06	0.06	0.07	0.21
Q	2.17	2.17	0.00	0.00	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
R	3.28	3.28	0.00	0.00	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
S1	1.24	0.00	0.00	0.10	0.00	1.14	8.99%	0.04	0.04	0.04	0.18
S2	0.97	0.00	0.00	0.83	0.00	0.14	77.72%	0.60	0.62	0.64	0.72
S3	0.90	0.00	0.00	0.77	0.00	0.13	77.25%	0.60	0.62	0.63	0.71
S4	1.84	0.00	0.00	0.03	0.00	1.81	3.48%	0.01	0.01	0.01	0.14
T1	0.71	0.00	0.00	0.71	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
T2	0.44	0.00	0.00	0.42	0.00	0.01	87.52%	0.71	0.73	0.74	0.79
T3	0.44	0.00	0.00	0.37	0.00	0.07	76.38%	0.59	0.61	0.62	0.71
T4	0.44	0.00	0.00	0.44	0.00	0.00	90.00%	0.73	0.75	0.76	0.81
T5	0.80	0.00	0.00	0.65	0.00	0.15	73.31%	0.56	0.58	0.59	0.68
U1	0.52	0.00	0.00	0.46	0.00	0.05	80.63%	0.63	0.65	0.67	0.74
U2	0.55	0.00	0.00	0.49	0.00	0.06	80.77%	0.64	0.65	0.67	0.74
U3	0.30	0.00	0.00	0.26	0.00	0.04	77.28%	0.60	0.62	0.63	0.71
U4	0.59	0.00	0.00	0.52	0.00	0.07	79.52%	0.62	0.64	0.66	0.73
V1	1.59	0.00	0.00	0.10	0.00	1.49	7.38%	0.03	0.03	0.04	0.17
V2	1.07	0.00	0.00	0.20	0.00	0.86	18.86%	0.10	0.10	0.11	0.26
V3	2.03	0.05	0.00	0.21	0.00	1.78	12.95%	0.06	0.06	0.07	0.21
V4	0.10	0.00	0.00	0.00	0.00	0.10	2.00%	0.01	0.01	0.01	0.13
V5	2.73	0.00	0.00	0.50	0.00	2.22	18.17%	0.09	0.10	0.11	0.25
V6	0.90	0.00	0.00	0.08	0.00	0.82	9.58%	0.04	0.04	0.05	0.18
W1	1.07	0.00	0.00	0.80	0.00	0.27	67.69%	0.51	0.52	0.54	0.64
W2	0.19	0.00	0.00	0.17	0.00	0.03	78.42%	0.61	0.63	0.64	0.72
X	1.93	0.00	0.00	0.03	0.00	1.91	3.25%	0.01	0.01	0.01	0.14

Pond C-2 (Basin B-2) 27.34 5.50 0.00 8.21 0.00 13.64 46.11%

Project Name: Redtail Ridge - PUD1
 Project No: 221236
 Date: 3/3/2025

STANDARD FORM SF-2 TIME OF CONCENTRATION

Designed By: ODV
 Checked By: TJS

Revised: _____

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Ti)					Tc CHECK (URBANIZED BASINS)			FINAL	REMARKS
BASIN	AREA (AC)	C _s	LENGTH (FT)	SLOPE %	Ti (MIN)	LENGTH (FT)	SLOPE %	C _v	VELOCITY (FPS)	Tt (MIN)	COMPOS. Tc (MIN)	TOTAL LENGTH	Tc = (L/180) + 10 (MIN)	Tc (MIN)	
O	0.25	0.08	50	5.00	7.71	0	2.00	15.00	2.12	0.00	7.71	50	10.28	7.71	
P	0.31	0.06	50	5.00	7.86	0	2.00	15.00	2.12	0.00	7.86	50	10.28	7.86	
Q	2.17	0.75	250	2.00	8.01	100	2.00	20.00	2.83	0.59	8.60	350	11.94	8.60	
R	3.28	0.75	250	2.00	8.01	100	2.00	20.00	2.83	0.59	8.60	350	11.94	8.60	
S1	1.24	0.04	400	3.00	26.96	525	2.00	15.00	2.12	4.12	31.08	925	15.14	15.14	
S2	0.97	0.62	100	3.00	6.06	450	2.00	20.00	2.83	2.65	8.71	550	13.06	8.71	
S3	0.90	0.62	150	3.00	7.49	200	2.00	20.00	2.83	1.18	8.67	350	11.94	8.67	
S4	1.84	0.01	400	3.00	27.67	300	2.00	15.00	2.12	2.36	30.02	700	13.89	13.89	
T1	0.71	0.75	150	3.00	5.42	575	2.00	20.00	2.83	3.39	8.81	725	14.03	8.81	
T2	0.44	0.73	100	3.00	4.76	475	2.00	20.00	2.83	2.80	7.56	575	13.19	7.56	
T3	0.44	0.61	100	3.00	6.23	375	2.00	20.00	2.83	2.21	8.44	475	12.64	8.44	
T4	0.44	0.75	100	3.00	4.43	265	2.00	20.00	2.83	1.56	5.99	365	12.03	5.99	
T5	0.80	0.58	100	3.00	6.63	175	2.00	20.00	2.83	1.03	7.66	275	11.53	7.66	
U1	0.52	0.65	100	3.00	5.68	575	2.00	20.00	2.83	3.39	9.07	675	13.75	9.07	
U2	0.55	0.65	100	3.00	5.66	430	2.00	20.00	2.83	2.53	8.19	530	12.94	8.19	
U3	0.30	0.62	100	3.00	6.11	260	2.00	20.00	2.83	1.53	7.65	360	12.00	7.65	
U4	0.59	0.64	150	3.00	7.13	75	2.00	20.00	2.83	0.44	7.57	225	11.25	7.57	
V1	1.59	0.03	400	4.00	24.70	225	5.00	15.00	3.35	1.12	25.81	625	13.47	13.47	
V2	1.07	0.10	625	4.00	28.81	225	5.00	15.00	3.35	1.12	29.92	850	14.72	14.72	
V3	2.03	0.06	575	4.00	28.71	230	6.00	15.00	3.67	1.04	29.75	805	14.47	14.47	
V4	0.10	0.01	100	4.00	12.64	0	2.00	15.00	2.12	0.00	12.64	100	10.56	10.56	
V5	2.73	0.10	750	4.00	31.71	0	2.00	15.00	2.12	0.00	31.71	750	14.17	14.17	
V6	0.90	0.04	200	4.00	17.26	0	2.00	15.00	2.12	0.00	17.26	200	11.11	11.11	
W1	1.07	0.52	500	3.00	16.41	450	2.00	20.00	2.83	2.65	19.06	950	15.28	15.28	
W2	0.19	0.63	100	3.00	5.97	95	2.00	20.00	2.83	0.56	6.53	195	11.08	6.53	
X	1.93	0.01	150	15.00	9.92	0	2.00	15.00	2.12	0.00	9.92	150	10.83	9.92	

1-HR Rainfall

<u>Return</u> <u>Interval (YR)</u>	<u>1-hour</u> <u>Rainfall</u>
WQ	0.6
2	0.801
5	1.08
10	1.35
100	2.49

tc	WQ	2yr	5yr	5yr	100yr
5	2.0351	2.717	3.663	4.579	8.446
6	1.934	2.582	3.482	4.353	8.028
7	1.844	2.462	3.320	4.150	7.654
8	1.763	2.354	3.174	3.968	7.318
9	1.690	2.256	3.042	3.803	7.014
10	1.623	2.167	2.922	3.652	6.737
11	1.562	2.086	2.812	3.515	6.483
12	1.506	2.011	2.711	3.389	6.250
13	1.454	1.942	2.618	3.272	6.036
14	1.407	1.878	2.532	3.165	5.837
15	1.362	1.818	2.452	3.065	5.653
16	1.321	1.763	2.377	2.972	5.481
17	1.282	1.712	2.308	2.885	5.321
18	1.246	1.663	2.243	2.804	5.171
19	1.212	1.618	2.182	2.727	5.030
20	1.180	1.576	2.124	2.656	4.898

Project Name: Redtail Ridge - PUD1
 Project No: 221236
 Date: 03/03/25
 Revised: 01/00/00

STANDARD FORM SF-2
Post-Development
Rational Method Procedure

Designed By: ODV
 Checked By: TJS
 Design Storm: 5 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					REMARKS
		AREA (AC)	RUNOFF COEFF	T _c (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	T _c (MAX)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	
O	-	0.25	0.08	7.71	0.02	3.21	0.07										
P	-	0.31	0.06	7.86	0.02	3.19	0.06										
Q	-	2.17	0.75	8.60	1.63	3.09	5.047										
R	2	3.28	0.75	8.60	2.47	3.09	7.63										
S1	4	1.24	0.04	15.14	0.05	2.44	0.12										
S2	4	0.97	0.62	8.71	0.60	3.08	1.86										
S3	-	0.90	0.62	8.67	0.56	3.08	1.72										
S4	1	1.84	0.01	13.89	0.02	2.54	0.06										
T1	1	0.71	0.75	8.81	0.53	3.07	1.63										
T2	1	0.44	0.73	7.56	0.32	3.24	1.02										
T3	1	0.44	0.61	8.44	0.27	3.11	0.83										
T4	2	0.44	0.75	5.99	0.33	3.48	1.14										
T5	2	0.80	0.58	7.66	0.46	3.22	1.49										
U1	2	0.52	0.65	9.07	0.34	3.03	1.02										
U2	2	0.55	0.65	8.19	0.36	3.15	1.12										
U3	3	0.30	0.62	7.65	0.19	3.22	0.61										
U4	3	0.59	0.64	7.57	0.38	3.23	1.23										
V1	3	1.59	0.03	13.47	0.05	2.58	0.13										
V2	3	1.07	0.10	14.72	0.11	2.47	0.27										
V3	3	2.03	0.06	14.47	0.13	2.49	0.32										
V4	4	0.10	0.01	10.56	0.00	2.86	0.00										
V5	4	2.73	0.10	14.17	0.27	2.52	0.67										
V6	4	0.90	0.04	11.11	0.04	2.80	0.11										
W1	4	1.07	0.52	15.28	0.56	2.43	1.36										
W2	4	0.19	0.63	6.53	0.12	3.39	0.41										
X	4	1.93	0.01	9.92	0.02	2.93	0.06										

Project Name: Redtail Ridge - PUD1
 Project No: 221236
 Date: 03/03/25
 Revised: 01/00/00

STANDARD FORM SF-2
Post-Development
Rational Method Procedure

Designed By: ODV
 Checked By: TJS
 Design Storm: 100 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					REMARKS
		AREA (AC)	RUNOFF COEFF	T _c (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	T _c (MAX)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	
O	-	0.25	0.23	7.71	0.06	7.41	0.43										
P	-	0.31	0.21	7.86	0.07	7.36	0.48										
Q	-	2.17	0.81	8.60	1.76	7.13	12.57										
R	2	3.28	0.81	8.60	2.66	7.13	18.99										
S1	4	1.24	0.18	15.14	0.22	5.63	1.26										
S2	4	0.97	0.72	8.71	0.69	7.10	4.93										
S3	-	0.90	0.71	8.67	0.64	7.11	4.56										
S4	1	1.84	0.14	13.89	0.25	5.86	1.48										
T1	1	0.71	0.81	8.81	0.57	7.07	4.06										
T2	1	0.44	0.79	7.56	0.35	7.46	2.58										
T3	1	0.44	0.71	8.44	0.31	7.18	2.21										
T4	2	0.44	0.81	5.99	0.35	8.03	2.85										
T5	2	0.80	0.68	7.66	0.54	7.43	4.05										
U1	2	0.52	0.74	9.07	0.38	6.99	2.66										
U2	2	0.55	0.74	8.19	0.40	7.26	2.93										
U3	3	0.30	0.71	7.65	0.22	7.43	1.61										
U4	3	0.59	0.73	7.57	0.43	7.46	3.23										
V1	3	1.59	0.17	13.47	0.27	5.94	1.58										
V2	3	1.07	0.26	14.72	0.27	5.70	1.56										
V3	3	2.03	0.21	14.47	0.43	5.75	2.47										
V4	4	0.10	0.13	10.56	0.01	6.59	0.08										
V5	4	2.73	0.25	14.17	0.69	5.81	3.98										
V6	4	0.90	0.18	11.11	0.17	6.46	1.07										
W1	4	1.07	0.64	15.28	0.68	5.60	3.83										
W2	4	0.19	0.72	6.53	0.14	7.83	1.09										
X	4	1.93	0.14	9.92	0.26	6.76	1.77										

RUNOFF SUMMARY TABLE			
BASIN	AREA (AC)	Q5 (CFS)	Q100 (CFS)
O	0.25	0.07	0.43
P	0.31	0.06	0.48
Q	2.17	5.05	12.57
R	3.28	7.63	18.99
S1	1.24	0.12	1.26
S2	0.97	1.86	4.93
S3	0.90	1.72	4.56
S4	1.84	0.06	1.48
T1	0.71	1.63	4.06
T2	0.44	1.02	2.58
T3	0.44	0.83	2.21
T4	0.44	1.14	2.85
T5	0.80	1.49	4.05
U1	0.52	1.02	2.66
U2	0.55	1.12	2.93
U3	0.30	0.61	1.61
U4	0.59	1.23	3.23
V1	1.59	0.13	1.58
V2	1.07	0.27	1.56
V3	2.03	0.32	2.47
V4	0.10	0.00	0.08
V5	2.73	0.67	3.98
V6	0.90	0.11	1.07
W1	1.07	1.36	3.83
W2	0.19	0.41	1.09
X	1.93	0.06	1.77

APPENDIX C – Hydraulic Computations

FlexTable: Conduit Table

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	System Known Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
F-1 (p-storm)	F2 (p-storm)	O-6	413.0	36.0	0.013	5,392.51	5,374.15	0.044	15.68	29.09	140.62	5,394.26	5,375.08
F-2 (p-storm)	F3 (p-storm)	F2 (p-storm)	57.1	36.0	0.013	5,399.57	5,397.51	0.036	13.84	24.38	126.63	5,401.16	5,398.49
F-3 (p-storm)	F4 (p-storm)	F3 (p-storm)	303.9	36.0	0.013	5,404.33	5,399.77	0.015	10.04	23.97	81.69	5,405.91	5,400.88
F-3-1 (p-storm)	F3-1 (p-storm)	F3 (p-storm)	37.1	12.0	0.013	5,407.04	5,406.67	0.010	3.02	0.41	3.56	5,407.30	5,406.90
F-4 (p-storm)	F5 (p-storm)	F4 (p-storm)	36.1	36.0	0.013	5,404.71	5,404.53	0.005	6.69	23.97	47.10	5,406.29	5,406.05
F-5 (p-storm)	F6 (p-storm)	F5 (p-storm)	80.5	36.0	0.013	5,405.31	5,404.91	0.005	6.59	22.61	47.02	5,406.84	5,406.38
F-5-1 (p-storm)	F5-1 (p-storm)	F5 (p-storm)	39.1	15.0	0.013	5,408.20	5,407.44	0.019	5.29	1.36	9.01	5,408.66	5,407.77
F-6 (p-storm)	F7 (p-storm)	F6 (p-storm)	261.8	36.0	0.013	5,411.28	5,405.51	0.022	6.72	3.75	99.01	5,411.88	5,406.85
F-7 (p-storm)	F8 (p-storm)	F7 (p-storm)	48.3	24.0	0.013	5,412.52	5,412.28	0.005	4.15	3.75	15.95	5,413.20	5,412.94
F-8 (p-storm)	F9 (p-storm)	F8 (p-storm)	188.4	24.0	0.013	5,413.20	5,412.62	0.003	3.49	3.75	12.55	5,413.95	5,413.30
F-9 (p-storm)	F10 (p-storm)	F9 (p-storm)	239.0	24.0	0.013	5,414.49	5,413.30	0.005	3.46	1.98	15.96	5,414.98	5,413.95
F-9-1 (p-storm)	F9-1 (p-storm)	F9 (p-storm)	28.7	12.0	0.013	5,415.32	5,415.03	0.010	4.55	1.77	3.58	5,415.89	5,415.53
F-10 (p-storm)	F10-1 (p-storm)	F10 (p-storm)	28.7	12.0	0.013	5,415.17	5,415.03	0.005	3.52	1.98	2.49	5,415.84	5,415.63
G-1 (p-storm)	G1 (p-storm)	F6 (p-storm)	25.1	36.0	0.013	5,405.54	5,405.41	0.005	6.38	18.86	47.98	5,406.93	5,406.88
G-2 (p-storm)	G2 (p-storm)	G1 (p-storm)	239.2	36.0	0.013	5,406.84	5,405.64	0.005	6.31	18.86	47.24	5,408.23	5,406.96
G-2-1 (p-storm)	G1-1 (p-storm)	O-18	32.0	12.0	0.013	5,408.21	5,408.06	0.005	3.26	1.49	2.44	5,408.77	5,408.58
G-3 (p-storm)	G3 (p-storm)	G2 (p-storm)	300.0	36.0	0.013	5,408.63	5,407.13	0.005	6.05	16.23	47.16	5,409.92	5,408.34
G-3-1 (p-storm)	G2-1 (p-storm)	G2 (p-storm)	32.0	12.0	0.013	5,409.51	5,408.86	0.020	5.21	1.14	5.08	5,409.96	5,409.18
G-3-2 (p-storm)	G2-2 (p-storm)	O-17	32.0	12.0	0.013	5,409.68	5,409.04	0.020	4.74	0.83	5.04	5,410.06	5,409.31
G-3-3 (p-storm)	G2-3 (p-storm)	O-16	32.0	12.0	0.013	5,410.04	5,409.52	0.016	4.66	1.02	4.54	5,410.46	5,409.84
G-4 (p-storm)	G3-1 (p-storm)	G3 (p-storm)	32.0	12.0	0.013	5,409.95	5,409.79	0.005	3.41	1.63	2.52	5,410.54	5,410.33
H-1 (p-storm)	H1 (p-storm)	F2 (p-storm)	61.1	24.0	0.013	5,402.60	5,402.01	0.010	5.35	3.98	22.22	5,403.30	5,402.58
H-1-1 (p-storm)	H1-1 (p-storm)	H1 (p-storm)	14.2	12.0	0.013	5,408.78	5,408.64	0.010	4.10	1.23	3.54	5,409.25	5,409.05
H-2 (p-storm)	H2 (p-storm)	H1 (p-storm)	189.0	24.0	0.013	5,404.43	5,402.60	0.010	4.82	2.75	22.26	5,405.01	5,403.30
H-2-1 (p-storm)	H2-1 (p-storm)	H2 (p-storm)	14.2	12.0	0.013	5,408.75	5,408.61	0.010	3.37	0.61	3.54	5,409.07	5,408.89
H-3 (p-storm)	H3 (p-storm)	H2 (p-storm)	167.0	24.0	0.013	5,406.05	5,404.43	0.010	4.48	2.14	22.28	5,406.56	5,405.01
H-3-1 (p-storm)	H3-1 (p-storm)	H3 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	4.00	1.12	3.54	5,409.21	5,409.01
H-4 (p-storm)	H4 (p-storm)	H3 (p-storm)	144.0	24.0	0.013	5,407.45	5,406.05	0.010	3.60	1.02	22.30	5,407.80	5,406.56
H-4-1 (p-storm)	H4-1 (p-storm)	H4 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	3.89	1.02	3.54	5,409.18	5,408.99

FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Known) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)
F2 (p-storm)	5,413.63	5,413.63	5,392.51	29.09	5,394.31	5,394.26	5,396.63	5,394.98	29.09	1.75
F3 (p-storm)	5,414.01	5,414.01	5,399.57	0.00	5,401.19	5,401.16	5,402.75	5,401.80	24.38	1.59
F3-1 (p-storm)	5,412.74	5,412.74	5,407.04	0.41	5,407.42	5,407.30	5,407.52	5,407.40	0.41	0.26
F4 (p-storm)	5,413.60	5,413.60	5,404.33	0.00	5,405.93	5,405.91	5,406.62	5,406.54	23.97	1.58
F5 (p-storm)	5,413.61	5,413.61	5,404.71	0.00	5,406.29	5,406.29	5,406.97	5,406.92	23.97	1.58
F5-1 (p-storm)	5,412.17	5,412.17	5,408.20	1.36	5,408.87	5,408.66	5,409.04	5,408.83	1.36	0.46
F6 (p-storm)	5,413.78	5,413.78	5,405.31	0.00	5,406.85	5,406.84	5,406.88	5,407.44	22.61	1.53
F7 (p-storm)	5,418.08	5,418.08	5,411.28	0.00	5,411.89	5,411.88	5,412.16	5,412.10	3.75	0.60
F8 (p-storm)	5,418.56	5,418.56	5,412.52	0.00	5,413.21	5,413.20	5,413.46	5,413.45	3.75	0.68
F9 (p-storm)	5,419.23	5,419.23	5,413.20	0.00	5,413.95	5,413.95	5,414.03	5,414.14	3.75	0.75
F9-1 (p-storm)	5,418.51	5,418.51	5,415.32	1.77	5,415.89	5,415.89	5,416.12	5,416.12	1.77	0.57
F10 (p-storm)	5,419.25	5,419.25	5,414.49	0.00	5,414.99	5,414.98	5,415.24	5,415.15	1.98	0.49
F10-1 (p-storm)	5,418.51	5,418.51	5,415.17	1.98	5,415.84	5,415.84	5,416.03	5,416.03	1.98	0.67
G1 (p-storm)	5,414.02	5,414.02	5,405.54	0.00	5,406.95	5,406.93	5,407.56	5,407.47	18.86	1.39
G1-1 (p-storm)	5,412.36	5,412.36	5,408.21	1.49	5,408.98	5,408.77	5,409.15	5,408.94	1.49	0.56
G2 (p-storm)	5,413.96	5,413.96	5,406.84	18.86	5,408.24	5,408.23	5,408.81	5,408.77	18.86	1.39
G2-1 (p-storm)	5,412.36	5,412.36	5,409.51	1.14	5,410.17	5,409.96	5,410.35	5,410.13	1.14	0.45
G2-2 (p-storm)	5,412.36	5,412.36	5,409.68	0.83	5,410.24	5,410.06	5,410.38	5,410.20	0.83	0.38
G2-3 (p-storm)	5,412.36	5,412.36	5,410.04	1.02	5,410.67	5,410.46	5,410.83	5,410.62	1.02	0.42
G3 (p-storm)	5,414.80	5,414.80	5,408.63	16.23	5,409.95	5,409.92	5,410.17	5,410.40	16.23	1.29
G3-1 (p-storm)	5,412.36	5,412.36	5,409.95	1.63	5,410.76	5,410.54	5,410.94	5,410.72	1.63	0.59
H1 (p-storm)	5,412.74	5,412.74	5,402.60	0.00	5,403.30	5,403.30	5,403.42	5,403.56	3.98	0.70
H1-1 (p-storm)	5,412.39	5,412.39	5,408.78	1.23	5,409.47	5,409.25	5,409.66	5,409.43	1.23	0.47
H2 (p-storm)	5,412.74	5,412.74	5,404.43	0.00	5,405.01	5,405.01	5,405.13	5,405.22	2.75	0.58
H2-1 (p-storm)	5,412.39	5,412.39	5,408.75	0.61	5,409.22	5,409.07	5,409.34	5,409.19	0.61	0.32
H3 (p-storm)	5,412.74	5,412.74	5,406.05	0.00	5,406.56	5,406.56	5,406.60	5,406.74	2.14	0.51
H3-1 (p-storm)	5,412.17	5,412.17	5,408.76	1.12	5,409.42	5,409.21	5,409.59	5,409.38	1.12	0.45
H4 (p-storm)	5,412.78	5,412.78	5,407.45	0.00	5,407.80	5,407.80	5,408.03	5,407.92	1.02	0.35
H4-1 (p-storm)	5,412.47	5,412.47	5,408.76	1.02	5,409.39	5,409.18	5,409.55	5,409.34	1.02	0.42

FlexTable: Conduit Table

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Invert (Start) (ft)	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	System Known Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
F-1 (p-storm)	F2 (p-storm)	O-6	413.0	36.0	0.013	5,392.51	5,374.15	0.044	20.59	80.93	140.62	5,395.29	5,375.78
F-2 (p-storm)	F3 (p-storm)	F2 (p-storm)	57.1	36.0	0.013	5,399.57	5,397.51	0.036	18.02	64.89	126.63	5,402.15	5,399.28
F-3 (p-storm)	F4 (p-storm)	F3 (p-storm)	303.9	36.0	0.013	5,404.33	5,399.77	0.015	12.78	63.80	81.69	5,406.90	5,402.37
F-3-1 (p-storm)	F3-1 (p-storm)	F3 (p-storm)	37.1	12.0	0.013	5,407.04	5,406.67	0.010	3.99	1.09	3.56	5,407.48	5,407.05
F-4 (p-storm)	F5 (p-storm)	F4 (p-storm)	36.1	36.0	0.013	5,404.71	5,404.53	0.005	9.03	63.80	47.10	5,407.63	5,407.10
F-5 (p-storm)	F6 (p-storm)	F5 (p-storm)	80.5	36.0	0.013	5,405.31	5,404.91	0.005	8.48	59.97	47.02	5,408.33	5,407.64
F-5-1 (p-storm)	F5-1 (p-storm)	F5 (p-storm)	39.1	15.0	0.013	5,408.20	5,407.44	0.019	7.04	3.83	9.01	5,408.99	5,408.02
F-6 (p-storm)	F7 (p-storm)	F6 (p-storm)	261.8	36.0	0.013	5,411.28	5,405.51	0.022	9.52	12.23	99.01	5,412.39	5,408.37
F-7 (p-storm)	F8 (p-storm)	F7 (p-storm)	48.3	24.0	0.013	5,412.52	5,412.28	0.005	5.60	12.23	15.95	5,413.83	5,413.54
F-8 (p-storm)	F9 (p-storm)	F8 (p-storm)	188.4	24.0	0.013	5,413.20	5,412.62	0.003	4.55	12.23	12.55	5,414.76	5,413.88
F-9 (p-storm)	F10 (p-storm)	F9 (p-storm)	239.0	24.0	0.013	5,414.49	5,413.30	0.005	4.76	6.19	15.96	5,415.37	5,414.76
F-9-1 (p-storm)	F9-1 (p-storm)	F9 (p-storm)	28.7	12.0	0.013	5,415.32	5,415.03	0.010	7.69	6.04	3.58	5,416.84	5,415.99
F-10 (p-storm)	F10-1 (p-storm)	F10 (p-storm)	28.7	12.0	0.013	5,415.17	5,415.03	0.005	7.88	6.19	2.49	5,416.88	5,415.99
G-1 (p-storm)	G1 (p-storm)	F6 (p-storm)	25.1	36.0	0.013	5,405.54	5,405.41	0.005	6.75	47.74	47.98	5,408.56	5,408.43
G-2 (p-storm)	G2 (p-storm)	G1 (p-storm)	239.2	36.0	0.013	5,406.84	5,405.64	0.005	7.62	47.74	47.24	5,409.61	5,408.58
G-2-1 (p-storm)	G1-1 (p-storm)	O-18	32.0	12.0	0.013	5,408.21	5,408.06	0.005	5.16	4.05	2.44	5,409.91	5,409.50
G-3 (p-storm)	G3 (p-storm)	G2 (p-storm)	300.0	36.0	0.013	5,408.63	5,407.13	0.005	7.51	40.85	47.16	5,410.79	5,409.62
G-3-1 (p-storm)	G2-1 (p-storm)	G2 (p-storm)	32.0	12.0	0.013	5,409.51	5,408.86	0.020	6.65	2.85	5.08	5,410.23	5,409.69
G-3-2 (p-storm)	G2-2 (p-storm)	O-17	32.0	12.0	0.013	5,409.68	5,409.04	0.020	6.21	2.21	5.04	5,410.32	5,410.20
G-3-3 (p-storm)	G2-3 (p-storm)	O-16	32.0	12.0	0.013	5,410.04	5,409.52	0.016	5.97	2.58	4.54	5,410.73	5,410.50
G-4 (p-storm)	G3-1 (p-storm)	G3 (p-storm)	32.0	12.0	0.013	5,409.95	5,409.79	0.005	5.17	4.06	2.52	5,411.28	5,410.87
H-1 (p-storm)	H1 (p-storm)	F2 (p-storm)	61.1	24.0	0.013	5,402.60	5,402.01	0.010	6.96	10.43	22.22	5,403.76	5,402.98
H-1-1 (p-storm)	H1-1 (p-storm)	H1 (p-storm)	14.2	12.0	0.013	5,408.78	5,408.64	0.010	5.11	3.23	3.54	5,409.55	5,409.39
H-2 (p-storm)	H2 (p-storm)	H1 (p-storm)	189.0	24.0	0.013	5,404.43	5,402.60	0.010	6.32	7.20	22.26	5,405.38	5,403.77
H-2-1 (p-storm)	H2-1 (p-storm)	H2 (p-storm)	14.2	12.0	0.013	5,408.75	5,408.61	0.010	4.40	1.61	3.54	5,409.29	5,409.09
H-3 (p-storm)	H3 (p-storm)	H2 (p-storm)	167.0	24.0	0.013	5,406.05	5,404.43	0.010	5.90	5.59	22.28	5,406.88	5,405.39
H-3-1 (p-storm)	H3-1 (p-storm)	H3 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	5.04	2.93	3.54	5,409.49	5,409.31
H-4 (p-storm)	H4 (p-storm)	H3 (p-storm)	144.0	24.0	0.013	5,407.45	5,406.05	0.010	4.78	2.66	22.30	5,408.02	5,406.89
H-4-1 (p-storm)	H4-1 (p-storm)	H4 (p-storm)	14.2	12.0	0.013	5,408.76	5,408.62	0.010	4.95	2.66	3.54	5,409.46	5,409.27

FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Known) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)
F2 (p-storm)	5,413.63	5,413.63	5,392.51	80.93	5,395.52	5,395.29	5,399.00	5,397.47	80.93	2.78
F3 (p-storm)	5,414.01	5,414.01	5,399.57	0.00	5,402.23	5,402.15	5,403.72	5,403.71	64.89	2.58
F3-1 (p-storm)	5,412.74	5,412.74	5,407.04	1.09	5,407.69	5,407.48	5,407.86	5,407.65	1.09	0.44
F4 (p-storm)	5,413.60	5,413.60	5,404.33	0.00	5,406.96	5,406.90	5,408.49	5,408.42	63.80	2.57
F5 (p-storm)	5,413.61	5,413.61	5,404.71	0.00	5,407.64	5,407.63	5,408.87	5,408.91	63.80	2.91
F5-1 (p-storm)	5,412.17	5,412.17	5,408.20	3.83	5,409.42	5,408.99	5,409.76	5,409.33	3.83	0.79
F6 (p-storm)	5,413.78	5,413.78	5,405.31	0.00	5,408.37	5,408.33	5,408.41	5,409.45	59.97	3.02
F7 (p-storm)	5,418.08	5,418.08	5,411.28	0.00	5,412.40	5,412.39	5,412.94	5,412.80	12.23	1.11
F8 (p-storm)	5,418.56	5,418.56	5,412.52	0.00	5,413.87	5,413.83	5,414.40	5,414.32	12.23	1.31
F9 (p-storm)	5,419.23	5,419.23	5,413.20	0.00	5,414.76	5,414.76	5,414.86	5,415.09	12.23	1.56
F9-1 (p-storm)	5,418.51	5,418.51	5,415.32	6.04	5,416.84	5,416.84	5,417.76	5,417.76	6.04	1.52
F10 (p-storm)	5,419.25	5,419.25	5,414.49	0.00	5,415.39	5,415.37	5,416.39	5,415.71	6.19	0.88
F10-1 (p-storm)	5,418.51	5,418.51	5,415.17	6.19	5,416.88	5,416.88	5,417.85	5,417.85	6.19	1.71
G1 (p-storm)	5,414.02	5,414.02	5,405.54	0.00	5,408.58	5,408.56	5,409.30	5,409.26	47.74	3.02
G1-1 (p-storm)	5,412.36	5,412.36	5,408.21	4.05	5,410.43	5,409.91	5,410.84	5,410.33	4.05	1.70
G2 (p-storm)	5,413.96	5,413.96	5,406.84	47.74	5,409.62	5,409.61	5,410.28	5,410.37	47.74	2.77
G2-1 (p-storm)	5,412.36	5,412.36	5,409.51	2.85	5,410.66	5,410.23	5,411.00	5,410.57	2.85	0.72
G2-2 (p-storm)	5,412.36	5,412.36	5,409.68	2.21	5,410.66	5,410.32	5,410.93	5,410.59	2.21	0.64
G2-3 (p-storm)	5,412.36	5,412.36	5,410.04	2.58	5,411.12	5,410.73	5,411.43	5,411.04	2.58	0.69
G3 (p-storm)	5,414.80	5,414.80	5,408.63	40.85	5,410.87	5,410.79	5,411.28	5,411.66	40.85	2.16
G3-1 (p-storm)	5,412.36	5,412.36	5,409.95	4.06	5,411.80	5,411.28	5,412.22	5,411.70	4.06	1.33
H1 (p-storm)	5,412.74	5,412.74	5,402.60	0.00	5,403.77	5,403.76	5,403.99	5,404.23	10.43	1.16
H1-1 (p-storm)	5,412.39	5,412.39	5,408.78	3.23	5,410.03	5,409.55	5,410.42	5,409.93	3.23	0.77
H2 (p-storm)	5,412.74	5,412.74	5,404.43	0.00	5,405.39	5,405.38	5,405.61	5,405.75	7.20	0.95
H2-1 (p-storm)	5,412.39	5,412.39	5,408.75	1.61	5,409.56	5,409.29	5,409.78	5,409.51	1.61	0.54
H3 (p-storm)	5,412.74	5,412.74	5,406.05	0.00	5,406.89	5,406.88	5,406.96	5,407.20	5.59	0.83
H3-1 (p-storm)	5,412.17	5,412.17	5,408.76	2.93	5,409.93	5,409.49	5,410.28	5,409.84	2.93	0.73
H4 (p-storm)	5,412.78	5,412.78	5,407.45	0.00	5,408.03	5,408.02	5,408.41	5,408.22	2.66	0.57
H4-1 (p-storm)	5,412.47	5,412.47	5,408.76	2.66	5,409.86	5,409.46	5,410.18	5,409.78	2.66	0.70

APPENDIX D – Final Drainage Plan

The diagram illustrates a basin design. The top part shows a cross-section of a basin with a triangular roof structure. The bottom part shows a plan view of the basin, which is a circle divided into four quadrants. The top quadrant is labeled 'BASIN DESIGNATION' and contains the letter 'A'. The bottom quadrant is labeled 'BASIN AREA' and contains the text 'AREA 1.0', 'Circum 0.53', and 'AC 0.65'.

LEGEND

RIGHT-OF-WAY _____

PROPERTY BOUNDARY _____

EX CONTOUR _____

PR CONTOUR _____

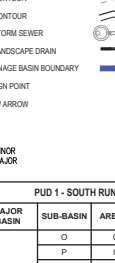
EX STORM SEWER _____

PR LANDSCAPE DRAIN _____

DRAINAGE BASIN BOUNDARY _____

DESIGN POINT 

FLOW ARROW 



 Know what's below. Call before you dig.		ISSUE DATE: #####	 HARRIS KOCHER SMITH 1120 Lincoln Street, Suite 1000 Denver, Colorado 80203 P: 303.623.6300 F: 303.623.6311 harris.kocher@smith.com	STERLING BAY	REDTAIL RIDGE PUD1 DRAINAGE PLAN	PRELIMINARY NOT FOR CONSTRUCTION	PROJECT # : 221236
		DATE: _____					SHEET NUMBER
		DESIGNED BY: TJS					ST23
		CHECKED BY: TJS					
		DRAWN BY: DDV					
						27 OF 57	

APPENDIX E – Master Drainage Plan Overlay



LEGEND:

BASIN BOUNDARY	---
GOODHUE IRRIGATION DITCH	---
TRIBUTARY I 10-YEAR FLOODPLAIN	---
TRIBUTARY I 100-YEAR FLOODPLAIN	---
PR PEDESTRIAN TRAIL	---
PROPOSED STORM SEWER OUTFALLS	---
DRAINAGE FLOW	→
PROPOSED CONTOURS	---
EXISTING CONTOURS	---
PHASING LINE	-----



BASIN SUMMARY AND DISCHARGE TABLE:

DESIGN POINT	CONTRIBUTING BASINS	CONTRIBUTING AREA (AC)	Q5 (CFS)	Q100 (CFS)
1	A-3-1 & A-3-2	1.19	0.62	1.96
2	DP 1 & A-3-3	1.54	0.95	2.92
3	DP 2 & A-3-4	1.89	1.31	3.94
4	88th St Culvert & School West Culvert	0	29.90	88.00
5	DP 4 & C-3-1 & C-3-2	2.48	31.32	92.51
6	DP 5 & School Pond Bypass	2.48	31.32	92.49
7	DP 6 & C-3-3 & C-3-4	3.34	0.56	44.55
8	DP 7 & School East Culvert	3.34	1.64	49.33
9	DP 8 & C-3-5 & C-3-6	4.58	2.58	52.19
10	DP 9 & C-3-7 & C-3-8	6.73	4.10	56.76
11	DP 10 & C-3-15 & C-3-16	8.05	4.76	58.81
12	DP 11 & C-3-17 & C-3-18	9.13	5.42	60.82
13	DP 12 & C-3-19	10.03	6.06	62.72
14	DP 13 & C-3-20	12.00	7.35	66.65
15	DP 14 & C-3-21	14.02	8.71	70.75
16	C-4-1 & C-4-2	2.78	1.67	5.19
17	C-5-1 & C-5-2	1.19	0.57	1.81
18	DP17 & Pond E	36.28	2.60	51.16
19	DP 18, C-5-3, & C-5-4	37.60	3.02	53.19
20	DP 19, C-5-5, & C-5-6	39.2	3.64	55.72
21	DP 20 & C-5-7 & C-5-8	40.82	4.31	58.31
22	C-5-9 & C-5-10	1.42	0.77	2.43
23	DP 22 & B2	32.06	44.52	120.7
24	DP21 & DP23	72.88	46.84	151.07
25	DP 29 & C-5-11 & C-5-12	75.18	48.46	155.85
26	C-6-1 & C-6-2, D-2	20.82	28.61	88.67
27	C-6-3 Offsite	0.32	0.39	1.14
28	Pond C-2 Release	115.63	4.36	77.40

*QMP/QMM WAS USED TO CALCULATE THESE VALUES. THE FULL QMP/QMM RESULTS TO CALCULATE RUNOFF FOR BASINS WILL BE INCLUDED WITH THE FINAL MASTER DRAINAGE REPORT
DESIGN POINTS ARE SHOWN ON SHEETS ST-8-ST-11

POND SUMMARY TABLE:

POND	WATERSHED AREA (ACRE)	CONTRIBUTING BASINS	WATERSHED IMPERVIOUSNESS (%)	100 YR STORAGE REQUIRED (AC-FT)	100 YR STORAGE PROVIDED (AC-FT)	5 YR RELEASE RATE (CFS)	100 YR RELEASE RATE (CFS)
A-3	1.89	A-3	75.00%	0.232	0.41	0.1	1.6
B	112.80	A-2 & B-1	85.00%	15,290	25,27	3.5	91.3
C-1	87.23	C-1, C-3	79.84%	8,851	16,66	6.7	81.0
C-2	87.35	B-2, C-2, C-5, C-6, D-4	78.29%	11,080	16,51	3.9	77.4
E	35.09	E	75.00%	4,383	5.41	2.3	48.4

PUD 1 OVERLAY - MASTER DRAINAGE PLAN

SCALE: 1"=300'

APPENDIX F – Master Drainage Report Documents

to the storm sewer in Campus drive beginning at the existing flared end section at the northwest corner of the parcel and be released into Pond C-1.

Basin B is in the central portion of the Site located to the north of Rockcress Drive, to the east of Basin A-1, to the south of Campus Drive, and to the west of Sorrel Avenue. A natural ridge in the southern portion of the parcel splits the basin into Sub-Basins B-1 draining north and B-2 draining south.

Sub-Basin B-1 will be developed to drain to a curb, gutter, inlet and storm sewer system that will release to a proposed Full Spectrum Detention Facility Pond B (hereinafter referred to as "Pond B") located at the northeast corner of Basin B. Pond B is planned to release north into Tributary I. Calculations for the design of Pond B as well as outlet structure design are included in Appendix C.

Sub-Basin B-2 drains south and is contributory to proposed Full Spectrum Detention Facility Pond C-2. A storm sewer outfall stub is provided to the southeast corner of Basin B2 to collect developed stormwater runoff from Basin B-2 and route to Pond C-2.

Basin C is in the eastern portion of the Site and generally lies east of Sorrel Avenue and west of S. 96th Street. A natural ridge in the south portion of the parcel splits the basin into Sub-Basins C-1 draining north and C-2 draining south. Basin C Sub-Basins include the portions of Campus Drive, Rockcress Drive, and Sorrel Avenue which are Tributary to Ponds C-1 and C-2.

Sub-Basin C-1 is in the northeastern portion of Basin C between Sorrel Avenue and S. 96th Street. This Sub-Basin is proposed to be developed at 80% Imperviousness. Sub-Basin C-1 contains the Full Spectrum Detention Facility Pond C-1 (hereinafter referred to as "Pond C-1"). Basin C-1 will be developed to drain to a curb, gutter, inlet and storm sewer system that will release to Pond C-1, located at the northeast corner of the basin. Pond C-1 is a planned permanent water surface facility with stormwater detention provided above the permanent water surface. This pond will follow state permit procedure for permanent water surface facilities. The outlet of Pond C-1 will release east into Tributary I.

Sub-Basin C-2 is the southeastern portion of Basin C between Sorrel Avenue and Northwest Parkway. This Sub-Basin is proposed to be developed at 80% Imperviousness. Runoff from Sub-Basin C-2 will be routed south through a proposed curb, gutter, inlet, and storm sewer system to Pond C-2 where it will be combined with flows from Sub-Basin C-5. The combined flows will then be detained for both the WQCV event and the major storm event. The outfall for Pond C-2 will be routed to the existing 48" RCP storm sewer releasing east under the Northwest Parkway.

Basin E is in the southwest portion of the Site and generally lies south of Basin A and west of Sub-Basin D-2. Stormwater runoff in Basin E is proposed to drain to a curb, gutter, inlet and storm sewer system that will release to a proposed Full Spectrum Detention Facility Pond E (hereinafter referred to as “Pond E”) located in the downgradient portion of Basin E. Pond E is planned to release northeast into the proposed storm sewer for Rockcress Drive. Flows will then be routed through storm sewer to Pond C-2 where they will be detained for the WQCV event and then released to the existing 48” HDPE under the Northwest Parkway.

Basin F is in the northern portion of the Site and is existing open space and will drain as it does historically. Basin F is bound on the north by the property line and on the east, west, and south by Campus Drive. The historical flows for Basin F generally flow from the extents of the basin to the center where they meet Tributary I.

Basin OS-1 is located generally west of the Site and is existing open space and roadway areas. Basin OS-1 will drain as it does historically. The historical flows for Basin OS-1 generally flow east to S. 88th Street. Flows are conveyed under 88th St. to Tributary I in Basin A via an existing 36” RCP culvert and two 18” CMP.

Basin OS-2 is located generally north of the Site and is existing farm and residential land. Basin OS-2 will be left to drain as it does historically. The historical flows for Basin OS-2 generally flow southeast into Basin F and then Tributary I.

Basin OS-3 is located generally north of the Site, east of OS-2, and is existing farm and residential land. Basin OS-3 will also be left to drain as it does historically, into Basin F and then Tributary I.

Basins OS-4-1, OS-4-2, OS-7-1, OS-7-2, OS-7-3, and OS-7-4 are located northeast of the Site, within S 96th Ave. These basins represent improvements to be completed off-site to that roadway in conjunction with the Project. Full details on these basins may be found in the Off-Site Roadway Improvements Addendum to Redtail Ridge Subdivision Filing No. 1, submitted April 1, 2022.

TABLE 1: POND SUMMARY TABLE

POND	WATERSHED AREA (ACRE)	CONTRIBUTING BASINS	WATERSHED IMPERVIOUSNESS (%)	100 YR STORAGE REQUIRED (AC-FT)	100 YR STORAGE PROVIDED (AC-FT)
A-3	1.67	A-3	75.0%	0.205	0.227
B	118.46	A-2-2, B-1	85.0%	16.043	17.515
C-1	67.40	C-1, C-3	79.8%	8.682	9.811
C-2	82.03	B-2 , C-2, C-5, C-6, D-1	77.8%	10.357	12.446
E	34.29	E	75.0%	4.205	4.413

TABLE 2: Basin Summary Table

BASIN	AREA (AC)	IMPERVIOUSNESS (%)	Q5 (CFS)	Q100 (CFS)
A-1	37.99	2%	2.30	41.92
A-2-1	14.62	2%	0.69	13.14
A-2-2	47.44	85%	63.12	171.71
A-3	1.67	75%	1.28	3.86
B-1	71.02	85%	99.51	269.69
B-2	25.45	85%	36.89	99.68
C-1	53.21	80%	64.57	183.61
C-2	19.63	80%	31.60	88.58
C-3	14.19	79%	7.42	22.67
C-4	2.78	75%	2.42	7.26
C-5	9.66	76%	4.06	12.91
C-6	1.82	75%	1.75	5.22
D-1	25.81	70%	27.59	85.56
D-2	19.24	2%	0.98	18.34
E	34.29	75%	40.63	120.09
F	17.05	2%	0.90	16.59
OS-1	77.43	9%	8.78	99.62
OS-2	32.32	6%	1.49	40.72
OS-3	19.51	5%	1.33	44.68
OS-4-1	1.51	86%	0.98	2.83
OS-4-2	1.66	88%	1.12	3.18
OS-7-1	0.53	100%	0.35	0.93
OS-7-2	0.51	100%	0.34	0.89
OS-7-3	0.55	100%	0.35	0.92
OS-7-4	0.56	100%	0.36	0.95

C. Goodhue Ditch

The Ditch traverses the far northeast corner of the Site and is owned by the Ditch Company. The Ditch contains a defined bed and bank with fringe wetlands along portions of the banks. The Ditch is shown on the United States Geological Survey (USGS) Louisville topographic quadrangle and on the National Hydrography Dataset (NHD) as a canal/ditch and intermittent stream.



BASIN BOUNDARY	
GOODHUE IRRIGATION DITCH	
TRIBUTARY 10-YEAR FLOODPLAIN	
TRIBUTARY 100-YEAR FLOODPLAIN	
PR PEDESTRIAN TRAIL	
PROPOSED STORM SEWER OUTFALLS	
DRAINAGE FLOW	
PROPOSED CONTOURS	
EXISTING CONTOURS	
PROPOSED PUBLIC STORM SEWER	

DESIGN POINT	CONTRIBUTING BASINS	CONTRIBUTING AREA (AC)	QS (CFS)
1	A-3-1 & A-3-2	2.48	5.35
2	D-1 & A-3-3	3.08	6.54
3	D-2 & A-3-4	3.43	7.24
4	Bibb St Culvert & School West Culvert	0.00	29.90
5	D-4 & C-3-1 & C-3-2	15.26	63.75
6	DP 5 & School Pond Bypass	15.26	0.00
7	DP 6 & C-3-3 & C-3-4	19.92	4.37
8	DP 7 & School East Culvert	19.92	5.47
9	DP 8 & C-3-5 & C-3-6	17.82	7.76
10	DP 9 & C-3-7 & C-3-8	19.58	11.18
15	DP 13 & C-3-15 & C-3-16	21.40	16.18
16	DP 15 & C-3-17 & C-3-18	22.59	17.72
17	DP 16 & C-3-19	23.15	18.63
18	DP 17 & C-3-20 & C-3-21	26.02	23.48
20	DP 18 & DP 17	28.04	26.59
21	C-4-1 & C-4-2	3.94	8.05
22	C-5-1 & C-5-2	10.00	20.98
23	C-5-3 & C-5-4	1.26	2.71
24	DP 2 & DP 23	11.30	22.67
25	C-5-6 & C-5-6	1.46	3.18
26	DP 24 & DP 25	12.76	24.63
27	DP 26 & C-5-7 & C-5-8	14.38	26.75
28	B-2	30.64	136.95
29	DP 28, C-5-9, & C-5-10	25.25	138.12
30	DP 27 & C-5-11 & C-5-12	16.08	29.88
31	C-6-1 & C-6-2	2.49	6.04
32	DP 30, DP 31 & D-1	16.40	27.92
33	DP 31 & DP 32	16.40	27.92

*THE RATIONAL METHOD WAS USED TO CALCULATE THESE VALUES. THE CUHP METHOD TO CALCULATE RUNOFF FOR LARGE BASINS WILL BE INCLUDED WITH THE FINAL MASTER DRAINAGE REPORT
*DESIGN POINTS ARE SHOWN ON SHEETS ST-8:ST-11

POUND	WATERSHED AREA (ACRES)	CONTRIBUTING BASINS	WATERSHED IMPERMEABILITY (%)	100 YR STORAGE REQUIRED (ACFT)	100 YR STORAGE PROVIDED (ACFT)	5 YR RELEASE RATE (CFR)	100 YR RELEASE RATE (CFR)
A-3	1.98	A-3	75.00%	0.232	0.41	0.1	1.6
B	112.89	A-32, B-1	80.00%	15,250	25,27	3.5	142.5
C-1	87.23	C-1, C-3	79.84%	8,651	16,86	6.7	87.4
D-2	87.35	B-2, C-2, C-6, C-6, D-1	78.29%	11,080	16.51	3.9	77.8
E	35.09	E	75.00%	4.303	5.41	2.3	49.4

MEMORANDUM

To: City of Louisville, Public Works Department

From: Cassie Slade, P.E., PTOE

Date: March 13, 2025

Project: Redtail Ridge

Subject: PUD 1 South Traffic Conformance Letter

With increases in SF and minor traffic adjustments, will overall SF still be met within the development? This needs to be addressed here and all future developments, especially if each PUD is requesting to exceed SF from the approved GDP.

The Fox Tuttle Transportation Group has prepared this traffic conformance letter for the proposed development of industrial use located in the Industrial District of the Redtail Ridge development in Louisville, Colorado. The site is located northwest of the intersection of Rockcross Drive and Sorrel Avenue, as shown on **Figure 1** at the end of this memorandum. PUD 1 South of Redtail Ridge plans to include two (2) industrial buildings for a total of 239,082 square feet (sf) of industrial space. Concurrent with PUD 1 South, Rockcross Drive will be built from Northwest Parkway west to Road C, as well as Sorrel Avenue north to Road B, and Road C west from Sorrel Avenue to Rockcross Drive. It is understood that there will be three (3) full movement accesses on Road C to support mobility and accessibility to PUD 1 South buildings.

The purpose of this "traffic conformance letter" is to determine if the proposed use of PUD 1 South is significantly different than the trip generation assumptions for this site as analyzed in the "Master" study and to identify if additional traffic analysis is necessary.

Comparison to Master Traffic Study

A **"Master" Transportation Study**¹ (MTS) was previously prepared for the entire Redtail Ridge development that will include a mix of industrial, GMP, life science, office, research and development, retail, hospital and medical office uses. The two (2) buildings within PUD 1 South were assumed to be industrial uses in the MTS. Development staging in the MTS was done in phases by horizon years rather than specific PUD lots, and PUD 1 South was included within Phase 1 of the MTS. Phase 1 of the MTS assumed a total development of 509,260 sf of industrial, 300,000 sf of life science and

¹ Redtail Ridge Traffic and Mobility Study. Fox Tuttle Transportation Group, LLC. July 2024 (updated).

598,940 sf of GMP space by Year 2025. The proposed PUD 1 South uses are consistent with uses assumed in Phase 1 of the MTS with additional development anticipated beyond PUD 1 South in Phase 1. **The plan for PUD 1 South is consistent with the land uses and roadway needs in the MTS.**

Trip Generation

To establish the volume of trips associated with the proposed project, the data contained in the *Institute of Transportation Engineers (ITE) Trip Generation Manual*² for the appropriate uses was applied. The proposed land use is estimated to mostly be new trips, known as ‘primary trips’, which is discussed below:

Primary Trips. These trips are made specifically to visit the site and are considered “new” trips. Primary trips would not have been made if the proposed project did not exist. Therefore, this is the only trip type that increases the number of trips made on a regional basis.

Non-Auto Trips. These trips are those that are completed by walking, biking, or transit. The existing transit service will provide employees the opportunity to travel to/from work by bus rather than a personal vehicle. The planned bicycle network throughout Redtail Ridge will provide high-comfort bicycle connections to bicycle facilities near the site. The development plans to use transportation demand management (TDM) to encourage carpooling and other modes to reduce the number of single-occupant vehicle (SOV) commute trips. A non-SOV reduction of 12% was applied for all uses within Redtail Ridge.

Multi-Use (Internal) Trips. These trips are internal from one land use or building to another within the site boundaries. For example, an office patron may also use a retail store or restaurant in one vehicle trip to the site. Multi-use or multi-purpose trips typically do not affect the exterior site access points, nor add any additional traffic volumes to the adjacent street network. For this project it is projected that the small retail uses on the site will be focused on serving the office and industrial employees of the project and most (75% estimated) of the trips accessing them will be on-site or internal trips. The other end of these internal trips were attributed to the office and industrial employees and resulted in a 3% reduction for those uses. Based on this approach, the multi-use factors applied for this project were assumed to be 3% for industrial and office uses and 75% for the retail uses.

Table 1 summarizes and compares the trip generation estimated for these buildings of the MTS and the PUD 1 South site plan for weekday daily, weekday AM and weekday PM peak periods.

² *Trip Generation Manual*. 11th Edition. Institute of Transportation Engineers. Washington, DC. 2021.

Redtail Ridge: PUD 1 South
Traffic Conformance Letter
 March 13, 2025

Table 1. Trip Generation Summary and Comparison

	Land Use	Size	Unit	Non-SOV	Internal Capture	Net Reduction Factor	Average Weekday Trips		Weekday AM Peak Hour Trips				Weekday PM Peak Hour Trips			
							Rate	Total	Rate	Total	In	Out	Rate	Total	In	Out
MTS	#130 Industrial Park	198.00	KSF	12%	3%	85%	*	1,143	0.4	68	55	13	0.4	68	14	54
		198.00	KSF			Subtotal		1,143		68	55	13		68	14	54
PUD 1 South	#130 Industrial Park	237.2	KSF	12%	3%	85%	*	1,256	0.4	81	66	15	0.4	81	17	64
		237.20	KSF			Subtotal		1,256		81	66	15		81	17	64
Difference in Trips (PUD 1 vs. MTS)								113		13	11	2		13	3	10

* ITE Equation: $EXP(0.52 \cdot LN(X) + 4.45)$

PUD 1 South is estimated to generate slightly more trips for that space as expected in the MTS, with an increase of 13 trips in the AM and PM peak hours. Land uses and trip generation of PUD 1 South are aligned with the assumed use in the MTS, with an increase in square footage (19.8% difference) for these two buildings. It should be noted that the overall square footage in Phase 1 under the current proposal is actually slightly less than shown in the MTS. The capacity analysis in the MTS indicated the study intersections would operate acceptably (LOS D or better) with the full Phase 1 development and associated roadway improvements. The updated PUD 1 South volume adds 9 or fewer trips to any individual movement, so therefore it is expected that the study intersections will operate acceptably with the PUD 1 South trips.

Proposed Access

With the construction of PUD 1 South, internal roadways will be constructed as planned for Phase 1 of the MTS:

- Rockcress Drive: built west from Northwest Parkway to Road A.
- Sorrel Avenue: built from Rockcress Drive to Campus Drive.
- Road C: built from Rockcress Drive to Sorrel Avenue.
- Road B: built from Road A to Sorrel Avenue.
- Road A: built from Rockcress Drive to Campus Drive.

Access from the PUD 1 South buildings will be provided exclusively to Road C. Three (3) full movement side-street stop-controlled access intersections are planned on Road C. The proposed site plan including access locations is shown in **Figure 2** at the end of this memorandum.

An estimate of traffic entering and exiting the accesses was performed, based on the site plan, truck and vehicle distribution was assigned to an access point based on the building use and square footage accessible from each access. Vehicle distribution through the street network used the same distribution assumption for external trip origins and destinations that were used in the MTS.

March 13, 2025

The added trips generated by PUD 1 South at public street intersections are shown in **Figure 3**. The trips generated by PUD 1 South in the MTS are shown in **Figure 4**. Comparing **Figure 3** and **Figure 4**, PUD 1 South is expected to generate slightly more trips as are expected from that space in the MTS. The trips generated by PUD 1 South are fewer than the trips generated by the total expected in Phase 1, and therefore are expected to be accommodated by the planned roadway network found to function acceptably with the complete traffic volume anticipated for Phase 1.

Travel Demand Management

Some physical infrastructure components of the project travel demand management (TDM) are being implemented with PUD 1 South. Pedestrian connections will be built to PUD 1 South from the surrounding roadways and facilities, including paths to internal parks both east and west of the two industrial buildings in PUD 1 South. This network will provide a comfortable connection between the PUD 1 South buildings and multimodal amenities such as the circulator shuttle stops and showers and changing facilities for bicycle commuters.

**Redtail Ridge: PUD 1 South
Traffic Conformance Letter**

March 13, 2025

Conclusions

The plan for PUD 1 South of Redtail Ridge is consistent with the land use assumptions of the MTS for the parcel with a slight increase in industrial use. PUD 1 South is expected to generate slightly more trips as expected in that space in the MTS. Access points to PUD 1 South are similar to the planned roadways and access in the MTS and are expected to distribute traffic to public streets consistent with the assumptions in the MTS. **It is anticipated that the planned roadway network and intersections can accommodate PUD 1 South trips without the need for additional analysis or mitigation measures since it is consistent with the MTS.**

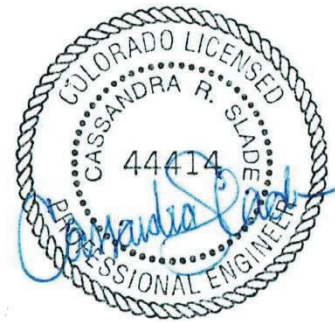
Hopefully the contents of this memorandum are helpful. If you have any questions, please give me a call.

Sincerely,

FOX TUTTLE TRANSPORTATION GROUP, LLC



Cassie Slade, P.E.,PTOE
Principal





PUD 1 Area



LIFE SCIENCE DISTRICT WEST

Tot. Life Sciences Building Area (SF) 274,135

Total Parking Stalls 825
Avg. Parking Ratio per 1K GSF 3

GMP / INDUSTRIAL DISTRICT

GMP Building Area (SF) 462,804
Industrial Building Area (SF) 612,400
Total District Building Area (SF) 1,075,204
Total Parking Stalls 2,220
Avg. Parking Ratio per 1K GSF 2.09

LIFE SCIENCE DISTRICT EAST

Tot. Life Sciences Building Area (SF) 165,000

Total Parking Stalls 492
Avg. Parking Ratio per 1K GSF 3

R&D DISTRICT

Tot. R&D Building Area (SF) 117,820

Total Parking Stalls 390
Avg. Parking Ratio per 1K GSF 3.3

OFFICE DISTRICT

Total Office Building Area (SF) 342,484
Total Parking Stalls 1,435
Avg. Parking Ratio per 1K GSF 4

AMENITY/ LIFE SCIENCES

Life Science Building Area (SF) 102,621
Amenity Building Area (SF) 15,540
Total District Building Area (SF) 118,161

Total Parking Stalls 398
Avg. Parking Ratio per 1K GSF 3.36

HOSPITAL

Total Building Area 435,600

TOTAL SITE DEVELOPMENT

Total Building Area (SF) 2,542,387



Perkins&Will

TRYBA ARCHITECTS



REDTAIL RIDGE
INNOVATION DISTRICT

FOX TUTTLE

TRANSPORTATION GROUP

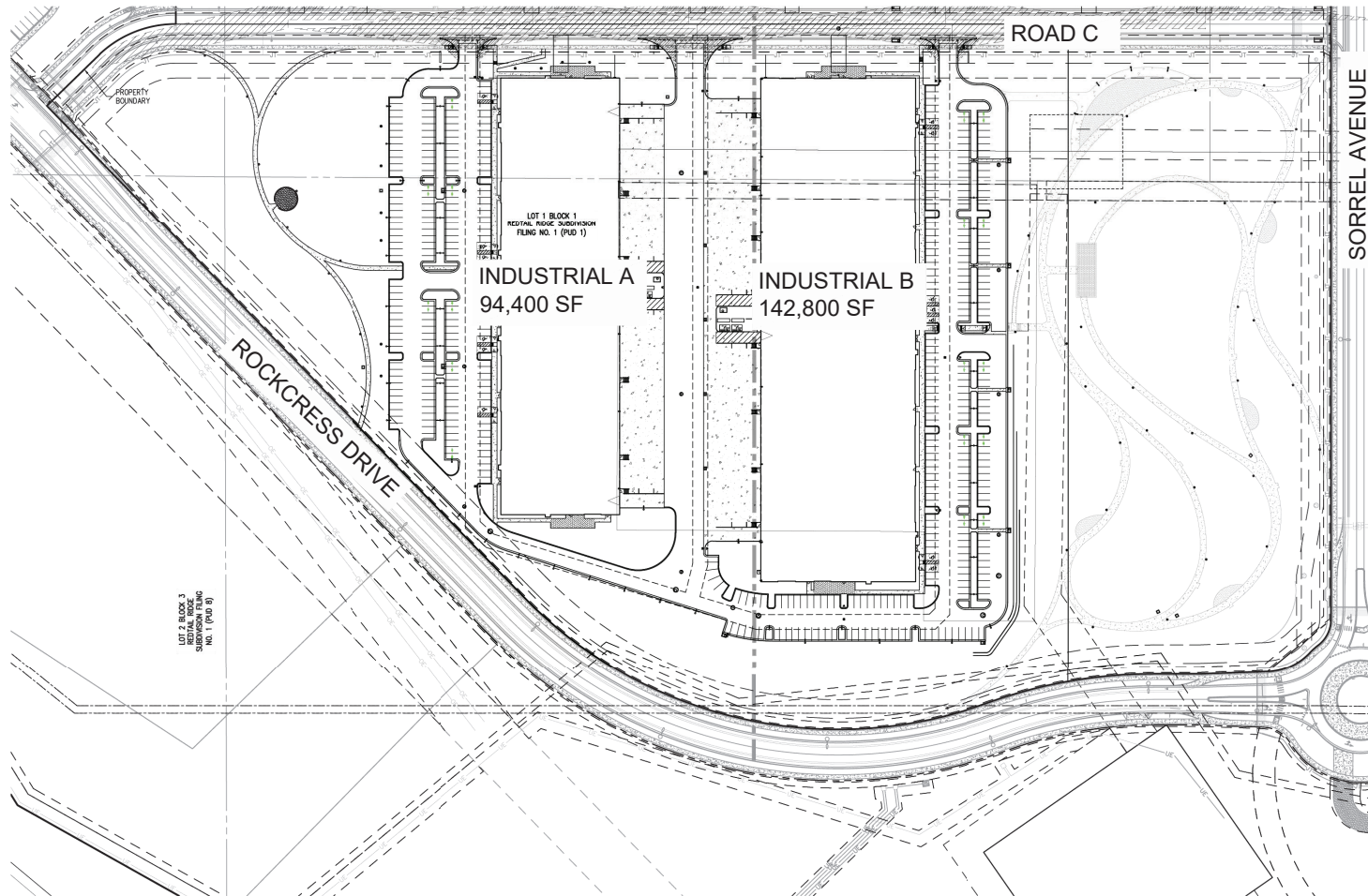
REDTAIL RIDGE PUD 1 SOUTH CONFORMANCE
PUD 1 SOUTH AREA

FT Project #	19055	Original Scale	NTS	Date	3/13/2025	Drawn by	SKK	Figure #	1
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REDTAIL RIDGE FILING NO. 1

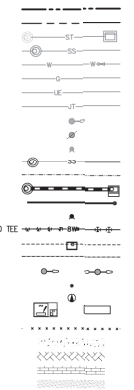
PLANNED UNIT DEVELOPMENT

LOT 1 BLOCK 1 & LOT 2 BLOCK 1



LEGEND:

PROPERTY BOUNDARY
 RIGHT-OF-WAY
 EXISTING STW SEWER W/ MH AND INLET
 EXISTING SANITARY SEWER W/ MH
 EXISTING WATER LINE W/ VALVE
 EXISTING GAS LINE
 EXISTING UNDERGROUND ELECTRIC
 EXISTING JOINT TRENCH
 EXISTING STREET LIGHT
 EXISTING TELEPHONE POLE
 EXISTING FIRE HYDRANT
 PROPOSED GUTTER/ DRAIN W/ MH
 PROPOSED SANITARY SERVICE W/ CLEAN OUT
 PROPOSED STORM SEWER W/ MH AND INLET
 PROPOSED LANDSCAPE DRAIN W/ INLET
 PROPOSED FIRE HYDRANT
 PROPOSED 8" WATER MAIN W/ BENDS, VALVE, AND TEE
 PROPOSED WATER SERVICE W/ METER
 PROPOSED FIRE SERVICE
 PROPOSED STREET LIGHT
 PROPOSED PEDESTRIAN LIGHT
 PROPOSED BUILDING ENTRANCE
 PROPOSED TRANSFORMER AND GENERATOR
 ABANDON EXISTING UTILITY LINE
 PROPOSED CONCRETE
 PROPOSED CONCRETE PAVERS
 PROPOSED PORCELAIN PAVERS
 PROPOSED CRUSHER FINES



ABBREVIATIONS

BUILD	BUILDING
C&G	CLUB & GUTTER
CONC	CONCRETE
DOB	DOWNDRAIN
DALE	DRY UTILITY EASEMENT
ELC	ELECTRIC
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
PH	FIRE HYDRANT
FL	FLOW LINE
GV	GATE VALVE
HT	HEIGHT
MANH	MANHOLE
N	NORTH NORTHING
PEO	PEDESTRIAN
R	PROPERTY LINE
PRO	PROPOSED
ROW	RIGHT OF WAY
RAE	RAILROAD EASEMENT
SS	SANITARY SEWER
STM	STORM
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER



SCALE: 1" = 100'

REVISION DATE:

ISSUE DATE: ##-##-202#

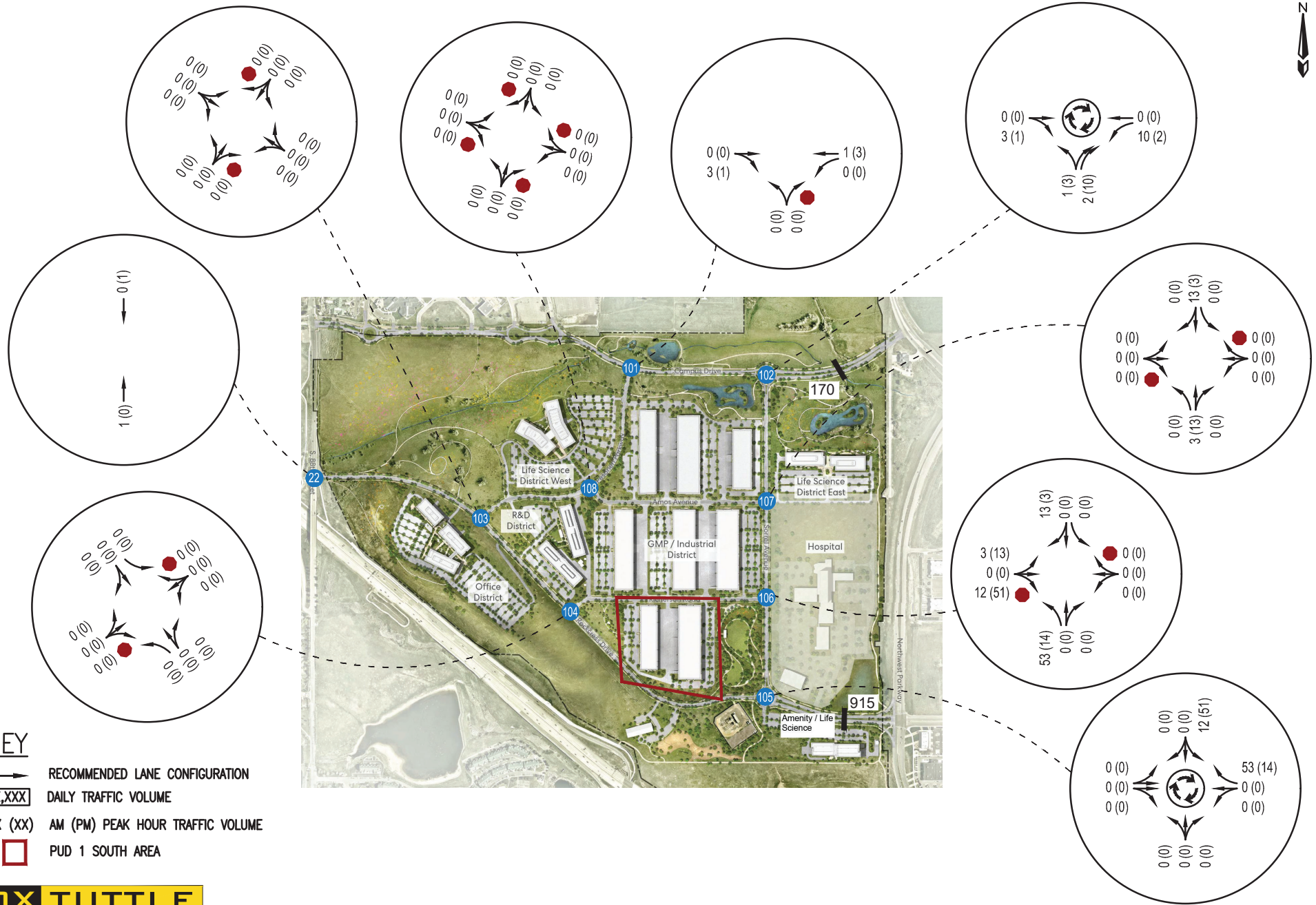
OVERALL SITE PLAN
 SHEET 2 OF 36

REDTAIL RIDGE PUD1 SOUTH

FOX TUTTLE
 TRANSPORTATION GROUP

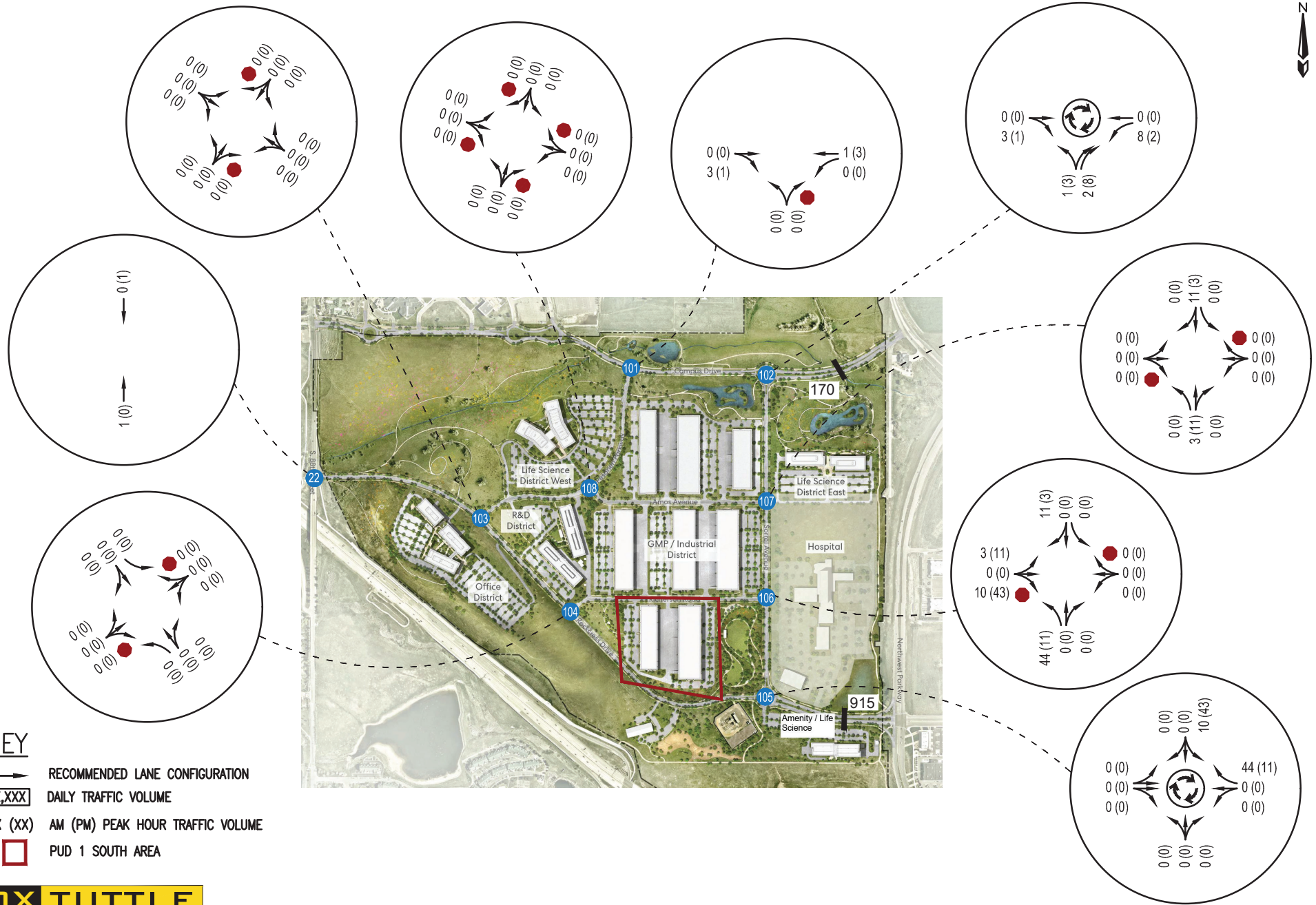
REDTAIL RIDGE PUD 1 SOUTH CONFORMANCE
 PUD 1 SOUTH SITE PLAN

FT Project #	19055	Original Scale	NTS	Date	3/13/2025	Drawn by	SKK	Figure #	2
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KEY

- RECOMMENDED LANE CONFIGURATION
- [X,XXX] DAILY TRAFFIC VOLUME
- XX (XX) AM (PM) PEAK HOUR TRAFFIC VOLUME
- PUD 1 SOUTH AREA



KEY

- RECOMMENDED LANE CONFIGURATION
- X,XXX DAILY TRAFFIC VOLUME
- XX (XX) AM (PM) PEAK HOUR TRAFFIC VOLUME
- PUD 1 SOUTH AREA



REDTAIL RIDGE PUD 1 SOUTH CONFORMANCE
MTS - PUD 1 SOUTH AREA GENERATED TRIPS

FT Project #	19055	Original Scale	NTS	Date	3/13/2025	Drawn by	SKK	Figure #	4
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March 14, 2025

Attention: Recipient Name

City of Louisville
749 Main Street
Louisville, CO 80027

Redtail Ridge PUD 1 – South
Utility Conformance Letter
HKS Project No. 221236

Add lift station sizing information to the report.

At this point, square footage increases must be done through a GDP amendment unless other PUDs will be reducing their SF to accommodate this increase in SF. Address this in all areas of the PUD submittal.

To whom it may concern,

The purpose of this letter is to serve as a formal recognition of PUD 1 South's compliance with the Redtail Ridge Final Master Utility Report dated January 27, 2021, revised March 3, 2023. This report analyzed water and sanitary sewer utilities to serve the Redtail Ridge development. A copy of the Final Master Utility Report has been included with this Utility Conformance Letter. The results below were calculated using assumptions provided by Dewberry that estimate sanitary sewer and water demands based on square footage of the proposed buildings. Water demands based on preliminary fixture counts for PUD 1, received from RTM Engineering, suggests that the flows based on square footage as they have been calculated in this letter and in the Final Master Utility Report, are higher than the PUD 1 site would require during operation. PUD 1 has been further subdivided since the Final Master Utility Report into PUD 1 North and PUD 1 South. For the purposes of ensuring compliance with the Final Master Utility Report, PUD 1 North and PUD 1 South are assumed be two parts of one PUD 1 utility planning area.

Proposed Sanitary Sewer System

The proposed Redtail Ridge PUD 1 South buildings will discharge into sanitary sewers constructed beneath the private road north of the site. The sanitary main will flow east and discharge into Sanitary Sewer Line A of the Redtail Ridge master project within Sorrel Avenue as is outlined in the Final Master Utility Report.

The Final Master Utility Report estimated that PUD 1 would have an area of 654,500 sq. ft with a peak flow of 223.8 GPM. At the time of writing this report, PUD 1 is expected to have a building area of 680,600 sq. ft with a peak flow of 231.3 GPM. Both peak flows are the high-density sanitary demands as outlined in the Final Master Utility Report. PUD 1 South will contribute 80.6 GPM at peak sanitary flow.

PUD 1 North and PUD 1 South are assumed to have the same peaking factor as the whole of PUD 1. Table 1 below shows the sanitary demand information published in the Redtail Ridge Final Master Utility Report and the sanitary demand using the current building information.

Table 1: Utility Report Sanitary Demand

PUD 1 - Industrial	Area (sq. ft)	Annual Average Daily Demand (GPD)	Average Daily Demand (GPM)	Average Daily Demand (CFS)	Peak Factor	Peak Flow (GPM)	Peak Flow (CFS)
PUD 1 North	443,400	61,324.8	42.6	0.095		150.7	0.336
PUD 1 South	237,200	32,806.1	22.8	0.051		80.6	0.180
PUD 1 Utility Conformance	680,600	94,131	65.4	0.146	3.54	231.3	0.515
Final Master Utility Report (PUD1)	654,500	90,521	62.9	0.140	3.56	223.8	0.499

The sanitary flows from PUD 1 are now higher than expected in the Final Master Utility Report. The sanitary system designed in the master project will have capacity to convey the slightly higher sanitary flows of PUD 1. The Final Master Utility Report anticipated that PUD 1-4, 6, 7 would "...be collected by Sanitary Line A at some point within Sorrel Avenue." Sanitary Line A, a 12" PVC sanitary main is designed with a minimum slope of 0.22% and can convey 2.172 CFS when flowing full at the minimum slope. The Final Master Utility Report anticipated that PUD 1-4, 6, 7 would generate a peak flow of 1.474 CFS; after the slight increase in sanitary demand, the peak flow for PUD 1-4, 6, 7 would be 1.490 CFS. Sanitary Line A will be flowing at 68.6% of the minimum slope pipe capacity.

Proposed Water System

PUD 1 South will construct water main loops through the parking lots from the 8" water mains constructed under the internal private roads on the north of PUD 1 South. The 8" water main north of PUD 1 South connects to 12" water mains in Sorrell Ave and Rockcress Dr. The 8" water main north of PUD 1 South will also connect to the future PUD 1 North.

Table 2, below, shows the water demands calculated in the Final Master Utility Report and the water demands based on the current square footage for PUD 1 North, PUD 1 South, and PUD 1 as a whole. The peaking factor for all is 2.68 as was requested by the City in the Final Master Utility Report.

Attention

Page 3 of 3

November 15, 2023

Table 2: Utility Report Water Demand

PUD 1 - Industrial	Average Daily Demand (GPD)	Average Daily Demand (GPM)	Peak Day Demand (GPD)	Peak Day Demand (GPM)
PUD 1 North	71,831	49.9	192,507	133.7
PUD 1 South	38,426	26.7	102,983	71.5
PUD 1 Utility Conformance	110,257	76.6	295,489	205.2
Final Master Utility Report (PUD 1)	108,625	75.4	291,116	202.2

Fire flows for PUD1 South will be higher than the 2,500 GPD. The largest building of PUD 1 South will have a required fire flow have been evaluated. The model has been included in the Final Master Utility Report.

Address lift station and wastewater treatment facility implication in this report/

With the updated PUD 1 demand, the maximum day demand is 1.204 MGD to 1.206 MGD. Using the highest water demand for the City water system between 2012 and 2019 was 8.735 MGD. The total estimated peak demand for the City, including all of Redtail Ridge, will be 9.941 MGD. The water treatment plants have a treatment capacity of 13.0 MGD and a pumping capacity of 11 MGD. The demand for water will still be under the treatment and pumping capacity for the City.

Preliminary fixture counts have been completed by RTM Engineering which estimated a peak demand of 600 GPM. Dewberry has confirmed that Average Daily Demands are expected to be 1/10th of the peak demands, meaning PUD 1 would expect to have an Average Daily Demand of 60 GPM, which is in compliance with the Final Master Utility Report.

Conclusion

If calculated using the same method as the Final Master Utility Report, PUD 1 will have higher water and sanitary demands than were anticipated in the Final Master Utility Report but both the sanitary and water systems are under the capacity for the master utilities. If the preliminary fixture counts are utilized to estimate future flows, then both the sanitary and water systems proposed will have lower demands than was anticipated in the Final Master Utility Report.

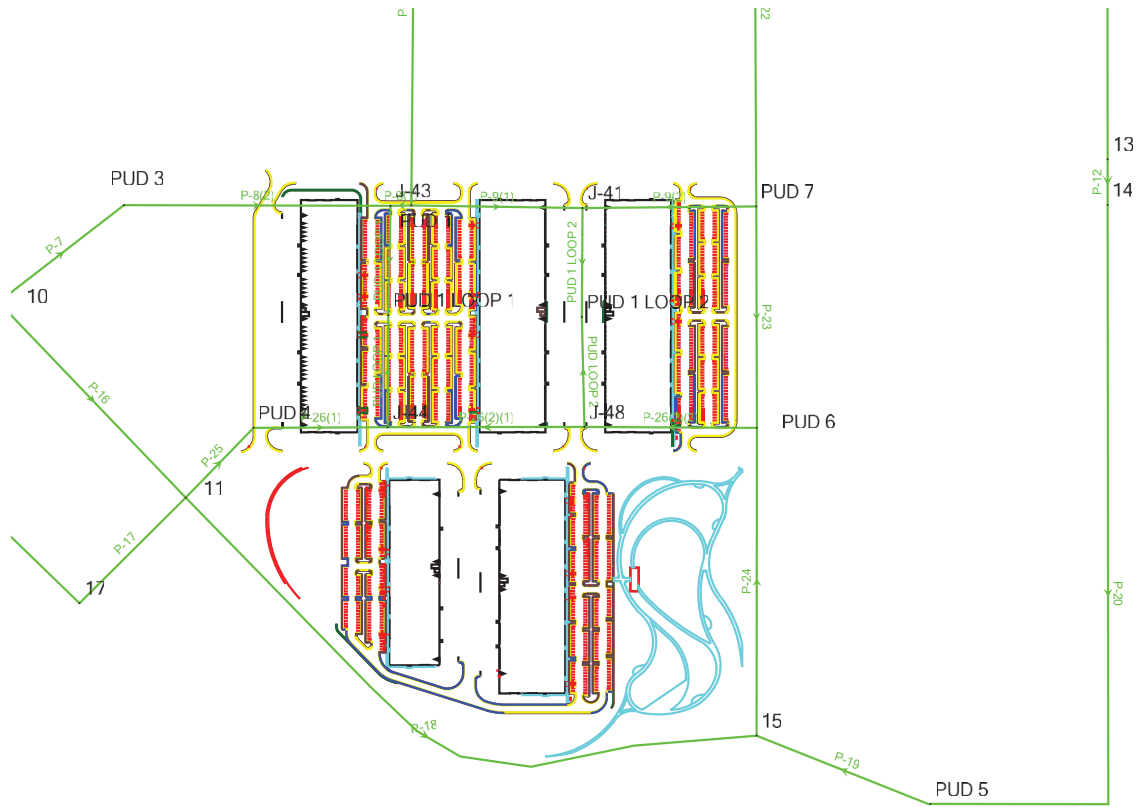
Please contact me if you have any questions or require additional information at jgrant@hkseng.com or 303-623-6300.

Sincerely,

HARRIS KOCHER SMITH

Jarrett Grant
Project Manager

Scenario: PUD 1 Fire



FlexTable: Pipe Table

Label	Length (Scaled) (ft)	Diameter (in)	Flow (gpm)	Material	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-26(2)(1)	626	8.0	-60	PVC	0.38	0.000
P-18	2,159	12.0	211	PVC	0.60	0.000
P-9(1)	545	8.0	131	PVC	0.84	0.000
P-19	595	12.0	-310	PVC	0.88	0.000
P-24	980	12.0	-521	PVC	1.48	0.001
P-15	820	8.0	264	PVC	1.68	0.001
P-17	476	8.0	264	PVC	1.68	0.001
P-23	704	12.0	736	PVC	2.09	0.001
EX-7	1,414	8.0	-367	DIP	2.34	0.002
P-20	2,473	8.0	-367	PVC	2.34	0.002
P-12	145	8.0	-367	PVC	2.34	0.002
P-2(1)	556	12.0	825	PVC	2.34	0.001
P-2(2)	525	12.0	825	PVC	2.34	0.001
P-16	861	12.0	879	PVC	2.49	0.002
P-13	479	8.0	392	PVC	2.50	0.002
P-14	747	8.0	392	PVC	2.50	0.002
P-4	528	12.0	-905	PVC	2.57	0.002
P-3	663	12.0	-905	PVC	2.57	0.002
EX-11	1,761	8.0	-451	DIP	2.88	0.003
EX-10	185	8.0	-471	DIP	3.01	0.003
P-8(1)	66	8.0	488	PVC	3.11	0.004
EX-9	718	8.0	-490	DIP	3.13	0.004
EX-2	831	18.0	2,570	DIP	3.24	0.002
EX-8	284	8.0	-517	DIP	3.30	0.004
P-8(2)	848	8.0	-582	PVC	3.72	0.005
EX-1	39	18.0	3,088	DIP	3.89	0.002
EX-4	2,066	12.0	1,470	PVC	4.17	0.004
EX-3	166	12.0	1,477	PVC	4.19	0.004
P-6	697	12.0	1,604	PVC	4.55	0.005
P-7	504	8.0	-725	PVC	4.63	0.008
P-22	1,269	12.0	-1,730	PVC	4.91	0.005
P-1	960	12.0	1,921	PVC	5.45	0.007
P-26(1)	427	8.0	871	PVC	5.56	0.011
P-5	2,686	12.0	1,996	PVC	5.66	0.007
EX-12	118	8.0	903	DIP	5.76	0.012
P-21	1,281	8.0	906	PVC	5.78	0.012
PUD LOOP 1	357	8.0	-930	Ductile Iron	5.94	0.016
P-25	310	8.0	932	PVC	5.95	0.012
PUD LOOP 2	350	8.0	-933	Ductile Iron	5.95	0.016
P-9(2)	552	8.0	-936	PVC	5.97	0.012
P-26(2)(2)	549	8.0	-993	PVC	6.34	0.014
PUD 1 LOOP 2	347	8.0	1,067	Ductile Iron	6.81	0.021
PUD 1 LOOP 1	348	8.0	1,070	Ductile Iron	6.83	0.021
EX-5	481	8.0	-1,271	DIP	8.12	0.022
EX-6	252	8.0	-1,271	DIP	8.12	0.022

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Pressure (psi)
2	5,475.00	0	65
3	5,470.00	0	67
4	5,430.00	0	80
6	5,393.70	0	93
7	5,380.00	0	99
8	5,370.00	0	104
9	5,432.07	0	75
10	5,420.02	0	79
11	5,396.13	0	89
13	5,367.00	0	104
14	5,368.11	0	103
15	5,377.00	0	97
16	5,430.00	0	76
17	5,395.00	0	89
18	5,370.00	0	108
IFM	5,470.66	27	67
J-40	5,402.71	0	89
J-41	5,393.29	0	87
J-43	5,401.44	0	83
J-44	5,388.01	0	89
J-48	5,385.09	0	90
JVL	5,467.02	7	68
MHS	5,456.88	20	71
MK8	5,459.71	19	70
PUD 1	5,400.00	287	84
PUD 1 LOOP 1	5,394.81	2,000	83
PUD 1 LOOP 2	5,389.21	2,000	86
PUD 2	5,412.25	190	85
PUD 3	5,420.00	143	77
PUD 4	5,390.00	62	90
PUD 5	5,370.00	57	100
PUD 6	5,382.52	264	94
PUD 7	5,386.49	58	93
PUD 8	5,410.00	128	83

FINAL MASTER UTILITY REPORT

for

REDTAIL RIDGE

**CITY OF LOUISVILLE
BOULDER COUNTY
STATE OF COLORADO**

January 27, 2021
Revised: March 3, 2023

Prepared for:

STERLING BAY
333 North Green
Suite 1100
Chicago, Illinois 60607

Prepared by:



1120 Lincoln Street, Suite 1000
Denver, CO 80203
Ph: 303-623-6300, Fax: 303-623-6311

Contact: Tim Sayler, PE
Tim Hoffman, PE
Harris Kocher Smith Project No. 190108

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ENGINEER CERTIFICATION

“This report for the utility design of Redtail Ridge was prepared by me (or under my supervision) in accordance with the provisions of the City of Louisville Design and Construction Standards; and designed to comply with the provisions thereof. I understand that the City of Louisville does not, and will not, assume liability for water and sanitary sewer facilities designed by others.”

Tim Sayler, P.E.
Licensed Professional Engineer
State of Colorado
No. 56955
On behalf of Harris Kocher Smith

1. INTRODUCTION

A. Site Location and Description

The proposed Redtail Ridge Site (hereinafter referred to as “Site”) is situated in the City of Louisville (hereinafter referred to as “City”); specifically, the Northeast ½ and South ½ of Section 20, the North ½ of Section 29, and the Northwest ¼ of Section 28, Township 1 South, Range 69 West of the 6th P.M. Counties of Boulder and Broomfield, State of Colorado. The Site is generally located East of S. 88th Street, South of Campus Drive, West of S. 96th Street and Northwest Parkway, and Northeast of Highway 36. A Vicinity Map is included in Appendix A, for reference.

The Site is approximately 389.1 acres and was a formerly developed office campus with recreational facilities. The Site is currently covered with grass vegetation, remnants of building slabs, and several private roadways. The proposed uses for the Site include industrial, office, retail, public open space, trail open space, and private open space.

B. Existing Water and Sewer Infrastructure

Maps provided by the City show existing water lines adjacent to the Site. These existing water lines consist of an 18-inch Polyvinyl Chloride (“PVC”) main that runs south within S. 88th Street and downsizes to 12-inch PVC at the intersection of S. 88th Street and Campus Drive. A 12-inch main continues east within Campus Drive and then the public main terminates at the east end of the existing Campus Drive right-of-way. There is also an existing 8-inch Ductile Iron Pipe (“DIP”) main that runs south within S. 96th Street and terminates at the intersection of S. 96th Street and Disc Drive. Finally, there are existing private mains on-Site, not within any known easement, that connects to the 12-inch PVC at the terminus of the Campus Drive right-of-way and runs east and south throughout the Site, terminating at a facility on-Site near Disk Drive.

A conceptual drawing of the existing water and proposed water can be found in Appendix F, for reference. Copies of the Utility Maps provided by the City can be found in Appendix C, for reference.

There are two sanitary sewer mains near the Site, according to the maps provided by the City. The first main terminates at the intersection of S. 88th Street and Campus Drive. At this location, the sanitary sewer main is an 8-inch PVC main which continues north into existing development north of the Site. The second main is an existing force main originating from an existing lift station on-Site and continuing north from the Site to terminate at a sanitary sewer manhole located approximately 3,600 feet north of Dillon Road.

A conceptual drawing of the existing sanitary sewer and proposed sanitary sewer can be found in Appendix F, for reference. Copies of the Utility Maps provided by the City can be found in Appendix C, for reference.

There are also portions of two City utility atlases in Appendix C. The first atlas is from the 2018 utility map book Index and does not include the existing sanitary sewer force main mentioned above. The second atlas is from the 2007 utility atlas index and does include the existing sanitary sewer force main mentioned above.

C. Previous Utility Studies

The *City of Louisville's 2013 Comprehensive Plan*, (hereinafter referred to as "Plan") analyzes both the existing water and sewer systems for the City. According to the Plan, the water supply originates from the South Boulder Creek Project, the Northern Colorado Water Conservancy District Colorado Big Thompson Project, and the Windy Gap Project. Water from these projects is treated at the following two water treatment facilities: the Howard Berry Plant (hereinafter referred to as "HBWTP") and the North Water Treatment Plant (hereinafter referred to as "NWTP"). The Plan concludes that the water supply and treatment capacity for the City is enough to accommodate the expected 20-year built-out of the City. Reference the Plan located in Appendix B for details. As far as the sewer for the City is concerned, the Plan indicates that the current City of Louisville Wastewater Treatment Plant (hereinafter referred to as "Plant") is currently operating at a daily average of 2 million gallons per day ("MGD"), which is approximately 59% of its operational capacity. In 1999, the Plant was updated to carry a maximum permitted capacity of 3.4 MGD; however, the Plan notes that the Plant had reached the end of its useful life by 2013. As such, the Plant will require upgrades unrelated to the proposed development of the Site to comply with current regulatory water quality requirements. The anticipated plan to update the Plant are discussed in the *City of Louisville Wastewater Facility Plan* and summarized below. Excerpts from the Plan are included in Appendix B, for reference.

According to the *City of Louisville Water System Facilities Plan Final Report* (hereinafter referred to as "Water Plan") prepared by Hatch Mott MacDonald, dated July 2012, the water available to the Site is from the NWTP which supplies 8 MGD to the existing water system. Together with the HBWTP with a supply of 5 MGD, the City has a gross treatment capacity of 13 MGD. The NWTP's pump station was rebuilt and moved in 2018. As of the date of this report it is not known if the operations performed in 2018 increased pumping capacity. The NWTP supplies pressurized water to both the high-pressure and mid-pressure zone pressure areas and gravity feeds to the low-pressure zone. The HBWTP pumps water to the high-pressure zone and gravity feeds the mid-pressure zone. Water is also able to "download" from the high-pressure zone to the mid-pressure zone through pressure reducing valves and zone valves operated by City staff. The Site will connect to the existing mid-pressure zone water system within Campus Drive and S. 88th Street. The mid-pressure zone system is intended to store 3.5 Million Gallons ("MG") of the 8.5 MG stored in the City's water system. As stated within the Water Plan, the 8.5 MG of storage is acceptable, and the entire storage should be maintained. Excerpts from the Water Plan are included in Appendix B, for reference.

The *City of Louisville Wastewater Facility Plan* (hereinafter referred to as "The Sewer Plan" prepared by Dewberry, dated April 2013, indicates that the Plant has a rated

capacity of 3.4 MGD and receives wastewater from approximately 63 miles of sanitary sewer, ranging from 8-inch PVC to 27-inch PVC. The Sewer Plan predicts a full build-out of the City by 2034 that will produce an average daily maximum month influent flow of 2.45 MGD. That said, the Plant has enough capacity for the full build-out of the City as the Sewer Plan concludes that the current Plant's treatment facilities are out of date. Current regulations concerning water quality require stricter levels of regulation compared to when the Plant was upgraded in 1999. Given this information, the Plant needed to be upgraded to comply with current regulations in support of the proposed development of the City unrelated to the development of the Site. These upgrades to the Plant were completed in 2018 based on the recommendations within the Sewer Plan. Excerpts from Sewer Plan are included in Appendix B, for reference.

D. Design Criteria

The City of Louisville criteria (hereinafter referred to as "City Criteria") was used for this report and supplemented with historical data. Additionally, calculations and demands were also coordinated with Dewberry based on historical City data to ensure consistency and confidence in providing water and sewer service to the Site.

Technical memos prepared by Dewberry, discussing the proposed water demand, sanitary sewer flows, the proposed lift station design, and the proposed improvements to the Louisville Wastewater Treatment Plant. These memos, *Dewberry Technical Memo 1 City of Louisville and Redtail Ridge Development Flows and Loads*, *Dewberry Technical Memo 1 City of Louisville and Redtail Ridge Development Projected Water Demand*, *Dewberry Technical Memo 2 - Wastewater Treatment Infrastructure*, and *Technical Memo 3 City of Louisville WWTP Wastewater Infrastructure Improvement Triggers* (hereinafter referred to as "WWTP Memos"). The WWTP Memos describing the flows and infrastructure enhancements to the Plant contain tables listing the criteria used for these elements of the proposed sanitary sewer system.

E. Project Timeline

Reference "*Table 5: PUD Totals*," on page 14, to view the development area associated with each PUD. Redtail Ridge will be built in two phases. Site utility construction will be performed with the first phase. Water lines, sanitary sewer, storm sewer and water quality facilities will be constructed to serve all the PUD areas. PUD areas 1-4 will be built with the first phase. Re remaining PUD's 5-8 will be built in a second phase. The final build-out will be evaluated, for sizing of the main public utilities in this report. A Utility Plan can be found in Appendix F, showing the location of the proposed utilities to be built. "*Table 5: PUD Totals*," shown on page 14, details the anticipated use and square footage to be built with each PUD. As site-specific development applications are submitted to the City, each development will need to provide a compliance letter showing conformance with this Final Master Utility Report.

2. PROPOSED SANITARY SEWER SYSTEM

A. On-Site Layout and Connection Options to City of Louisville Sanitary Sewer System

The proposed sanitary sewer system on-Site will connect to the off-Site improvements at the intersection of Rockcress Drive (formally known as Tape Drive) and Northwest Parkway, near the southeast corner of the Site. This serves as the low point for the entire Site where all sanitary sewer flows can eventually reach by gravity flow. From this intersection, there will be proposed sanitary sewer mains running north and west to provide service to the different development parcels within the Site.

The proposed sanitary sewer line within Campus Drive (hereinafter referred to as “Line A”) will begin on the north side of Rock Creek Tributary I within the eastern portion of the City Owned Parcel, from there it is routed south across the Rock Creek Tributary I and back into Campus Drive near the northeast corner of Parcel A. Line A will then run east to the intersection of Campus Drive and Sorrel Avenue, then south within Sorrel to Rockcress Drive. Line A runs east towards Northwest Parkway then turns south at the intersection of Rockcress Drive and Northwest Parkway and terminate at the proposed lift station in the southeast corner of the Site.

The proposed sanitary sewer line within Rockcress Drive, west of Sorrel Avenue (hereinafter referred to as “Line B”), will begin at the intersection of Rockcress Drive and Sorrel Avenue and run west within Rockcress Drive approximately 185 feet and will terminate with a manhole and provide a stub. Line B will be extended, as Line C approximately 3070-feet northwest within Rockcress Drive to serve developments south of Rockcress Drive.

B. Off-Site Layout and Connection Options to City of Louisville Sanitary Sewer System

The proposed sanitary sewer system off-Site will convey the Site’s sanitary sewer anticipated peak hour flow of 1.067 MGD, or approximately 741.4 GPM (1.652 cfs), from the lift station at the southwest corner of the intersection of Rockcress Drive and Northwest Parkway and route the flows north approximately 2.6-miles to connect to an existing 21-inch main (hereinafter referred to as “the Connection Point”). The Connection Point is located near the intersection of County Road and Rex Street, east of Louisville Community Park.

Referencing city provided utility maps, all sanitary manholes downstream from the Connection Point that could be located were surveyed and invert information was collected. Pipes with unconfirmed inverts were not used in this analysis. Based on collected invert information; a 21” PVC main within the Railroad ROW downstream of the connection point was found to have a minimum pipe slope of 0.216%. This pipe is the most restrictive downstream of the connection point. All other surveyed pipes have a steeper slope or a larger diameter. The proposed lift station is being designed for a

maximum capacity of 1.5 MGD. At full build-out, the pipe downstream of the Connection Point is adequately sized to convey the existing peak day flows and the proposed full build-out peak day flows from the Site to the Plant. A conceptual drawing and the Utility Plan can be found in Appendix F, for reference.

The sanitary sewer force main (hereinafter referred to as “Line F”) conveys flows from the Site to the Connection Point. The Utility Plan identifies a location for a lift station in the southeast corner of the Site. On-Site sanitary flows will gravity drain to this lift station location, the lift station will then pipe the sanitary flows through Line F to the Connection Point, then on to the Plant within existing sewer mains. The Sewer Plan indicates that the Plant will need to be upgraded to comply with current regulations on water quality and to accommodate future flows. This analysis and design information is included in the WWTP Memos prepared by Dewberry.

C. Flow Calculations

The high-range sanitary sewer average day flow calculated by Dewberry for the Site is estimated in the WWTP Memos to be 0.376 MGD for the complete build-out condition of the Site. Coordinated demands with Dewberry were used to estimate the average daily sanitary demand for each parcel’s planned use. A range of demands for low, medium, and high density were provided by Dewberry in the WWTP Memos. “*Table 1: Full Build-Out Sanitary Demand by PUD*,” shown on page 7 below, shows the coordinated sanitary flows. *The Table 1* uses the High range projected average flows for each PUD from the Dewberry WWTP Memos. For this analysis the “High” demand values were used by request of the City of Louisville to analyze sizing of the on-site gravity mains *Table 1* shown below on page 7, shows the high density demand flows for each parcel at full build out of development based on the densities in “*Table 5: PUD Totals*” on page 14.

The on-Site gravity sewer mains were then sized based on City Criteria. “*Table 1: Full Build-Out Sanitary demand by PUD*.” Outlines the demand by PUD at full build-out. The on-Site gravity mains were sized based on the final build-out peak day demand of each development PUD. Individual peaking factors were evaluated for each PUD to establish a peak flow. The average day demands were multiplied by their peaking factors. A peaking factor of 4.5 was used for PUD 6, this is a coordinated value with the applicant of PUD 6. Using the average flow for each PUD a Total peaking factor for the entire Redtail Site was calculated to be 2.83. Resulting in a peak flow of 1.652 cfs (1.067 MGD) for the full build-out of the Site. This peaking factor is close to the 2.49 peaking factor at the Connection Point. Peaking factors are typically larger when evaluating smaller areas as seen in Table 1 below. The factors for the individual PUD’s are larger than the peaking factor for the site overall. 9The lift station for the Site, according to the WWTP Memos will be designed to pump a peak hour capacity of 1.5 MGD. The proposed on-site gravity mains will utilize a mix of 8-inch PVC, 10-inch PVC, and 12-inch PVC (see Appendix F for proposed layout and pipe flow information). The force main will utilize (2) 8-inch PVC lines in parallel to be able to convey self-cleaning pipe velocities and to limit friction losses at full build-out.

Table 1: Full Build-Out Sanitary Demand by PUD

PUD	Use	Area	Annual Average Daily Demand (GPD)	Average Daily Demand (GPM)	Average Daily Demand (CFS)	Peak Factor	Peak Flow (GPM)	Peak Flow (CFS)
PUD - 1	Industrial	654,500 sq. ft	90,521	62.9	0.140	3.56	223.8	0.499
PUD - 2	Industrial	453,700 sq. ft	62,749	43.6	0.097	3.78	164.5	0.367
PUD - 3	Medical	300,000 sq. ft	41,492	28.8	0.064	4.03	116.2	0.259
PUD - 4	Medical	118,800 sq. ft	16,431	11.4	0.025	4.68	53.4	0.119
PUD - 5	Office/Retail	113,000 sq. ft	19,012	13.2	0.029	4.57	60.3	0.134
PUD - 6	Hospital	435,000 sq. ft	94,800	65.8	0.147	4.50	296.3	0.660
PUD - 7	Medical	165,000 sq. ft	22,820	15.8	0.035	4.44	70.4	0.157
PUD - 8	Office	360,000 sq. ft	28,800	20.0	0.045	4.28	85.5	0.191
SUM		2,600,000 sq. ft	376,626	261.5	0.583		1070.5	2.385
TOTAL			376,626	261.5	0.583	2.83	741.4	1.652

Note: GPM = Gallons Per Minute, CFS = Cubic Feet per Second, GPD = gallons per day

Flow data was collected over a 4-week period in November 2019 to evaluate the capacity of the Connection Point. Over the collection period the highest measured flow was 958.68 GPM or 2.134 cfs. The average flow was 383.89 GPM, with a standard deviation of 198.86 GPM. The Sewer Plan, Table 7-2, has a historical peak hour factor of 1.62 for the Annual Average Maximum Day Flows. Based on collected data, the peak hour factor at the Connection Point is 2.49. Giving a standard range of flows between 582.75 GPM and 185.03 GPM (average flow +/- the standard deviation). The Sewer Plan average influent flows in the winter months is approximately 80% of the average influent flows in the summer months. Utilizing this information, the summer average influent flow is then increased to approximately 479.86 GPM (1.069 cfs) with a peak flow of 1,194.85 GPM (2.662 cfs).

“Figure 1: Connection Point Flow Monitoring” below shows the 4-weeks of flow monitoring that was collected in GPM. The peak value seen during the collection period was 958.68 GPM (2.134 cfs), adjusted for summer months this increases to 1,194.85 GPM (2.662 cfs). This summer peak value, combined with the peak hour flows from the Site, 741.4 GPM (1.652 cfs), totals 1,936 GPM or 4.314 cfs. The Connection Point will have a flow depth of 0.96-feet and will be 56% full. It is important to note that the Site will have an average daily flow of 261.5GPM (from “Table 1: Full Build-Out High Sanitary Demand by PUD”) combined with the City’s average flow of 383.89 GPM from monitoring, totals an estimated total daily average flow of 645.39 GPM (1.437 cfs). This average flow at the minimum slope (0.216%) within the 21-inch main will have a flow depth of 0.53-ft (6.36-inches) and will on average be 26% full at full build-out. City maps show no additional connections to the 21-inch line downstream of the Connection Point, until where the main upsizes to a 24-inch pipe just west of the Plant. At this location west

of the Plant there is an 18-inch pipe connection behind Empire Storage approximately 670-feet west of the Plant.

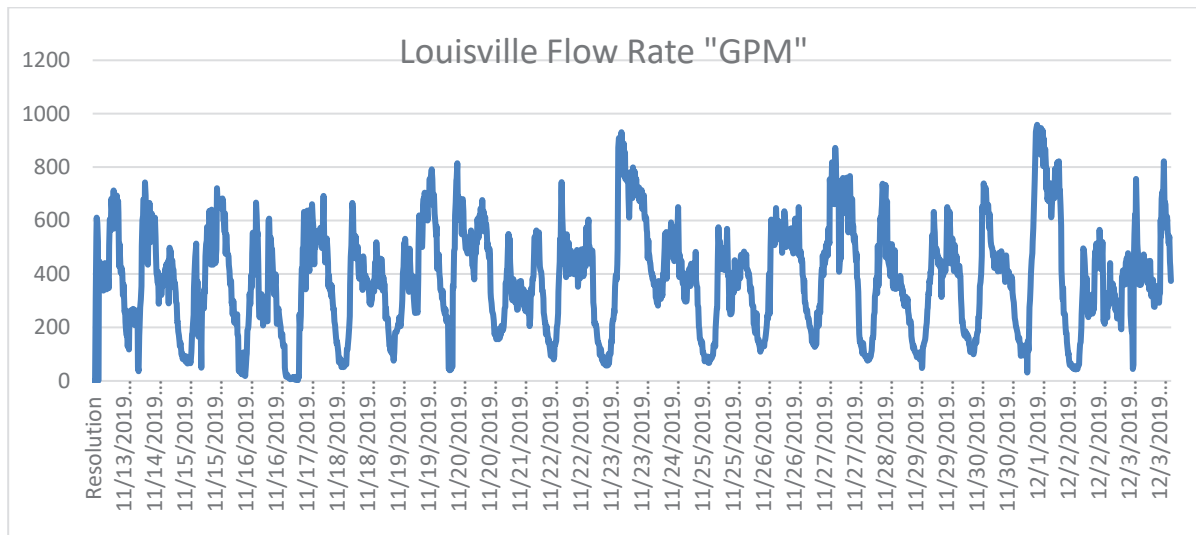


Figure 1: Connection Point Flow Monitoring

It is assumed that PUD areas 1 – 4, 6, 7 will all be collected by Sanitary Line A at some point within Sorrel Avenue. PUD area 8 will be served by Line C. Sanitary Line A between Sorrel Avenue and Northwest Parkway is assumed to convey the total peak sanitary flow from the Site to the Lift Station. Table 2 below outlines the possible peak flow combinations for PUD areas that could be served at private connection points to the Site sanitary sewer mains. Q full based is on full flow capacity of the constructed minimum slopes of Sanitary lines A-C in the Civil Construction Plans.

Table 2: PUD Sanitary Flow Combinations

PUD Area	Peak Flow (cfs)	Constructed Min. Slope (%)	Diameter (in)	Q Full (CFS)
PUD 2 & 3	0.626	0.4	8	0.994
PUD 2, 3 & 7	0.782	0.4	8	0.994
PUD 1 & 4	0.618	0.4	8	0.994
PUD 1 - 4, 6, 7	1.474	0.22	12	2.172
PUD 8	0.191	0.4	8	0.994
SITE TOTAL	1.652	0.22	12	2.172

PUD 2 & 3	0.626
PUD 2, 3 & 7	0.782
PUD 1 & 4	0.618

PUD 1-4, 6, 7	1.474
PUD 8	0.191
Site total	1.652

Sanitary Sewer line A utilizes the minimum allowable slope in 12" pipe sections at the south end of Sorrel Avenue. The total site flow projected at this point is 1.474 cfs. The pipe capacity is 2.172 cfs. Based on proposed constructed slopes. The sanitary sewer mains are sized to convey flows to the lift station. Future flow monitoring can be used for each PUD to show compliance with the peak flows projected from each PUD.

D. Available Downstream Capacity and Project Phasing

The WWTP Memos, in conjunction with the Sewer Plan, detail how much capacity the downstream sanitary sewer and Plant currently have available for new developments to add to the system. It is known that the Site sanitary sewer flows will cause a need to increase the capacity of the Plant through various enhancements, including accommodations to increase in sanitary loading on the Plant. The WWTP Memos submitted to the City of Louisville from Dewberry detail the design and analysis of the Plant enhancements to accommodate the additional flows.

The Site phasing was broken out below such that the listed development parcel per Phase has listed the sanitary sewer improvements to be constructed during said Phase.

Redtail Ridge Subdivision Phase 1 – PUD 1-4, 6, 7

- Sanitary Sewer Line A constructed in its entirety, see Section 2A on page 4 and Appendix F Utility Plan to reference Line A's alignment.
- Sanitary Sewer Line B construction in its entirety, see Section 2A on page 4 and Appendix F Utility Plan to reference Line A's alignment.
- Sanitary Sewer Line C construction in its entirety, see Section 2A on page 4 and Appendix F Utility Plan to reference Line A's alignment.

Redtail Ridge Subdivision Phase 2 – PUD 5 & 8

- Sanitary Sewer Line D constructed in its entirety, on an as needed basis, see Section 2A on page 4 and Appendix F Utility Plan to reference Line A's alignment.
- Sanitary Sewer Line E construction in its entirety, see Section 2A on page 4 and Appendix F Utility Plan to reference Line A's alignment.

Refer to the WWTP Memos for when the enhancements to the Plant will be required.

Complete Build-Out Condition

The complete build-out condition specified in this report represents the condition where each PUD is all built-out and contributing sanitary sewer flow to the Plant. In this report,

this condition is represented by an estimated high-range sanitary sewer average day flow rate of 0.376 MGD per the WWTP Memos.

3. PROPOSED WATER SYSTEM

A. On-Site Layout and Connection Options to City of Louisville Water System

There will be several proposed water main segments needed within the Site. The first will be connecting to the existing 12-inch PVC main in Campus Drive, near the southeast corner of the Monarch School Campus, to the main in S. 96th Street at its future intersection with Campus Drive via the proposed Campus Drive extension. See Section 3.B of this report on page 10 for further pressure information. A second 12-inch PVC main is proposed to connect to the existing 18-inch DIP main at the intersection of Campus Drive and S. 88th Street and will continue south within S. 88th Street to the proposed intersection of Rockcress Drive and S. 88th Street. This 12-inch PVC main will then head south and east within Rockcress Drive to just west of the intersection of Rockcress Drive and Northwest Parkway. At this intersection, this 12-inch PVC main will downsize to an 8-inch PVC main and run north, within private property in an easement to be dedicated to the City along the eastern property line of the Site eventually connecting to the existing 8-inch DIP main within S. 96th Street. A portion of the existing line in S. 96th Street shall be replaced with the development of the Site. A third proposed 12-inch PVC water line will connect the water main in Campus Drive to the water main in Rockcress Drive within Sorrel Avenue. Per the City's request a Pressure Reducing Valve (PRV) shall be installed at the intersection of Dillion Road and S. 96th Street. This will rezone the pipelines in Paradise Lane, S. 96th Street, and Dillion Road south and west of the PRV to be part of the Mid-Pressure Water Zone.

No additional looping is anticipated to be part of this development. Specific water main loops for each parcel within the development will be provided with the PUD processes for each development parcel. As such, a single connection point was provided for each parcel and to a water main for the purposes of this report. A Utility Plan showing the existing and proposed water mains has been provided in Appendix F, for reference.

B. Available Pressure and Capacity

The Site lies within the City's Mid-Pressure Water Zone (hereinafter referred to as MPWZ) and adjacent to the Low-Pressure Water Zone (hereinafter referred to as LPWZ). The MPWZ has pumps from the NWTP and floating storage at HBWTP. The MPWZ is pressurized with pumps and maintains a pressure of 70-80 pounds per square inch ("psi"). The PRV will be installed on the water main within S. 96th Street north at Dillion Road and serve as the new boundary of the MPWZ to the LPWZ. PRV's will allow water to move to the LPWZ when system demand lowers pressure in the low zone and will prevent backflow from the LPWZ to MPWZ. The PRV's are proposed to be set at 60 psi to ensure that the LPWZ does not become pressurized by the MPWZ. The contractor installing the PRV shall follow City of Louisville construction standards during installation.

Pressure information provided by the City indicates the following: a pressure range of 70-80 psi for the 18-inch PVC main within S. 88th Street in the pressurized MPWZ, and a pressure range of 60-70 psi for the 8-inch PVC main within S. 96th Street and within the LPWZ. A hydrant flow test was provided by the City of Louisville Fire Protection District that resulted in a static pressure of 85 psi. The location of the hydrant tested was within Campus Drive, at the southeast corner of the Monarch School Campus, and is connected to the MPWZ. For modeling of the water system, a static pressure of 85 psi was converted to an elevation head of 196-feet for a reservoir at the upstream end of the water main. The tested hydrant was at an approximate elevation of 5,430-feet, thus resulting in an elevation head of 5,626-feet. With the use of PRV's, it was assumed that water from the LPWZ will not flow "backwards" through the PRV's and into the MPWZ. As mentioned above, the PRV's have a pressure setting of 60 psi to limit flow from the MPWZ to the LPWZ. This model assumed that there is sufficient water supply to the LPWZ and this zone is not included within the analysis.

C. Average and Peak Water Demand Calculations

The Average Day Demand for each PUD was calculated based on the demand assumptions provided by Dewberry. The high-density demands were used per the city's request. The peak day demand as calculated from the Water Plan was used in the model for the Site as requested by the City multiplying the max monthly flow (MMF) by a peaking factor of 2.68. "Table 3: Assumed Water Demands" below contains the assumed water demands by use.

Table 3: Assumed Water Demands

Commercial or Residential Unit Assumptions	Low	Medium	High
Office Space ft ² /person	350	300	250
Industrial (Domestic), ft ² /person	2,000	1,500	1,000
Industrial Water Demand, gal/ft ²	0.04	0.08	0.12

The City has a high-zone storage capacity of 2.0 MGD and mid-zone storage capacity of 3.5 MGD. The NWTP has a firm minimum pumping capacity of 3.0 MGD and the HBWTP has a firm minimum pumping capacity of 3.5 MGD. The two combined results in a 6.5 MGD firm minimum pumping capacity for both plants. Both plants combined have a total maximum pumping capacity of 11.0 MGD assuming both plants are fully operational.

Average demand values from the Water Plan indicated an average day demand of 3.385 MGD and a peak day demand of 8.420 MGD for all uses within the City. Using the High Assumed Water Demands and the city requested peaking factor of 2.68, "Table 3: Water Demands by PUD" shows the Average Daily and Peak Daily Demand per PUD area at project build-out.

Table 4: Full Build-out Water Demands by PUD

	Use	Average Daily Demand (GPD)	Average Daily Demand (GPM)	Peak Day Demand (ADD*2.68) (GPD)	Peak Day Demand (ADD*2.68) (GPM)
PUD - 1	Industrial	108625	75.4	291116	202.2
PUD - 2	Industrial	75299	52.3	201802	140.1
PUD - 3	Medical	49790	34.6	133437	92.7
PUD - 4	Medical	19717	13.7	52841	36.7
PUD - 5	Office/Retail	22871	15.9	61294	42.6
PUD - 6	Hospital	111200	77.2	298016	207.0
PUD - 7	Medical	27385	19.0	73391	51.0
PUD - 8	Office	34560	24.0	92621	64.3
Total:		449447	312.1	1204517	836.5

Note: Max day demand is 1.204 MGD

Adding the 1.204 MGD Peak day demand (from “*Table 3: Full Build-out Water Demands by PUD*”) to the City’s 8.420 MGD peak day demand from the Water Plan would increase the City’s total peak day demand to 9.624 MGD at full build-out. These demand estimates are conservative and do not include irrigation for the proposed PUD areas.

The City of Louisville has provided water data from 2012-2019 for additional analysis. Each month was evaluated to find the highest and lowest demand of each month on any given day. Winter weather months (November – April) had a low average demand of 1.311 MGD and a high average demand of 2.309 MGD. At full build-out the winter months will increase the low range demand to 2.515 MGD and a high demand of 3.513 MGD. Hot weather months (June – October) had a low average demand of 2.966 MGD and a high average demand of 6.490 MGD. This increases the summer full build-out demand to 4.170 MGD and 7.694 MGD, respectively. The highest demand seen was in August 2015 with a demand of 8.735 MGD. This highest demand along with the full build-out peak demand of the project of 1.204 MGD (from “*Table 3: Full Build-out Water Demands*”

by PUD”) results in a total estimated demand of 9.939. Given that the City has a total treatment capacity of 13.0 MGD between both water plants, it is not anticipated that the development will have any negative impacts on any water treatment facilities. It should be noted that this demand exceeds the firm pumping capacity but is less than the combined total pumping capacity of the two City water plants. For additional technical information on water system upgrades refer to Technical Memo 2.

D. Fire Flow Water Demand

The model was evaluated to quantify the maximum fire flow that the public mains can provide within the City’s criteria at full build-out. It was determined the maximum fire flow that can be supported at full build-out is 2,000 GPM. The City’s fire department provided a letter that approves a 50% reduction when an approved sprinkler system is used for fire suppression. This letter can be seen in Appendix E, for reference. Fire flows greater than 2,000 GPM will have to be evaluated by PUD to determine impacts to the proposed water system. For the purposes of this model, a 2,000 GPM fire flow requirement was utilized for the fire demand of each PUD along with the peak day demands.

E. Irrigation Water Demand

The WWTP Memos delineate the anticipated irrigation demand for the development of the Site. Table 4 below outlines the irrigation demand. For water modeling purposes the peak day irrigation demand was used and divided between the PUD areas. Further information about irrigation demand can be viewed in *Dewberry Tech Memo 1 City of Louisville and Redtail Ridge Development Projected Water Demands*.

Table 4. Redtail Ridge Irrigation Demand

Average Irrigation, MGD	Max Month Irrigation, MGD	Peak Day Irrigation, MGD
0.51	0.76	1.08

F. Water Modeling

In the analysis of the water system, this report models the full build-out Peak day + irrigation demands and Peak day + irrigation + fire flow demands. The Peak day demands using the requested peaking factor of 2.68 was analyzed in the model. The water pressures for the full build-out Peak day + irrigation demands were between 65 psi and 111 psi. The water pressures for the full build-out Peak day + irrigation + Fire Flow demands were between 65 psi and 109 psi with pipe velocities under 9.20 ft/s. Additionally the worst-case Peak day + fire flow demand model was determined to indicate a maximum allowable fire flow for the water system. This worst-case scenario estimates a maximum allowable fire flow of 2,000 GPM fire flow per City Criteria while also keeping pressures within City thresholds and pipe velocities under 10 ft/s. These

velocities are less than the City Criteria limit of 15 ft/s specified in Section 302 Main Size. Node pressures, node demands, and pipe velocities can be found in Appendix E, for reference.

Irrigation flows are included in the design scenarios because fire emergencies can happen at any time. Peak hour flows were not evaluated in the model because the peak day plus fire flow scenarios have a higher demand than a domestic peak hour scenario.

G. Project Phasing

The Site phasing was broken out below such that the listed development parcel per phase has listed the water system improvements to be constructed during said phase.

Redtail Ridge Subdivision Phase 1 – PUD 1-4, 6, 7

- The water main will connect to the existing water main near Disk Drive and S. 96th Street and continue south within an easement dedicated to the City to the intersection of Rockcress Avenue and Northwest Parkway. From this intersection it will turn west and run within Rockcress Drive to the intersection of Rockcress Drive and Sorrel Avenue, see Section 3A on page 9 and Appendix F Utility Plan to reference this alignment.
- The water main will be constructed from the round-a-bout of Rockcress Drive and Sorrel Avenue north within Sorrel Avenue to the round-a-bout at Sorrel Avenue and Campus Drive. See Section 3A on page 9 and Appendix F Utility Plan to reference this alignment.
- From the round-a-bout at Sorrel Avenue and Campus Drive, the water main will split to the west and east. To the west, it will continue within Campus Drive to where it connects to the existing water near the southeast corner of the Monarch School Campus. To the east, from the round-a-bout, the main will continue within Campus Drive to the intersection of Campus Drive and S. 96th Avenue where it will connect to the existing water main in S. 96th Street. See Section 3A on page 9 and Appendix F Utility Plan to reference this alignment.

Redtail Ridge Subdivision Phase 2 – PUD 5 & 8

- The water main will be constructed from the round-a-bout of Rockcress Drive and Sorrel Avenue northwest within Rockcress Drive to the intersection of Rockcress Drive and S. 88th Street. See Section 3A on page 9 and Appendix F Utility Plan to reference this alignment.
- The water main will continue within S. 88th Street north to connect to an existing main near Campus Drive and S. 88th Street. See Section 3A on page 9 and Appendix F Utility Plan to reference this alignment.

Complete Build-out Condition

The complete build-out condition specified in this report represents the condition where each PUD is complete and contributing demands to the water system. This report references PUD areas and their associated square footage that will be occupied by each

planning area. “Table 5: PUD Totals” below details the square footage used to determine demands for the water system.

Table 5: PUD Totals

PUD Area	Square Footage	Use
PUD - 1	654,500	Industrial
PUD - 2	453,700	Industrial
PUD - 3	300,000	Medical
PUD - 4	118,800	Medical
PUD - 5	113,000	Office/Retail
PUD - 6	435,000	Hospital
PUD - 7	165,000	Medical
PUD - 8	360,000	Office
Total:	2,600,000	

4. CONCLUSIONS

A. Analysis Summary

The proposed sanitary sewer for the Site will be designed to have capacity for the estimated 1.067 MGD peak day flow expected with the full build-out condition of the Site based on coordinated sanitary loads with Dewberry. This flow will be conveyed from the Site to the Plant through an off-Site force main (Line F) and from the lift station in the southeast corner of the Site. Line F will have the capacity needed to accommodate flows from the Site’s development. At the Connection Point Line F will connect to existing sanitary sewer infrastructure and convey both existing and proposed flows to the Plant for treatment. Per the WWTP Memos, the Plant will undergo enhancements to accommodate the increase in flow and to comply with current regulatory water quality requirements.

Based on provided flow monitoring an existing winter peak flow of 2.134 cfs was observed at the Connection Point in November 2019. A summer peak flow was estimated to be 2.662 cfs based on the collected flow data and the City’s historical data. The full build-out peak flow for the Site will be 1.652 cfs. This totals a summer peak flow of 4.314 cfs at the Connection Point, which results in a flow depth of 0.96-ft (11.52-inches) and

equates to approximately 56% full in a 21-in main at the calculated minimum slope of 0.216% and Manning's value of $n=0.013$. At the time this report was written, and with the data on the existing flows at the Connection Point, the Connection Point has enough capacity for existing peak flows and the anticipated peak flows at full build-out of the Site.

The on-Site gravity sanitary sewer mains are designed in accordance with City Criteria and will have capacity to convey the sanitary flows from the development parcels to the on-Site lift station.

The analyzed water scenarios had pressure values between 65 psi and 111 psi with pipe velocities under 9.20 ft/s. Additionally the worst-case peak day + fire flow demand was determined to indicate a maximum allowable fire flow for the water system. This worst-case scenario estimates a maximum allowable fire flow of 2,000 GPM fire flow per City Criteria while also keeping pressures within City thresholds and pipe velocities under 10 ft/s.

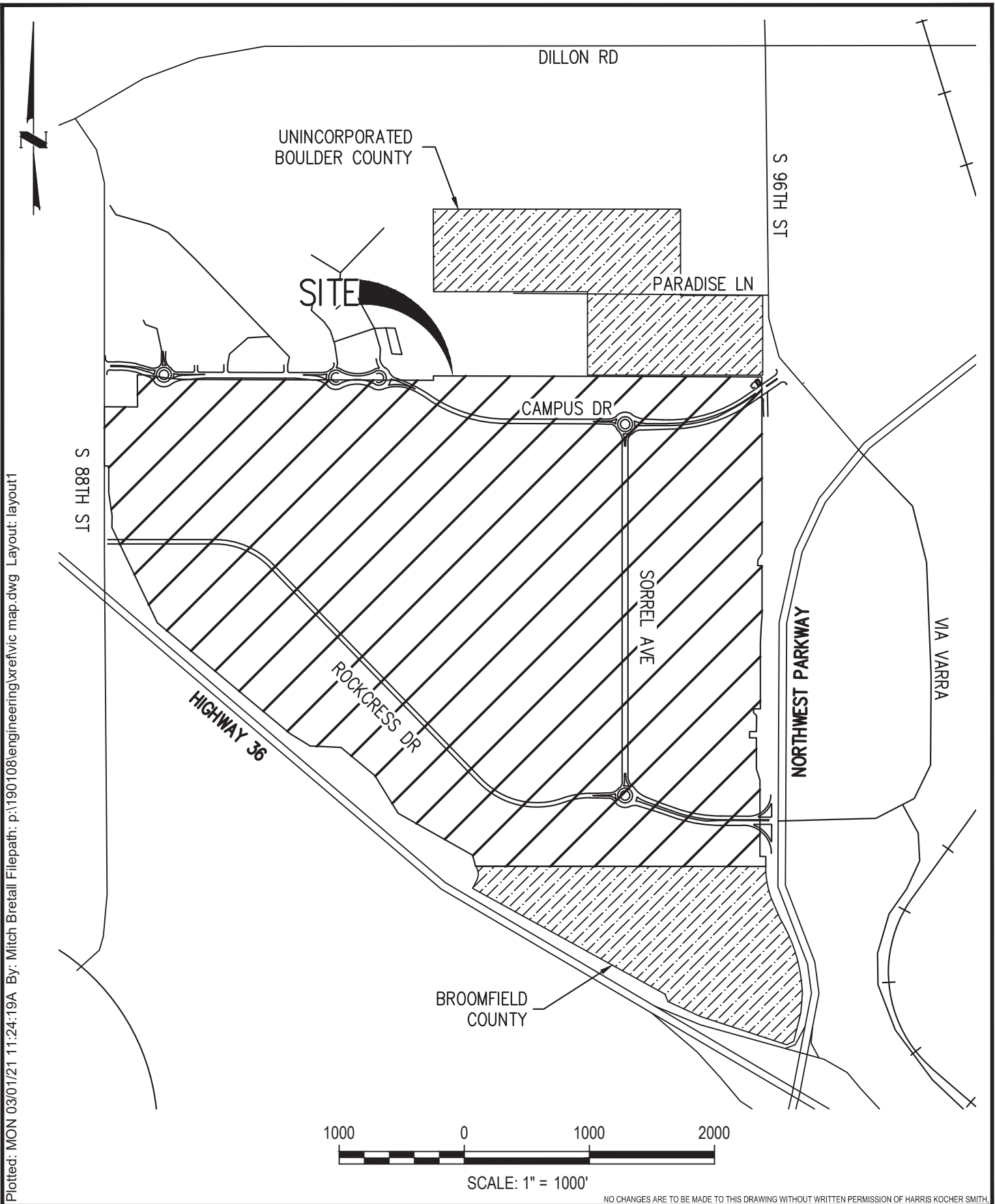
At full build-out the proposed water mains are sufficient to supply peak hour demand as well as fire flow scenarios for the Site. As previously stated, the City has a current treatment capacity of 13.0 MGD, a total pump capacity of 11.0 MGD, a firm pumping capacity of 6.5 MGD, and a storage capacity of 8.5 MGD. The Site has an estimated full build-out peak day demand of 1.204 MGD, resulting in a City peak day demand of 9.624 MGD, which is still within the City's treatment capacity of 13.0 MGD. The City also had 5.5 MGD of storage between the HPWZ and MPWZ.

5. LIST OF REFERENCES

1. City of Louisville Comprehensive Plan, City of Louisville, May 2013
2. City of Louisville and Redtail Ridge Development Flows, Dewberry, February 2020
3. City of Louisville Department of Public Works Engineering Division Design and Construction Standards, City of Louisville, March 2015
4. *Wastewater Facility Plan*, City of Louisville, April 2013
5. Water System Facilities Plan, Final Report, City of Louisville, July 2012
6. Technical Memorandum 1: City of Louisville and Redtail Ridge Development Projected Water Demands, November 2022
7. Technical Memorandum 1: City of Louisville and Redtail Ridge Development Flows and Loads, October 2022
8. Technical Memorandum 2: Wastewater Treatment Infrastructure, January 2021
9. Technical Memorandum 3 City of Louisville WWTP Wastewater infrastructure Improvement Triggers, June 2022

APPENDIX A – Vicinity Map

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ISSUE DATE: 06-06-2019		PROJECT #: 190108	
DATE		REVISION COMMENTS	

BRUE BAUKOL PARTNERS

REDTAIL RIDGE
VICINITY MAP

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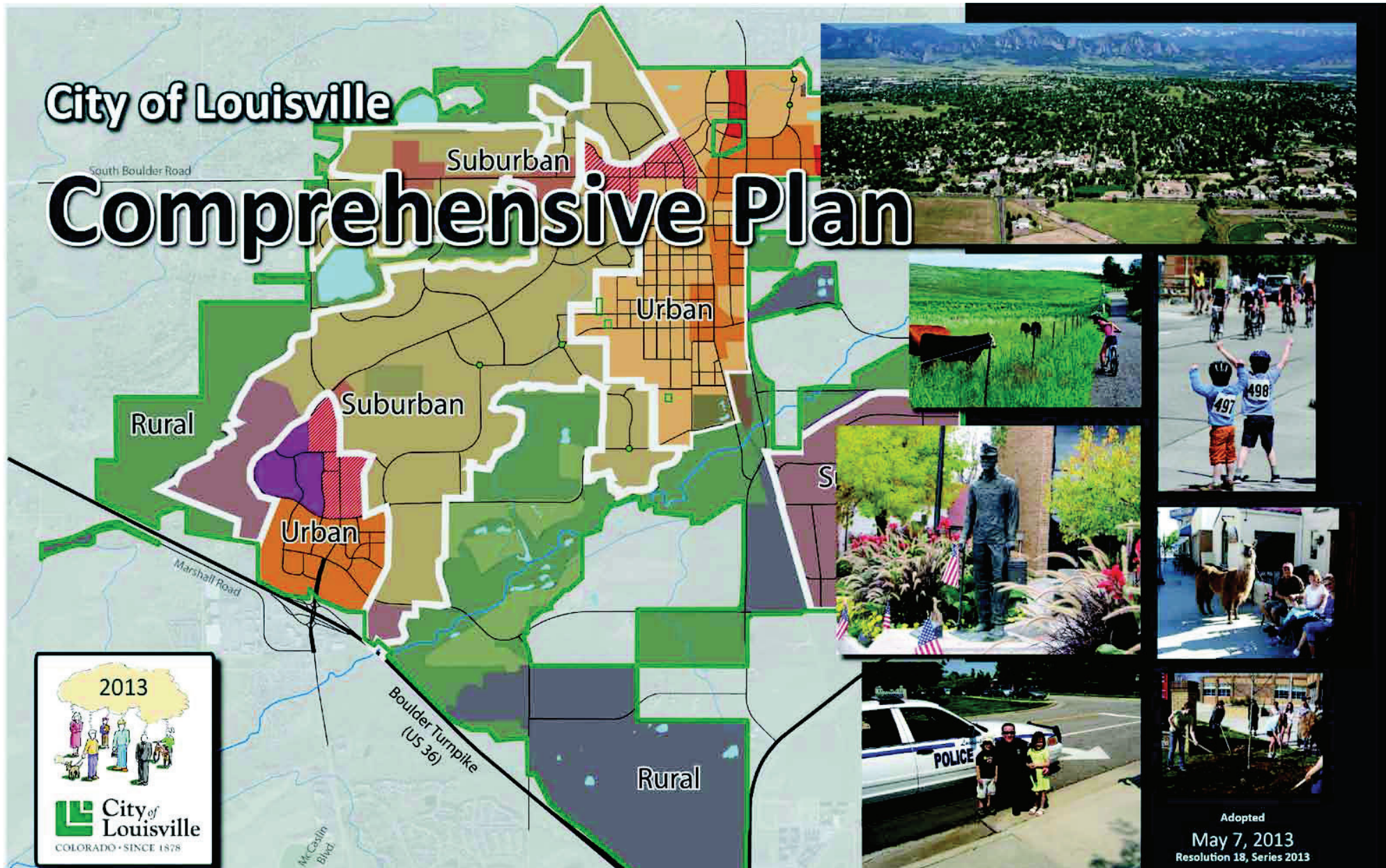
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DRAWN BY: SJA
SHEET NO.
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1 OF 1

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

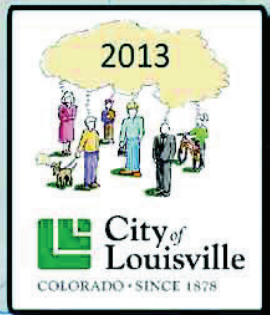
APPENDIX B – Reference Material

City of Louisville

Comprehensive Plan



Adopted
May 7, 2013
Resolution 18, Series 2013



The Planning Context

Block Pattern

The City's street network, or block pattern, is the skeleton of the community. The block pattern dictates the development flexibility and ultimately the physical character of the community. The block pattern establishes the street network and street hierarchy of the community, which in turn dictate the mass, scale, and orientation of buildings. Together, the streets and buildings determine the City's walkability.

As existing streets are improved and new streets are proposed in the Comprehensive Plan, it is important to understand the block pattern that is envisioned will establish the character of development and redevelopment for years to come.

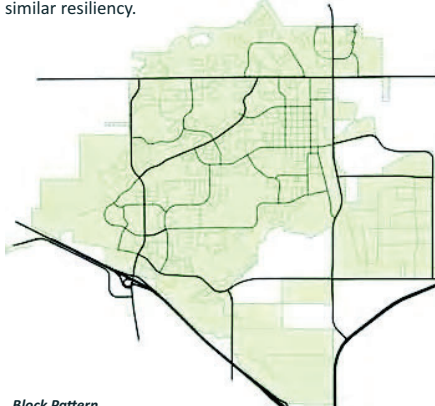
The City's existing block pattern creates three distinctive character zones within Louisville: *urban*, *suburban*, and *rural*. Downtown and Old Town (built before 1960) and the newer subdivisions of North End and Steel Ranch (built since 2008) have established interconnected streets with smaller block patterns and supporting alleys. The block structure in the northeastern portion of the City dictates smaller property parcels, interconnected smaller streets and a more walkable urban character.

Contrasting Downtown and Old Town are the suburban (less walkable) areas of the City along South Boulder Road and McCaslin Boulevard and everything built between 1961 and 2007. The character of these suburban and rural areas of town is influenced by their limited street networks and larger arterials, creating single purpose suburban retailing and employment environments.

A problem with suburban block patterns is that after 10 to 15 years, the retail centers built upon them are outperformed by newer competition. Significant public investment is then needed to reshape the blocks to accommodate a variety of retailing formats and land development patterns, allowing the retail centers to successfully compete again.

Block patterns and infrastructure inform an area's building inventory, development patterns, and land use types. It is important for the Comprehensive Plan to

enable the development of more urban block patterns, building stock and community supported land uses. Urban block patterns, like that in Old Town and Downtown Louisville, have high resiliency and flexibility in accommodating development and redevelopment over time. Typical suburban block patterns have not demonstrated similar resiliency.



Block Pattern

Municipal Utilities and Infrastructure

Municipal utilities and infrastructure (water, sewer, and storm water) are critical in defining the economic vitality and physical character of the City. Their capacity defines the growth potential of the City. Their placement and design contribute to the physical character of the City.

Louisville's water supply originates from two primary sources: South Boulder Creek and the Northern Colorado Water Conservancy District consisting of the Colorado Big Thompson and Windy Gap projects.

The City is treating 4,000 acre-feet (AF) of water a year, with peak demands approaching 9.0 million gallons per day (mgd). Raw water from the City's established sources is treated and distributed to individual businesses and residences from the City's two water treatment facilities: the Howard Berry Plant and the North Plant. Currently, both plants operate at or under capacity.



Raw Water Sources

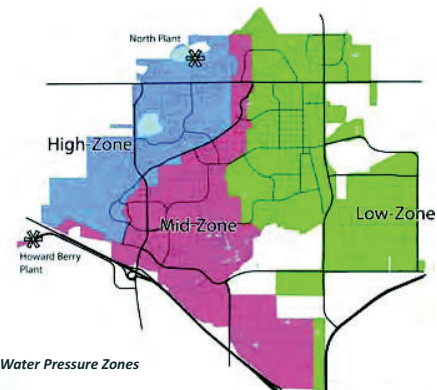
The two water treatment plants have a combined treatment capacity of 13 mgd. Together, the two facilities serve three pressure zones within the City. A water system capacity analysis examined both demand and location of the projected build-out of the City as well as the 20 year market forecast.

The existing water supply and treatment capacity are sufficient to accommodate the expected 20-year development absorption assumptions of the Framework.

However, it is important to note, the Howard Berry Plant may require additional capacity to serve the projected build-out of the mid and lower water pressure zones of the City. The primary driver of future water demand will be the office and industrial uses expected in the Centennial Valley, the Phillips 66 property, and the Colorado Technology Center (CTC).

The Wastewater Treatment Plant provides sanitary sewage treatment for the City of Louisville. There is a surplus of sanitary treatment capacity currently on-line to serve the projected demand of the City as reflected in the Framework.

The Sanitary Treatment Plant is currently operating at a daily average of 2 million gallons per day (mgd) or 59% of its capacity. Historically, the plant has seen flows as high as 2.8 mgd. Additional treatment capacity was added in 1999 giving the plant a maximum permitted capacity of 3.4 mgd.



Water Pressure Zones

The Wastewater Treatment Plant has reached the end of its useful life based upon the age of the facility and upcoming regulatory water quality requirements.

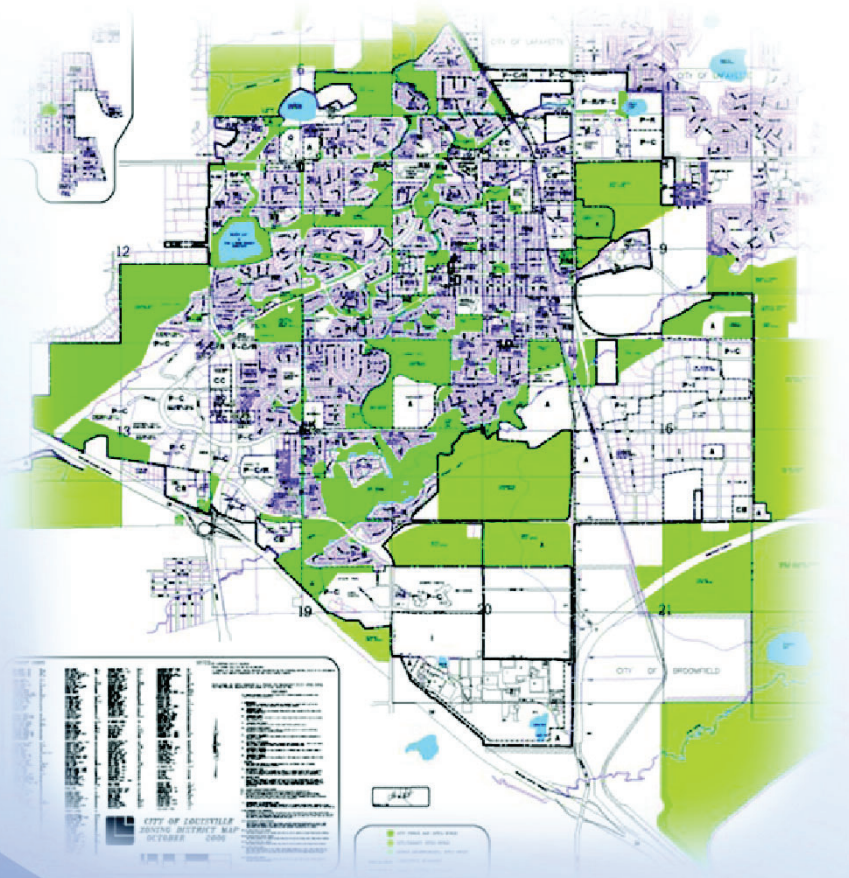
Construction is currently being planned for the Wastewater Treatment Plant to meet regulatory and growth requirements. Improvements to transmission mains and lift stations will be needed with build out of the Colorado Technology Center and the Phillips 66 property.

There are also limitations in the sanitary sewer pipes located in the Downtown and Old Town areas. The pipes in this area are the original vitrified clay pipes, constructed in the mid 1900s. As the pipes have aged, they have begun to break down. The City annually replaces portions of these pipes with PVC pipes to maintain the integrity of the collection system.



Waste Water Treatment Plant Improvement Timelines





City of Louisville

Water System Facilities Plan Final Report

July 2012



Hatch Mott
MacDonald
www.hatchmott.com

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Background

The City of Louisville initiated the Water System Facilities Plan project to provide the City with a detailed Capital Management Plan for the City's water system. The Water System Facilities Plan addresses the raw water delivery system, water treatment facilities, pump stations and water storage tanks. The Capital Management Plan provides a roadmap for planning upgrades, maintenance projects, and expansions for the system.

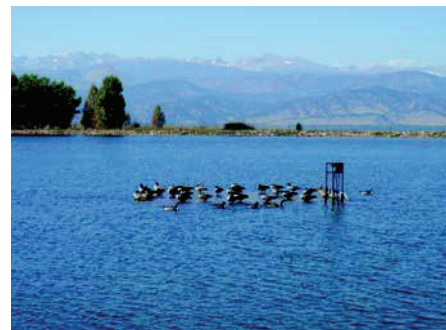
The identified planning period for the project is buildout of the water system, which is expected to occur around 2035. The Water System Facilities Plan is also focused on larger capital projects in lieu of smaller maintenance and repair projects that are addressed in other City planning documents.

Project Development

The Water System Facilities Plan identifies major capital improvement projects based on the evaluation of six key elements:

- An evaluation of water demands and future water use trends
- An evaluation of the treatment plant capacities
- A review of current and future regulations
- A review of water system operability
- An evaluation of water system security
- An evaluation of water system redundancy

In addition to the evaluations, a public outreach program was performed to receive input from the public on their level of satisfaction with the water system, as well as to identify customer expectations for level of service. Major elements of the public outreach program included public announcements, a mailed survey and a public meeting.



Louisville Reservoir

Water System Facilities Plan Results

A total of 26 projects were identified as a result of the above mentioned evaluations. The projects range from relatively minor rehabilitation projects with capital costs of less than \$100,000, to major expansions of water treatment facilities with capital costs of several million dollars. It is anticipated that additional projects will be added to the Capital Management Plan over time as additional system needs are identified.

The following documents were produced as part of the Water System Facilities Plan:

- The Water System Facilities Plan report
- A Capital Management Plan developed in an electronic spreadsheet format
- A Survey Summary Report that was produced as part of a Public Outreach Program
- Supporting spreadsheet documents including water treatment facility capacity evaluations and water demand projections

CHAPTER 1

Project Introduction

1.0 PROJECT INTRODUCTION

This chapter provides a discussion of the project background and goals, as well as the organization of the final project documents.

1.1 PROJECT BACKGROUND

A key to successful management and growth of a water system is careful and thoughtful planning. Identifying critical infrastructure needs and developing adequate budgeting for improvements within a cost effective framework is critical to the success of a water utility.

The City of Louisville initiated this Water System Facilities Plan project to provide the City with a detailed Capital Management Plan for the City's raw water supply system, water treatment facilities, pumping stations and water storage tanks. The Capital Management Plan will provide a roadmap for planning upgrades, maintenance projects, and expansions that will meet the needs and expectations of both the City's residents and staff.

This Water System Facilities Plan and the associated Capital Management Plan cumulates work and knowledge that comes from evaluations of key planning components and provides the City with a road map for future improvements. The Water System Facilities Plan incorporates evaluation and review of six key components that impact the water system planning, including:

- An evaluation of water demands
- An evaluation of the treatment plant capacities
- A review of current and future regulations
- A review of water system operability
- An evaluation of water system security
- An evaluation of water system redundancy

These various components of water system planning, and general concepts on how they impact the Water System Facilities Plan, are represented in Diagram 1-1. The evaluation of these six projects components, both individually and in combination, leads to the identification of specific projects which are recommended for the water system. These evaluations are discussed in this report. A public outreach program was also completed as part of the project to receive input from the citizens regarding the six identified components and as they pertain to expectations for the level of service.

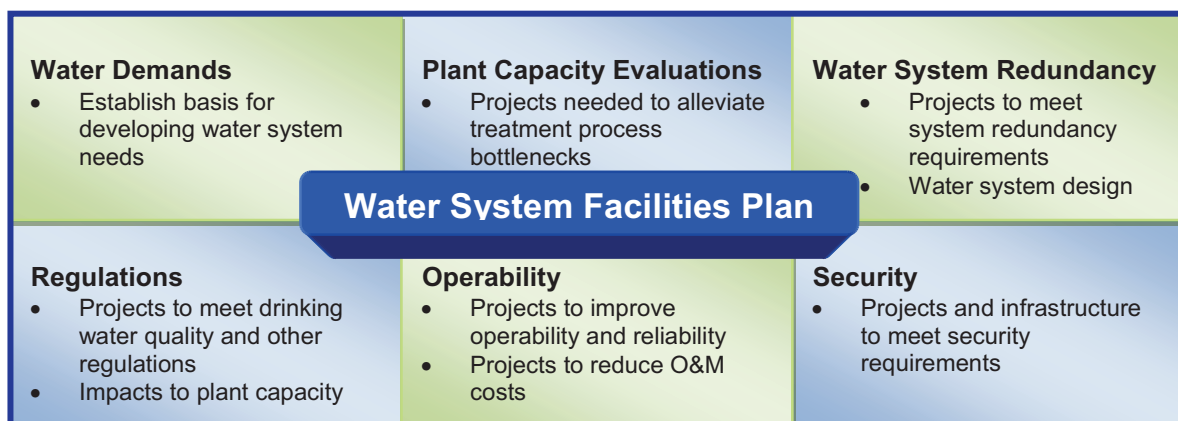


Diagram 1-1: Key Planning Components for the Water System Facilities Plan

Since this document contains information that may be considered sensitive, such as descriptions of the water system, discussions on systems redundancy and vulnerabilities, and facility security, this document should be handled carefully.

1.2 PROJECT SCOPE AND OBJECTIVES

The Water System Facilities Plan focuses on the raw water supply system, water treatment facilities, pumping stations and water storage tanks. Buried small diameter water distribution pipes and other “buried infrastructure” will be addressed in other planning documents.

In addition, the City maintains an updated and thorough maintenance program for all of their facilities, which includes replacement and rehab for most of the standard equipment inside of the facilities such as valves, pumps, compressors and chemical metering pumps. This type of equipment typically has predictable schedules for repair or replacement based on life expectancy, and is not impacted by the six evaluation components identified for the Water System Facilities Plan. This project is therefore focused on identifying either one time or otherwise unique projects that would not be captured in other City planning documents.

Two objectives for the project that were identified through workshops with City staff include:

Develop a Comprehensive and Well Developed List of Capital Improvements Projects. Developing a comprehensive list of capital improvements projects provides the foundation for developing the Capital Management Plan. Essential to this effort is establishing the scope of the identified projects, identifying the correct triggers for these projects, and developing reliable cost information for completing these projects.

Ability for the Planning Documents to Remain Relevant. One problem often encountered with planning documents is that they often become quickly dated, and end up collecting dust on a shelf. The reason for this is that all planning projects contain a number of assumptions and planning conditions that will inevitably change over time. In order to prevent this often encountered problem is to develop the planning tools so that they include decision trees and other items that allow modifications to be made with minimal work, thereby allowing changing conditions to be taken into account and the report recommendations to be updated.

1.3 PROJECT DOCUMENT ORGANIZATION

The Water System Facilities Plan consists of two primary documents, and several supporting documents, shown in Diagram 1-2. The two primary documents consist of:

- This Water System Facilities Report, which includes a description of the Capital Management Plan, and the overall work and evaluations that went into completing the project.
- The Capital Management Plan prepared in an electronic spreadsheet format.

Supporting documentation that was prepared as part of this Water System Facilities Plan includes the following:

- An electronic spreadsheet based Capacity Evaluation for each of the two water treatment facilities.
- A Summary Report prepared to summarize the Public Outreach Program, in particular the public survey.
- Individual Project Sheets describing each project.

A summary of the public outreach effort that was initiated in conjunction with this project is further discussed in Chapter 10.

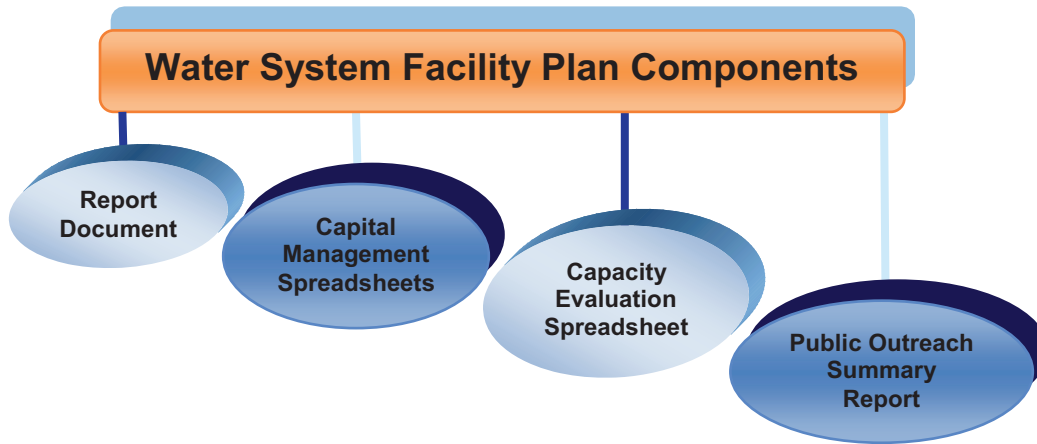


Diagram 1-2: Facilities Plan Documents

1.4 INFORMATION USED IN DEVELOPING THE WATER SYSTEM FACILITIES PLAN

A list of background documents that were reviewed and used in preparing this plan is included in Appendix A. Copies of reference articles are also included in the Appendix.

CHAPTER 2

Description of Water System

2.0 DESCRIPTION OF WATER SYSTEM

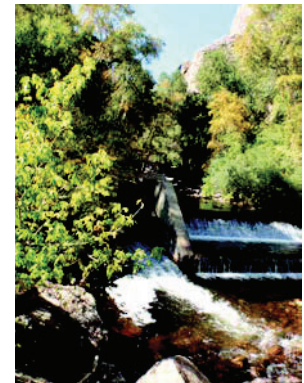
The following chapter provides a general description of the City of Louisville water system, including the raw water delivery system, water treatment facilities, distribution system and water storage tanks.

2.1 GENERAL DESCRIPTION

The City of Louisville receives raw water from South Boulder Creek near Eldorado Springs, Colorado Big Thompson and Windy Gap resources, and owns shares in the Farmers Reservoir and Irrigation Company (FRICO). A series of facilities and structures, including Louisville Reservoir, Marshall Lake and Harper Lake, are used to transmit and store these water sources. The City's raw water supply sources are partially inter-connected. The raw water is treated at two separate conventional dual-media water treatment plants that have a combined gross treatment capacity of 13 million gallons per day (mgd). The North Water Treatment Plant (NWTP) was constructed during the early 1980s, while the Howard Berry Water Treatment Facility (HBWTF) was constructed in 1993. Water is then delivered to the water distribution system, and stored in 8.5 million gallons (MG) of system storage. The water distribution system has three pressure zones; two feed by gravity and one is delivered by pump stations at either water treatment plant.

2.2 RAW WATER DELIVERY SYSTEM

The City of Louisville's raw water supply system consists of facilities that divert, convey, and store raw water supplies for delivery to the NWTP and the HBWTF. Historically, the community's water system was solely from the Louisville Reservoir, which was constructed in the late 1890's. Due to a drought in the 1950's, the Louisville Pipeline was constructed. Additional water rights have been acquired from South Boulder Creek due to growth. In the 1970s, as the community grew, additional efforts were taken to obtain and store water in Marshall Lake, a major reservoir in the Louisville area. Harper Lake Reservoir was constructed in 1985 to supplement the NWTP. The City is an allottee of the Northern Colorado Water Conservancy District and Municipal Sub District which provides the Colorado Big Thompson and Windy Gap water resources. Other resources include rights and storage on Coal Creek.

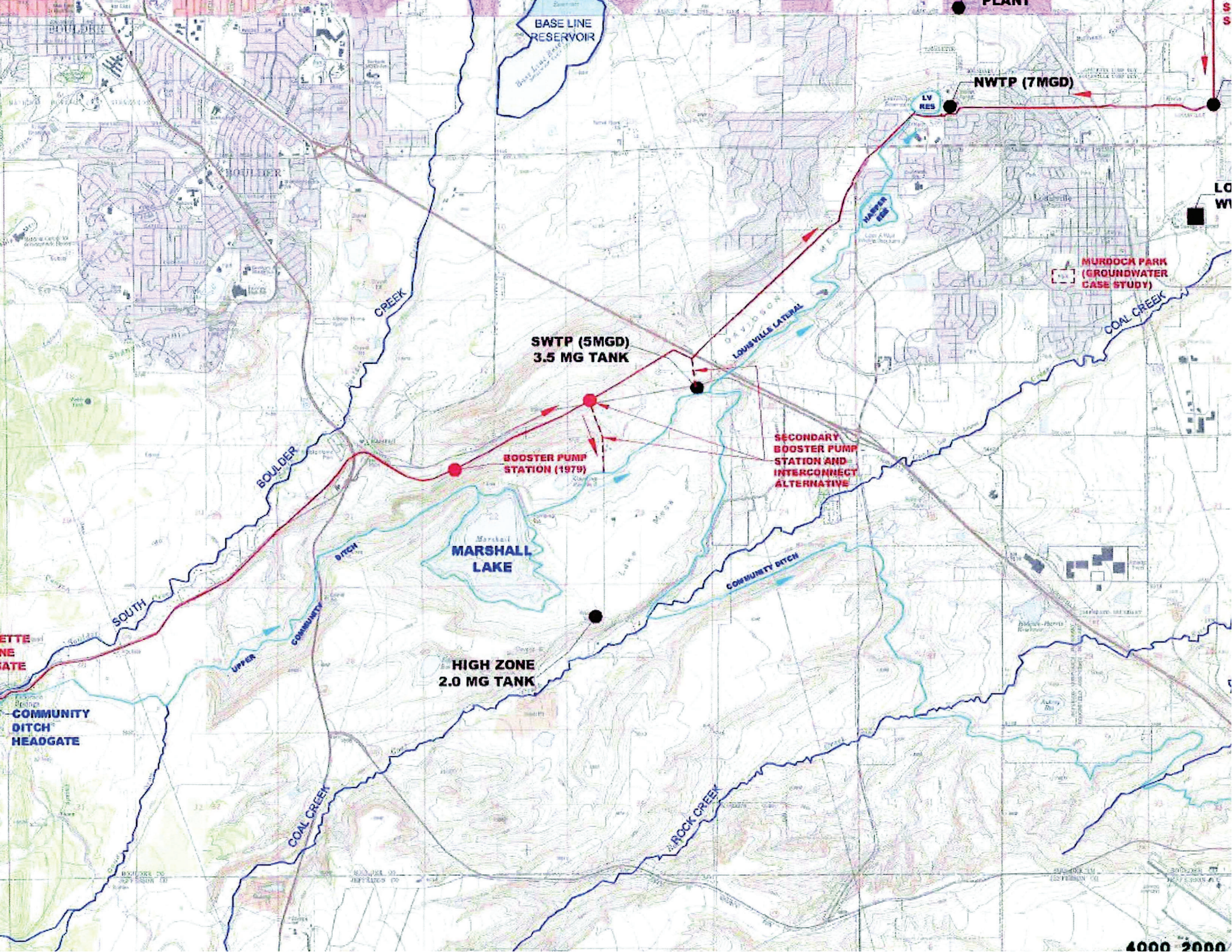


*Water Diversion Structure
in Eldorado Canyon*

This raw water system includes 715 acre-feet in Harper Lake and 210 acre-feet in Louisville Reservoir. The City owns a portion of shares in FRICO's Marshall Lake division. The Southern Water Supply Pipeline carries CO-BT&WG water from Carter Lake to the Louisville Reservoir. The Louisville Pipeline transfers water from Eldorado Springs and it flows by gravity to the HBWTF, or to Harper Lake or Louisville Reservoir.

Water from Louisville Reservoir and Harper Lake are solely fed to the NWTP, while water stored in Marshall Lake feeds the HBWTF. Marshall Lake reserves can also flow through the Louisville Lateral to Harper Lake and Louisville Reservoir.

Key components of the water system are shown in the following map from the City's 2003 Raw Water Master Plan Update.



BASE LINE
RESERVOIR

NWTP (7MGD)

LV
RES

MURDOCK PARK
(GROUNDWATER
CASE STUDY)

SWTP (5MGD)
3.5 MG TANK

BOOSTER PUMP
STATION (1979)

SECONDARY
BOOSTER PUMP
STATION AND
INTERCONNECT
ALTERNATIVE

MARSHALL
LAKE

HIGH ZONE
2.0 MG TANK

ETTE
NE
GATE

COMMUNITY
DITCH
HEADGATE

2.3 WATER TREATMENT PLANTS

The current NWTP treatment train was constructed in several phases during the early 1980s, while the HBWTF was constructed in 1993. The plants were constructed as conventional dual-media filtration plants, to treat surface water sources. The WTPs were planned and constructed during a time period when there were significantly less stringent requirements for finished water turbidity, regardless, both plants are able to achieve current turbidity standards. Both plants were designed by the same engineering firm and within relatively close time frames, thus the designs of the facilities (technology and equipment selections, general process sizing) are very similar.

The NWTP and HBWTF are conventional water treatment facilities utilizing the following treatment processes: pre-oxidation with chlorine dioxide, coagulation and flocculation, sedimentation, and filtration followed by chlorine disinfection, fluoride treatment, pH adjustment and corrosion control. The major treatment processes are discussed in further detail below.

Coagulation and Flocculation. Most colloidal material in water (suspended solids that are small enough to pass through a conventional dual-media filter) have a negative surface electrochemical charge. Most pathogenic materials in water demonstrate similar negative surface charges. These materials are removed from water by adding a coagulant such as alum that acts to destabilize the negative surface charge of the particle thereby causing the colloidal material to become charge neutral. This allows the colloidal and pathogenic materials to agglomerate into larger particles. The water containing the charge neutral particles is then passed through a flocculation process which consists of multiple stages of gentle stirring causing these particles to collide and form larger solids. These solids become large enough to either be settled or filtered out of the water. The primary coagulant chemicals currently used by Louisville are alum and polymer.

Sedimentation. Sedimentation (settling) is used to remove flocs by gravity and removing a large percentage of the solids loading from the water, thereby extending the filter run time. Both water treatment plants use tube settlers to enhance the natural settling process.

Filtration. Filtration provides a positive barrier for pathogenic organisms and other suspended solids remaining in the water. Flocculated particles that do not settle out in the sedimentation process are strained out of the water in the filter. The City's filters have a media depth of approximately 28 inches (not including the underlying support layers).



Filtration provides a positive barrier for pathogenic organisms

Disinfection and Chemical Treatment. Following filtration water flows into the clearwell, or chlorine contact tank. The clearwell volume provides contact time for disinfection of the water. Gaseous chlorine is fed to disinfect the water and maintain a residual chlorine concentration in the distribution system in order to provide protection from pathogenic organisms. Fluoride is added in small amounts to assist in preventing tooth decay, the pH is adjusted for stability, and silicate is added for corrosion control in order to protect pipelines to protect the pipelines and prevent elevated concentrations of metals that can occur with corrosive water.

The NWTP has two flocculation and sedimentation trains, and four filters, with a gross production capacity of 8.0 mgd. The HBWTF has one flocculation and sedimentation train, and two filters, with a gross production capacity of 5.0 mgd.

2.4 DISTRIBUTION SYSTEM

There are three pressure zones throughout the City of Louisville as shown in Figure 2-1; the Low Zone, Mid Zone and High Zone. Water from the NWTP flows into the Low Zone by gravity, and can be pumped to the High Zone from the High Zone Pump Station located at the plant. Water from the HBWTF flows to the Mid Zone by gravity, and can also be pumped to the High Zone by a High Zone Pump Station located at that facility. Water can download from the High Zone to the Mid Zone, or from the Mid Zone to the Low Zone, through interconnecting PRVs in emergencies, or from zone valves operated by City staff. Flow of water into the various pressure zones is summarized in Table 2-1.

Table 2-1: Current Pressure Zone Configuration

Zone	NWTP	HBWTF
Low Zone	Gravity Fed	Gravity fed to Mid Zone and download to Low Zone
Mid Zone	Pumped to High Zone and download to Mid Zone	Gravity fed
High Zone	Pumped	Pumped

The City prefers to pump water from the HBWTF to the High Zone to reduce electrical demands by taking advantage of lower pumping heads. However, during times of the year the City may only operate one plant, and pumping to the High Zone and downloading to lower zones may be used as a water delivery strategy.

Total and firm pumping capacity from each plant to the High Zone is summarized in Table 2-2. Pumping capacity from the NWTP is limited by high velocities in the transmission line and distribution system. The firm pumping capacity of the HBWTF is based on the largest pump being out of service.

Table 2-2: High Zone Firm Pumping Capacity

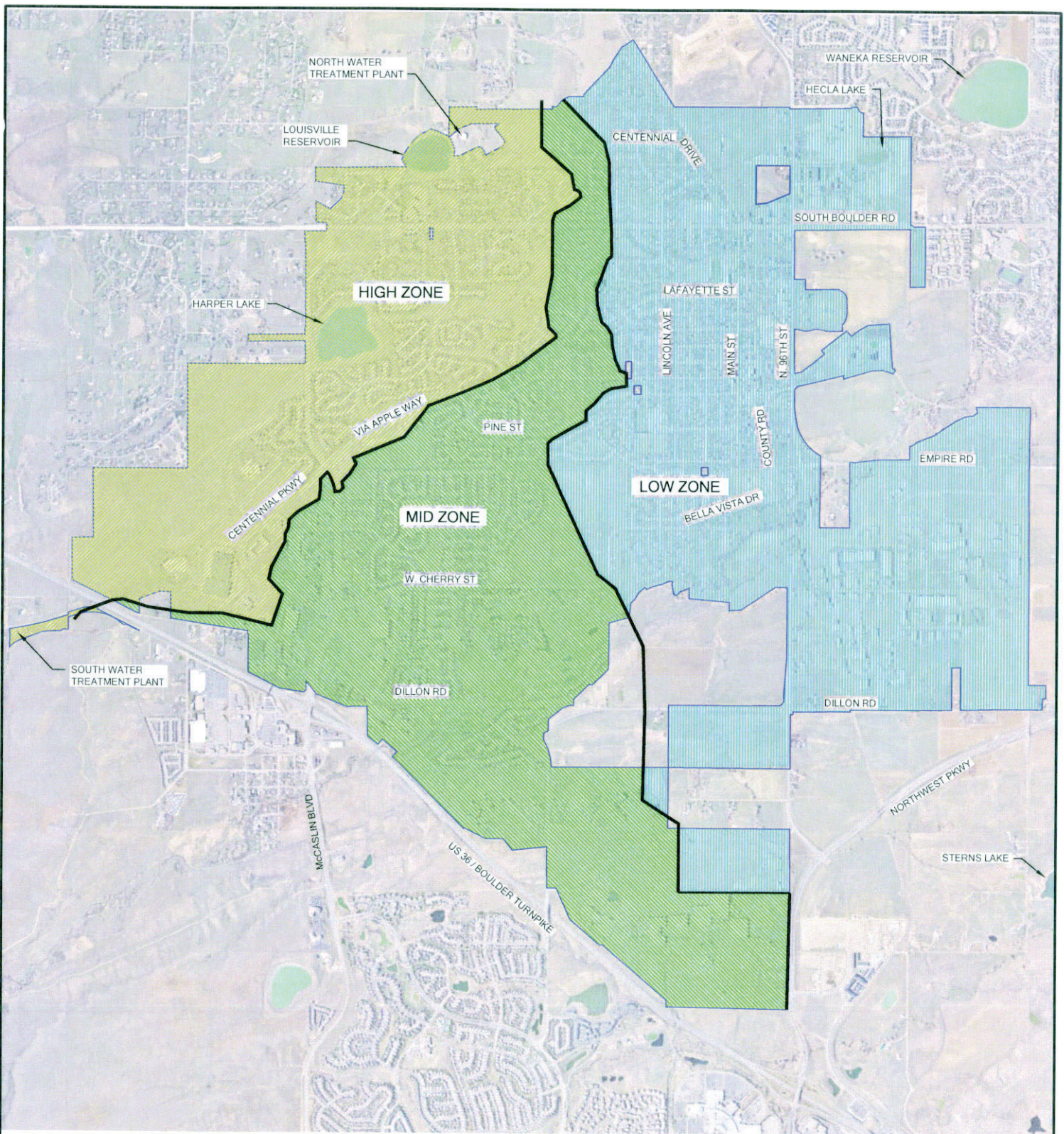
Plant	Total Pumping Capacity	Firm Pumping Capacity
NWTP	5.0	3.0
HBWTF	6.0	3.5

2.5 WATER STORAGE

The industry standard is for water utilities to provide water treatment capacity to meet Peak Day Demands, while providing proper storage volume to meet emergency and fire storage needs as well as operational volume for daily flow variations. This approach generally provides the optimal balance between providing a durable system, controlling capital costs and managing water quality. Increasing water treatment capacity and offsetting storage volume is cost prohibitive, while decreasing treatment capacity and increasing storage can result in water quality problems as well as leave a community susceptible to water shortage when weather conditions result in sustained Peak Day Demands.

Various guidance documents such as AWWA Manuals of Practice, Colorado Department of Public Health and Environment (CDPHE) design criteria and Insurance Services Office (ISO)

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INDICATED BOUNDARIES ARE
APPROXIMATE LOCATION



LEGEND

-  HIGH ZONE
-  MID ZONE
-  LOW ZONE

FIGURE 2-1
CITY OF LOUISVILLE - WATER FACILITY PLAN
LOUISVILLE WATER PRESSURE ZONES

guidelines can provide significantly different answers as to the amount of water storage that a water utility should provide. HMM's experience is that different water utilities across Colorado provide significantly different quantities of water storage as compared to their Peak Day Demands, and can be impacted by such things as water quality concerns, to the hydraulic condition of the distribution system.

While it was beyond the scope of this project to perform a storage evaluation, the issue of water storage is important in the evaluation of system needs and several identified projects, including evaluations of necessary water production capacity, pumping facilities and whether both the clearwell and 3 MG Tank at the NWTP should be maintained. Many water utilities in the Denver Metro area provide storage of approximately 70-80% of Peak Day Demand plus fire flow, although as noted there can be significant deviations from this rough guide. The City of Louisville stores approximately 8.5 million gallons of water, distributed as indicated in Table 2-3. An assessment of Table 2-3 shows that the City provides acceptable water storage, however may want to construct further storage in the Mid Zone in the future. The issue of storage volume will be reviewed by City staff through further planning. For the purposes of the Facilities Plan, it was decided that the 8.5 MG of storage is acceptable, but that the entire storage volume should be maintained.

Table 2-3: City of Louisville Water Storage

Pressure Zone	Water Storage Volume	Buildout Peak Day Demand
Low	3.0	3.0 – 3.5
Mid	3.5	4.7 – 5.9
High	2.0	2.7 – 2.8
Total	8.5	10.4 – 12.2

meeting water demands that actually occur in the system. If demand numbers are overly conservative, significant investment may be made in developing and maintaining unnecessary infrastructure. Based on the experience of HMM, a significant number of communities in the Colorado Front Range are currently revising Master Plan work completed either prior to or immediately following the drought of 2002, and are generally lowering water demands projections and revising Capital Investment Plans appropriately.

In order to address this problem in the Facilities Plan, both high and low water demand projections were developed to bracket a realistic range of future water demands. This methodology allows a reasonable range of demands to be considered when performing system planning.

In relation to the high end water demand projections shown in Table 4-4, average pre-drought water use projections were used in developing the demands. While this is not as conservative as using the highest demands from the highest year, the use of pre-drought demands does provide a reasonably conservative demand basis, considering that many items that result in water conservation such as low-flow fixtures are permanently in place. In addition, there is reason to believe that further water conservation measures will occur in future years further reducing customer water use, which provides an additional level of conservatism to the water demand projections. As an example, further legislation requiring even lower water usage for toilets and urinals has been in development, and most expect the legislation to be passed by legislation in upcoming years. While Louisville is currently at about 90% buildout, fixtures in existing homes and buildings will need to be replaced, and may be replaced with even more efficient fixtures.

Table 4-4: Average Day Demand Projection Summary

Year	Population ⁽¹⁾⁽²⁾	Single Family Population ⁽³⁾⁽⁴⁾	Single Family Avg. Day Demand (MGD)		Multifamily Population ⁽³⁾⁽⁵⁾	Multifamily Avg. Day Demand (MGD)	Non-Residential Services ⁽²⁾⁽³⁾⁽⁶⁾	Non-Residential Average Day Flow (MGD)		Total Demand Based on User Categories (MGD) ⁽¹⁰⁾		Avg. Demand (MGD) ⁽¹⁾	
1998	18,177	15,158	1.959		3,019	0.227	387	1.148		3.996		4.033	
1999	18,062	15,306	1.865		2,756	0.225	482	1.129		3.859		3.973	
2000	19,051	15,306	2.108		3,745	0.234	482	1.306		4.373		4.454	
2001	19,088	15,306	1.993		3,782	0.236	482	1.216		4.129		4.253	
2002	18,747	15,306	1.567		3,441	0.196	482	0.720		2.976		3.089	
2003	18,419	15,296	1.691		3,123	0.204	496	0.989		3.457		3.408	
2004	18,574	15,330	1.486		3,244	0.194	519	0.915		3.111		2.996	
2005	18,427	15,337	1.658		3,090	0.229	522	1.061		3.534		3.496	
2006	18,723	15,345	1.842		3,378	0.239	530	1.307		4.061		3.855	
2007	18,989	No Data	No Data		No Data	No Data	No Data	No Data		No Data		3.72	
2008	19,461	No Data	No Data		No Data	No Data	No Data	No Data		No Data		3.716	
2009	19,656	No Data	No Data		No Data	No Data	No Data	No Data		No Data		3.251	
2010	18,376	15,319	1.585		3,057	0.226	549	1.014		3.385		3.37	
2011	18,410	15,415	No Data		2,995	No Data	550	No Data		No Data		No Data	
PROJECTED	Population ⁽²⁾	Single Family Population ⁽²⁾	Single Family Avg. Day Demand (MGD)		Multifamily Population ⁽²⁾	Multifamily Average Day Flow (MGD) ⁽⁵⁾	Non-Residential Services ⁽²⁾⁽⁶⁾	Non-Residential Average Day Flow (MGD)		Total Demand Based on User Categories (MGD) ⁽¹⁰⁾		Average Flow Based on Total Population (MGD)	
			Low ⁽⁷⁾	High ⁽⁸⁾				Low ⁽⁷⁾	High ⁽⁸⁾	Low	High	Low	High
2012	18,497	15,855	1.893	2.057	3,248	0.229	552	1.338	1.454	4.146	4.483	3.757	4.083
2013	18,584	15,920	1.901	2.066	3,267	0.230	553	1.341	1.458	4.161	4.499	3.769	4.103
2014	18,671	15,985	1.908	2.074	3,286	0.231	555	1.344	1.461	4.176	4.515	3.784	4.122
2015	18,758	16,050	1.916	2.083	3,305	0.233	556	1.348	1.465	4.191	4.531	3.800	4.141
2019	19,123	16,141	1.927	2.094	3,540	0.249	559	1.354	1.472	4.232	4.574	3.865	4.222
2020	19,215	16,165	1.930	2.098	3,601	0.254	570	1.381	1.502	4.273	4.618	3.881	4.242
2025	20,162	16,401	1.958	2.128	4,215	0.297	576	1.395	1.517	4.375	4.725	4.049	4.451
2030	22,192	16,908	2.018	2.194	5,529	0.389	604	1.465	1.592	4.642	5.005	4.409	4.899
BUILDOUT	23,000	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	4.552	5.078

(1) Historical population values from PRJCTNS spreadsheet from City of Louisville.

(2) Population projections from Impact Fee Report dated 10/18/2011.

(3) Historical population from Meter Data Spreadsheet from City of Louisville. No data given for years 2007 - 2009.

(4) Single Family Units assumed to contain 2.6 people.

(5) Assumed 1.8 persons per unit based on previous data from 1998 - 2010 ex 2007-2009

(6) Non-residential services include irrigation, city, and commercial.

(7) Low single family use and low non-residential projections assumes no savings from programs. Low single family use projections assume 30% of future households conserve 14% of total use based on new fixture technology.

(8) High single family use and high non-residential projections assume 8% savings from 2 programs. High single family use projection assume 75% of future households conserve 21% of total use based on new fixture technology.

(9) Previous data for multifamily units showed no conservation, therefore no conservation was assumed for multifamily units.

4.3.4 Peaking Factor and System Peak Day Demands

Peak Day Demands are typically used to size water treatment facilities and other components of the water distribution system. The City has historically used a Peaking Factor of 2.64 for planning purposes. Previous flow data from 2003 through 2010 shows that the average peaking factor is 2.59. For the purposes of this study, a more conservative peaking factor was used to develop future Peak Day Demands in order to prevent underestimating future system demands. Therefore, the 75th percentile peaking factor of 2.68 was used in calculating Peak Day Demand projections.

The 75th percentile peaking factor was calculated using data from the post-drought years of 2003 – 2010, shown in Table 4-5. The 75th percentile value was considered appropriate considering that a conservative high and low based Average Day Demand are used in developing the projected Peak Day Demands.

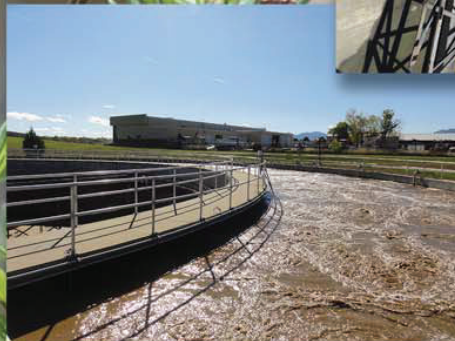
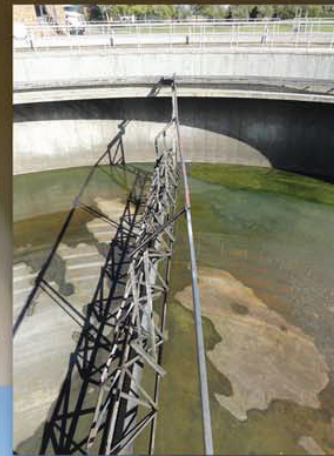
Table 4-5: Historical Post Drought Peaking Factors

Year	Peak Day Demand	Average Day Demand	Peaking Factor
2003	9.717	3.408	2.85
2004	7.796	2.996	2.60
2005	9.473	3.496	2.71
2006	9.462	3.855	2.46
2007	8.923	3.720	2.40
2008	9.933	3.716	2.67
2009	7.880	3.251	2.42
2010	8.420	3.370	2.50
Average			2.59
75 th Percentile			2.68

Figure 4-3 shows the resulting Peak Day Demand projection from the customer category projection, peak day demand projection, and total population projection. The graph includes the following:

- The blue curve shows the historical Peak Day Demand in the City. The vertical red line in the year 2002 represents a marker for the drought year. A significant reduction in Peak Day Demands is indicated following the drought due to water conservation.
- A red bar in the year 2012 indicates the post-drought water use for the 2012 year. This bar captures a majority of Peak Day Demands following the drought. While recent years (2009 – 2011) show Peak Day Demands below this bar, using data from these years is not recommended, and is not considered conservative for water system planning. These recent years are likely impacted by economic downturn and higher summer month precipitation.
- The green and purple projection curves are the low and high demand projections, respectively, previously discussed in the chapter. These projections correspond well to the red bar indicating the expected range of “base” post drought Peak Day Demands. The high demand curve is a highly conservatively forecast based on pre-drought demand data. Water system planning typically requires a conservative approach as

Wastewater Facility Plan



April 2013

SECTION 1 EXECUTIVE SUMMARY

This Wastewater Facility Plan provides the City of Louisville with an analysis of their existing wastewater treatment infrastructure, a summary of the current and projected regulatory requirements, projections of future wastewater flows and loads, an evaluation of treatment alternatives, and recommended improvements to their wastewater treatment infrastructure. This Plan provides a roadmap infrastructure needs required to meet future the demands of population growth, address facility deficiencies, and meet anticipated regulatory changes.

1.1 SUMMARY OF EXISTING WASTEWATER TREATMENT PLANT (WWTP)

The Louisville WWTP utilizes preliminary and secondary treatment with disinfection to treat wastewater. The WWTP also has tertiary effluent filters for effluent reuse during the summer months. The original facility, constructed in 1952, and has since undergone five major and two minor upgrades. The plant currently has a rated capacity of 3.4 million gallons per day (MGD) and 7,089 pounds per day (ppd) of BOD₅. The WWTP currently consists of:

- A headworks with 2 mechanical bar screens (each with a 3 MGD capacity), one screenings washer, one manual bar screen, two gravity grit chambers, and two parshall flumes for influent flow measurement.
- One 2.2 million gallon aeration basin with two dedicated blowers and fine bubble diffusers.
- Two secondary clarifiers. One 120 ft diameter and one 80 ft diameter.
- UV disinfection rated for 5.8 million gallons per day (MGD) installed in one channel.
- One 2 MGD filtration system for producing reuse water for irrigation.
- A gaseous chlorine disinfection system for disinfecting reuse water. This system, with a gaseous sulfur dioxide system, also serves as a backup disinfection system to the existing UV system.
- Solids handling including a rotary drum thickener, one aerobic digester with two blowers, and one dewatering centrifuge.
- A composting facility.
- Ancillary process equipment including return activated sludge (RAS) pumps, waste activated sludge (WAS) pumps, scum pumps, electrical gear, and instrumentation.

The City's WWTP receives wastewater from approximately 63 miles of sanitary sewer ranging in size from 8 to 27-inch diameter buried pipe. The wastewater collection system currently includes three lift stations which will soon be expanded to four with the North End development.

1.2 PLANNING CRITERIA

The City of Louisville currently has an estimated population of 18,500 that produces approximately 1.7 MGD and 3,700 pounds per day of BOD₅. The City is planning for growth to a buildout population of 23,000 in 2034. The growth in population will also increase wastewater flows and loads to the WWTP. Planning criteria for the City of Louisville WWTP

are provided in **Table 1-1**. Maximum month conditions are utilized to determine plant capacity and planning criteria. Average daily influent wastewater flow during the maximum month is projected to increase to 2.45 MGD at buildout. The flow projections represent an almost 25 percent increase in flow from 2011 to buildout as a result of the population growth within the service area. Projected maximum months loads at buildout for BOD₅, TSS, and NH₃ are 5,515, 6,340, and 664 pounds per day (ppd), respectively.

Table 1-1 Planning Criteria for City of Louisville WWTP

Parameter	Year 2022			Year 2032			Year 2034		
	AA	MM	PH	AA	MM	PH	AA	MM	PH
Flow, mgd	1.79	2.15	3.88	2.07	2.48	4.49	2.11	2.53	4.58
BOD ₅ , ppd	3,819	4,697		4,404	5,417		4,483	5,515	
TSS, ppd	4,001	5,401		4,614	6,229		4,696	6,340	
NH ₃ , ppd	439	566		506	653		515	664	
TKN, ppd	654	844		754	973		767	989	
Phosphorus, ppd	77	91		88	104		90	106	

1.3 WWTP DISCHARGE PERMIT AND REGULATORY REVIEW

The WWTP operates under permit number CO0023078. The last permit renewal was issued August 16, 2011 and expires at midnight on September 30, 2016. The facility has a permitted hydraulic capacity of 3.4 million gallons per day (MGD) and an organic capacity of 7,089 pounds per day (ppd) of BOD₅. Current ammonia discharge limits vary by month and range from a low of 7.5 mg/L in November to a high of 12.0 mg/L in February. The permit includes a compliance schedule to meet new lower Ammonia discharge limits that are effective on August 1, 2017. The ammonia limits effective on August 1, 2017 are significantly lower; they range from a low of 1.7 mg/L for the months of July, August, and September to a high of 2.6 mg/L in January.

In 2012, the Colorado Department of Public Health and Environment (CDPHE) approved a revised Regulation 31 – The Basic Standards and Methodologies for Surface Water and new Regulation 85 – Nutrients Management Control Regulation. Regulation 31, an extension of the EPA’s EcoRegion Concept, sets water quality goals and standards for total nitrogen and phosphorus in Colorado’s streams and rivers. Regulation 85 sets wastewater treatment facility effluent limits on total inorganic nitrogen (TIN) and phosphorus at 7 and 0.7 mg/L, respectively, for plants larger than 1 MGD. The requirements for TIN and phosphorus are projected to become effective in 2022.

1.4 TREATMENT PERFORMANCE AND EVALUATION

Louisville’s WWTP treated an annual average daily flow of 1.67 MGD in 2011 and 3,548 ppd of BOD₅ in 2011. The aeration basin was originally designed to reduce BOD₅ and total suspended solids (TSS) in the effluent to less than 30 mg/L each. The treatment plant is designed to reduce carbonaceous BOD₅ and total suspended solids (TSS) in the effluent to less than 30 mg/L each. It was not designed to provide the nitrification (the biological oxidation of ammonia) required to achieve

SECTION 4 HISTORICAL AND PROJECTED WASTEWATER PRODUCTION

This section presents the historical and projected wastewater production rates based on a review of the service area, projected population growth, and historical per capital wastewater flows and loads. The capacity and specific treatment facilities required to provide sufficient treatment at the City's Wastewater Treatment Plant (WWTP) depend in part on future development of the service area, flow variations, and waste characteristics.

4.1 HISTORICAL WASTEWATER PRODUCTION

Historical wastewater characteristics for the City are presented in this section based on a five and one half year record of flows and waste strength from 2007 through mid-2012.

HISTORICAL WASTEWATER FLOWS

Wastewater flows for the City's WWTP are given in **Table 4-1**. The highest recorded annual average flow (AAF) was 1.82 MGD in 2007 and the lowest recorded AAF was 1.67 MGD in 2011. The AAF for 2012 is trending slightly lower than 2011 through June. The average day maximum month flow (MMF) of 2.19 MGD recorded in June 2009 represents 64 percent of the nominal capacity of 3.4 MGD. The ratio of MMF to AAF ranged from 1.02 to 1.22. The 95 percent confidence interval for max month flow over the 5.5 years of data is 1.16.

Table 4-1 Historical Influent Flows

Month	Influent Flow, MGD					
	2007	2008	2009	2010	2011	2012
Jan	1.77	1.63	1.59	1.62	1.51	1.64
Feb	1.81	1.61	1.58	1.62	1.55	1.67
Mar	1.76	1.60	1.64	1.76	1.49	1.63
Apr	1.84	1.64	1.92	1.91	1.54	1.63
May	2.01	1.68	2.04	2.07	1.79	1.63
Jun	2.02	1.83	2.19	2.12	1.91	1.59
Jul	1.84	1.82	1.91	1.97	1.96	--
Aug	1.84	1.79	1.77	1.82	1.79	--
Sep	1.84	1.82	1.81	1.66	1.69	--
Oct	1.80	1.70	1.66	1.64	1.61	--
Nov	1.65	1.62	1.76	1.60	1.59	--
Dec	1.62	1.62	1.67	1.49	1.61	--
AAF	1.82	1.70	1.80	1.77	1.67	1.63
MMF	2.02	1.83	2.19	2.12	1.96	1.67
MMF/AAF	1.11	1.08	1.22	1.20	1.18	1.02

Note: AAF = Average Annual Daily Flow, MMF = Average Daily Flow in the Maximum Month

WASTEWATER SYSTEM PEAKING FACTORS

Peaking factors are used in the planning process to help predict maximum conditions that must be accounted for in the facility design. The peaking factors represent the maximum day and maximum month conditions when compared to the average annual condition. The MMPFs represent the average daily value during the maximum month for each parameter.

The historical maximum day and maximum month peaking factors (MMPFs) for the City's WWTP are summarized in **Table 4-17**. Historical peaking factors for influent flow, BOD₅, TSS, and NH₃ were determined by dividing the monthly average by the corresponding annual average for each year from 2007 through mid-2012. The maximum day and maximum month peaking factors were determined based on a statistical analysis of the 95th and 99th percentile frequency of the monthly peaking factors over the five and one-half year historical record. Utilizing the 95th or 99th percentile values helps eliminate outliers in the data set; this reduces the potential for over planning or designing systems.

Table 4-17 Historical Maximum Month Peaking Factors

Parameter	Peaking Factors			
	Maximum Day		Maximum Month	
	95 th percentile	99 th percentile	95 th percentile	99 th percentile
Flow	1.23	1.62	1.21	1.22
BOD ₅			1.20	1.21
TSS			1.29	1.31
Ammonia			1.33	1.35

Table 4-17 summarizes MMPFs selected as the planning criteria for evaluation of treatment alternatives included in this Master Plan. Each peaking factor was rounded to two significant digits. At two significant digits, the difference between the 95th and 99th percentile for flow, BOD₅, and TSS differed by one percent. The difference between the 95th and 99th percentile for ammonia differed by two percent. The 95th percentile MMPFs for flow, BOD₅, and NH₃ are values that are typical for communities in the Front Range of Colorado.

The City of Louisville is able to export flow information from the WWTP's Supervisory Control and Data Acquisition (SCADA) system. Flow information is collected at four minute intervals on a continuous basis. Flow data from the maximum flow days for 2009 and 2010 were exported therefore, allowing the peak hour flow to be determined from data. The peak flow day for 2009 occurred on April 18. Data for this day was not able as a result of a software problem that occurred while installing a new SCADA system. The next highest flow day for 2009 occurred on June 2 with a recorded flow of 2.549 MGD. The peak flow day for 2010 occurred on June 13 with a recorded flow of 2.396. **Table 4-18** provides a summary of the recorded peak daily flow, peak hour flow, and the calculated peaking factors.

Table 4-18 Calculated Wastewater Peaking Factors

Date	Recorded Daily Flow, MGD	Average Annual Daily Flow, MGD	Peak Hour Flow, MGD	Peak Hour Factor ¹
June 2, 2009	2.549	1.80	3.912	2.17
June 13, 2010	2.396	1.77	3.531	1.99

¹ Peak Hour Factor = Peak Hour Flow/Average Annual Daily Flow

The peak hour flow can also be estimated using an equation developed by the Denver Regional Council of Governments (DRCOG) for reviewing utility plans and for interceptor certification. The wastewater flow peaking factor used by DRCOG was established in the 1977 regional management plan, and subsequently confirmed through numerous planning processes. It is calculated by the following formula:

$$\text{Peaking Factor} = 3.65 / (\text{Average Total Flow MGD})^{0.167}$$

(The maximum peaking factor used in any assessment should be less than 5.0)

Typically, the average total flow is based on a monthly average. The maximum peaking factor of 5.0 generally applies to very small treatment works. Although no minimum peaking factor is recommended herein, a factor of less than 1.0 is not appropriate. Using this formula, the calculated average peak hour flow peaking factor for the Louisville WWTP is 3.33.

4.2 WASTEWATER FLOW AND LOAD PROJECTIONS

Flow and load projections for the City of Louisville were calculated by multiplying the population projections (provided by the City) by the historical per capita flow/load contribution given in **Table 4-16**. Projections of flow and load from commercial and industrial are not calculated separately because the flow and load from commercial and industrial sources is a relatively minor contributor to the City's total wastewater flow and load. The contribution from commercial/industrial sources are included in the calculated historical per capita flow and loads and, thus, are inherent in the wastewater flow and load projections. Currently, the City has approximately 33 residents per commercial/industrial connection and is projected to have 35 residents per commercial/industrial connection in Year 2030.

The max month peaking factors used for planning purposes utilize the 95th percent confidence interval. Using the 95th percent confidence interval eliminates outliers and reduces the potential of planning and design for conditions not likely to be observed.

FLOW PROJECTIONS

The projected influent wastewater flows for years 2012 to buildout at a population of 23,000 (shown as year 2034) are given in **Table 4-19**. It is estimated that the annual average daily wastewater flows will increase to 2.11 MGD a buildout (estimated to be 2034). Average daily influent wastewater flow during the maximum month is projected to increase to 2.45 MGD. The flow projections represent an almost 25 percent increase from current (2012) through buildout. The increased flows are the result of the population growth within the service area. The ultimate

5.1 WASTEWATER TREATMENT PLANT SITE

The WWTP is located about a mile west of downtown Louisville at 1601 Empire Drive, Louisville, Colorado. As shown in **Figure 5-2**, the WWTP is located in the northeast portion of Louisville and is bordered by Empire Drive to the south, N. 96th Street (Highway 42) to the west, and W. South Boulder Road to the north. The Public Land Survey System coordinates for the site are NW 1/4 and NE 1/4 of SW 1/4 & SW 1/4 and

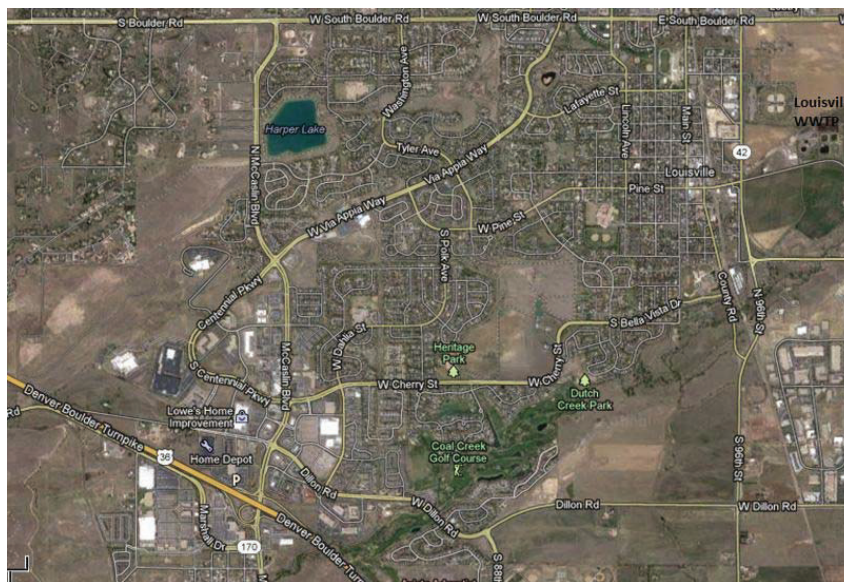


Figure 5-2 Location of the City of Louisville WWTP
(www.googlemaps.com, 2012)

SE 1/4 of the NW 1/4 of Section 9, T1S, Range 69W. Latitude and longitude of the WWTP are 39°58'30" North and 105° 7'30" West, respectively. The most recent FEMA floodplain map shows the facility to be located either outside the 500 year flood plain or above the base floodplain elevations.

5.2 WASTEWATER TREATMENT PLANT PERFORMANCE

The WWTP currently treats approximately 1.67 MGD and 3,548 ppd of BOD₅. The plant is currently rated for 3.4 MGD and 7,089 ppd of BOD₅. The treatment plant is designed to reduce carbonaceous BOD₅ and total suspended solids (TSS) in the effluent to less than 30 mg/L each. It was not designed for nitrification (the biological oxidation of ammonia) or for denitrification (the biological reduction of nitrate to nitrogen gas). The WWTP meets the current required ammonia discharge criteria through the efforts of Plant Operations Staff, who manage the biological processes to achieve nitrification and limited denitrification. This operations approach is currently possible because the WWTP is operating well below its rated capacity (underloaded). Historical performance of the facility in terms of BOD₅, TSS, and ammonia are presented in this section.

REDUCTION IN FIVE DAY BIOCHEMICAL OXYGEN DEMAND (BOD₅)

Monthly average influent and effluent BOD₅ for the WWTP are shown in **Figure 5-3** from January of 2007 through June of 2012. Influent BOD₅ concentrations range between a minimum of 137 mg/L and a maximum of 431 mg/L for data evaluated. The average influent BOD₅ concentration over this five and one-half year period was 250 mg/L. Between 2007 and 2012, the final effluent BOD₅ varied between a minimum of 0.4 mg/L to a maximum of 9 mg/L. The average effluent BOD₅ concentration over the five and one-half year period was 2.7 mg/L. Treatment efficiency averaged 99 percent removal, but varied between 99.5 and 97.8 percent

ELECTRICAL SYSTEMS

The electrical distribution equipment has been provided under numerous modification projects spanning a number of years at the WWTP. The Main Distribution Panel was provided in 1987, the standby generator was provided in 1999, and the Reclaimed Water System was added as recently as the mid 2000s. The equipment life for distribution equipment including switchboards/panelboards, switchgear, transformers, and motor control centers is typically 20-30 years. Moisture and dust are two of the main factors that decrease the life of the equipment. Most of the distribution equipment at the WWTP is located in dedicated electrical rooms and symptoms of moisture and dust on the equipment were not readily apparent. Electrical equipment that has not been exposed to moisture and dust can often stay in service much longer than its normal expected life. A NETA (International Electrical Testing Association) accredited acceptance testing firm should be hired to perform visual and mechanical inspection and testing of the equipment. An in depth assessment of the condition of major components can be performed after acceptance testing.

A thermographic survey was performed at the WWTP in October, 2011. The report noted a few items requiring attention, and the entity performing the survey tightened conductor connections. The thermographic survey report recommended monitoring of the equipment and did not indicate that any repairs were required.

The WWTP has a backup generator that provides power to essential plant equipment during a power failure. The connected loads to the generator exceed the rating of the generator which requires the Plant Operations Staff to monitor loads placed on the generator when it is in use.

ADMINISTRATION AND OPS BUILDINGS

The Administration and Ops Buildings at the Louisville WWTP appear to be in good condition, meet the building, electrical, and fire protection code that were applicable at time they were constructed, and no obvious safety concerns were noted. The existing Operations Lab is 25 years old could benefit from a new HVAC system and a new chemical hood. Additionally, there is currently minimal shop space available for Plant Operations Staff to perform maintenance of plant equipment, and to store tools and spare parts.

5.4 SUMMARY AND CONCLUSIONS

A majority of the facilities and equipment at the Louisville WWTP was constructed over 20 years ago and were designed to meet the effluent limits and regulatory requirements in place at the time. Effluent limits in the near future contain tighter limits on ammonia and, in less than 10 years, limits for both phosphorus and total inorganic nitrogen (TIN) are expected to be imposed. Additionally, regulatory requirements have become stricter and now require redundant process equipment and trains so that one train/piece of equipment can be out of service while treatment is maintained. The Louisville WWTP was not designed to meet the effluent limits for ammonia or TIN and redundant process trains/equipment are currently not provided for many of the processes. Below is a summary of the WWTP evaluation.

- The plant headworks will need to be replaced due to equipment age, structural condition, and operation and maintenance concerns. HVAC and electrical gear in the current headworks does not meet the current electrical and the current fire protection code (NFPA 820) and would need to be upgraded with any modifications to the facility.
- The secondary process lacks redundancy. Additional aeration basins will need to be constructed and capable of meeting the projected future regulatory criteria.
- For buildout conditions, the existing secondary process has capacity to meet the ammonia limits effective August 1, 2017; however, it cannot meet the phosphorus and TIN limits projected to be effective in 2022. The process cannot meet the new ammonia limits at its current rated capacity.
- It is possible to maintain the existing secondary process as part of the treatment process until the nutrient criteria (for phosphorus and TIN) become effective in 2022.
- Solids handling facilities at the WWTP have sufficient capacity to meet projected buildout conditions. Redundancy and equipment age/condition issues should be addressed.
- The UV system has sufficient capacity to meet the projected buildout conditions; however, the system lacks a redundant channel and is reaching its useful life and should be replaced. Currently, all the UV modules are located in one channel which makes it difficult to maintain. If two channels were utilized, one channel could be taken out of service for maintenance and cleaning while the other was in operation.
- Irrigation water for the WWTP site is currently taken from the chlorine contact chamber upstream of the UV disinfection system posing health concerns for staff. The irrigation system should be modified to use disinfected water from the Reclaimed Water System.
- Gaseous chlorine is a poisonous gas. It should be replaced with a less toxic compound such as sodium hypochlorite or an onsite generation system.
- Remodel existing Operations Lab and construct new 2,000 square foot Shop Building.

7.3 PROJECT PHASING

The recommended upgrades to the Louisville WWTP address equipment/structure age issues, City growth, redundancy requirements, and stricter effluent limits effective in 2017 and 2022. There is limited opportunity to construct the upgrades in phases to spread out the capital expenditures.

It is possible to construct two new secondary process trains now and utilize the existing secondary process as a redundant secondary process until the total inorganic nitrogen (TIN) and phosphorus limits become effective in 2022. In this scenario, the construction of the third new secondary process would be delayed by approximately five years. This approach was evaluated by Dewberry and City staff, and it was decided to construct the entire WWTP upgrades in one single phase based on the following:

1. Utilizing the existing secondary process until 2022 would require a new blower (to replace the unreliable high speed turbo blower), new 120 ft diameter clarifier mechanism, and structural repairs to the clarifier concrete. Estimated cost of these improvements is \$1.2 million while the cost of the third secondary process train is estimated to be \$3 million. It should be noted that these improvements would only delay the construction of the third process train and would not replace it, i.e., the upgraded equipment and structures would be decommissioned in 2022.
2. To improve plant hydraulics and minimize potential sewer backups, the hydraulic profile of the WWTP will be lowered. It would be extremely difficult to construct a new headworks to address the hydraulic issues in the influent sewer that would also fit the hydraulic profile of the existing secondary process and the new upgraded secondary process. Doing so would require compromises in the headworks design which would not be optimal for the new treatment processes. .
3. Phasing of the project would require two significant construction projects at the WWTP site in a span of seven years; phase one 2015-2017 and phase two 2020-2022. Construction generates traffic and noise and is disruptive to plant operations. Splitting the work into two phases would increase the amount and duration of construction activity and the associated impacts on City staff as well as surrounding residents.

7.4 REVISED CONSTRUCTION AND TOTAL PROJECT COSTS

The construction cost for the recommended upgrades presented in **Section 6** are refined in **Table 7-4**. The costs were refined to address wastewater data collected during the final planning stage of this plan, and several other issues identified by the project team. These issues are:

1. Upsizing the secondary process to accommodate the MMPFs listed in **Table 7-2** and the secondary process design criteria in **Table 7-3**.
2. Additional civil site work to address flood concerns related to the downtown Louisville stormwater issue.
3. Constructing a new building for the upgraded UV systems. The two proposed site layouts for the WWTP locate the new secondary process far from the existing UV

disinfection system and there is insufficient hydraulic elevation available to accommodate reusing the existing system at its present location.

4. Additional site piping costs for constructing the influent sewer to the new headworks, located further east on the property.
5. Design and construct a new influent sewer from Highway 42 to the WWTP.
6. Design and construct a new 8" water line to the WWTP.
7. Repave all existing asphalt surface.

As shown **Table 7-4**, the total estimated construction cost for the recommended WWTP upgrades is \$18.1 million and the estimated total project cost is \$21.8 million. Detailed planning level cost estimates for the recommended upgrades are provided in **Appendix C**.

Table 7-4 Construction and Total Project Costs

Item	Cost
Headworks	1,978,000
Modified UCT Process	6,853,000
UV Disinfection	833,000
Aerobic Digestion	1,320,000
New Influent Sewer, new water line, Repave existing asphalt	492,000
Lab Remodel and New Shop Building	620,000
Subtotal	12,096,000
Contractor OH&P, Bonding, Mob/Demob	2,419,000
Contingency (25%)	3,629,000
Estimated Construction Cost	18,144,000
Legal, Permitting, Planning and Engineering (20%)	3,629,000
Total Project Cost	21,773,000

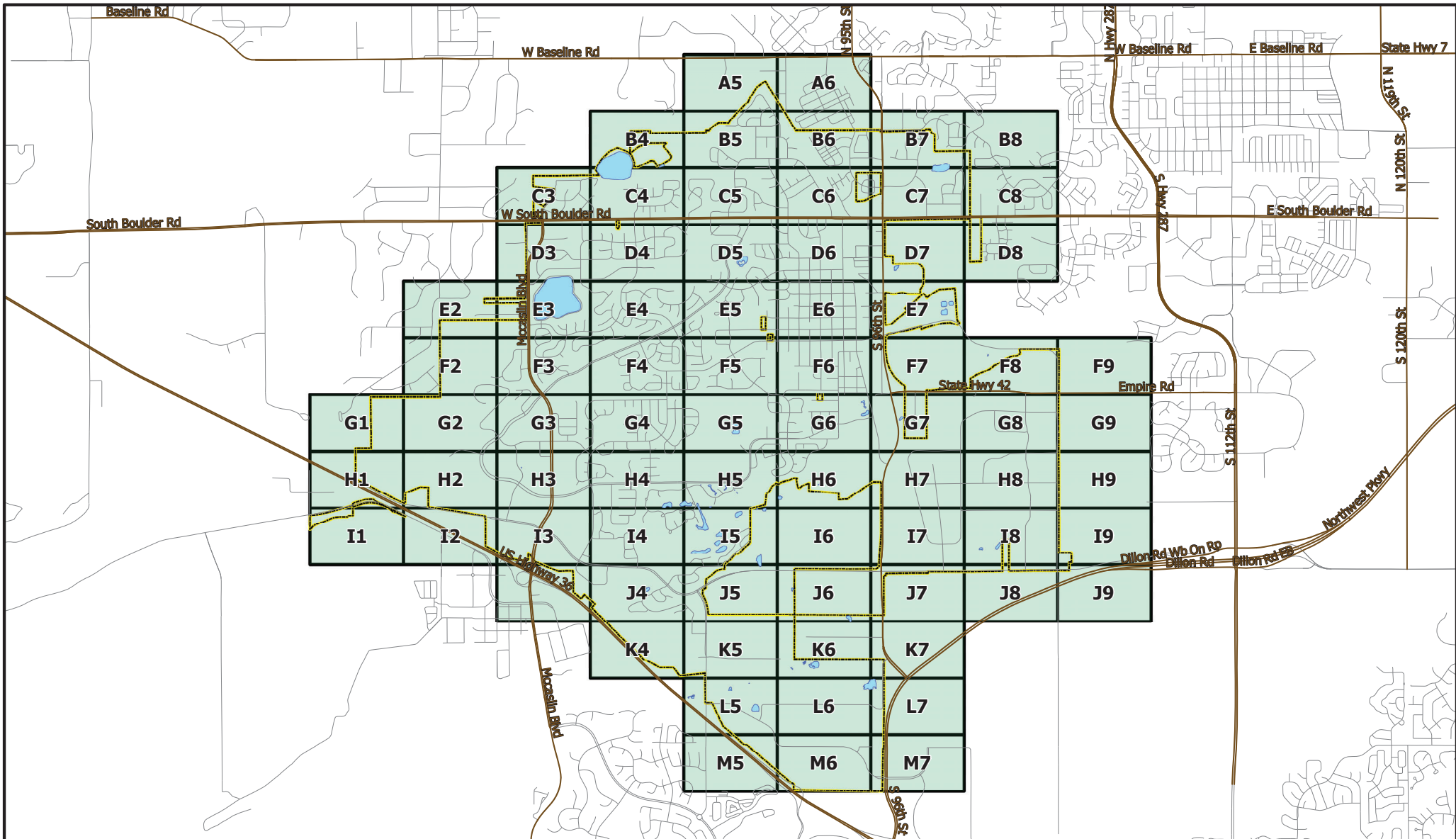
7.5 SCHEDULE

As shown in **Table 7-5**, design, bidding, and construction of the WWTP upgrades is estimated to have a duration of 46 months. This assumes 18 months for design, 20 months for construction, and 4 months for startup and commissioning. It is desirable to have the upgraded WWTP operational some period of time prior to effective date of the stricter limits on August 1, 2017 to give Plant Staff time to learn and optimize the new process. Incorporating two months into the schedule for Plant Staff increases the total project schedule to 4 years.

Table 7-5 Project Duration

Item	Duration
Design	18 months
PEL Development (part of design process)	2 months
CDPHE Review	2 months
Bidding Process	2 months
Construction	22 months
Startup and Commissioning	2 months
Total Project Duration	46 months

APPENDIX C – City of Louisville Utility Maps



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Map Index

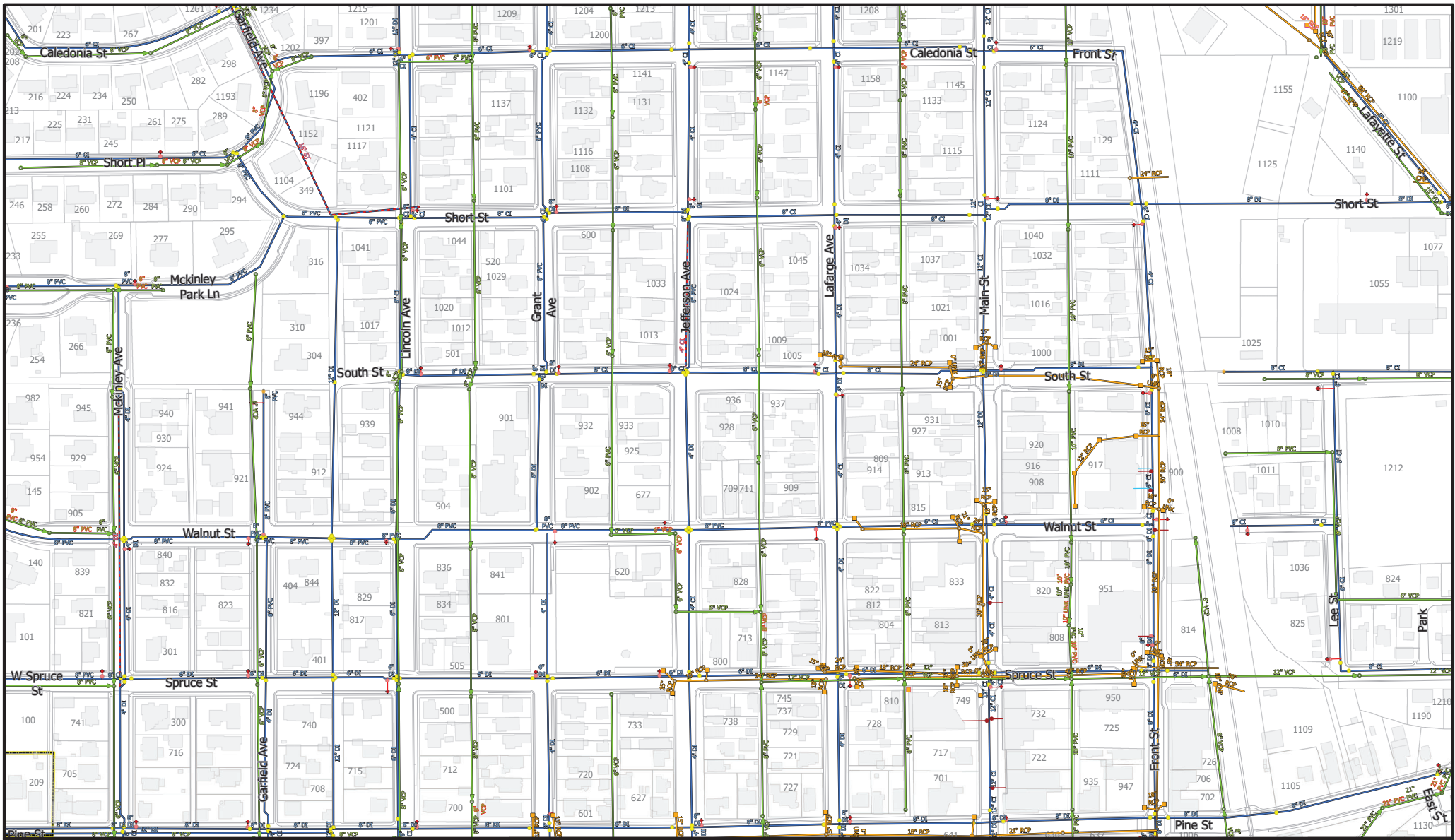
Lake

Minor Street

City Limit

Major Street

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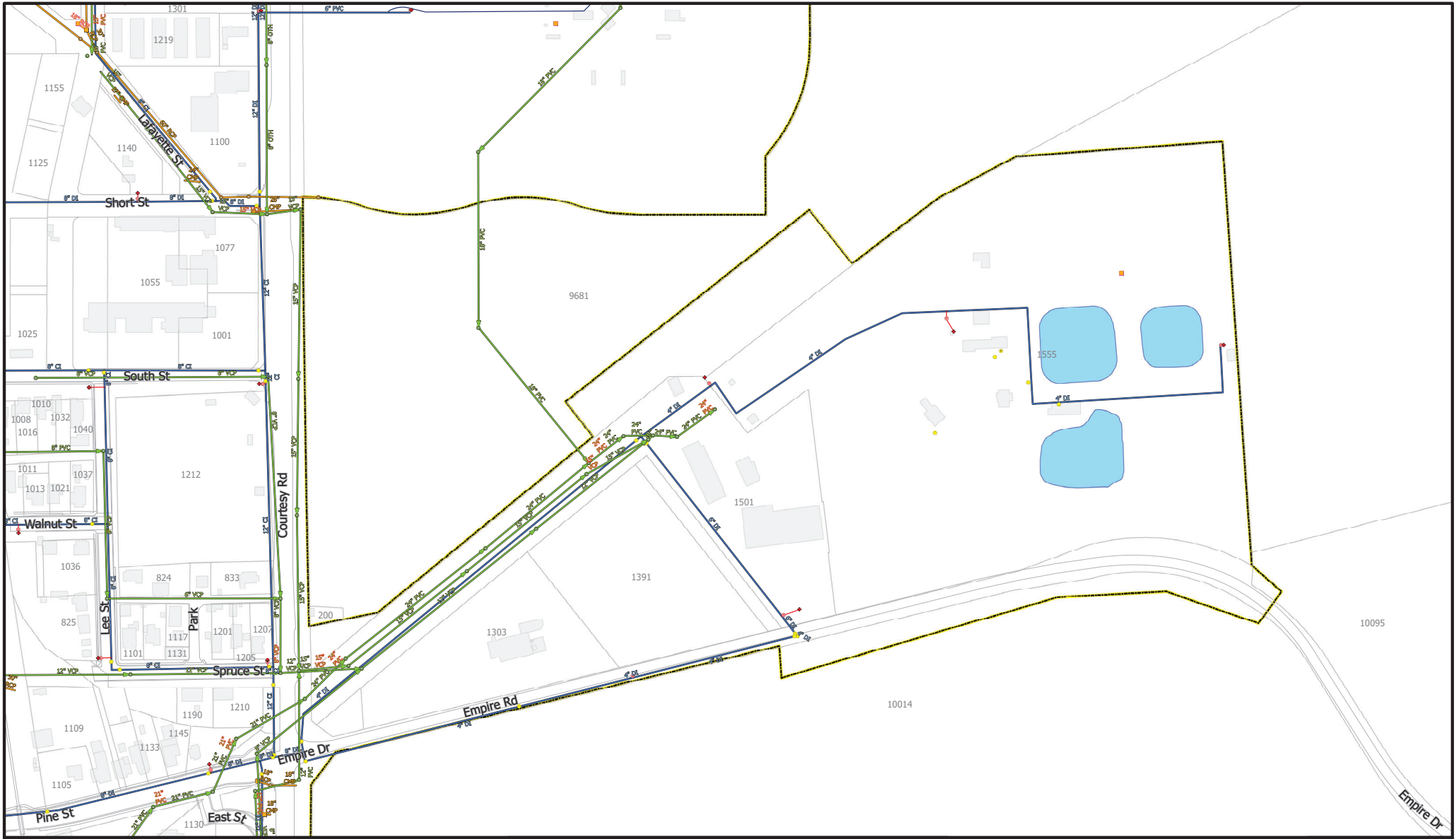
STORM SEWER

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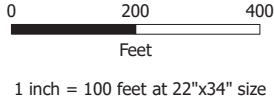
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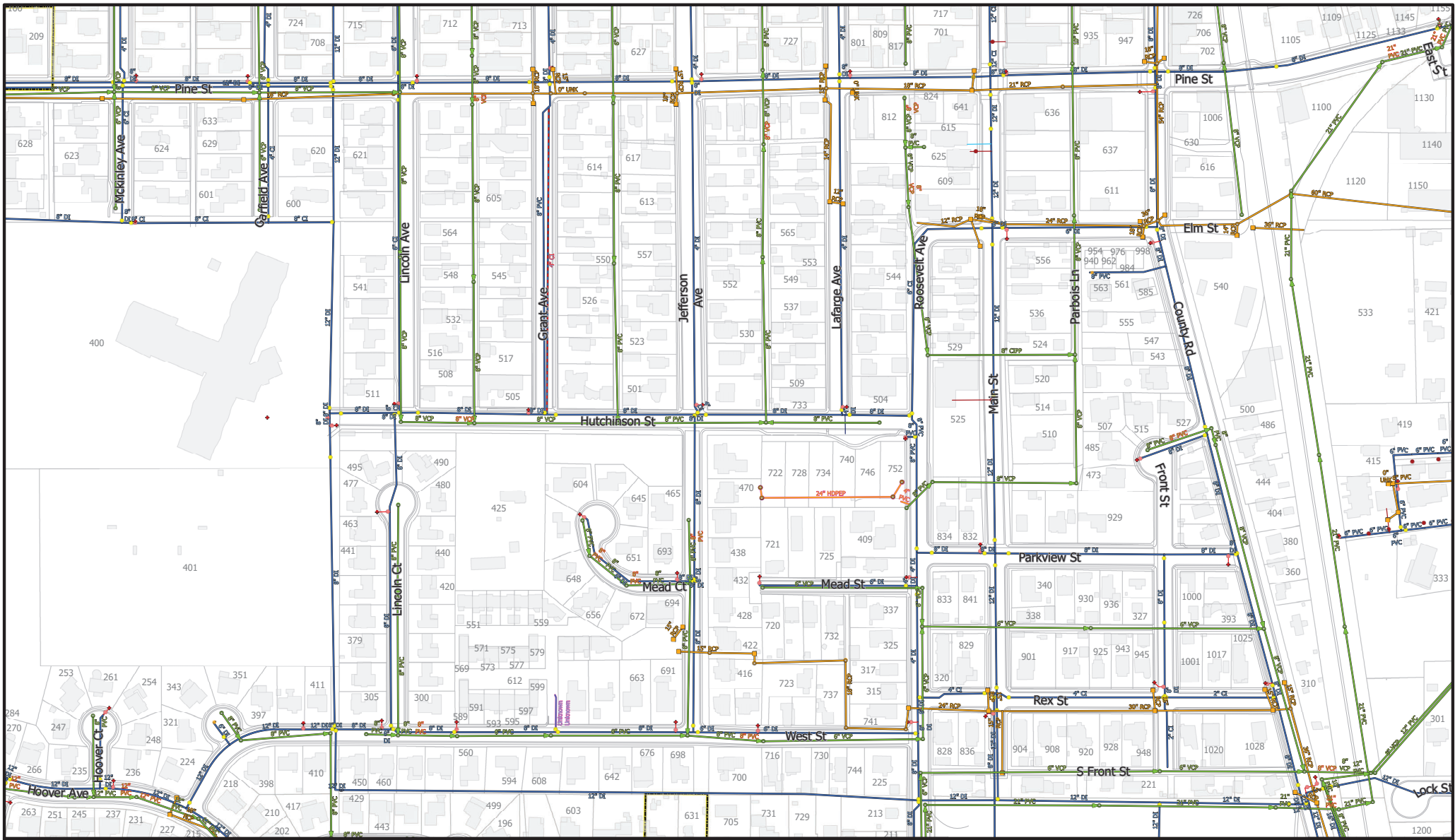
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□ Lift Station	▲ Private Fitting	— Private Main	⊙ Airvac	— Active Main	— Active Main	F6	F7	F8
● Public Manhole	▲ Public Inlet		● Check Valve	— Abandoned Main	— Abandoned Main			
● Private Manhole	▲ Private Inlet		■ PRV	— Private Main	— Private Main			
— Active Main	● Public Manhole	● Private Manhole	● Blow-Off Valve	— Other Main	— Other Main			
— Abandoned Main	● Private Manhole	● Active Main	● Fireline Valve					
— Private Main	— Active Main		● Fire Hydrant Valve					



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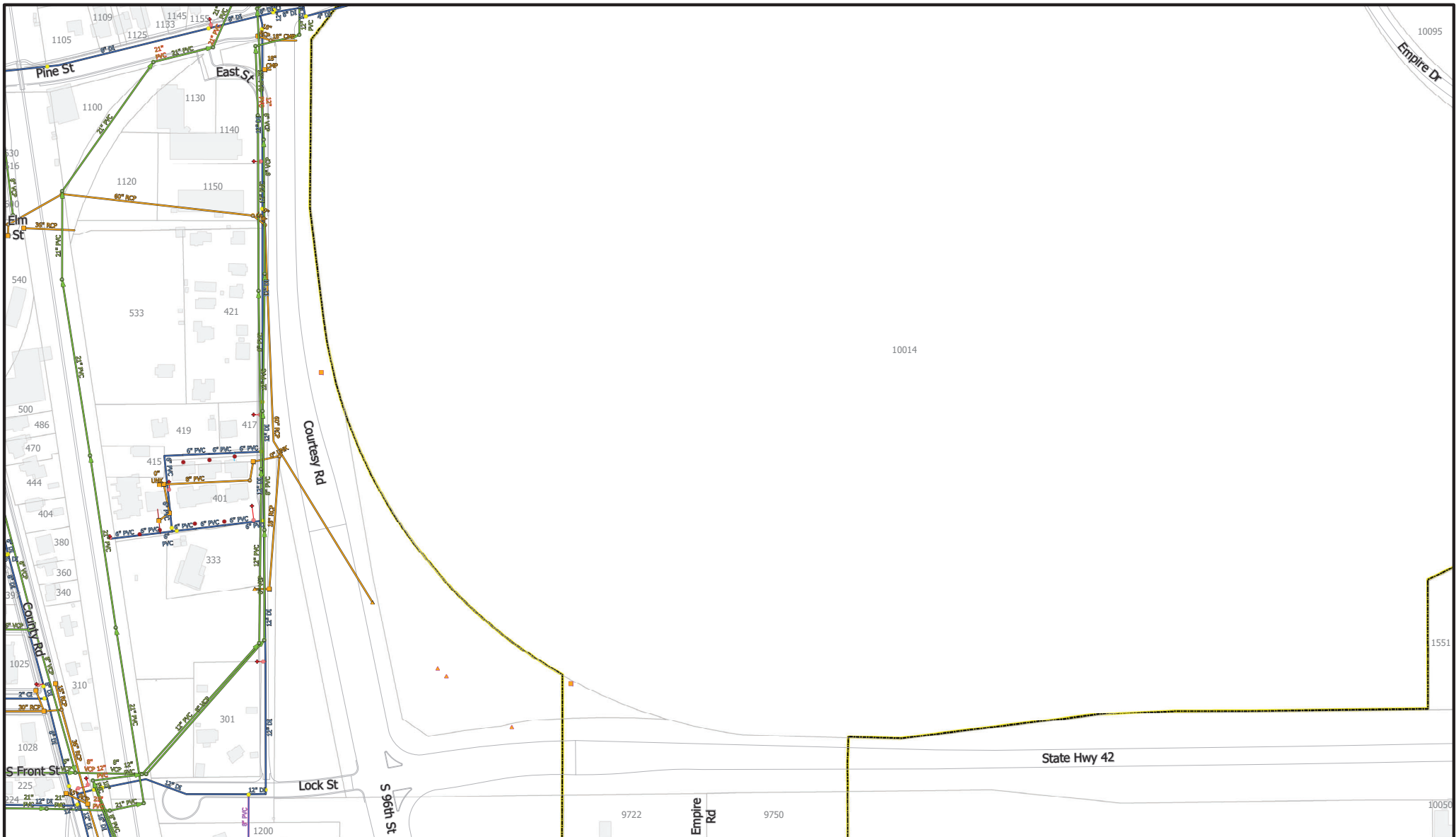
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G5	G6	G7



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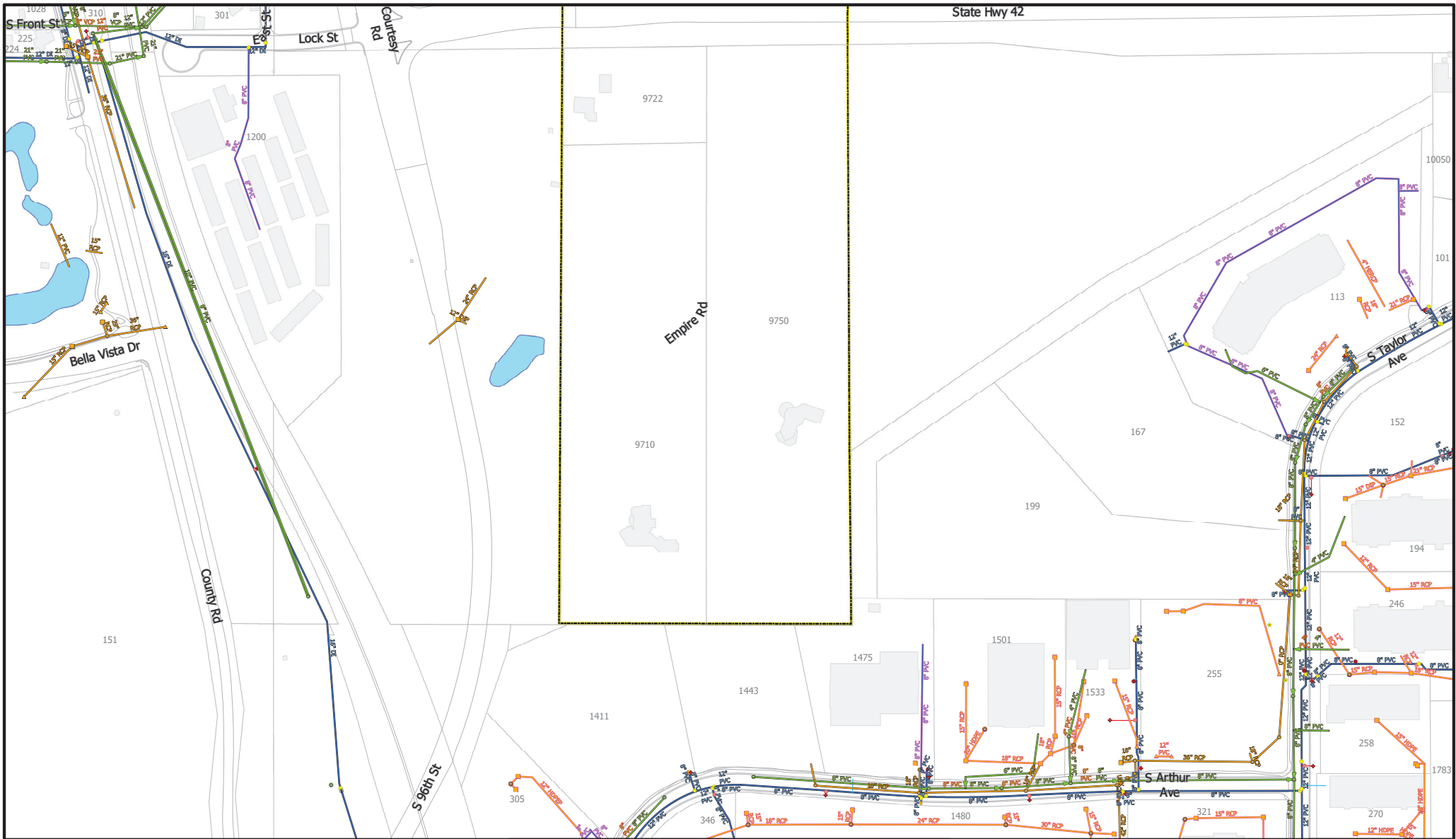
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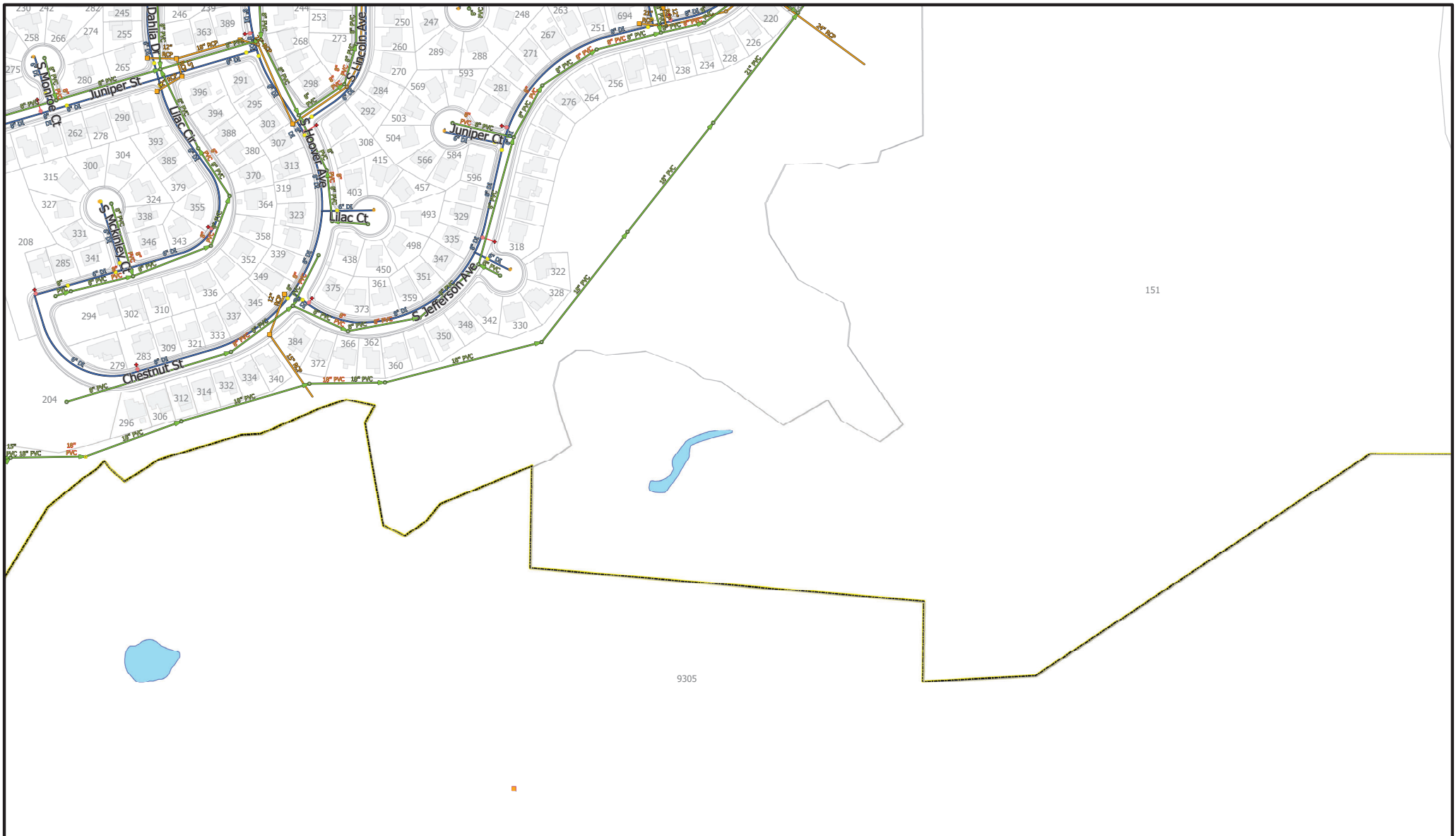
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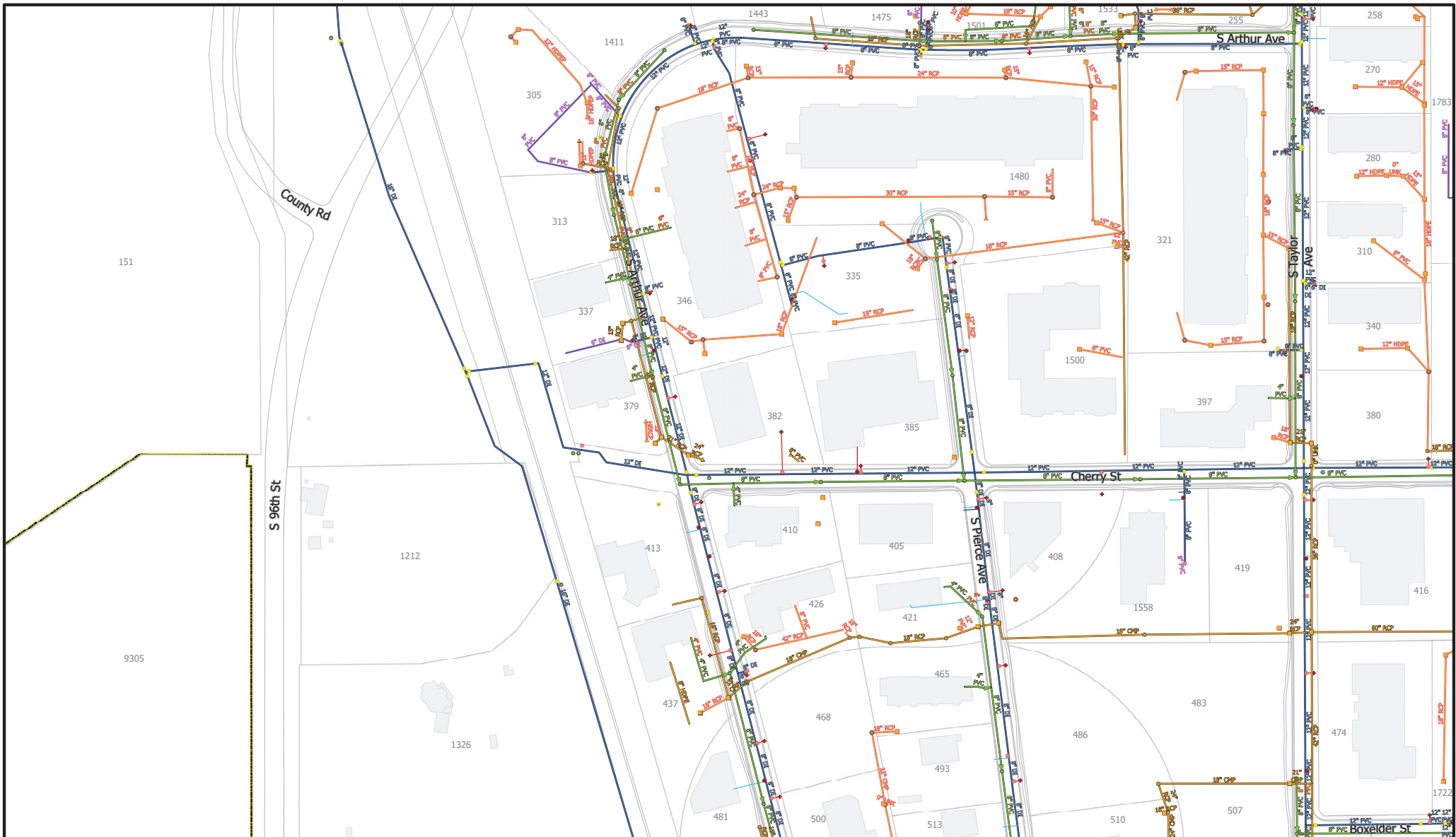
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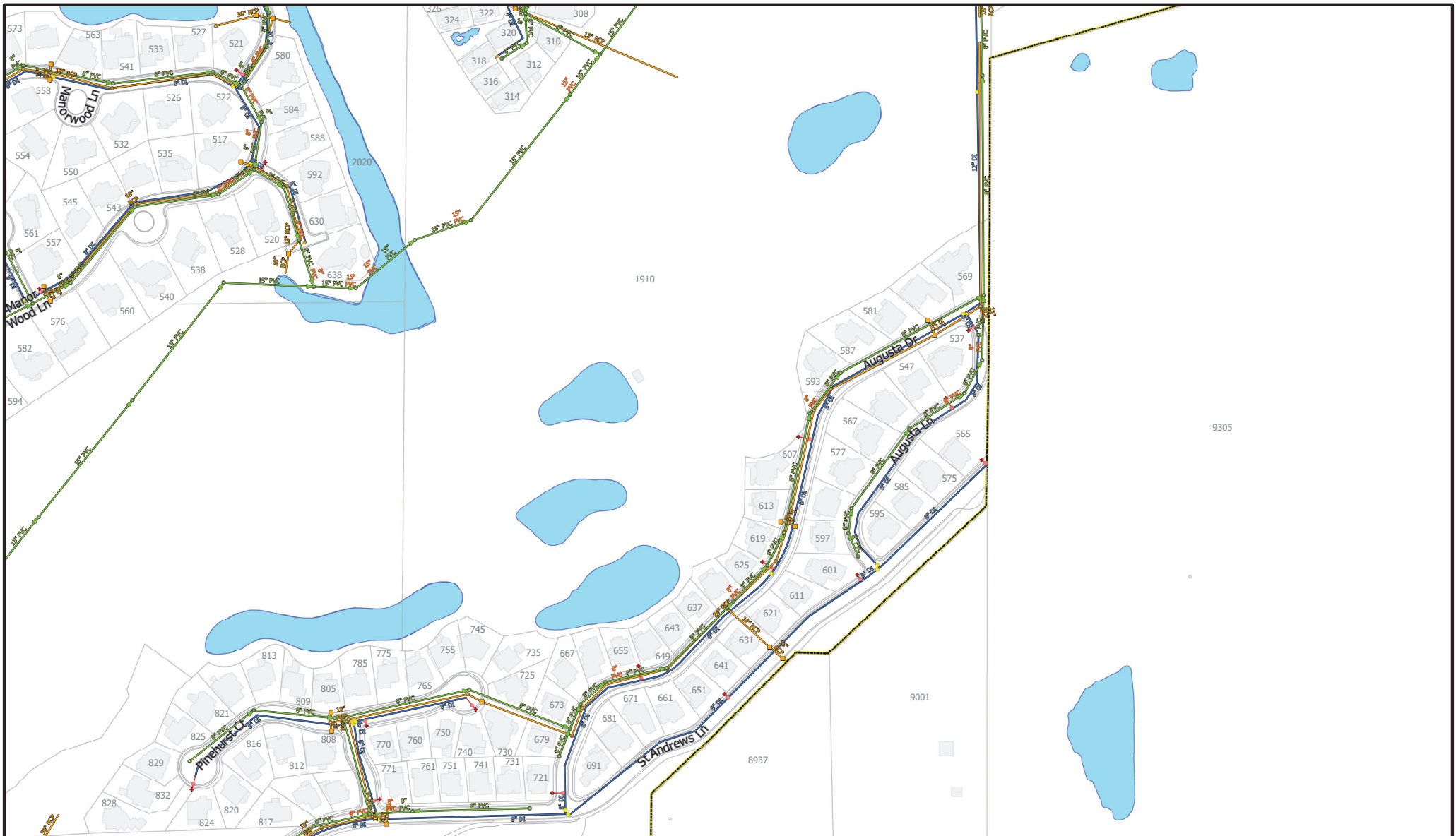
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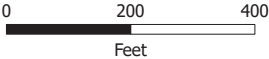
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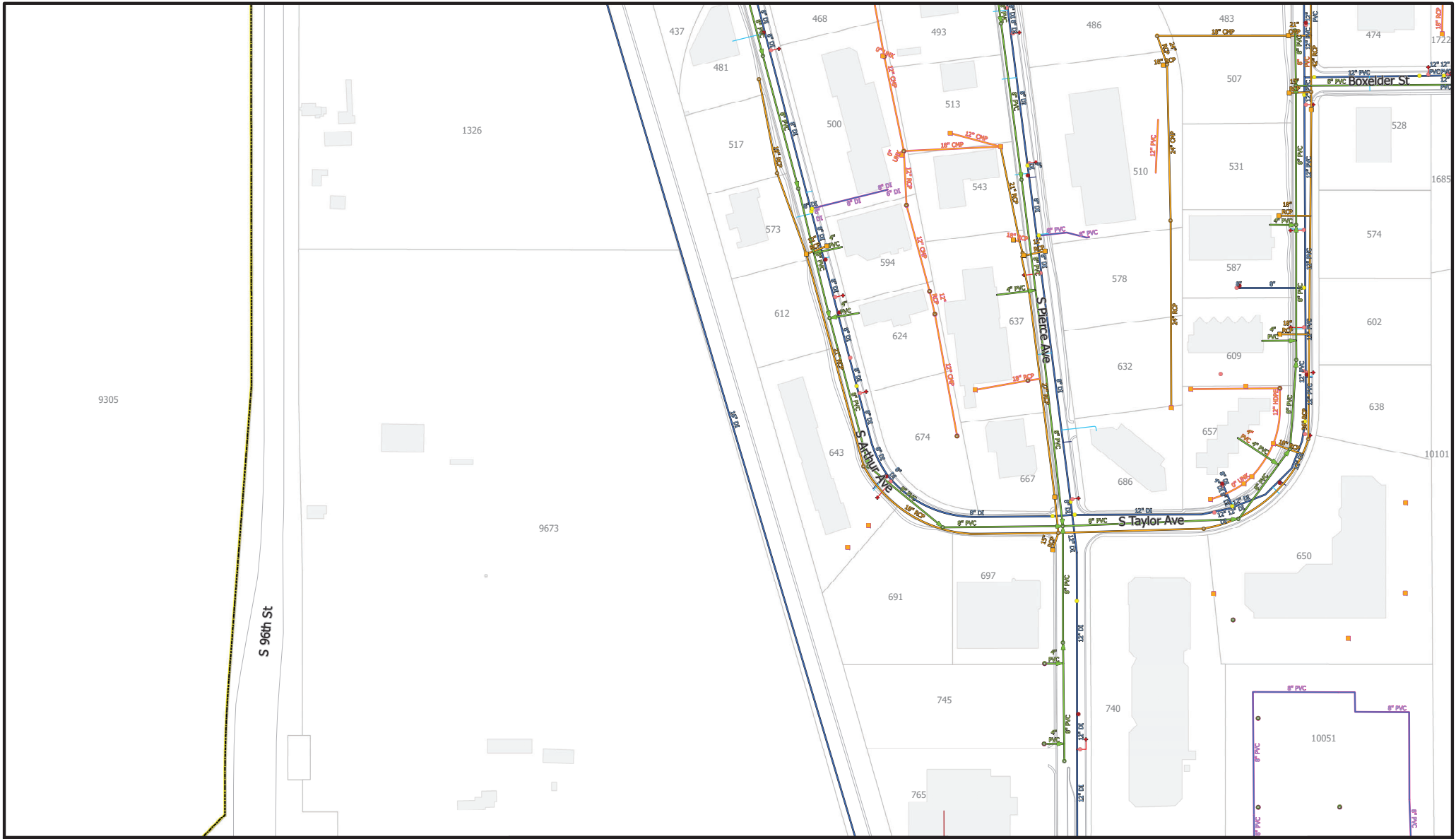
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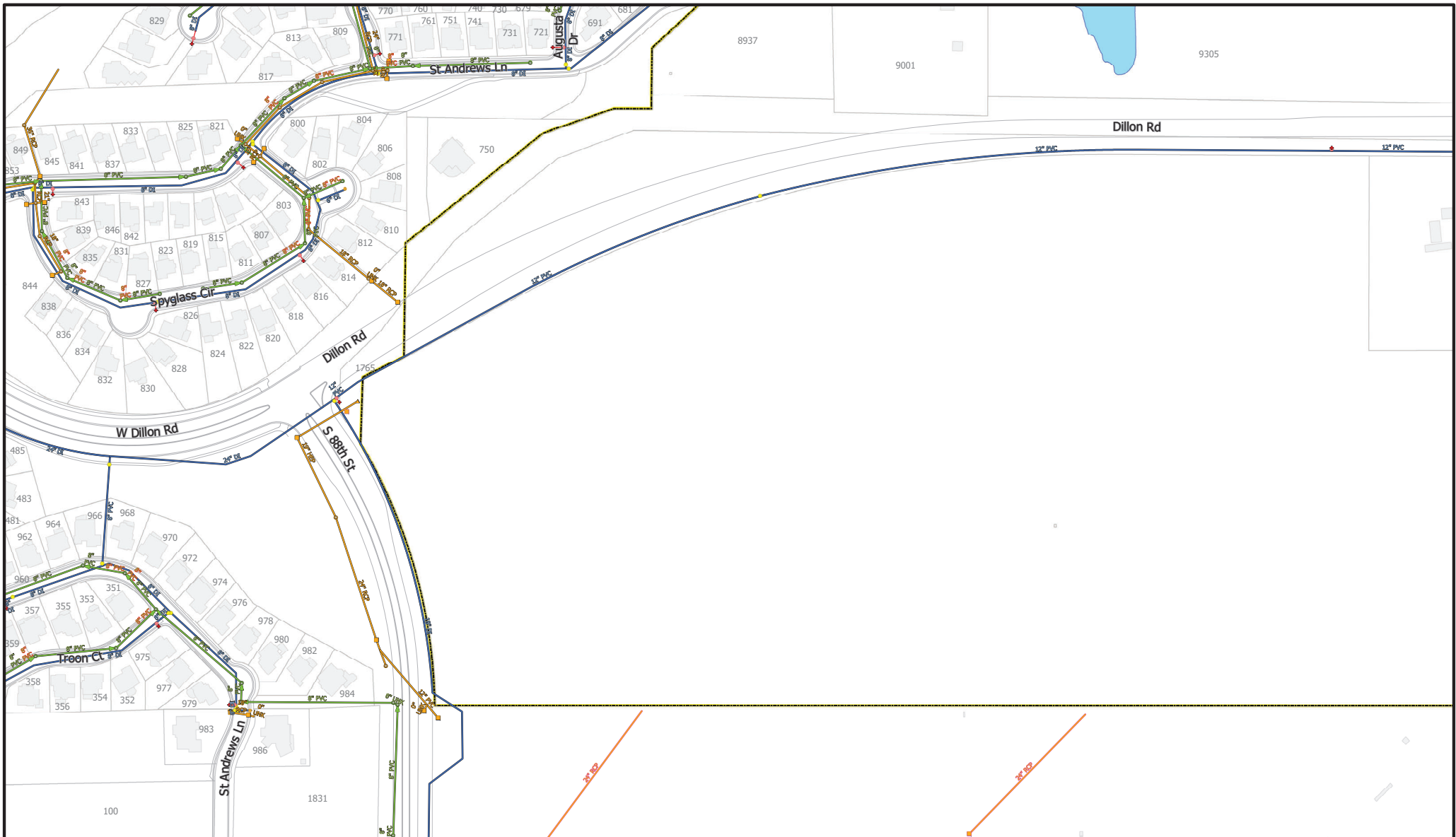
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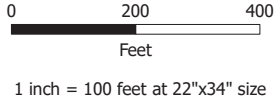
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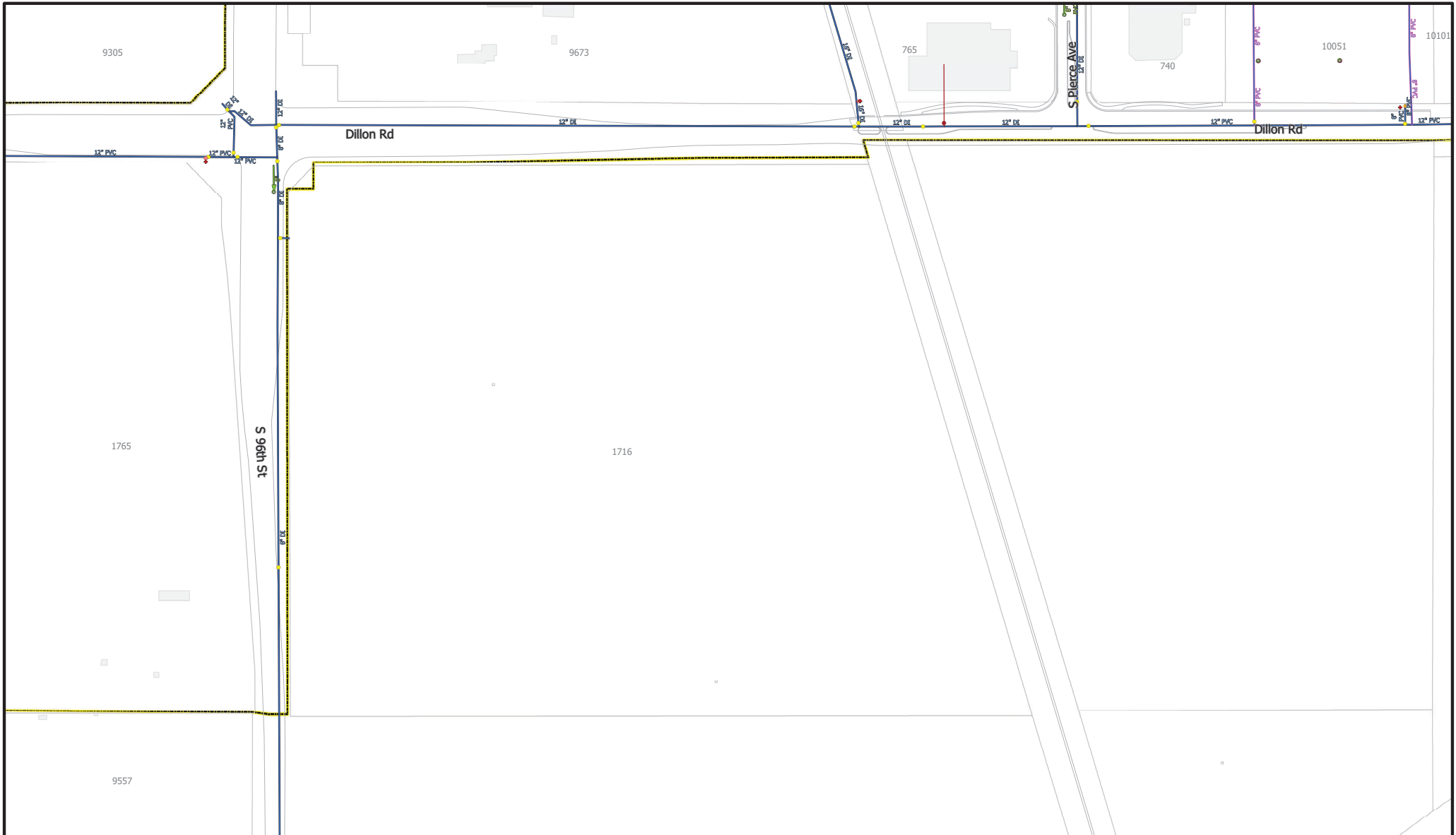
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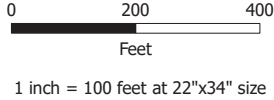
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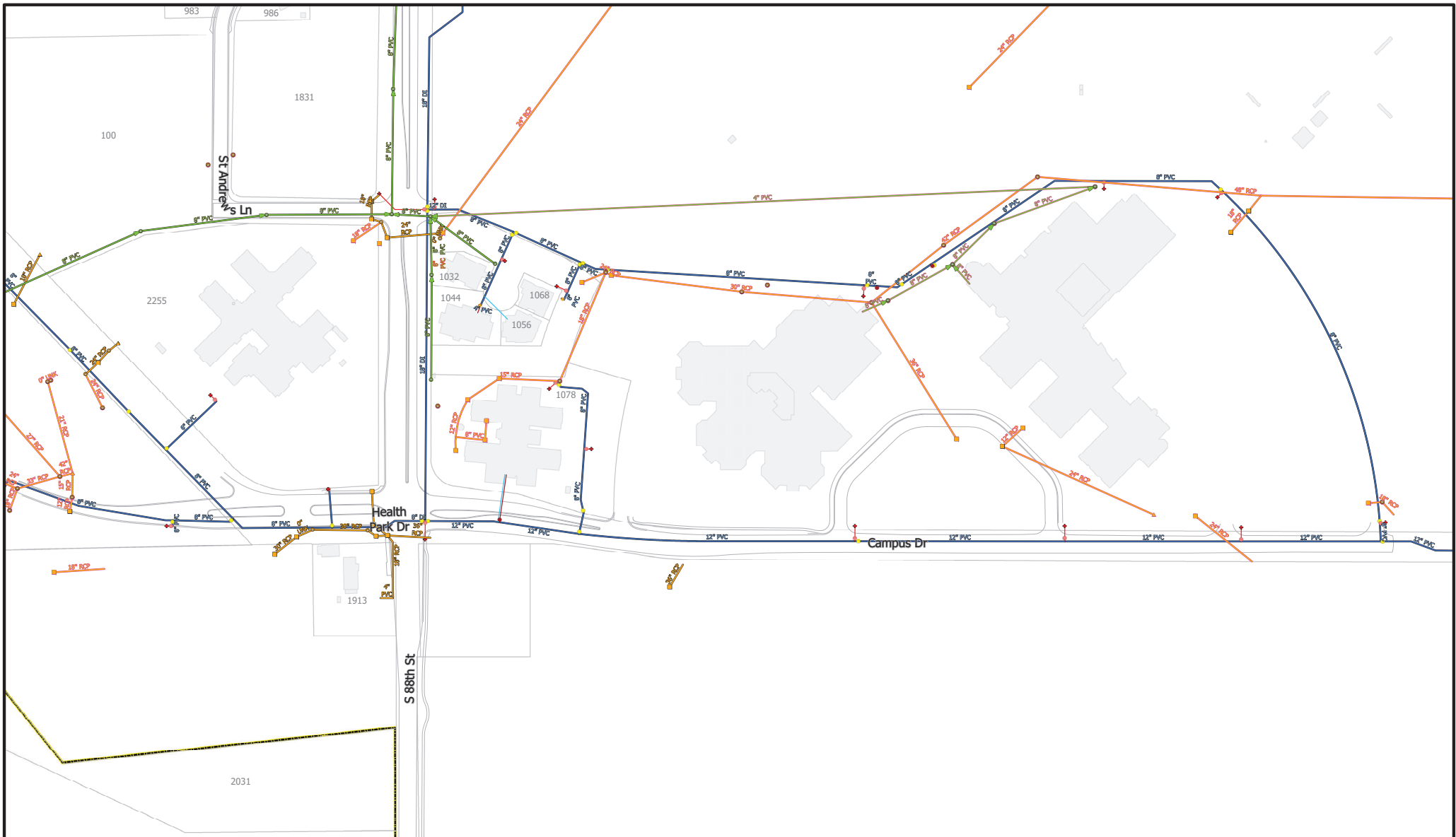
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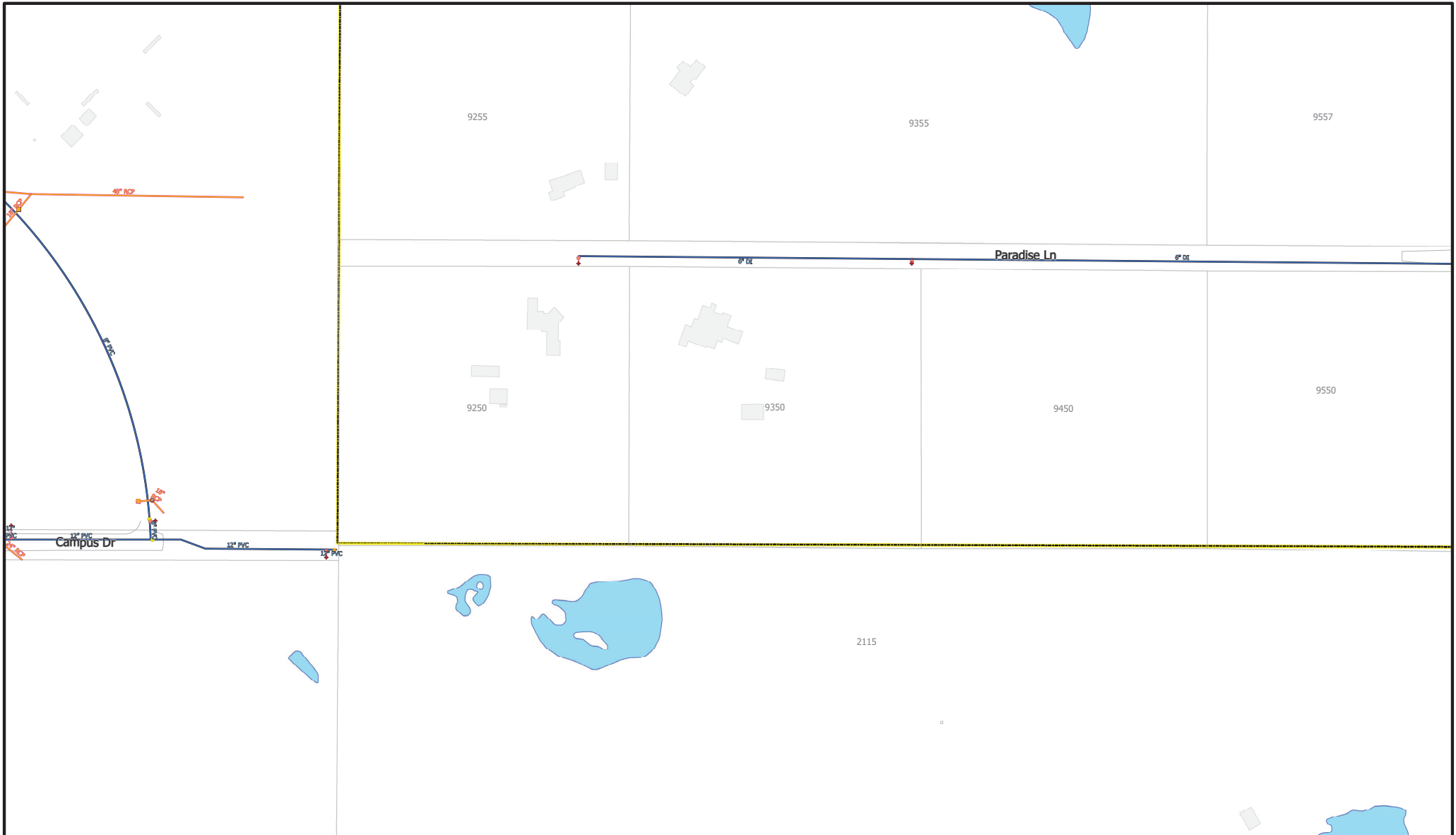
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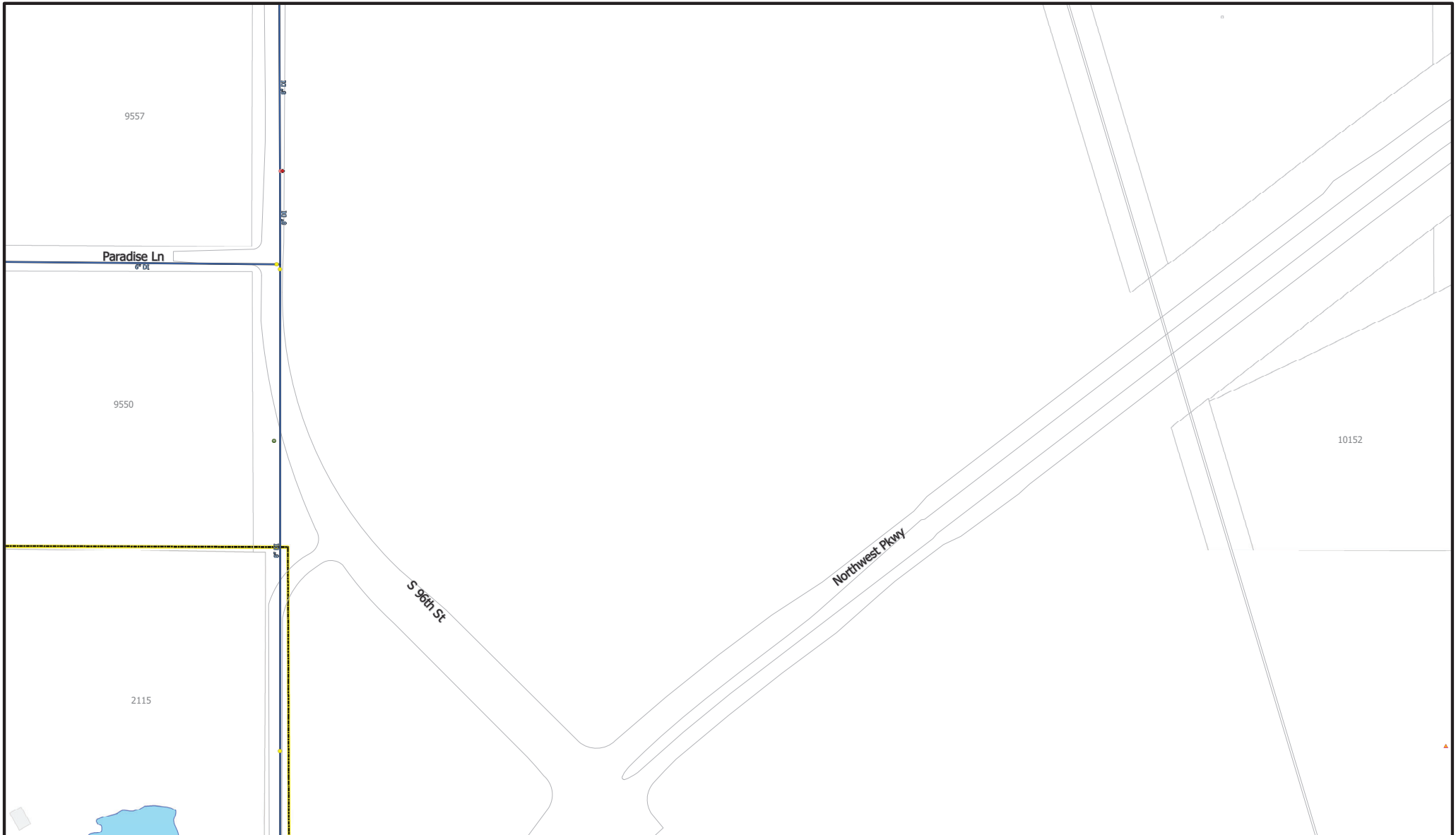
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0 200 400

Feet

1 inch = 100 feet at 22"x34" size



The City of **Louisville, Colorado**

2018 Utility Map Book Pages

SANITARY SEWER

- Clean Out
- Lift Station
- Public Manhole
- Private Manhole
- Active Main
- Abandoned Main
- Private Main

STORM SEWER

- Public Fitting
- Private Fitting
- Public Inlet
- Private Inlet
- Public Manhole
- Private Manhole
- Active Main
- Abandoned Main
- Private Main

WATER SYSTEM

- Fire Hydrant
- Airvac
- Check Valve
- PRV
- Blow-Off Valve
- Fireline Valve
- Fire Hydrant Valve
- Isolation Valve
- Fire Hydrant Line
- Active Main
- Abandoned Main
- Private Main
- Other Main

J6	J7	J8
K6	K7	--
L6	L7	--



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- Private Main

STORM SEWER

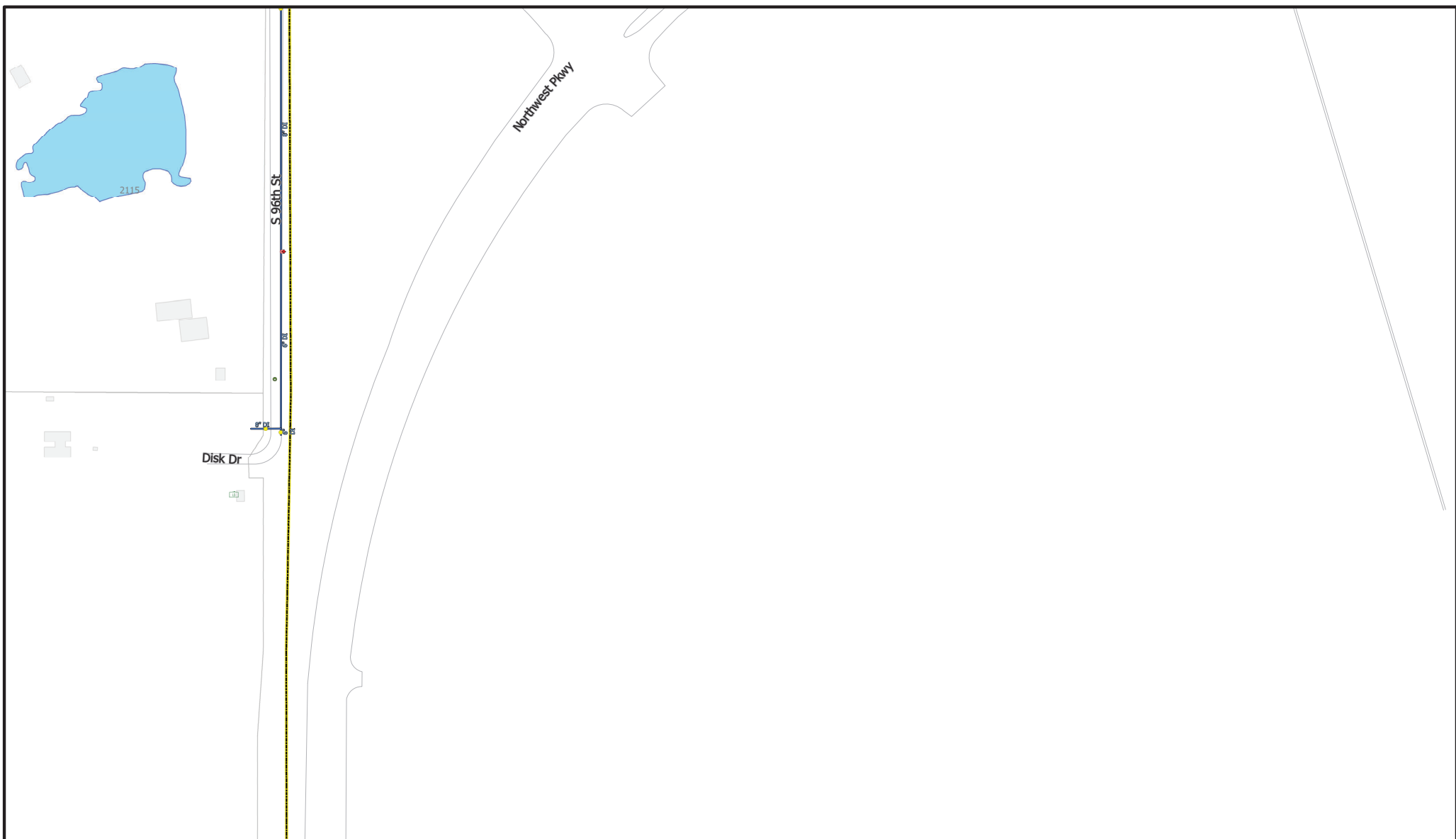
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- ▲ Private Fitting
- Public Inlet
- Private Inlet
- Public Manhole
- Private Manhole
- Active Main
- Abandoned Main
- Private Main

WATER SYSTEM

- ◆ Fire Hydrant
- ⊙ Airvac
- Check Valve
- PRV
- Blow-Off Valve
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- Isolation Valve
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- Private Main
- Other Main

K4	K5	K6
--	L5	L6
--	M5	M6





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The City of **Louisville, Colorado**

2018 Utility Map Book Pages

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- Private Main

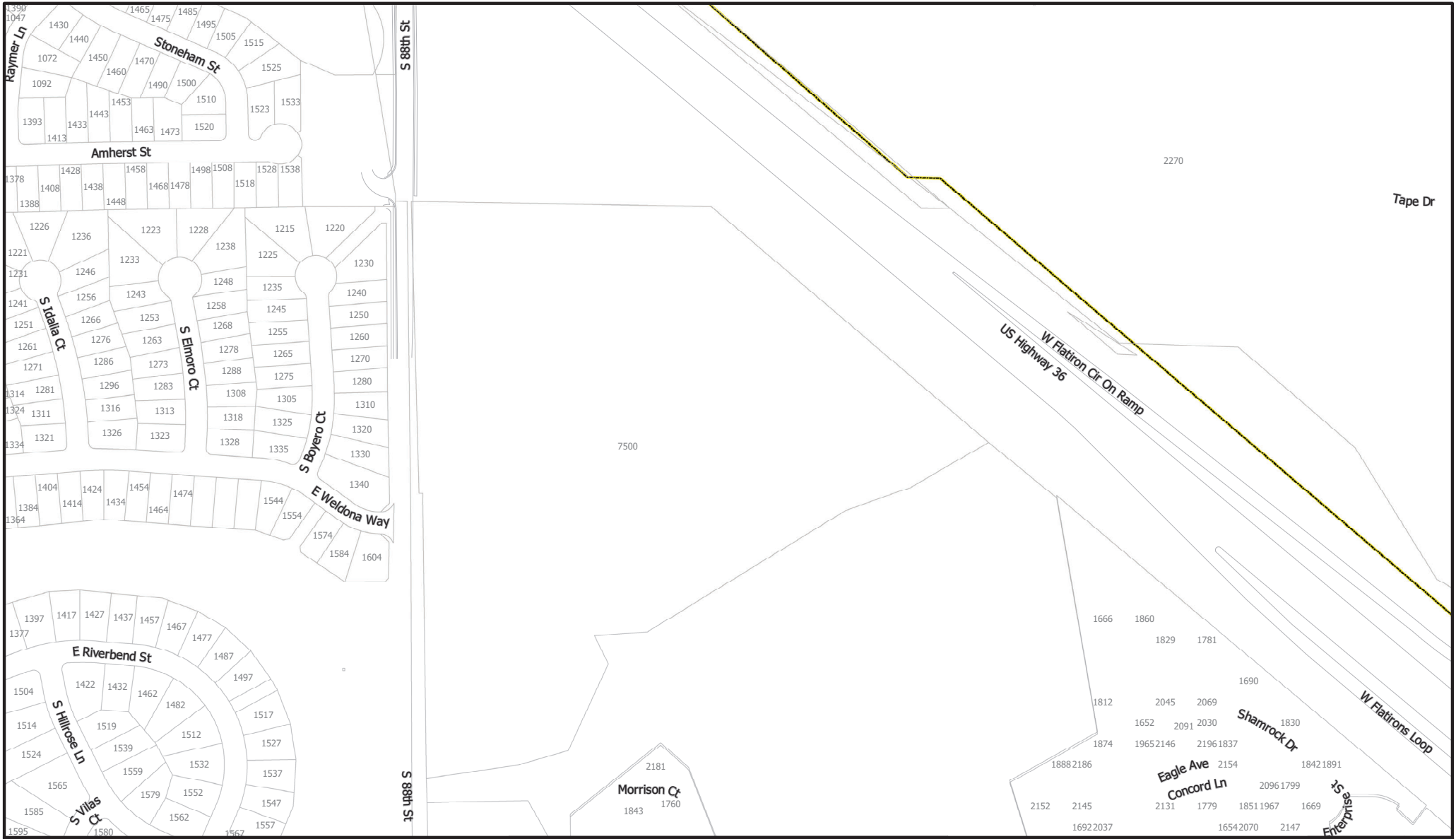
STORM SEWER

- ▲ Public Fitting
- ▲ Private Fitting
- Public Inlet
- Private Inlet
- Public Manhole
- Private Manhole
- Active Main
- Abandoned Main
- Private Main

WATER SYSTEM

- ◆ Fire Hydrant
- ⊙ Airvac
- Check Valve
- PRV
- Blow-Off Valve
- Fireline Valve
- Fire Hydrant Valve
- Isolation Valve
- Fire Hydrant Line
- Active Main
- Abandoned Main
- Private Main
- Other Main

K6	K7	--
L6	L7	--
M6	M7	--

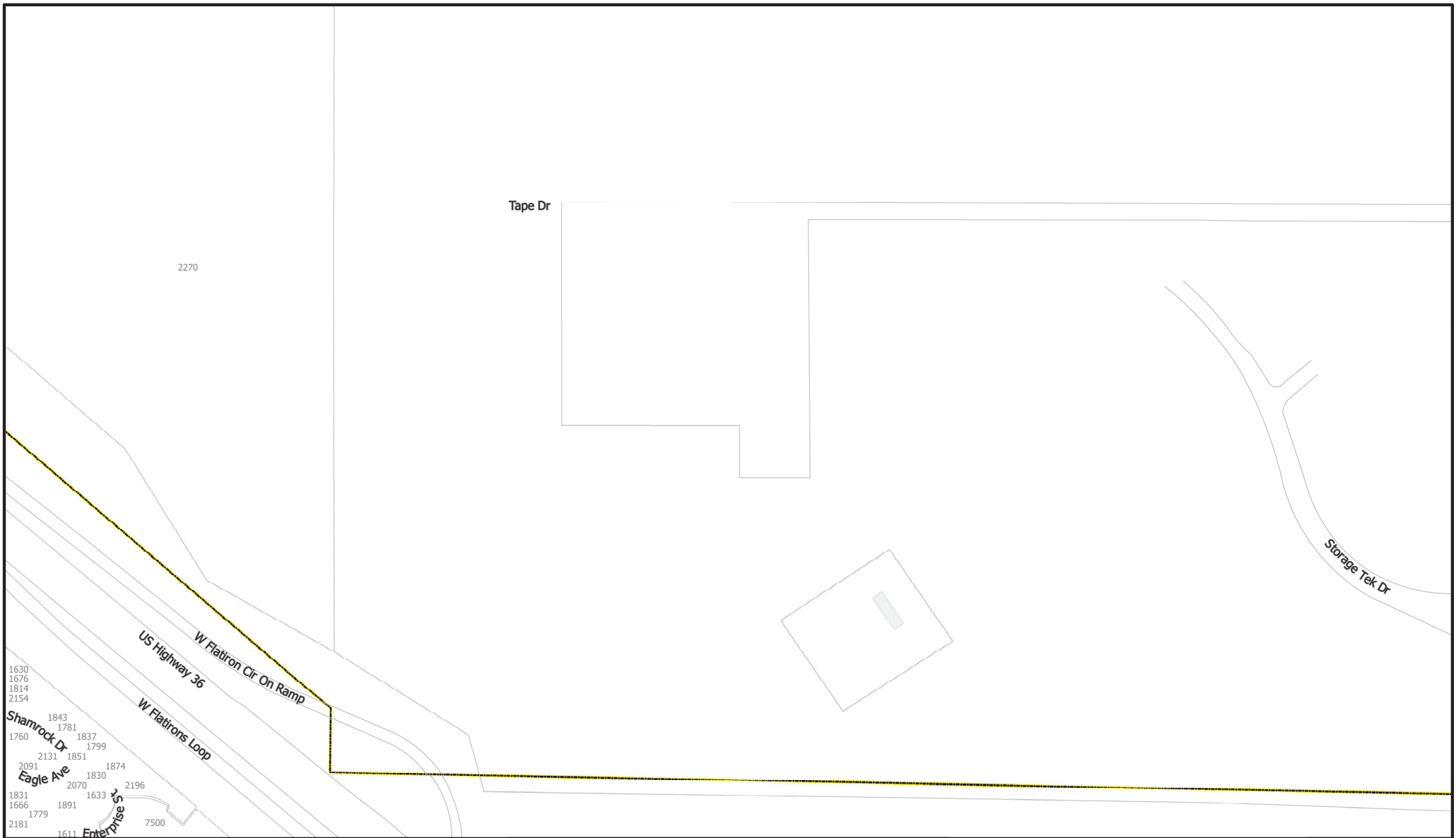


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0 200 400 Feet
1 inch = 100 feet at 22"x34" size

The City of Louisville, Colorado
2018 Utility Map Book Pages

SANITARY SEWER	STORM SEWER	WATER SYSTEM		L5	L6
- Clean Out - Lift Station - Public Manhole - Private Manhole - Active Main - Abandoned Main - Private Main	- Public Fitting - Private Fitting - Public Inlet - Private Inlet - Public Manhole - Private Manhole - Active Main	- Fire Hydrant - Airvac - Check Valve - PRV - Blow-Off Valve - Fireline Valve - Fire Hydrant Valve	- Isolation Valve - Fire Hydrant Line - Active Main - Abandoned Main - Private Main - Other Main	--	--
				M5	M6
				--	--



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The City of **Louisville, Colorado**

2018 Utility Map Book Pages

SANITARY SEWER

- Clean Out
- Lift Station
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- Abandoned Main
- Private Main

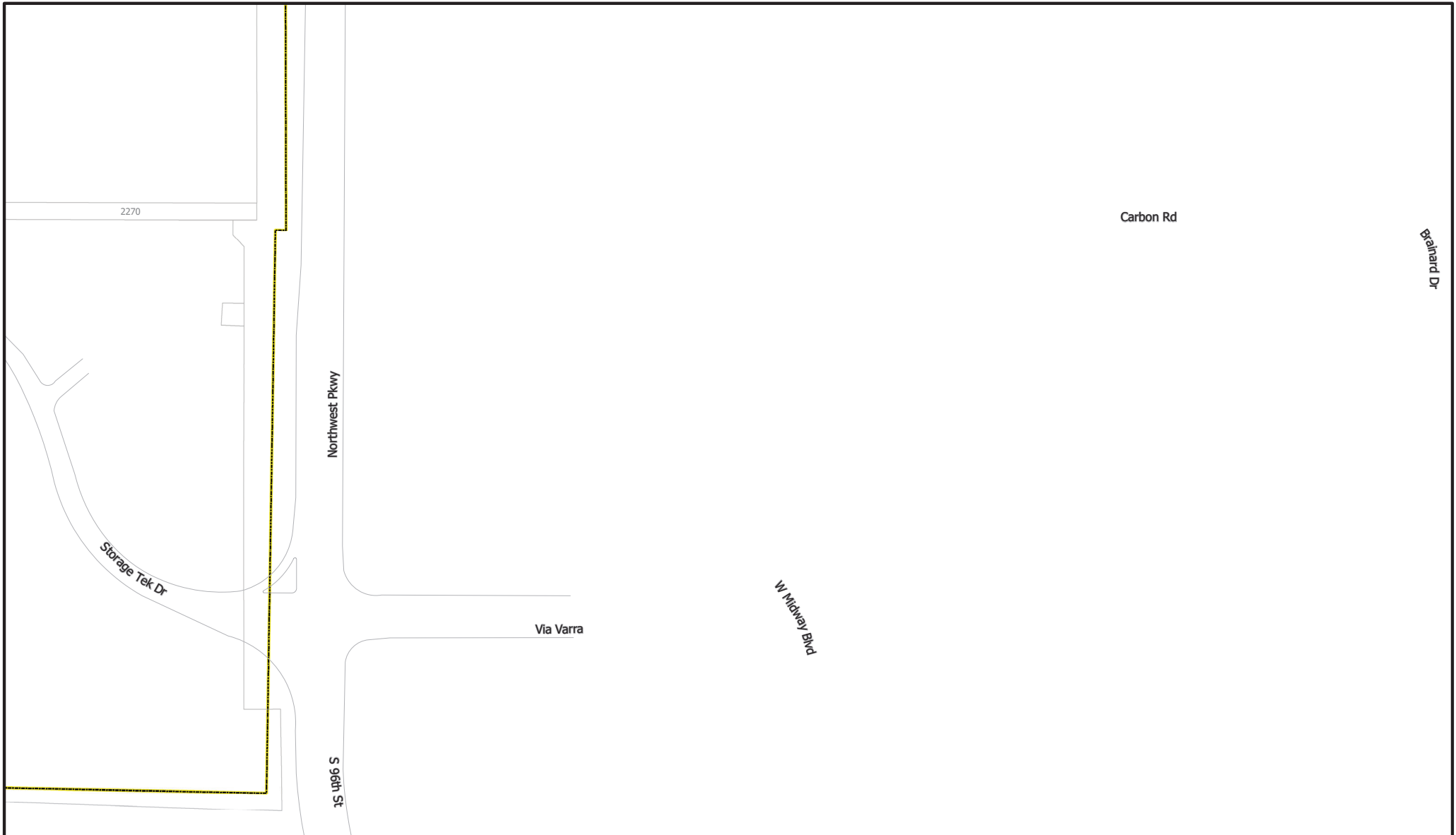
STORM SEWER

- ▲ Public Fitting
- ▲ Private Fitting
- Public Inlet
- Private Inlet
- Public Manhole
- Private Manhole
- Active Main
- Abandoned Main
- Private Main

WATER SYSTEM

- ◆ Fire Hydrant
- ⊗ Airvac
- Check Valve
- PRV
- Blow-Off Valve
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- Fire Hydrant Valve
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- Fire Hydrant Line
- Active Main
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- Private Main
- Other Main

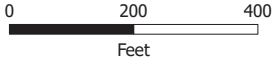
L5	L6	L7
M5	M6	M7
--	--	--



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The City of **Louisville, Colorado**

2018 Utility Map Book Pages

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- Abandoned Main
- Private Main

STORM SEWER

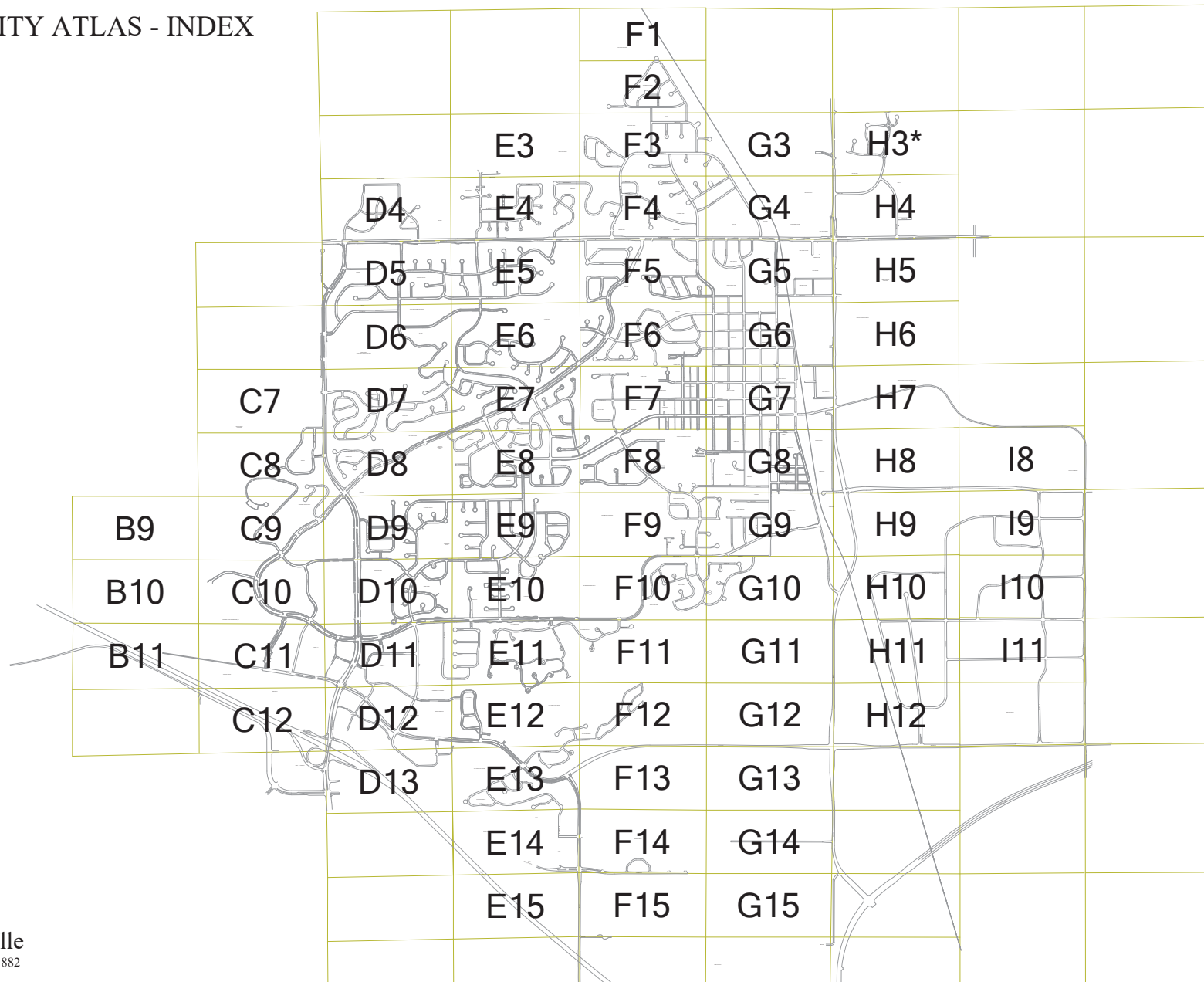
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- Private Fitting
- Public Inlet
- Private Inlet
- Public Manhole
- Private Manhole
- Active Main
- Abandoned Main
- Private Main

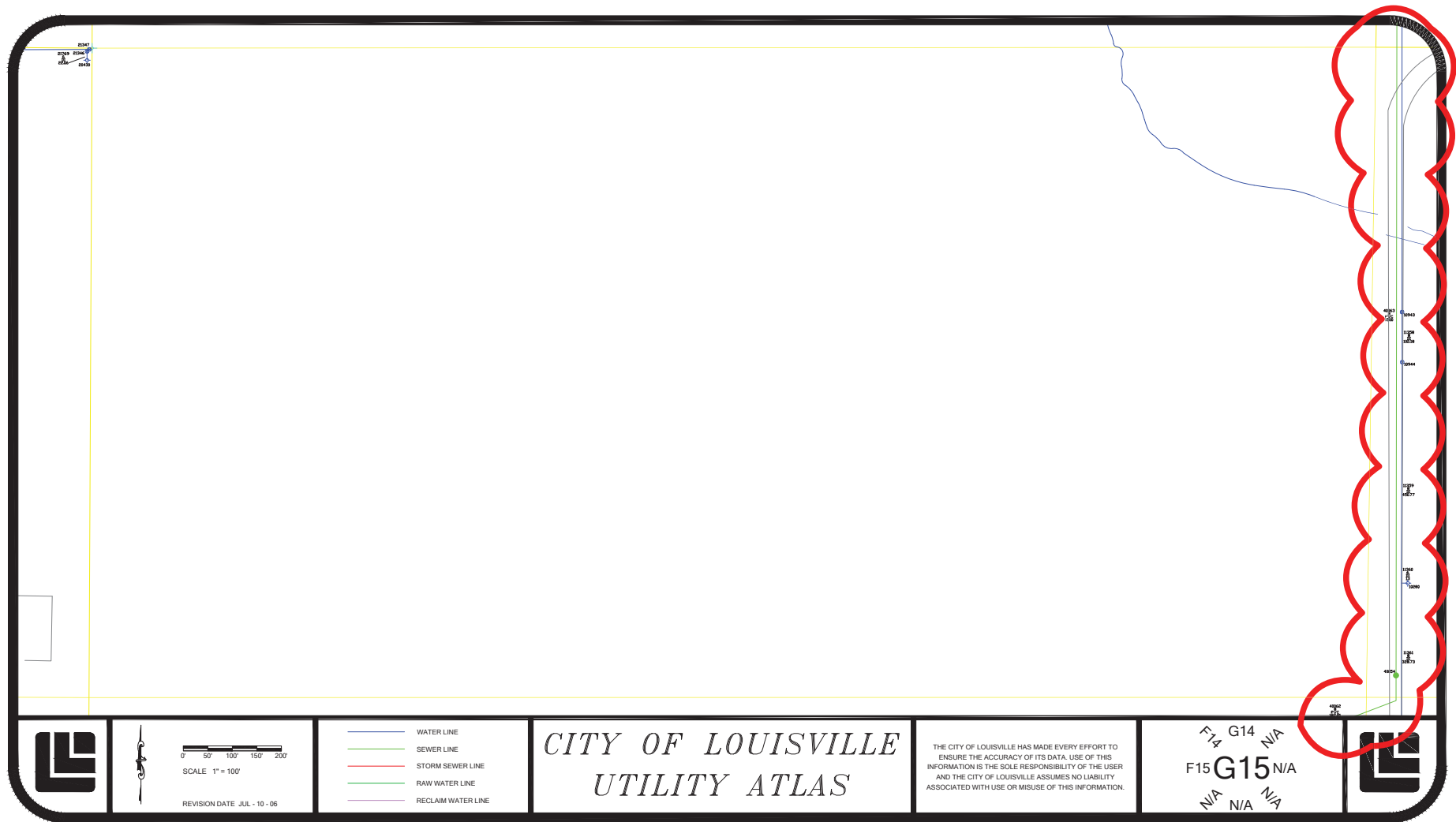
WATER SYSTEM

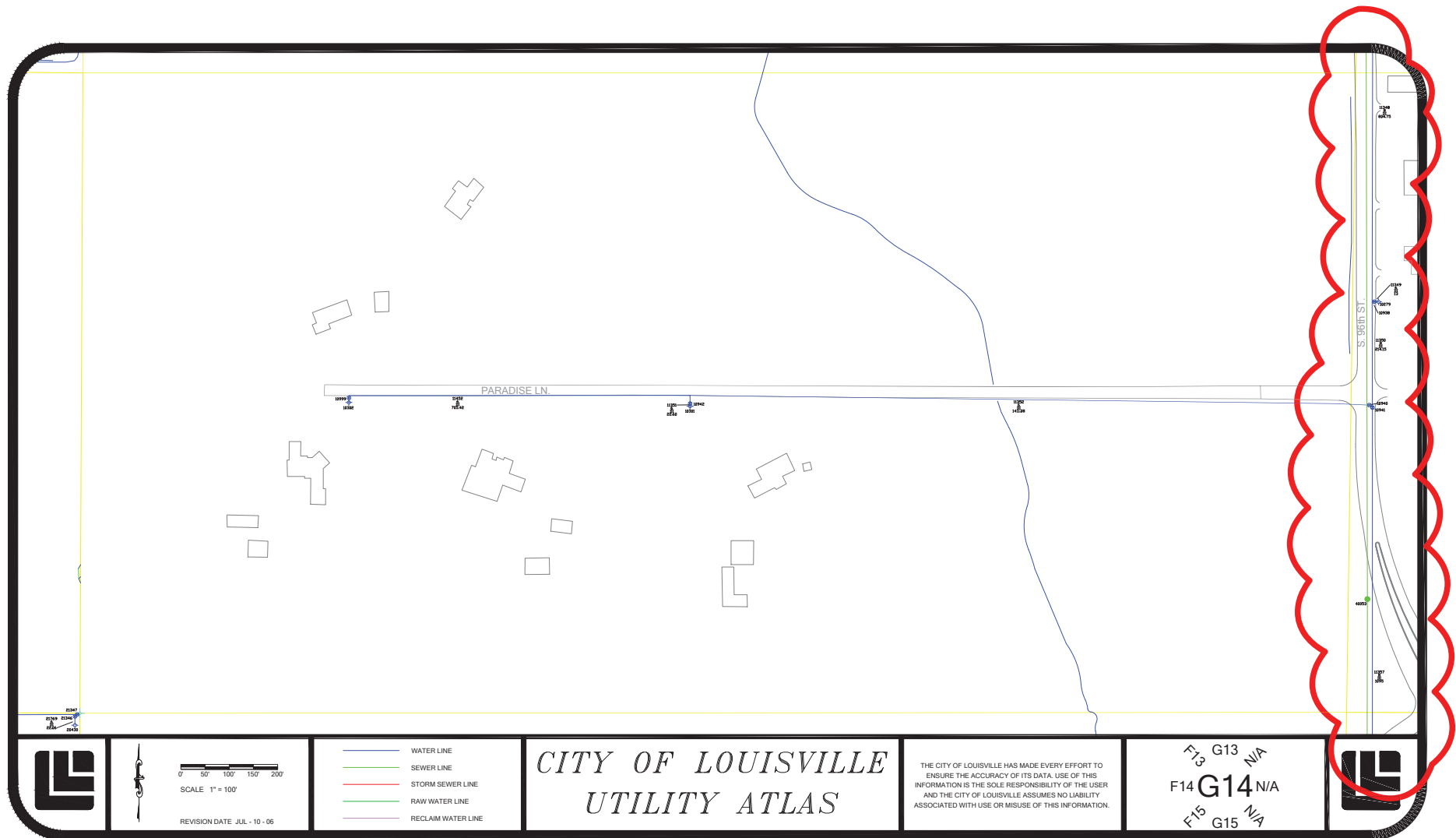
- Fire Hydrant
- Airvac
- Check Valve
- PRV
- Blow-Off Valve
- Fireline Valve
- Fire Hydrant Valve
- Isolation Valve
- Fire Hydrant Line
- Active Main
- Abandoned Main
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- Other Main

L6	L7	--
M6	M7	--
--	--	--

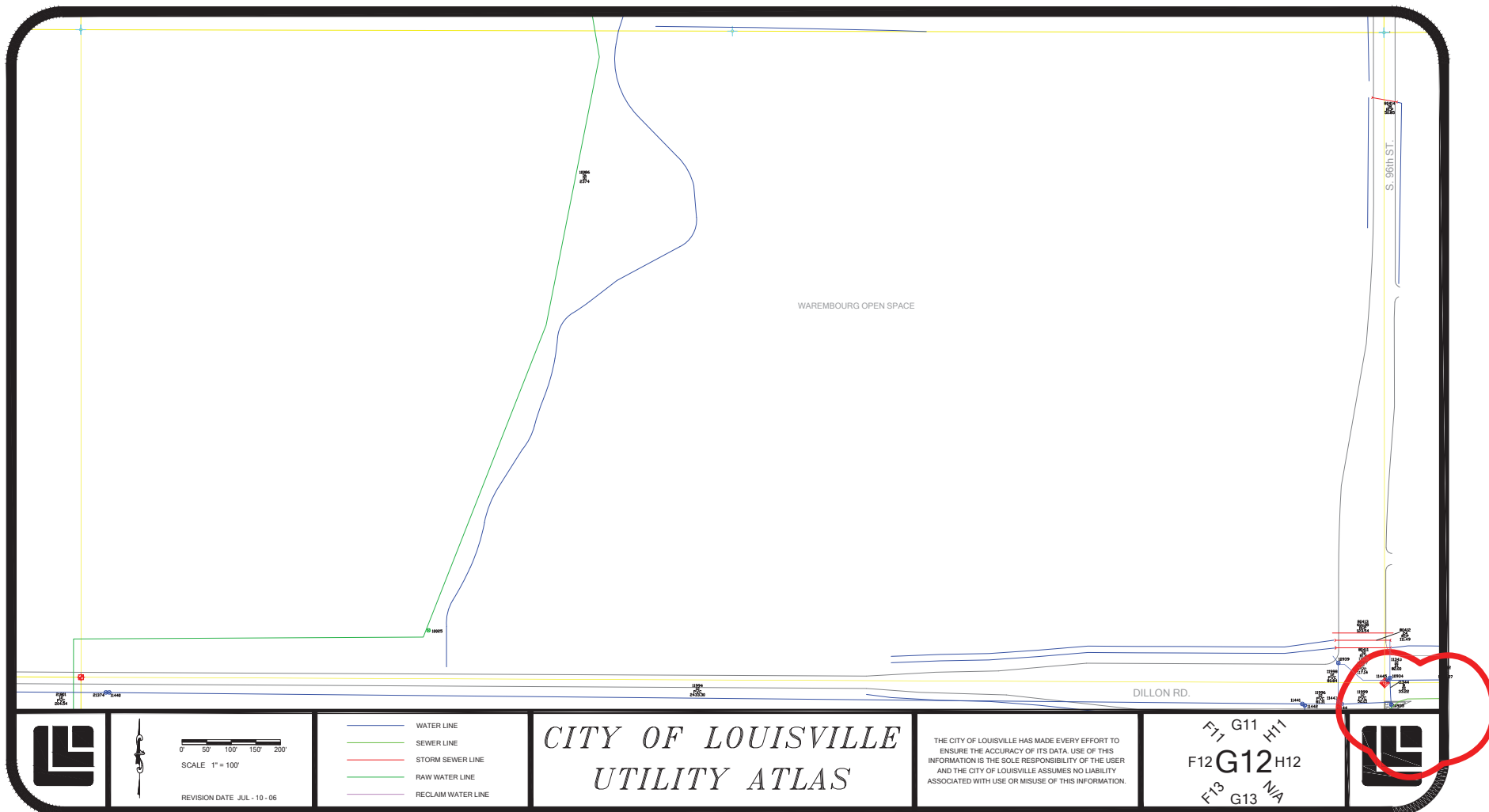
2007 UTILITY ATLAS - INDEX



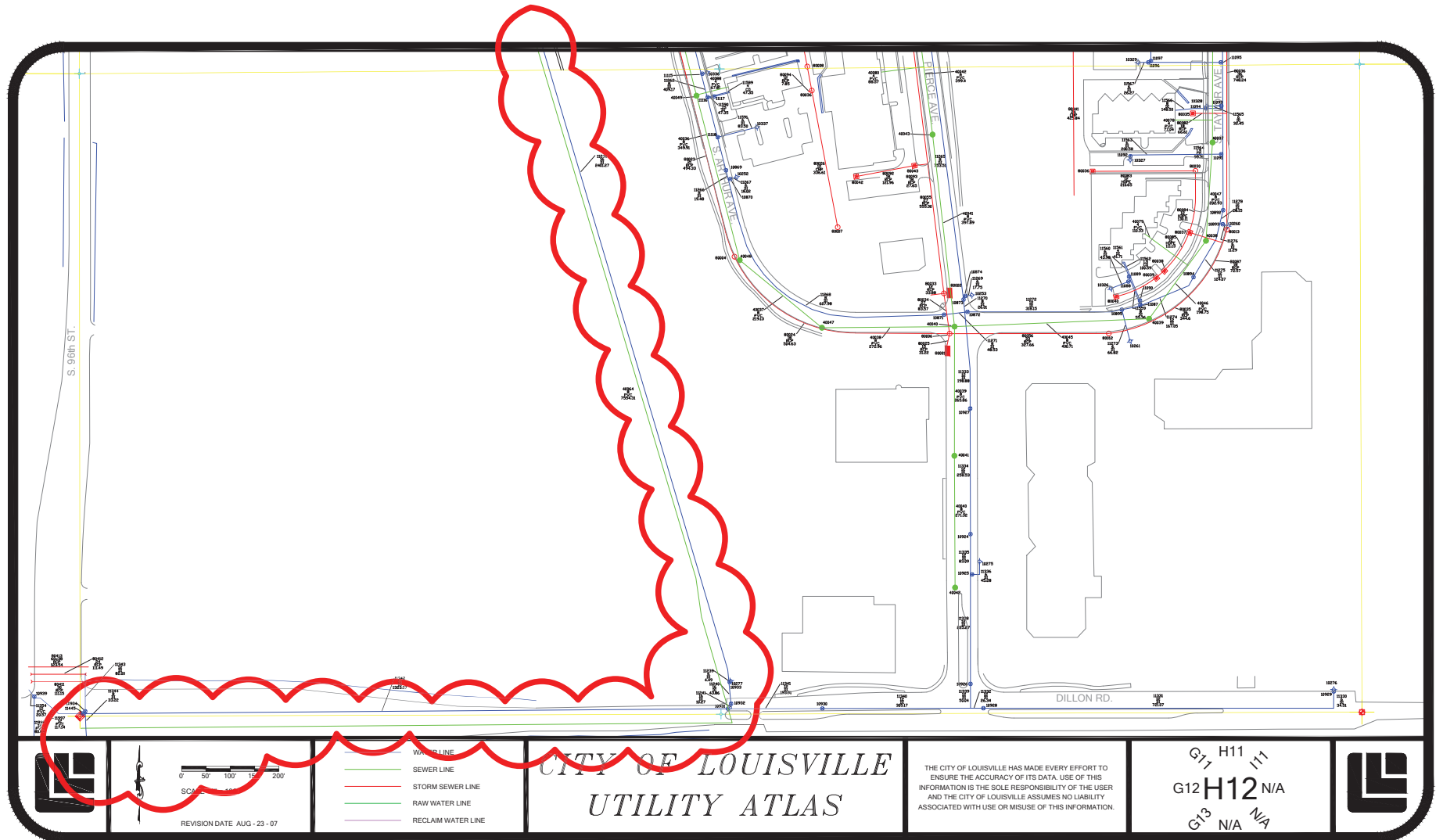


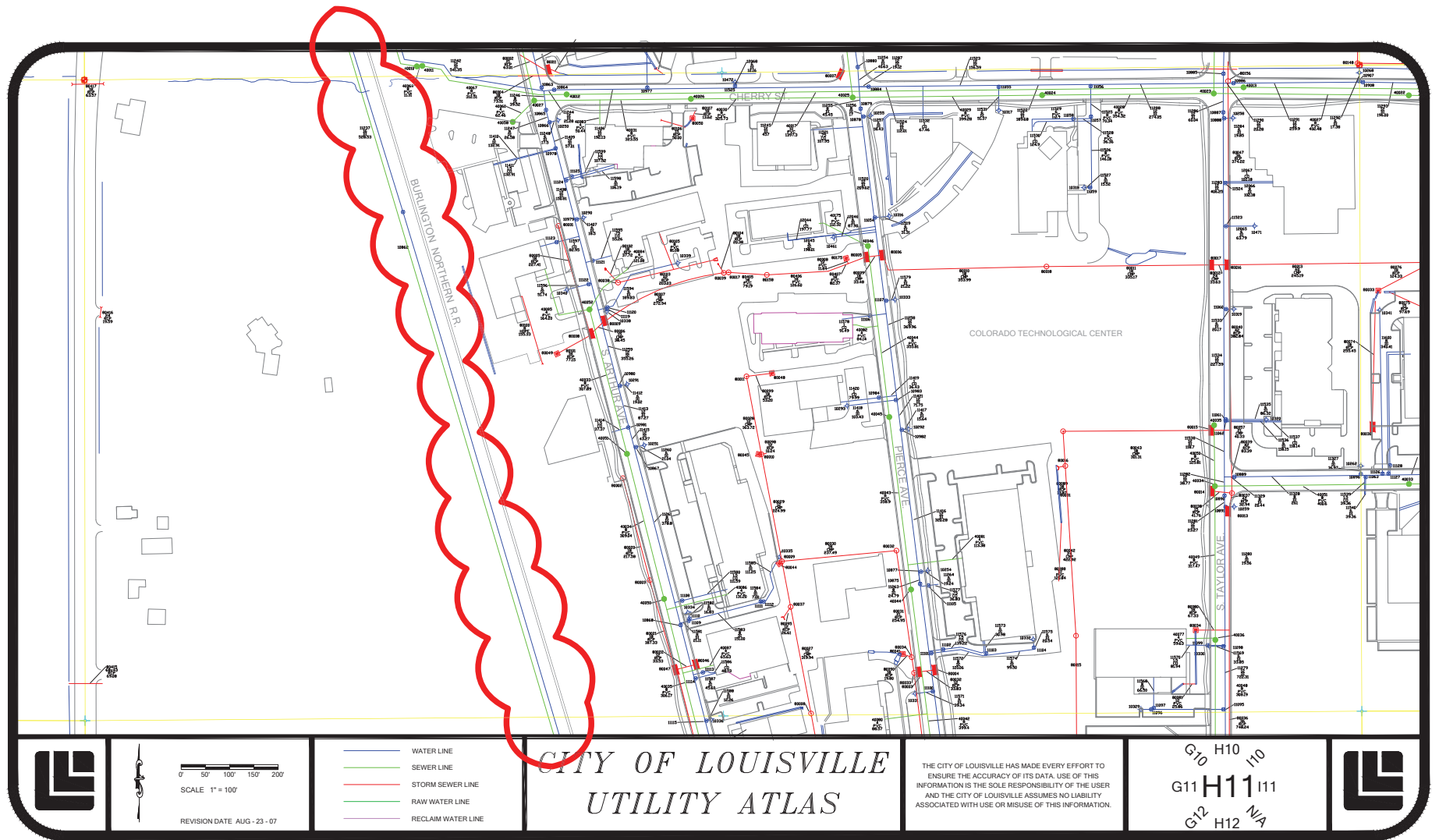




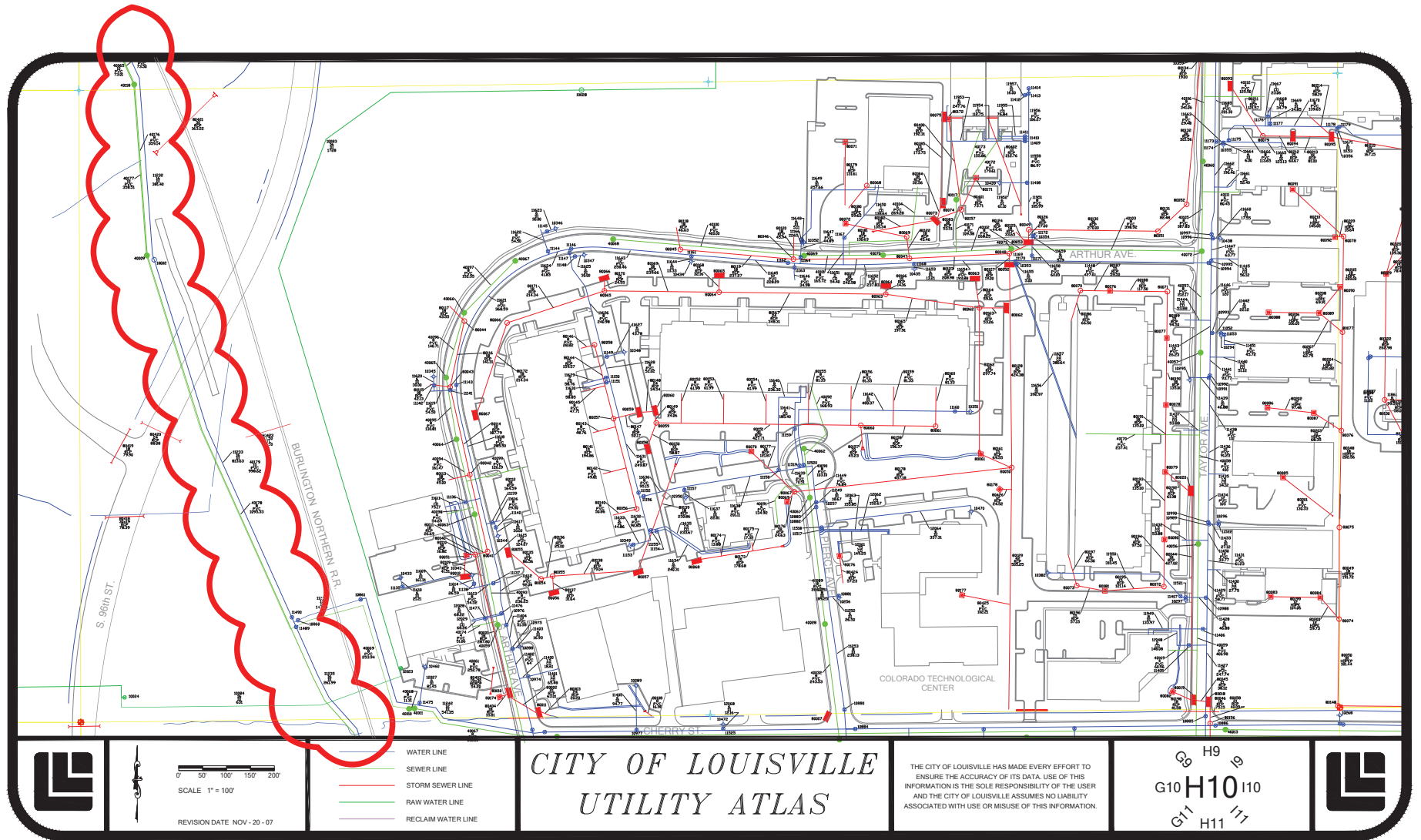


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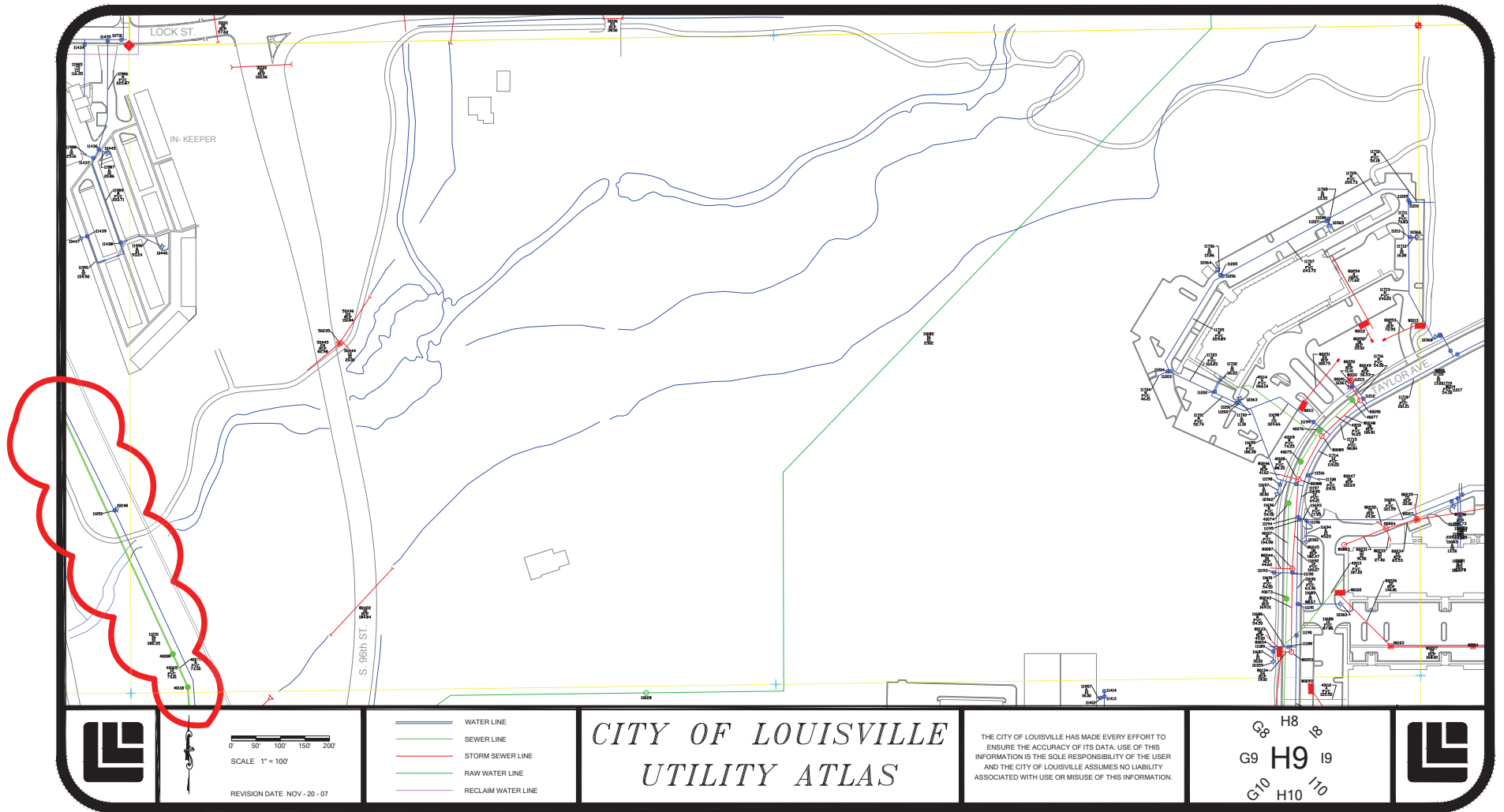




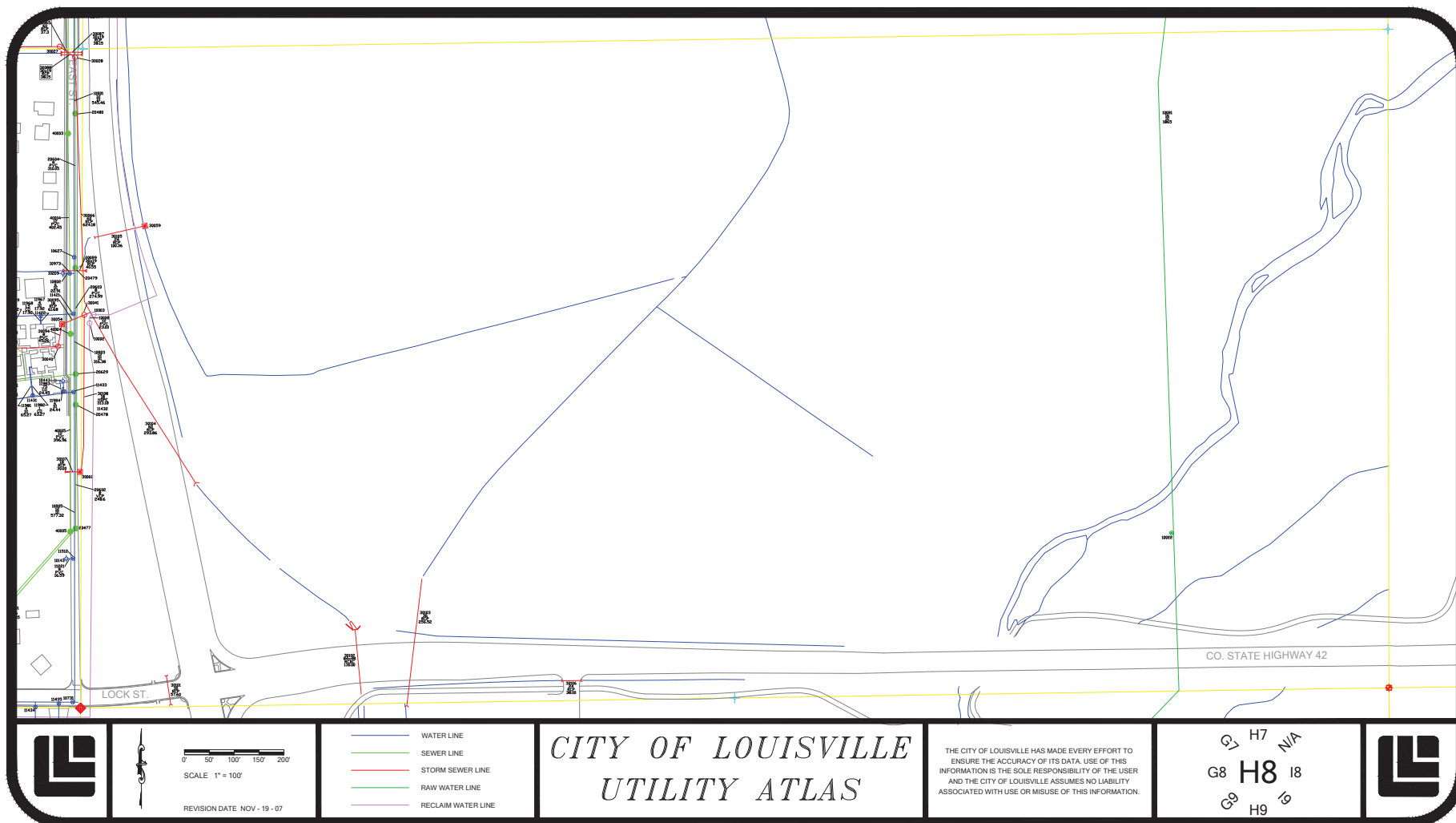
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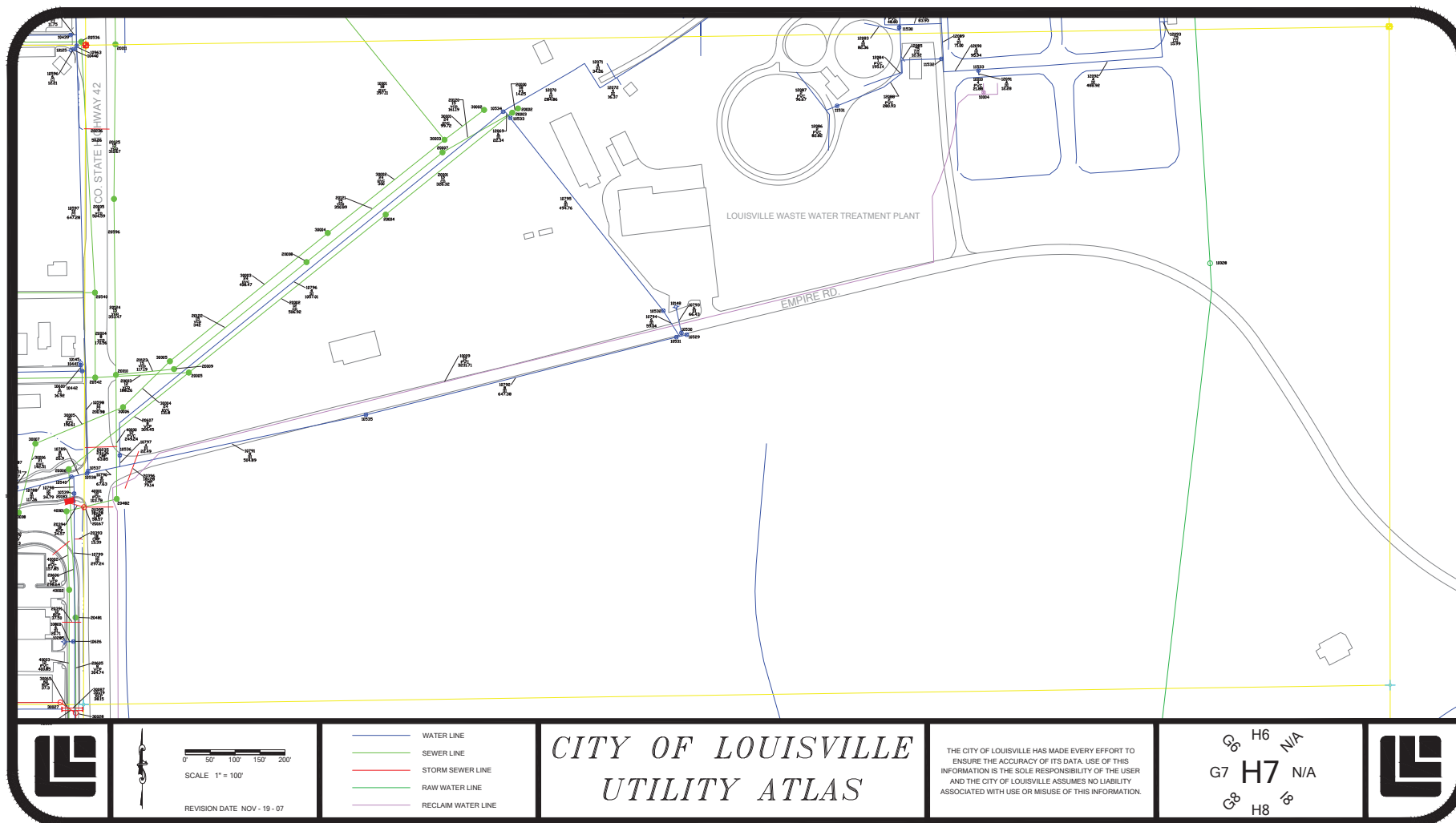
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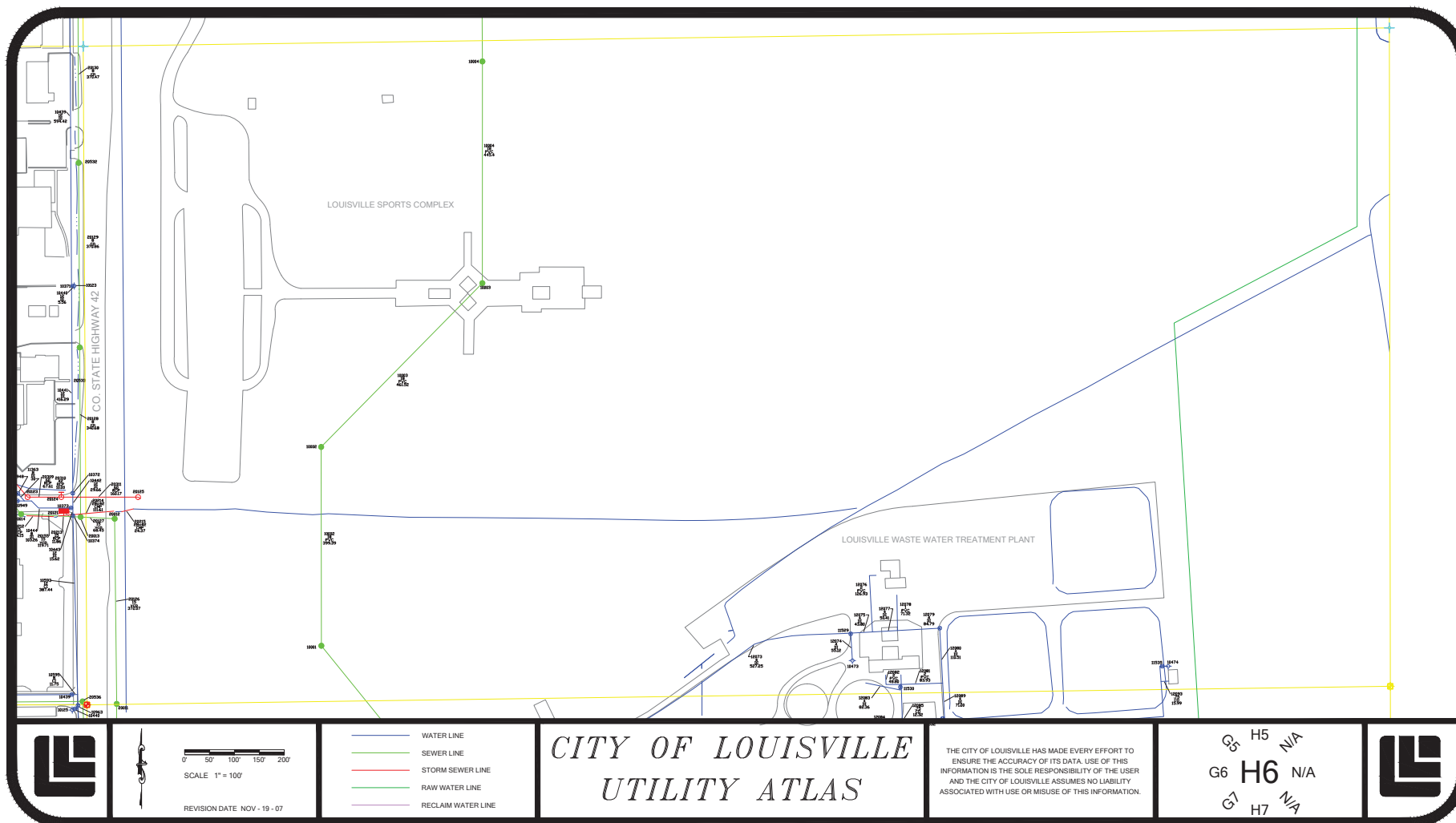
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APPENDIX D – Sanitary Sewer Capacity Calculations



On Site Sanitary Sewer Pipe Capacity (Known Depth)

Pipe Diameter (in)	Min Slope (%)	Max Flow Area (ft^2)	% Full	Flow (cfs)	Flow (MGD)	Velocity (fps)
8	0.40	0.35	100	0.83	0.54	2.42
10	0.28	0.54	100	1.22	0.79	2.29
12	0.22	0.79	100	1.76	1.14	2.26
15	0.15	1.23	100	2.50	1.62	2.04

Off Site Sanitary Sewer Pipe Capacity (Known Flow)

Pipe Diameter (in)	Min Slope (%)	Flow Area (ft^2)	% Full	Flow (cfs)	Flow (MGD)	Velocity (fps)
18	0.12	1.35	77	3.09	2.00	2.29
21	0.10	1.42	59	3.09	2.00	2.18
24	0.08	1.54	49	3.09	2.00	2.01

Assumptions:

Minimum pipe slopes per City of Louisville standards.

Mannings n-value = 0.013 per City of Louisville standards.

Note: The maximum buildout flow for the site is 2.0 MGD per the City of Louisville WWTP Expansion Redtail Ridge Report prepared by Dewberry.

Channel Report

Sanitary Line A - PUD 3

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.10

Highlighted

Depth (ft) = 0.17

Q (cfs) = 0.104

Area (sqft) = 0.07

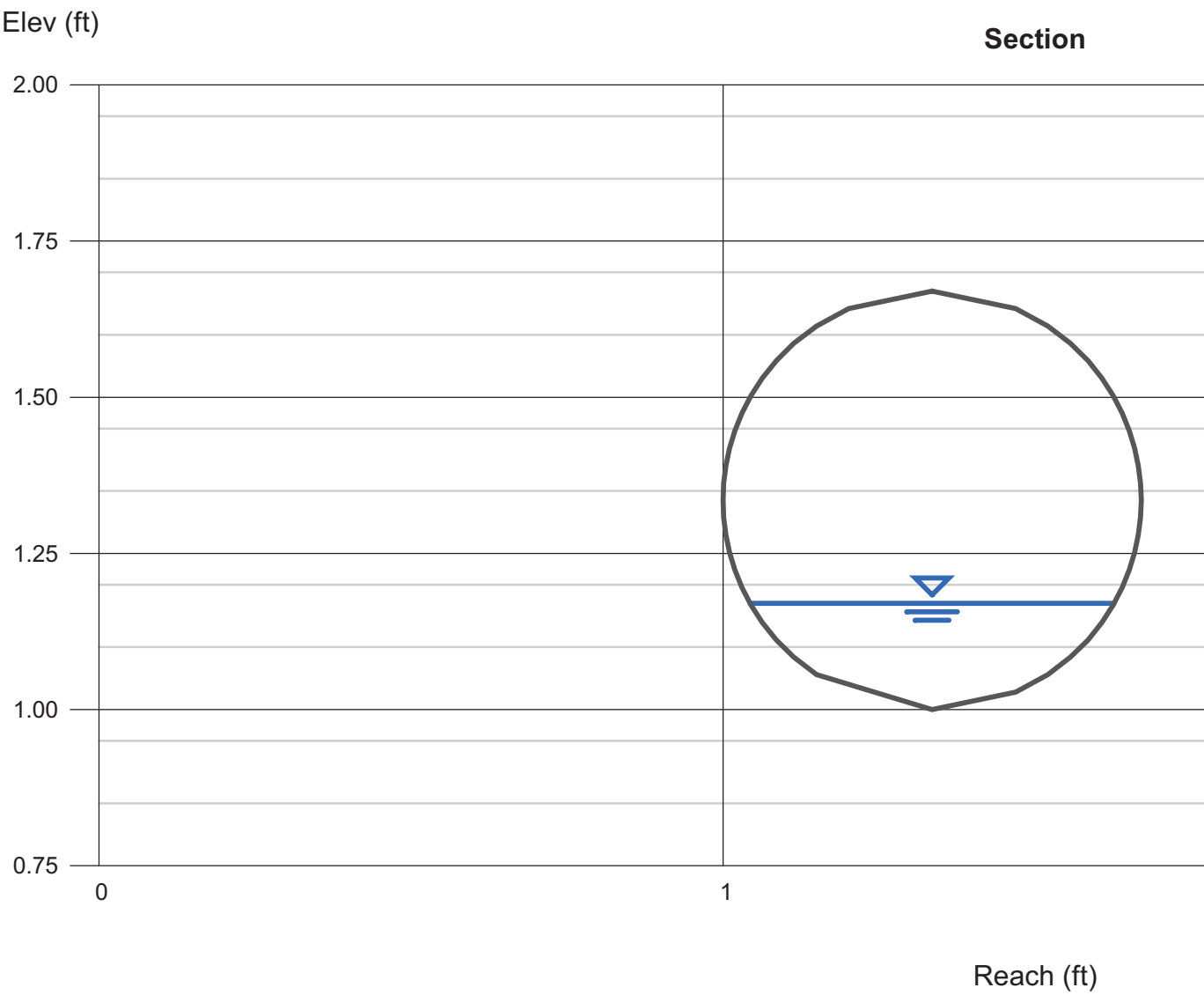
Velocity (ft/s) = 1.46

Wetted Perim (ft) = 0.71

Crit Depth, Yc (ft) = 0.15

Top Width (ft) = 0.58

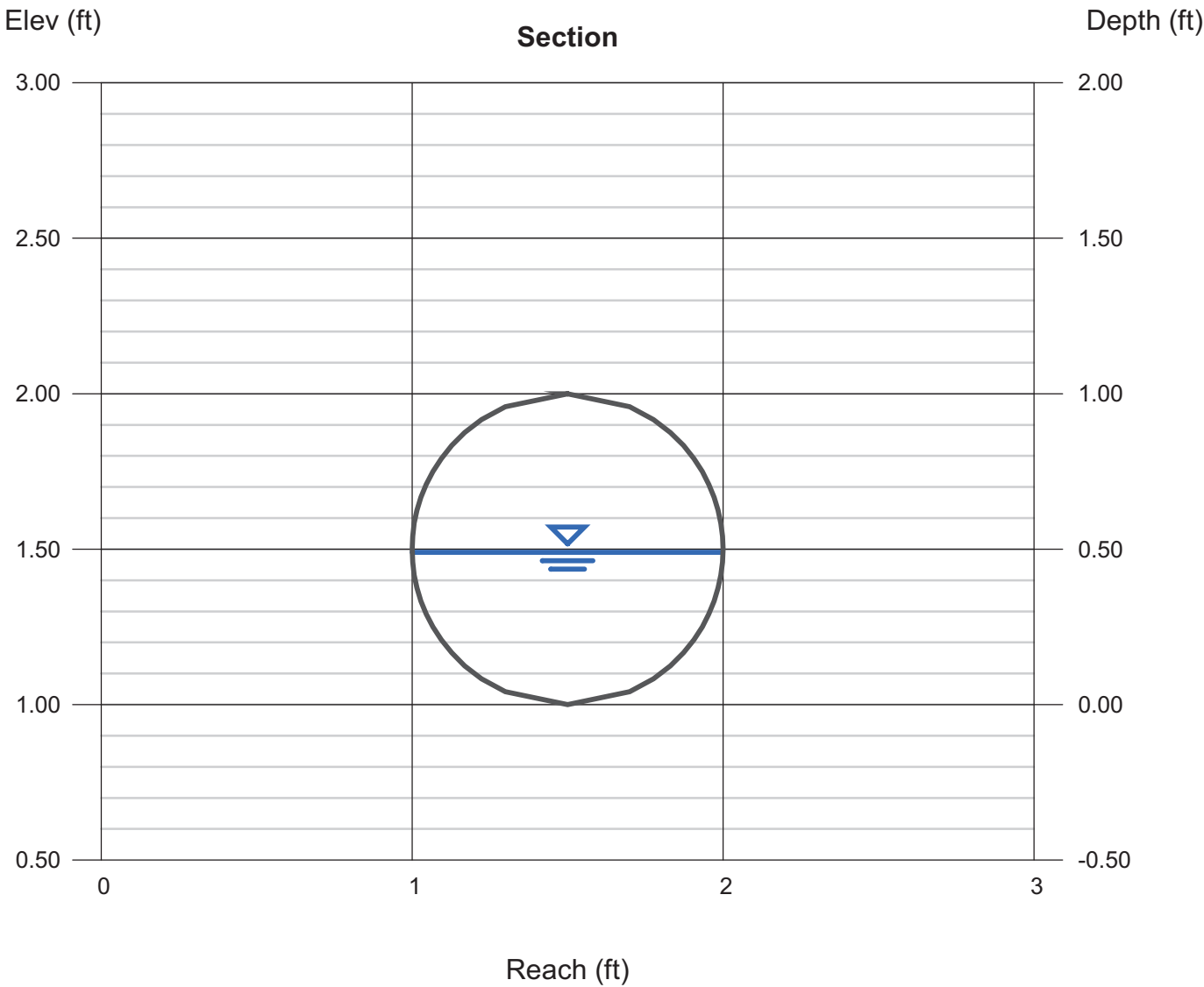
EGL (ft) = 0.20



Channel Report

Sanitary Line A - PUD 1-4, 6, 7

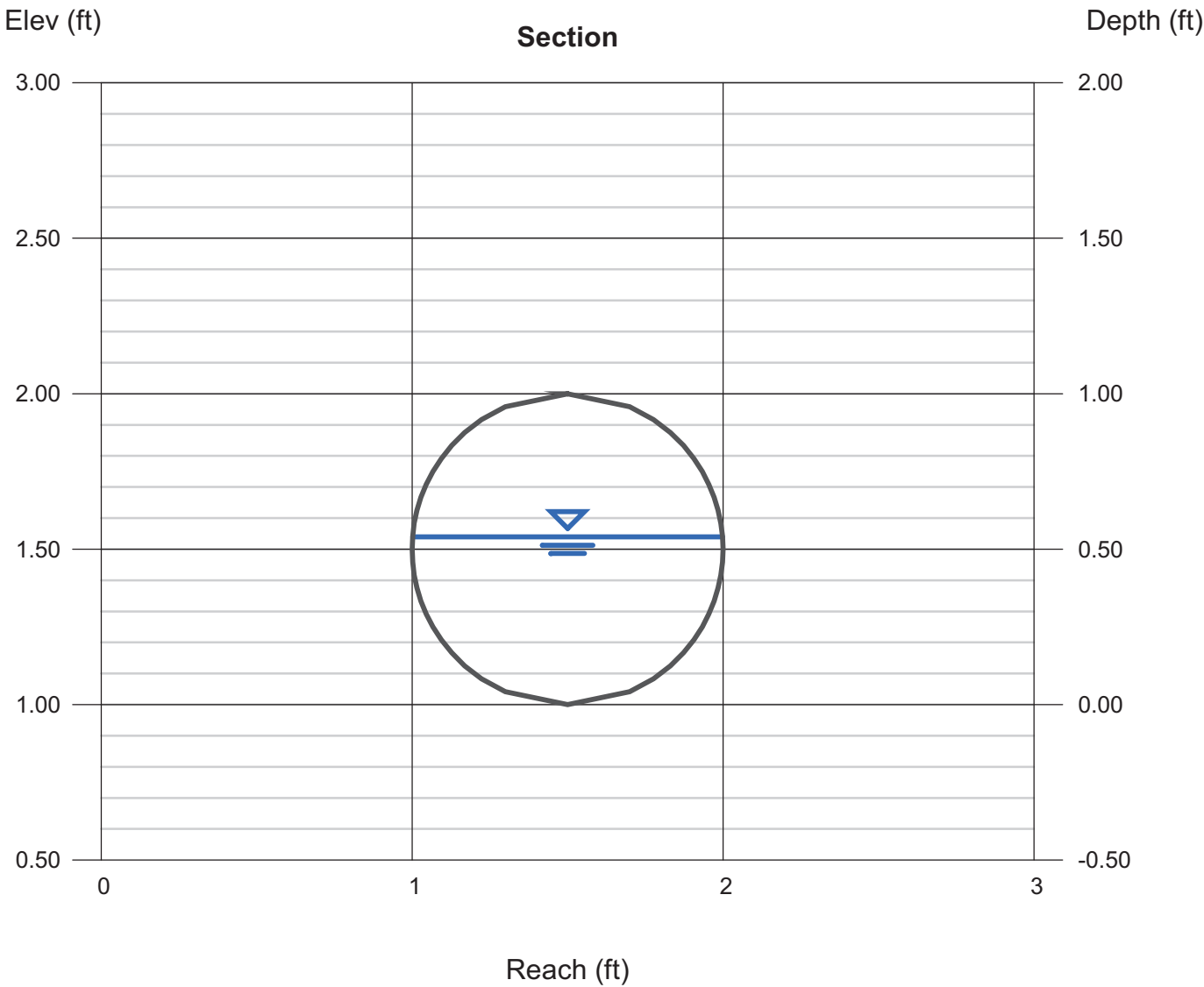
Circular		Highlighted	
Diameter (ft)	= 1.00	Depth (ft)	= 0.49
		Q (cfs)	= 0.790
		Area (sqft)	= 0.38
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.05
Slope (%)	= 0.22	Wetted Perim (ft)	= 1.55
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.38
		Top Width (ft)	= 1.00
		EGL (ft)	= 0.56
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 0.79		



Channel Report

Sanitary Line A - PUD 1-8

Circular		Highlighted	
Diameter (ft)	= 1.00	Depth (ft)	= 0.54
		Q (cfs)	= 0.932
		Area (sqft)	= 0.43
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.14
Slope (%)	= 0.22	Wetted Perim (ft)	= 1.65
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.41
		Top Width (ft)	= 1.00
		EGL (ft)	= 0.61
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 0.93		



Channel Report

Sanitary Line B - PUD 5, 8

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.12

Highlighted

Depth (ft) = 0.18

Q (cfs) = 0.120

Area (sqft) = 0.08

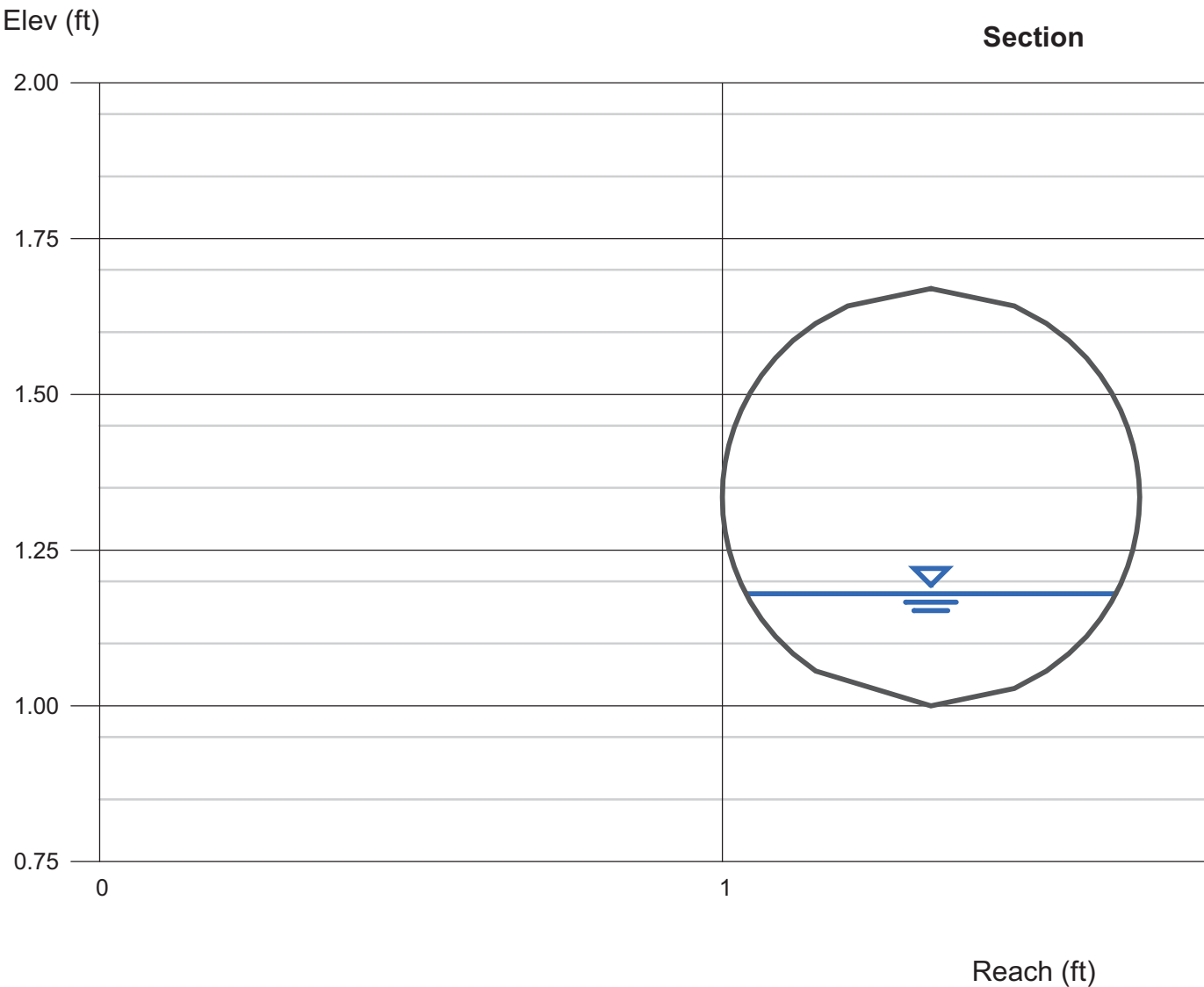
Velocity (ft/s) = 1.57

Wetted Perim (ft) = 0.73

Crit Depth, Yc (ft) = 0.16

Top Width (ft) = 0.59

EGL (ft) = 0.22



Channel Report

Sanitary Line C - PUD 8

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.07

Highlighted

Depth (ft) = 0.14

Q (cfs) = 0.072

Area (sqft) = 0.05

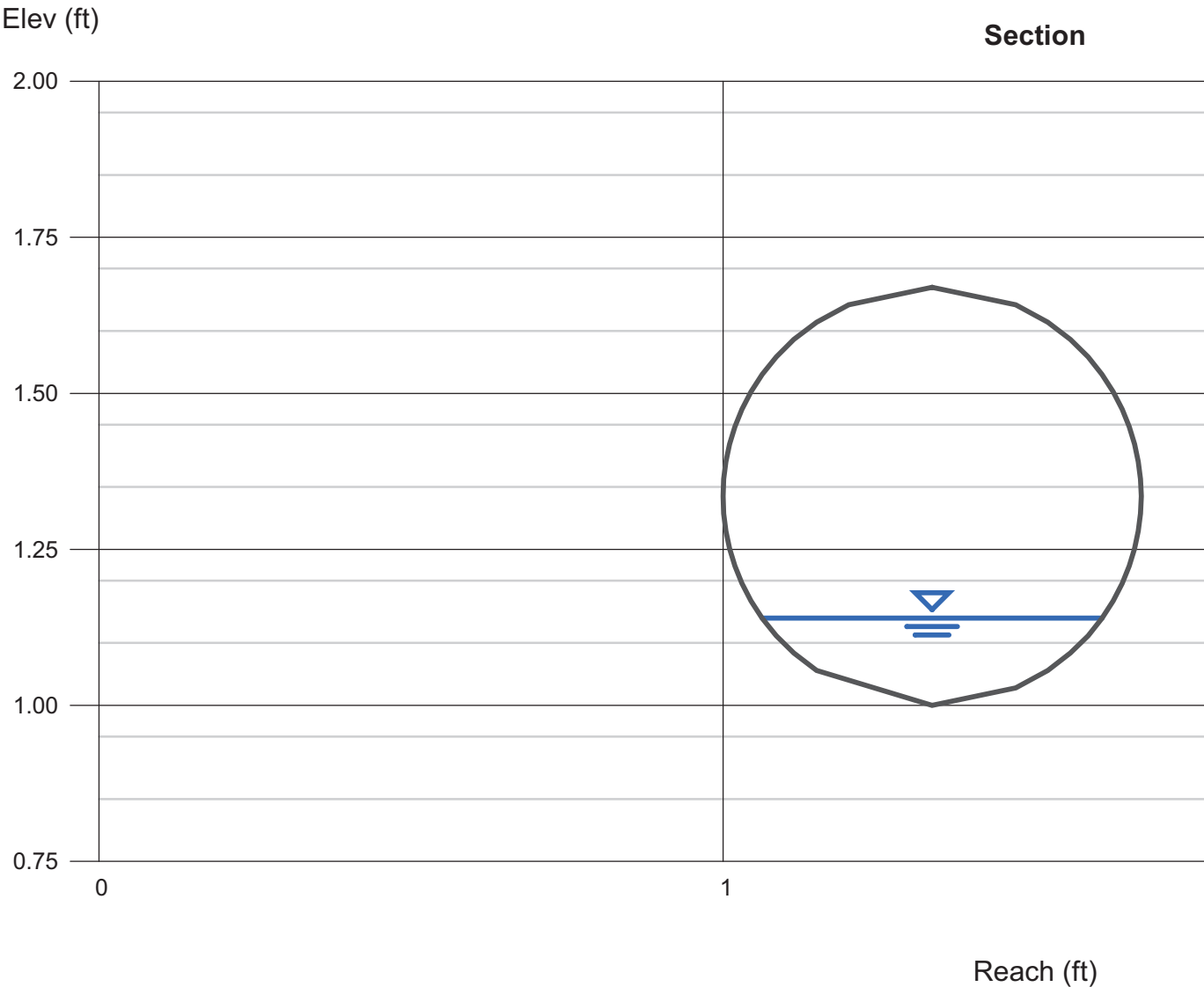
Velocity (ft/s) = 1.35

Wetted Perim (ft) = 0.64

Crit Depth, Yc (ft) = 0.13

Top Width (ft) = 0.54

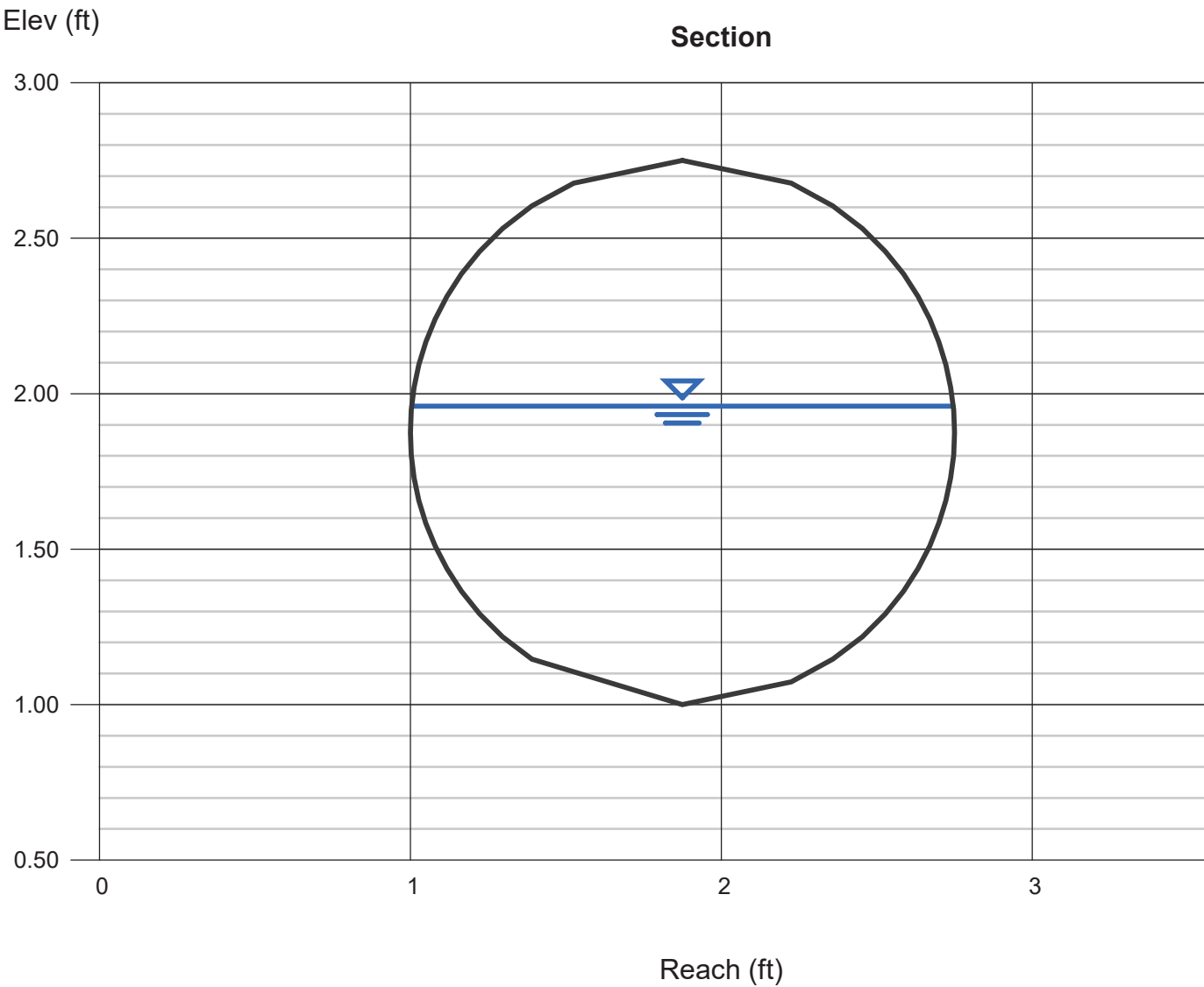
EGL (ft) = 0.17



Channel Report

21-inch Interceptor @ 0.216% Peak Flow = 4.314 cfs

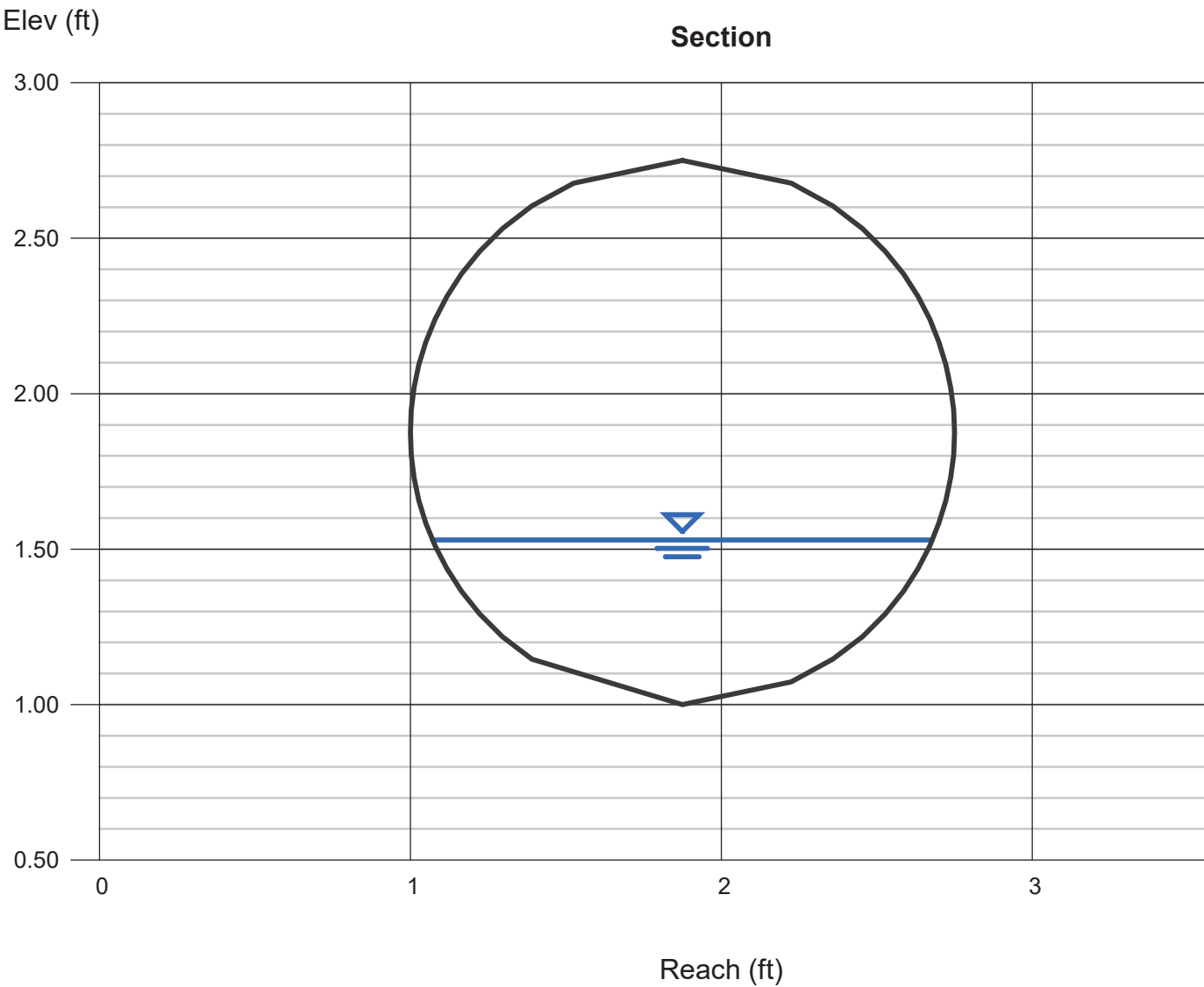
Circular		Highlighted	
Diameter (ft)	= 1.75	Depth (ft)	= 0.96
		Q (cfs)	= 4.314
		Area (sqft)	= 1.35
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 3.19
Slope (%)	= 0.22	Wetted Perim (ft)	= 2.92
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.76
		Top Width (ft)	= 1.74
		EGL (ft)	= 1.12
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 4.31		



Channel Report

21-inch Interceptor @ 0.216% Average Flow = 1.437 cfs

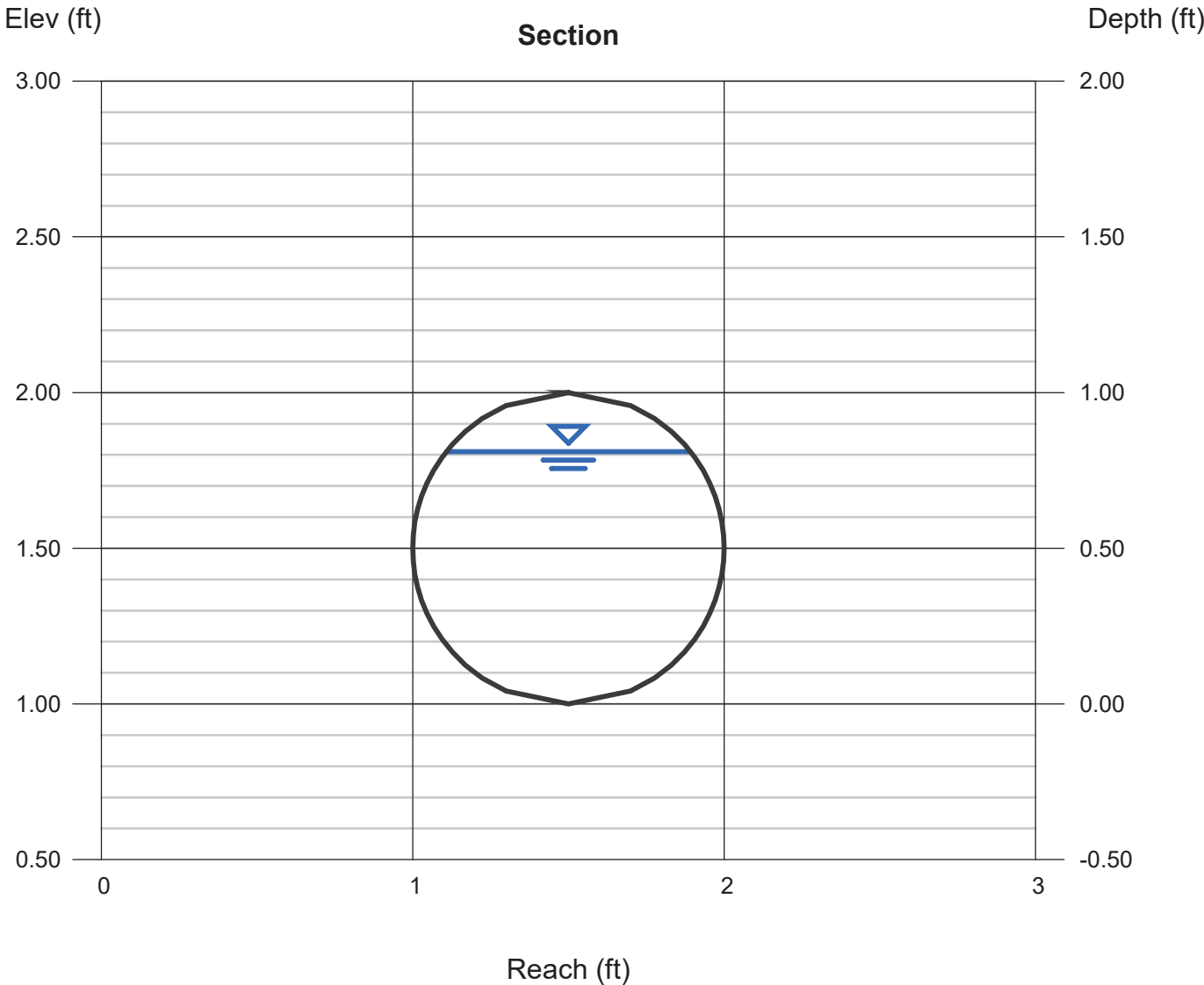
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Diameter (ft)	= 1.75	Depth (ft)	= 0.53
		Q (cfs)	= 1.439
		Area (sqft)	= 0.62
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.32
Slope (%)	= 0.22	Wetted Perim (ft)	= 2.05
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.43
		Top Width (ft)	= 1.61
		EGL (ft)	= 0.61
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 1.44		



Channel Report

Sanitary Line A - PUD 1-8

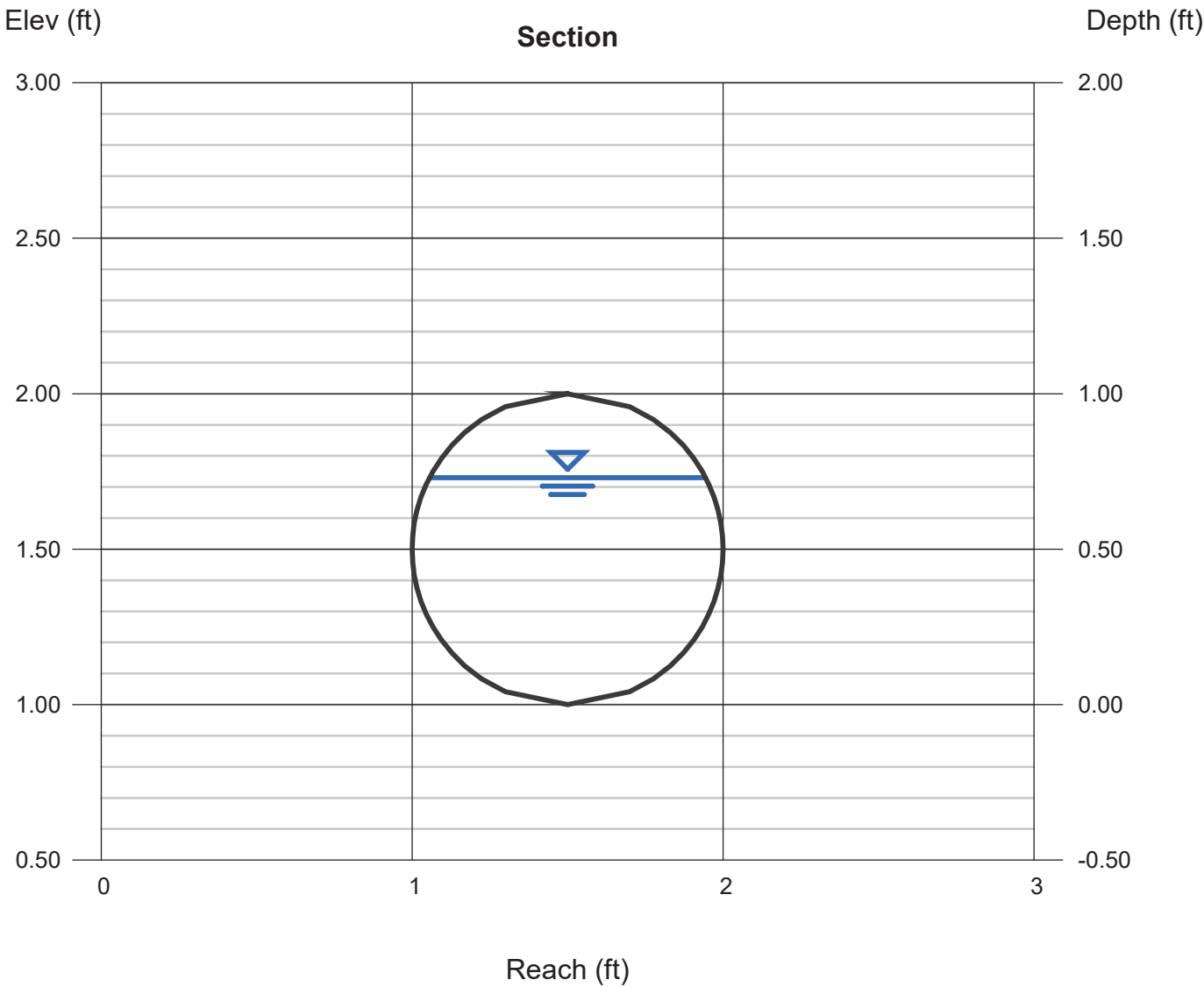
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Diameter (ft)	= 1.00	Depth (ft)	= 0.81
		Q (cfs)	= 1.652
		Area (sqft)	= 0.68
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.42
Slope (%)	= 0.22	Wetted Perim (ft)	= 2.24
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.55
		Top Width (ft)	= 0.78
		EGL (ft)	= 0.90
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 1.65		



Channel Report

Sanitary Line A - PUD 1-4, 6, 7

Circular		Highlighted	
Diameter (ft)	= 1.00	Depth (ft)	= 0.73
		Q (cfs)	= 1.470
		Area (sqft)	= 0.61
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.39
Slope (%)	= 0.22	Wetted Perim (ft)	= 2.05
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.52
		Top Width (ft)	= 0.89
		EGL (ft)	= 0.82
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 1.47		



Channel Report

Sanitary Line A - PUD 2 & 3

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.63

Highlighted

Depth (ft) = 0.46

Q (cfs) = 0.626

Area (sqft) = 0.26

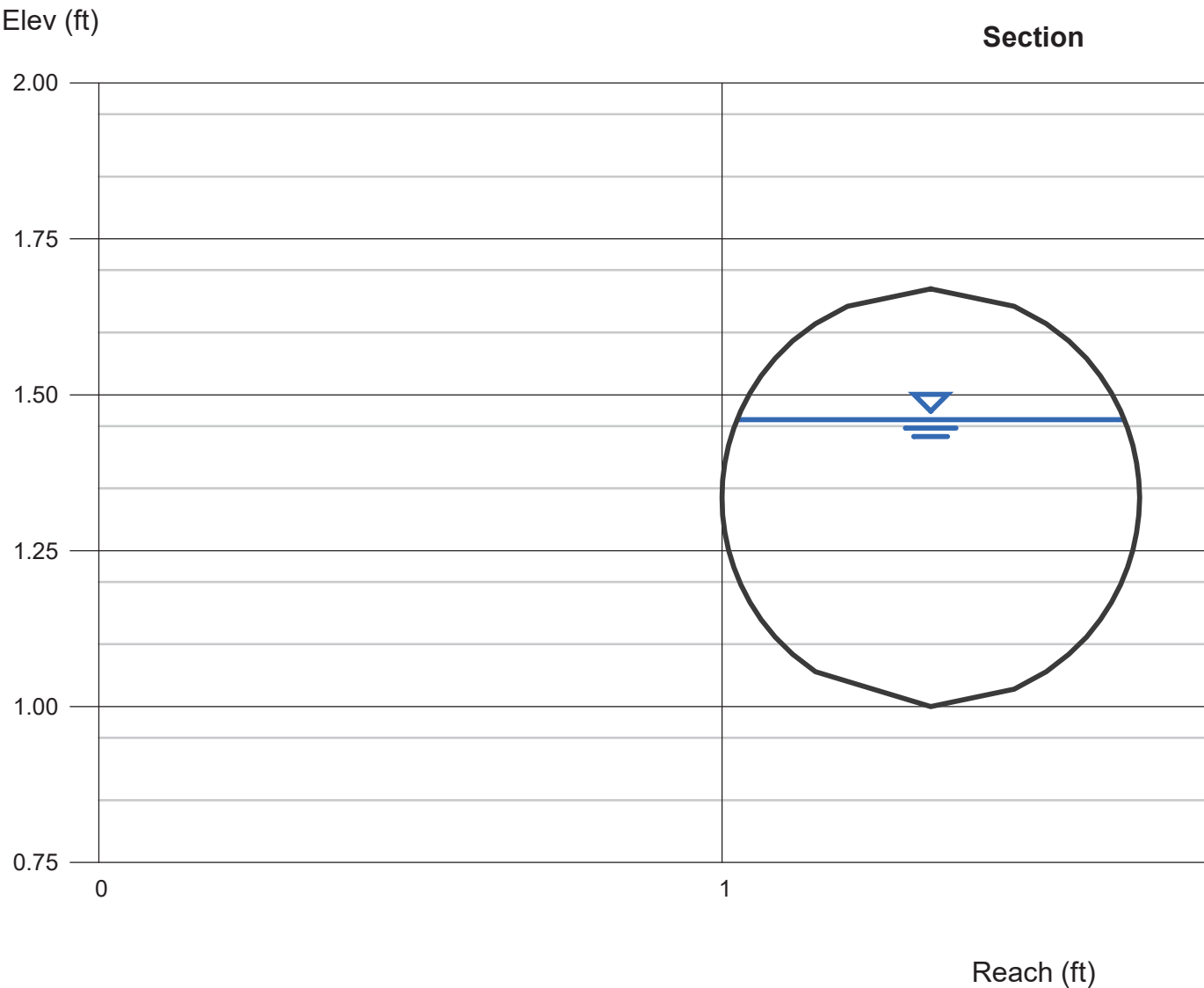
Velocity (ft/s) = 2.42

Wetted Perim (ft) = 1.31

Crit Depth, Yc (ft) = 0.38

Top Width (ft) = 0.62

EGL (ft) = 0.55



Channel Report

Sanitary Line B - PUD 8

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.19

Highlighted

Depth (ft) = 0.23

Q (cfs) = 0.191

Area (sqft) = 0.11

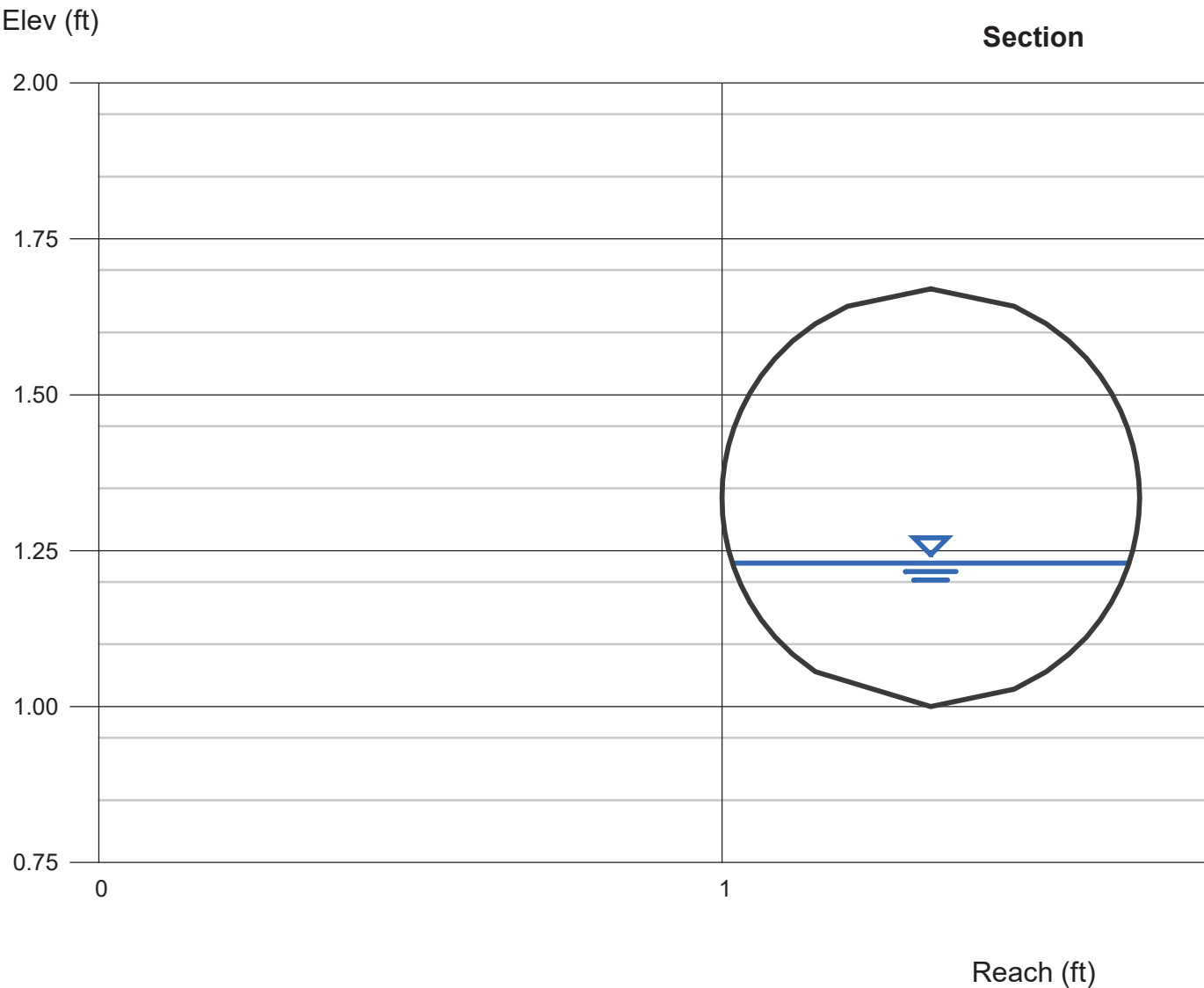
Velocity (ft/s) = 1.77

Wetted Perim (ft) = 0.84

Crit Depth, Yc (ft) = 0.20

Top Width (ft) = 0.64

EGL (ft) = 0.28



Channel Report

Sanitary Line B - PUD 5, 8

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1.00

Slope (%) = 0.40

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.33

Highlighted

Depth (ft) = 0.31

Q (cfs) = 0.325

Area (sqft) = 0.16

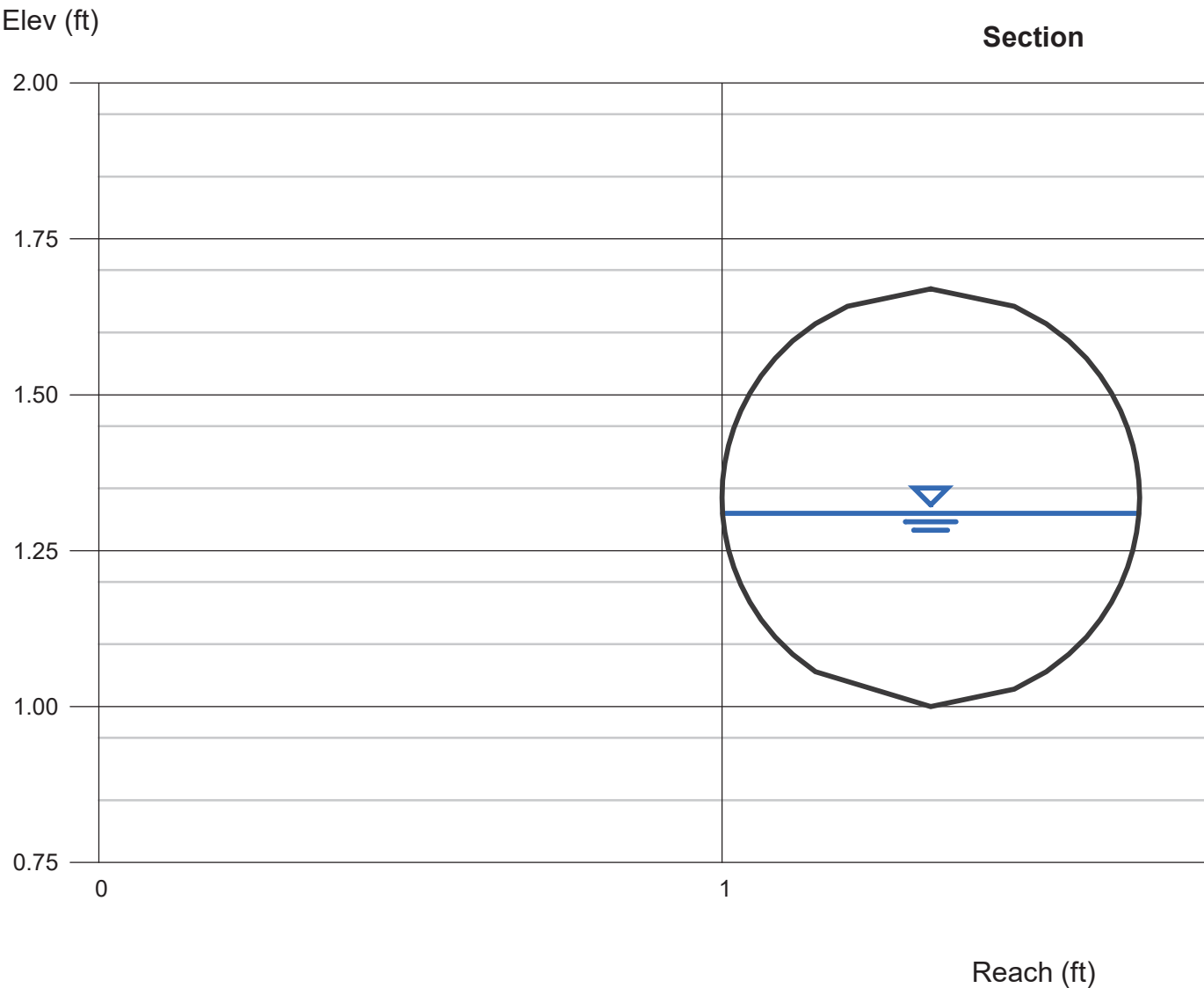
Velocity (ft/s) = 2.03

Wetted Perim (ft) = 1.00

Crit Depth, Yc (ft) = 0.27

Top Width (ft) = 0.67

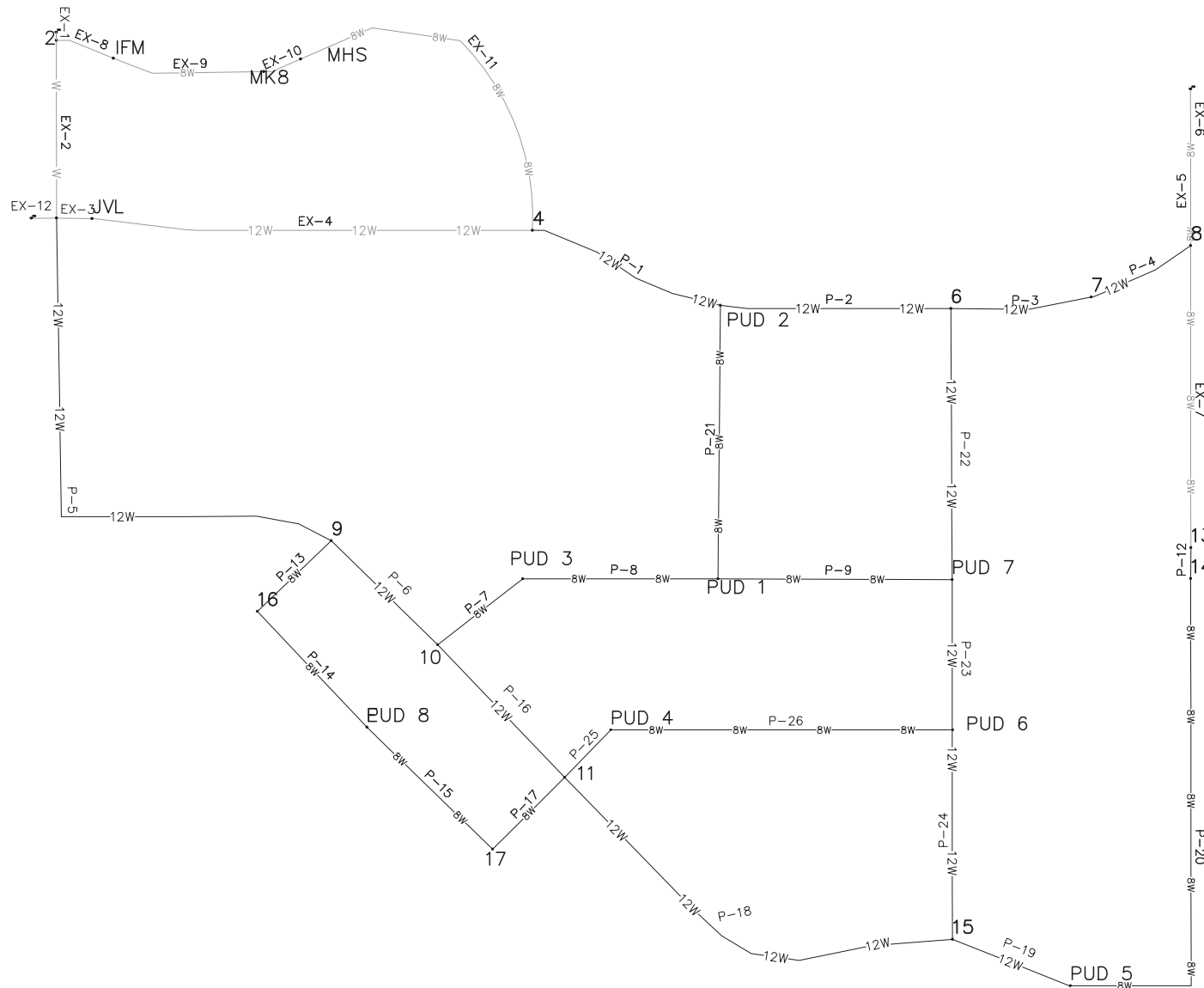
EGL (ft) = 0.37



APPENDIX E – Water System Calculations and Model

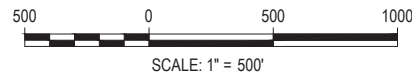
NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT WRITTEN PERMISSION OF HARRIS KOCHER SMITH.

FILEPATH: P:\190108\DOCUMENTS\UTILITIES\WATER\APP E WATER LAYOUT.DWG LAYOUT: LAYOUT1
PLOTED: THU 03/02/23 11:40:18A BY: TIM HOFFMAN



LEGEND

- EX 8" PIPE — 8W —
- EX 18" PIPE — W —
- EX 12" PIPE — 12W —
- PR 8" PIPE — 8W —
- PR 12" PIPE — 12W —



REDTAIL RIDGE PROPOSED WATER NETWORK

ISSUE DATE: 06-19-2019	PROJECT #: 190108
DATE	REVISION COMMENTS
03/02/23	PER CITY OF LOUISVILLE COMMENTS

DESIGNED BY: TEH
CHECKED BY: TEH
DRAWN BY: TEH
SHEET NO.
1
1 OF 1

Scenario: Peak Day
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	758	0.96	0.000
EX-2	18.0	DIP	150.0	598	0.75	0.000
EX-3	12.0	PVC	150.0	364	1.03	0.000
EX-4	12.0	PVC	150.0	357	1.01	0.000
EX-5	8.0	DIP	150.0	-293	1.87	0.001
EX-6	8.0	DIP	150.0	-293	1.87	0.001
EX-7	8.0	DIP	150.0	-75	0.48	0.000
EX-8	8.0	DIP	150.0	-160	1.02	0.000
EX-9	8.0	DIP	150.0	-133	0.85	0.000
EX-10	8.0	DIP	150.0	-114	0.73	0.000
EX-11	8.0	DIP	150.0	-94	0.60	0.000
EX-12	8.0	DIP	150.0	211	1.34	0.001
P-1	12.0	PVC	150.0	451	1.28	0.000
P-2	12.0	PVC	150.0	106	0.30	0.000
P-3	12.0	PVC	150.0	-218	0.62	0.000
P-4	12.0	PVC	150.0	-218	0.62	0.000
P-5	12.0	PVC	150.0	445	1.26	0.000
P-6	12.0	PVC	150.0	340	0.96	0.000
P-7	8.0	PVC	150.0	-172	1.10	0.001
P-8	8.0	PVC	150.0	-29	0.19	0.000
P-9	8.0	PVC	150.0	-103	0.66	0.000
P-12	8.0	PVC	150.0	-75	0.48	0.000
P-13	8.0	PVC	150.0	105	0.67	0.000
P-14	8.0	PVC	150.0	105	0.67	0.000
P-15	8.0	PVC	150.0	-24	0.15	0.000
P-16	12.0	PVC	150.0	168	0.48	0.000
P-17	8.0	PVC	150.0	-24	0.15	0.000
P-18	12.0	PVC	150.0	67	0.19	0.000
P-19	12.0	PVC	150.0	-19	0.05	0.000
P-20	8.0	PVC	150.0	-75	0.48	0.000
P-21	8.0	PVC	150.0	155	0.99	0.000
P-22	12.0	PVC	150.0	-324	0.92	0.000
P-23	12.0	PVC	150.0	163	0.46	0.000
P-24	12.0	PVC	150.0	-86	0.24	0.000
P-25	8.0	PVC	150.0	77	0.49	0.000
P-26	8.0	PVC	150.0	16	0.10	0.000

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Scenario: Peak Day
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.99	65
40	3	5,470.00	0	5,625.91	67
45	4	5,430.00	0	5,625.26	84
95	6	5,393.70	0	5,624.80	100
147	7	5,380.00	0	5,624.88	106
37	8	5,370.00	0	5,624.94	110
72	9	5,432.07	0	5,624.74	83
190	10	5,420.02	0	5,624.56	88
75	11	5,396.13	0	5,624.50	99
34	13	5,367.00	0	5,624.78	112
184	14	5,368.11	0	5,624.76	111
43	15	5,377.00	0	5,624.47	107
200	16	5,430.00	0	5,624.64	84
204	17	5,395.00	0	5,624.49	99
220	18	5,370.00	0	5,625.64	111
157	IFM	5,470.66	27	5,625.86	67
167	JVL	5,467.02	7	5,625.86	69
164	MHS	5,456.88	20	5,625.57	73
161	MK8	5,459.71	19	5,625.62	72
173	PUD 1	5,400.00	287	5,624.27	97
170	PUD 2	5,412.25	190	5,624.84	92
188	PUD 3	5,420.00	143	5,624.29	88
207	PUD 4	5,390.00	62	5,624.46	101
146	PUD 5	5,370.00	57	5,624.47	110
209	PUD 6	5,382.52	264	5,624.45	105
175	PUD 7	5,386.49	58	5,624.50	103
202	PUD 8	5,410.00	128	5,624.48	93

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Scenario: PUD 1 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	2,218	2.80	0.001
EX-2	18.0	DIP	150.0	1,822	2.30	0.001
EX-3	12.0	PVC	150.0	1,106	3.14	0.002
EX-4	12.0	PVC	150.0	1,099	3.12	0.002
EX-5	8.0	DIP	150.0	-903	5.76	0.012
EX-6	8.0	DIP	150.0	-903	5.76	0.012
EX-7	8.0	DIP	150.0	-211	1.35	0.001
EX-8	8.0	DIP	150.0	-396	2.53	0.003
EX-9	8.0	DIP	150.0	-370	2.36	0.002
EX-10	8.0	DIP	150.0	-350	2.24	0.002
EX-11	8.0	DIP	150.0	-330	2.11	0.002
EX-12	8.0	DIP	150.0	640	4.09	0.006
P-1	12.0	PVC	150.0	1,429	4.05	0.004
P-2	12.0	PVC	150.0	255	0.72	0.000
P-3	12.0	PVC	150.0	-692	1.96	0.001
P-4	12.0	PVC	150.0	-692	1.96	0.001
P-5	12.0	PVC	150.0	1,357	3.85	0.003
P-6	12.0	PVC	150.0	1,107	3.14	0.002
P-7	8.0	PVC	150.0	-960	6.13	0.013
P-8	8.0	PVC	150.0	-817	5.21	0.010
P-9	8.0	PVC	150.0	-987	6.30	0.014
P-12	8.0	PVC	150.0	-211	1.35	0.001
P-13	8.0	PVC	150.0	250	1.60	0.001
P-14	8.0	PVC	150.0	250	1.60	0.001
P-15	8.0	PVC	150.0	122	0.78	0.000
P-16	12.0	PVC	150.0	147	0.42	0.000
P-17	8.0	PVC	150.0	122	0.78	0.000
P-18	12.0	PVC	150.0	133	0.38	0.000
P-19	12.0	PVC	150.0	-154	0.44	0.000
P-20	8.0	PVC	150.0	-211	1.35	0.001
P-21	8.0	PVC	150.0	983	6.28	0.014
P-22	12.0	PVC	150.0	-947	2.69	0.002
P-23	12.0	PVC	150.0	-97	0.28	0.000
P-24	12.0	PVC	150.0	-287	0.81	0.000
P-25	8.0	PVC	150.0	136	0.87	0.000
P-26	8.0	PVC	150.0	74	0.47	0.000

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Scenario: PUD 1 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.95	65
40	3	5,470.00	0	5,625.27	67
45	4	5,430.00	0	5,620.10	82
95	6	5,393.70	0	5,616.32	96
147	7	5,380.00	0	5,616.97	103
37	8	5,370.00	0	5,617.49	107
72	9	5,432.07	0	5,616.08	80
190	10	5,420.02	0	5,614.44	84
75	11	5,396.13	0	5,614.40	94
34	13	5,367.00	0	5,616.38	108
184	14	5,368.11	0	5,616.27	107
43	15	5,377.00	0	5,614.30	103
200	16	5,430.00	0	5,615.56	80
204	17	5,395.00	0	5,614.53	95
220	18	5,370.00	0	5,623.08	109
157	IFM	5,470.66	27	5,625.24	67
167	JVL	5,467.02	7	5,624.88	68
164	MHS	5,456.88	20	5,623.27	72
161	MK8	5,459.71	19	5,623.65	71
173	PUD 1	5,400.00	2,787	5,599.08	86
170	PUD 2	5,412.25	190	5,616.49	88
188	PUD 3	5,420.00	143	5,607.90	81
207	PUD 4	5,390.00	62	5,614.29	97
146	PUD 5	5,370.00	57	5,614.33	106
209	PUD 6	5,382.52	264	5,614.11	100
175	PUD 7	5,386.49	58	5,614.09	98
202	PUD 8	5,410.00	128	5,614.76	89

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Scenario: PUD 2 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	2,220	2.80	0.001
EX-2	18.0	DIP	150.0	1,780	2.24	0.001
EX-3	12.0	PVC	150.0	1,261	3.58	0.003
EX-4	12.0	PVC	150.0	1,254	3.56	0.003
EX-5	8.0	DIP	150.0	-915	5.84	0.012
EX-6	8.0	DIP	150.0	-915	5.84	0.012
EX-7	8.0	DIP	150.0	-110	0.70	0.000
EX-8	8.0	DIP	150.0	-439	2.80	0.003
EX-9	8.0	DIP	150.0	-413	2.63	0.003
EX-10	8.0	DIP	150.0	-393	2.51	0.002
EX-11	8.0	DIP	150.0	-373	2.38	0.002
EX-12	8.0	DIP	150.0	627	4.00	0.006
P-1	12.0	PVC	150.0	1,627	4.62	0.005
P-2	12.0	PVC	150.0	-873	2.48	0.002
P-3	12.0	PVC	150.0	-805	2.28	0.001
P-4	12.0	PVC	150.0	-805	2.28	0.001
P-5	12.0	PVC	150.0	1,146	3.25	0.003
P-6	12.0	PVC	150.0	904	2.56	0.002
P-7	8.0	PVC	150.0	-414	2.64	0.003
P-8	8.0	PVC	150.0	-272	1.73	0.001
P-9	8.0	PVC	150.0	-206	1.31	0.001
P-12	8.0	PVC	150.0	-110	0.70	0.000
P-13	8.0	PVC	150.0	242	1.55	0.001
P-14	8.0	PVC	150.0	242	1.55	0.001
P-15	8.0	PVC	150.0	114	0.73	0.000
P-16	12.0	PVC	150.0	489	1.39	0.001
P-17	8.0	PVC	150.0	114	0.73	0.000
P-18	12.0	PVC	150.0	376	1.07	0.000
P-19	12.0	PVC	150.0	-54	0.15	0.000
P-20	8.0	PVC	150.0	-110	0.70	0.000
P-21	8.0	PVC	150.0	-190	1.21	0.001
P-22	12.0	PVC	150.0	68	0.19	0.000
P-23	12.0	PVC	150.0	-331	0.94	0.000
P-24	12.0	PVC	150.0	-430	1.22	0.000
P-25	8.0	PVC	150.0	227	1.45	0.001
P-26	8.0	PVC	150.0	166	1.06	0.001

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Scenario: PUD 2 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.95	65
40	3	5,470.00	0	5,625.30	67
45	4	5,430.00	0	5,618.69	82
95	6	5,393.70	0	5,615.73	96
147	7	5,380.00	0	5,616.59	102
37	8	5,370.00	0	5,617.28	107
72	9	5,432.07	0	5,618.58	81
190	10	5,420.02	0	5,617.45	85
75	11	5,396.13	0	5,617.01	96
34	13	5,367.00	0	5,616.94	108
184	14	5,368.11	0	5,616.91	108
43	15	5,377.00	0	5,616.32	104
200	16	5,430.00	0	5,618.09	81
204	17	5,395.00	0	5,617.13	96
220	18	5,370.00	0	5,623.00	109
157	IFM	5,470.66	27	5,625.09	67
167	JVL	5,467.02	7	5,624.81	68
164	MHS	5,456.88	20	5,622.67	72
161	MK8	5,459.71	19	5,623.13	71
173	PUD 1	5,400.00	287	5,614.92	93
170	PUD 2	5,412.25	2,690	5,614.10	87
188	PUD 3	5,420.00	143	5,616.07	85
207	PUD 4	5,390.00	62	5,616.73	98
146	PUD 5	5,370.00	57	5,616.33	107
209	PUD 6	5,382.52	264	5,615.92	101
175	PUD 7	5,386.49	58	5,615.75	99
202	PUD 8	5,410.00	128	5,617.33	90

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Scenario: PUD 3 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	2,112	2.66	0.001
EX-2	18.0	DIP	150.0	1,749	2.21	0.001
EX-3	12.0	PVC	150.0	991	2.81	0.002
EX-4	12.0	PVC	150.0	984	2.79	0.002
EX-5	8.0	DIP	150.0	-836	5.34	0.010
EX-6	8.0	DIP	150.0	-836	5.34	0.010
EX-7	8.0	DIP	150.0	-233	1.48	0.001
EX-8	8.0	DIP	150.0	-363	2.31	0.002
EX-9	8.0	DIP	150.0	-336	2.14	0.002
EX-10	8.0	DIP	150.0	-317	2.02	0.002
EX-11	8.0	DIP	150.0	-296	1.89	0.001
EX-12	8.0	DIP	150.0	614	3.92	0.006
P-1	12.0	PVC	150.0	1,280	3.63	0.003
P-2	12.0	PVC	150.0	433	1.23	0.000
P-3	12.0	PVC	150.0	-603	1.71	0.001
P-4	12.0	PVC	150.0	-603	1.71	0.001
P-5	12.0	PVC	150.0	1,373	3.89	0.003
P-6	12.0	PVC	150.0	1,139	3.23	0.002
P-7	8.0	PVC	150.0	-1,519	9.70	0.030
P-8	8.0	PVC	150.0	923	5.89	0.012
P-9	8.0	PVC	150.0	-554	3.54	0.005
P-12	8.0	PVC	150.0	-233	1.48	0.001
P-13	8.0	PVC	150.0	234	1.49	0.001
P-14	8.0	PVC	150.0	234	1.49	0.001
P-15	8.0	PVC	150.0	105	0.67	0.000
P-16	12.0	PVC	150.0	-380	1.08	0.000
P-17	8.0	PVC	150.0	105	0.67	0.000
P-18	12.0	PVC	150.0	-239	0.68	0.000
P-19	12.0	PVC	150.0	-176	0.50	0.000
P-20	8.0	PVC	150.0	-233	1.48	0.001
P-21	8.0	PVC	150.0	657	4.19	0.006
P-22	12.0	PVC	150.0	-1,037	2.94	0.002
P-23	12.0	PVC	150.0	425	1.20	0.000
P-24	12.0	PVC	150.0	63	0.18	0.000
P-25	8.0	PVC	150.0	-36	0.23	0.000
P-26	8.0	PVC	150.0	-97	0.62	0.000

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Scenario: PUD 3 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.96	65
40	3	5,470.00	0	5,625.33	67
45	4	5,430.00	0	5,621.11	83
95	6	5,393.70	0	5,617.72	97
147	7	5,380.00	0	5,618.22	103
37	8	5,370.00	0	5,618.63	108
72	9	5,432.07	0	5,615.94	80
190	10	5,420.02	0	5,614.21	84
75	11	5,396.13	0	5,614.49	94
34	13	5,367.00	0	5,617.30	108
184	14	5,368.11	0	5,617.16	108
43	15	5,377.00	0	5,614.79	103
200	16	5,430.00	0	5,615.48	80
204	17	5,395.00	0	5,614.59	95
220	18	5,370.00	0	5,623.46	110
157	IFM	5,470.66	27	5,625.35	67
167	JVL	5,467.02	7	5,625.01	68
164	MHS	5,456.88	20	5,623.71	72
161	MK8	5,459.71	19	5,624.02	71
173	PUD 1	5,400.00	287	5,609.93	91
170	PUD 2	5,412.25	190	5,618.16	89
188	PUD 3	5,420.00	2,443	5,598.88	77
207	PUD 4	5,390.00	62	5,614.50	97
146	PUD 5	5,370.00	57	5,614.83	106
209	PUD 6	5,382.52	264	5,614.80	100
175	PUD 7	5,386.49	58	5,615.08	99
202	PUD 8	5,410.00	128	5,614.77	89

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Scenario: PUD 4 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	1,987	2.50	0.001
EX-2	18.0	DIP	150.0	1,649	2.08	0.001
EX-3	12.0	PVC	150.0	910	2.58	0.002
EX-4	12.0	PVC	150.0	903	2.56	0.002
EX-5	8.0	DIP	150.0	-796	5.08	0.009
EX-6	8.0	DIP	150.0	-796	5.08	0.009
EX-7	8.0	DIP	150.0	-270	1.72	0.001
EX-8	8.0	DIP	150.0	-338	2.16	0.002
EX-9	8.0	DIP	150.0	-311	1.98	0.002
EX-10	8.0	DIP	150.0	-292	1.86	0.001
EX-11	8.0	DIP	150.0	-272	1.73	0.001
EX-12	8.0	DIP	150.0	579	3.70	0.005
P-1	12.0	PVC	150.0	1,174	3.33	0.003
P-2	12.0	PVC	150.0	563	1.60	0.001
P-3	12.0	PVC	150.0	-526	1.49	0.001
P-4	12.0	PVC	150.0	-526	1.49	0.001
P-5	12.0	PVC	150.0	1,319	3.74	0.003
P-6	12.0	PVC	150.0	996	2.82	0.002
P-7	8.0	PVC	150.0	-2	0.01	0.000
P-8	8.0	PVC	150.0	141	0.90	0.000
P-9	8.0	PVC	150.0	-7	0.05	0.000
P-12	8.0	PVC	150.0	-270	1.72	0.001
P-13	8.0	PVC	150.0	323	2.06	0.002
P-14	8.0	PVC	150.0	323	2.06	0.002
P-15	8.0	PVC	150.0	195	1.24	0.001
P-16	12.0	PVC	150.0	994	2.82	0.002
P-17	8.0	PVC	150.0	195	1.24	0.001
P-18	12.0	PVC	150.0	-328	0.93	0.000
P-19	12.0	PVC	150.0	-213	0.60	0.000
P-20	8.0	PVC	150.0	-270	1.72	0.001
P-21	8.0	PVC	150.0	421	2.69	0.003
P-22	12.0	PVC	150.0	-1,089	3.09	0.002
P-23	12.0	PVC	150.0	1,024	2.90	0.002
P-24	12.0	PVC	150.0	115	0.33	0.000
P-25	8.0	PVC	150.0	1,517	9.68	0.030
P-26	8.0	PVC	150.0	-645	4.12	0.006

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Scenario: PUD 4 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.96	65
40	3	5,470.00	0	5,625.40	67
45	4	5,430.00	0	5,621.80	83
95	6	5,393.70	0	5,618.56	97
147	7	5,380.00	0	5,618.96	103
37	8	5,370.00	0	5,619.27	108
72	9	5,432.07	0	5,616.68	80
190	10	5,420.02	0	5,615.33	85
75	11	5,396.13	0	5,613.68	94
34	13	5,367.00	0	5,617.52	108
184	14	5,368.11	0	5,617.34	108
43	15	5,377.00	0	5,614.21	103
200	16	5,430.00	0	5,615.85	80
204	17	5,395.00	0	5,614.00	95
220	18	5,370.00	0	5,623.69	110
157	IFM	5,470.66	27	5,625.43	67
167	JVL	5,467.02	7	5,625.13	68
164	MHS	5,456.88	20	5,624.01	72
161	MK8	5,459.71	19	5,624.27	71
173	PUD 1	5,400.00	287	5,615.67	93
170	PUD 2	5,412.25	190	5,619.29	90
188	PUD 3	5,420.00	143	5,615.33	85
207	PUD 4	5,390.00	2,162	5,604.28	93
146	PUD 5	5,370.00	57	5,614.28	106
209	PUD 6	5,382.52	264	5,614.24	100
175	PUD 7	5,386.49	58	5,615.67	99
202	PUD 8	5,410.00	128	5,614.56	89

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Scenario: PUD 5 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	2,193	2.77	0.001
EX-2	18.0	DIP	150.0	1,817	2.29	0.001
EX-3	12.0	PVC	150.0	1,034	2.93	0.002
EX-4	12.0	PVC	150.0	1,027	2.91	0.002
EX-5	8.0	DIP	150.0	-930	5.94	0.012
EX-6	8.0	DIP	150.0	-930	5.94	0.012
EX-7	8.0	DIP	150.0	-455	2.91	0.003
EX-8	8.0	DIP	150.0	-376	2.40	0.002
EX-9	8.0	DIP	150.0	-349	2.23	0.002
EX-10	8.0	DIP	150.0	-330	2.11	0.002
EX-11	8.0	DIP	150.0	-310	1.98	0.002
EX-12	8.0	DIP	150.0	638	4.07	0.006
P-1	12.0	PVC	150.0	1,337	3.79	0.003
P-2	12.0	PVC	150.0	702	1.99	0.001
P-3	12.0	PVC	150.0	-475	1.35	0.000
P-4	12.0	PVC	150.0	-475	1.35	0.000
P-5	12.0	PVC	150.0	1,421	4.03	0.004
P-6	12.0	PVC	150.0	1,091	3.09	0.002
P-7	8.0	PVC	150.0	-129	0.82	0.000
P-8	8.0	PVC	150.0	13	0.09	0.000
P-9	8.0	PVC	150.0	144	0.92	0.000
P-12	8.0	PVC	150.0	-455	2.91	0.003
P-13	8.0	PVC	150.0	330	2.11	0.002
P-14	8.0	PVC	150.0	330	2.11	0.002
P-15	8.0	PVC	150.0	202	1.29	0.001
P-16	12.0	PVC	150.0	962	2.73	0.002
P-17	8.0	PVC	150.0	202	1.29	0.001
P-18	12.0	PVC	150.0	932	2.64	0.002
P-19	12.0	PVC	150.0	2,101	5.96	0.008
P-20	8.0	PVC	150.0	-455	2.91	0.003
P-21	8.0	PVC	150.0	445	2.84	0.003
P-22	12.0	PVC	150.0	-1,177	3.34	0.003
P-23	12.0	PVC	150.0	1,263	3.58	0.003
P-24	12.0	PVC	150.0	1,170	3.32	0.003
P-25	8.0	PVC	150.0	232	1.48	0.001
P-26	8.0	PVC	150.0	170	1.09	0.001

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Scenario: PUD 5 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.96	65
40	3	5,470.00	0	5,625.28	67
45	4	5,430.00	0	5,620.71	83
95	6	5,393.70	0	5,616.43	96
147	7	5,380.00	0	5,616.75	102
37	8	5,370.00	0	5,617.01	107
72	9	5,432.07	0	5,615.26	79
190	10	5,420.02	0	5,613.67	84
75	11	5,396.13	0	5,612.11	93
34	13	5,367.00	0	5,612.39	106
184	14	5,368.11	0	5,611.92	105
43	15	5,377.00	0	5,608.43	100
200	16	5,430.00	0	5,614.40	80
204	17	5,395.00	0	5,612.46	94
220	18	5,370.00	0	5,622.91	109
157	IFM	5,470.66	27	5,625.30	67
167	JVL	5,467.02	7	5,624.93	68
164	MHS	5,456.88	20	5,623.54	72
161	MK8	5,459.71	19	5,623.87	71
173	PUD 1	5,400.00	287	5,613.51	92
170	PUD 2	5,412.25	190	5,617.52	89
188	PUD 3	5,420.00	143	5,613.51	84
207	PUD 4	5,390.00	62	5,611.82	96
146	PUD 5	5,370.00	2,557	5,603.85	101
209	PUD 6	5,382.52	264	5,610.98	99
175	PUD 7	5,386.49	58	5,613.09	98
202	PUD 8	5,410.00	128	5,613.05	88

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Scenario: PUD 6 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	2,199	2.77	0.001
EX-2	18.0	DIP	150.0	1,818	2.29	0.001
EX-3	12.0	PVC	150.0	1,049	2.97	0.002
EX-4	12.0	PVC	150.0	1,042	2.95	0.002
EX-5	8.0	DIP	150.0	-924	5.90	0.012
EX-6	8.0	DIP	150.0	-924	5.90	0.012
EX-7	8.0	DIP	150.0	-309	1.97	0.002
EX-8	8.0	DIP	150.0	-380	2.43	0.002
EX-9	8.0	DIP	150.0	-354	2.26	0.002
EX-10	8.0	DIP	150.0	-334	2.13	0.002
EX-11	8.0	DIP	150.0	-314	2.01	0.002
EX-12	8.0	DIP	150.0	639	4.08	0.006
P-1	12.0	PVC	150.0	1,356	3.85	0.003
P-2	12.0	PVC	150.0	715	2.03	0.001
P-3	12.0	PVC	150.0	-615	1.74	0.001
P-4	12.0	PVC	150.0	-615	1.74	0.001
P-5	12.0	PVC	150.0	1,409	4.00	0.004
P-6	12.0	PVC	150.0	1,092	3.10	0.002
P-7	8.0	PVC	150.0	-232	1.48	0.001
P-8	8.0	PVC	150.0	-90	0.57	0.000
P-9	8.0	PVC	150.0	253	1.62	0.001
P-12	8.0	PVC	150.0	-309	1.97	0.002
P-13	8.0	PVC	150.0	316	2.02	0.002
P-14	8.0	PVC	150.0	316	2.02	0.002
P-15	8.0	PVC	150.0	188	1.20	0.001
P-16	12.0	PVC	150.0	860	2.44	0.001
P-17	8.0	PVC	150.0	188	1.20	0.001
P-18	12.0	PVC	150.0	661	1.87	0.001
P-19	12.0	PVC	150.0	-252	0.72	0.000
P-20	8.0	PVC	150.0	-309	1.97	0.002
P-21	8.0	PVC	150.0	451	2.88	0.003
P-22	12.0	PVC	150.0	-1,330	3.77	0.003
P-23	12.0	PVC	150.0	1,525	4.33	0.004
P-24	12.0	PVC	150.0	-913	2.59	0.002
P-25	8.0	PVC	150.0	387	2.47	0.002
P-26	8.0	PVC	150.0	326	2.08	0.002

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Scenario: PUD 6 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.96	65
40	3	5,470.00	0	5,625.28	67
45	4	5,430.00	0	5,620.59	82
95	6	5,393.70	0	5,616.18	96
147	7	5,380.00	0	5,616.70	102
37	8	5,370.00	0	5,617.12	107
72	9	5,432.07	0	5,615.42	79
190	10	5,420.02	0	5,613.83	84
75	11	5,396.13	0	5,612.56	94
34	13	5,367.00	0	5,614.87	107
184	14	5,368.11	0	5,614.64	107
43	15	5,377.00	0	5,610.61	101
200	16	5,430.00	0	5,614.63	80
204	17	5,395.00	0	5,612.86	94
220	18	5,370.00	0	5,622.95	109
157	IFM	5,470.66	27	5,625.29	67
167	JVL	5,467.02	7	5,624.92	68
164	MHS	5,456.88	20	5,623.48	72
161	MK8	5,459.71	19	5,623.82	71
173	PUD 1	5,400.00	287	5,613.21	92
170	PUD 2	5,412.25	190	5,617.31	89
188	PUD 3	5,420.00	143	5,613.35	84
207	PUD 4	5,390.00	62	5,611.81	96
146	PUD 5	5,370.00	57	5,610.70	104
209	PUD 6	5,382.52	2,764	5,609.00	98
175	PUD 7	5,386.49	58	5,612.00	98
202	PUD 8	5,410.00	128	5,613.38	88

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Scenario: PUD 7 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	1,902	2.40	0.001
EX-2	18.0	DIP	150.0	1,559	1.97	0.001
EX-3	12.0	PVC	150.0	936	2.66	0.002
EX-4	12.0	PVC	150.0	929	2.64	0.002
EX-5	8.0	DIP	150.0	-812	5.18	0.010
EX-6	8.0	DIP	150.0	-812	5.18	0.010
EX-7	8.0	DIP	150.0	-214	1.37	0.001
EX-8	8.0	DIP	150.0	-343	2.19	0.002
EX-9	8.0	DIP	150.0	-316	2.02	0.002
EX-10	8.0	DIP	150.0	-297	1.90	0.001
EX-11	8.0	DIP	150.0	-277	1.77	0.001
EX-12	8.0	DIP	150.0	548	3.50	0.005
P-1	12.0	PVC	150.0	1,206	3.42	0.003
P-2	12.0	PVC	150.0	630	1.79	0.001
P-3	12.0	PVC	150.0	-597	1.69	0.001
P-4	12.0	PVC	150.0	-597	1.69	0.001
P-5	12.0	PVC	150.0	1,171	3.32	0.003
P-6	12.0	PVC	150.0	914	2.59	0.002
P-7	8.0	PVC	150.0	-320	2.04	0.002
P-8	8.0	PVC	150.0	-177	1.13	0.001
P-9	8.0	PVC	150.0	276	1.76	0.001
P-12	8.0	PVC	150.0	-214	1.37	0.001
P-13	8.0	PVC	150.0	256	1.64	0.001
P-14	8.0	PVC	150.0	256	1.64	0.001
P-15	8.0	PVC	150.0	128	0.82	0.000
P-16	12.0	PVC	150.0	595	1.69	0.001
P-17	8.0	PVC	150.0	128	0.82	0.000
P-18	12.0	PVC	150.0	447	1.27	0.000
P-19	12.0	PVC	150.0	-157	0.45	0.000
P-20	8.0	PVC	150.0	-214	1.37	0.001
P-21	8.0	PVC	150.0	386	2.46	0.002
P-22	12.0	PVC	150.0	-1,227	3.48	0.003
P-23	12.0	PVC	150.0	-554	1.57	0.001
P-24	12.0	PVC	150.0	-604	1.71	0.001
P-25	8.0	PVC	150.0	276	1.76	0.001
P-26	8.0	PVC	150.0	214	1.37	0.001

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Scenario: PUD 7 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.97	65
40	3	5,470.00	0	5,625.46	67
45	4	5,430.00	0	5,621.66	83
95	6	5,393.70	0	5,618.13	97
147	7	5,380.00	0	5,618.62	103
37	8	5,370.00	0	5,619.02	108
72	9	5,432.07	0	5,618.46	81
190	10	5,420.02	0	5,617.31	85
75	11	5,396.13	0	5,616.67	95
34	13	5,367.00	0	5,617.88	109
184	14	5,368.11	0	5,617.76	108
43	15	5,377.00	0	5,615.73	103
200	16	5,430.00	0	5,617.92	81
204	17	5,395.00	0	5,616.82	96
220	18	5,370.00	0	5,623.60	110
157	IFM	5,470.66	27	5,625.42	67
167	JVL	5,467.02	7	5,625.17	68
164	MHS	5,456.88	20	5,623.95	72
161	MK8	5,459.71	19	5,624.22	71
173	PUD 1	5,400.00	287	5,615.94	93
170	PUD 2	5,412.25	190	5,619.02	89
188	PUD 3	5,420.00	143	5,616.46	85
207	PUD 4	5,390.00	62	5,616.27	98
146	PUD 5	5,370.00	57	5,615.77	106
209	PUD 6	5,382.52	264	5,614.98	101
175	PUD 7	5,386.49	2,058	5,614.52	99
202	PUD 8	5,410.00	128	5,617.08	90

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Scenario: PUD 8 Fire
Current Time Step: 0.000 h
FlexTable: Pipe Table

Label	Diameter (in)	Material	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
EX-1	18.0	DIP	150.0	2,260	2.85	0.001
EX-2	18.0	DIP	150.0	1,906	2.40	0.001
EX-3	12.0	PVC	150.0	945	2.68	0.002
EX-4	12.0	PVC	150.0	938	2.66	0.002
EX-5	8.0	DIP	150.0	-833	5.32	0.010
EX-6	8.0	DIP	150.0	-833	5.32	0.010
EX-7	8.0	DIP	150.0	-277	1.77	0.001
EX-8	8.0	DIP	150.0	-354	2.26	0.002
EX-9	8.0	DIP	150.0	-327	2.09	0.002
EX-10	8.0	DIP	150.0	-308	1.96	0.002
EX-11	8.0	DIP	150.0	-288	1.84	0.001
EX-12	8.0	DIP	150.0	669	4.27	0.007
P-1	12.0	PVC	150.0	1,225	3.48	0.003
P-2	12.0	PVC	150.0	570	1.62	0.001
P-3	12.0	PVC	150.0	-556	1.58	0.001
P-4	12.0	PVC	150.0	-556	1.58	0.001
P-5	12.0	PVC	150.0	1,631	4.63	0.005
P-6	12.0	PVC	150.0	290	0.82	0.000
P-7	8.0	PVC	150.0	200	1.28	0.001
P-8	8.0	PVC	150.0	343	2.19	0.002
P-9	8.0	PVC	150.0	-165	1.05	0.000
P-12	8.0	PVC	150.0	-277	1.77	0.001
P-13	8.0	PVC	150.0	1,341	8.56	0.024
P-14	8.0	PVC	150.0	1,341	8.56	0.024
P-15	8.0	PVC	150.0	-1,287	8.22	0.022
P-16	12.0	PVC	150.0	490	1.39	0.001
P-17	8.0	PVC	150.0	-1,287	8.22	0.022
P-18	12.0	PVC	150.0	-605	1.72	0.001
P-19	12.0	PVC	150.0	-220	0.62	0.000
P-20	8.0	PVC	150.0	-277	1.77	0.001
P-21	8.0	PVC	150.0	466	2.97	0.003
P-22	12.0	PVC	150.0	-1,125	3.19	0.002
P-23	12.0	PVC	150.0	903	2.56	0.002
P-24	12.0	PVC	150.0	385	1.09	0.000
P-25	8.0	PVC	150.0	-192	1.23	0.001
P-26	8.0	PVC	150.0	-254	1.62	0.001

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Scenario: PUD 8 Fire
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	2	5,475.00	0	5,625.95	65
40	3	5,470.00	0	5,625.21	67
45	4	5,430.00	0	5,621.36	83
95	6	5,393.70	0	5,617.90	97
147	7	5,380.00	0	5,618.33	103
37	8	5,370.00	0	5,618.68	108
72	9	5,432.07	0	5,612.29	78
190	10	5,420.02	0	5,612.16	83
75	11	5,396.13	0	5,611.71	93
34	13	5,367.00	0	5,616.84	108
184	14	5,368.11	0	5,616.65	108
43	15	5,377.00	0	5,613.37	102
200	16	5,430.00	0	5,600.73	74
204	17	5,395.00	0	5,601.06	89
220	18	5,370.00	0	5,623.48	110
157	IFM	5,470.66	27	5,625.37	67
167	JVL	5,467.02	7	5,624.92	68
164	MHS	5,456.88	20	5,623.81	72
161	MK8	5,459.71	19	5,624.10	71
173	PUD 1	5,400.00	287	5,614.28	93
170	PUD 2	5,412.25	190	5,618.64	89
188	PUD 3	5,420.00	143	5,612.52	83
207	PUD 4	5,390.00	62	5,611.92	96
146	PUD 5	5,370.00	57	5,613.44	105
209	PUD 6	5,382.52	264	5,613.69	100
175	PUD 7	5,386.49	58	5,614.82	99
202	PUD 8	5,410.00	2,628	5,582.71	75

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LOUISVILLE FIRE
PROTECTION DISTRICT
"OUR FAMILY SERVING YOUR FAMILY"
895 W. VIA APPIA LOUISVILLE, CO 80027
HEADQUARTERS: 303.666.6595 | FAX: 303.666.7659
LOUISVILLEFIRE.COM



November 14, 2019

Mark Beal, Director of Construction
Ryan Companies US, Inc.
3900 East Camelback Road Suite 100
Phoenix, Arizona 85018

Subject: Medtronics (Fire Flow)

Dear Mr. Beal,

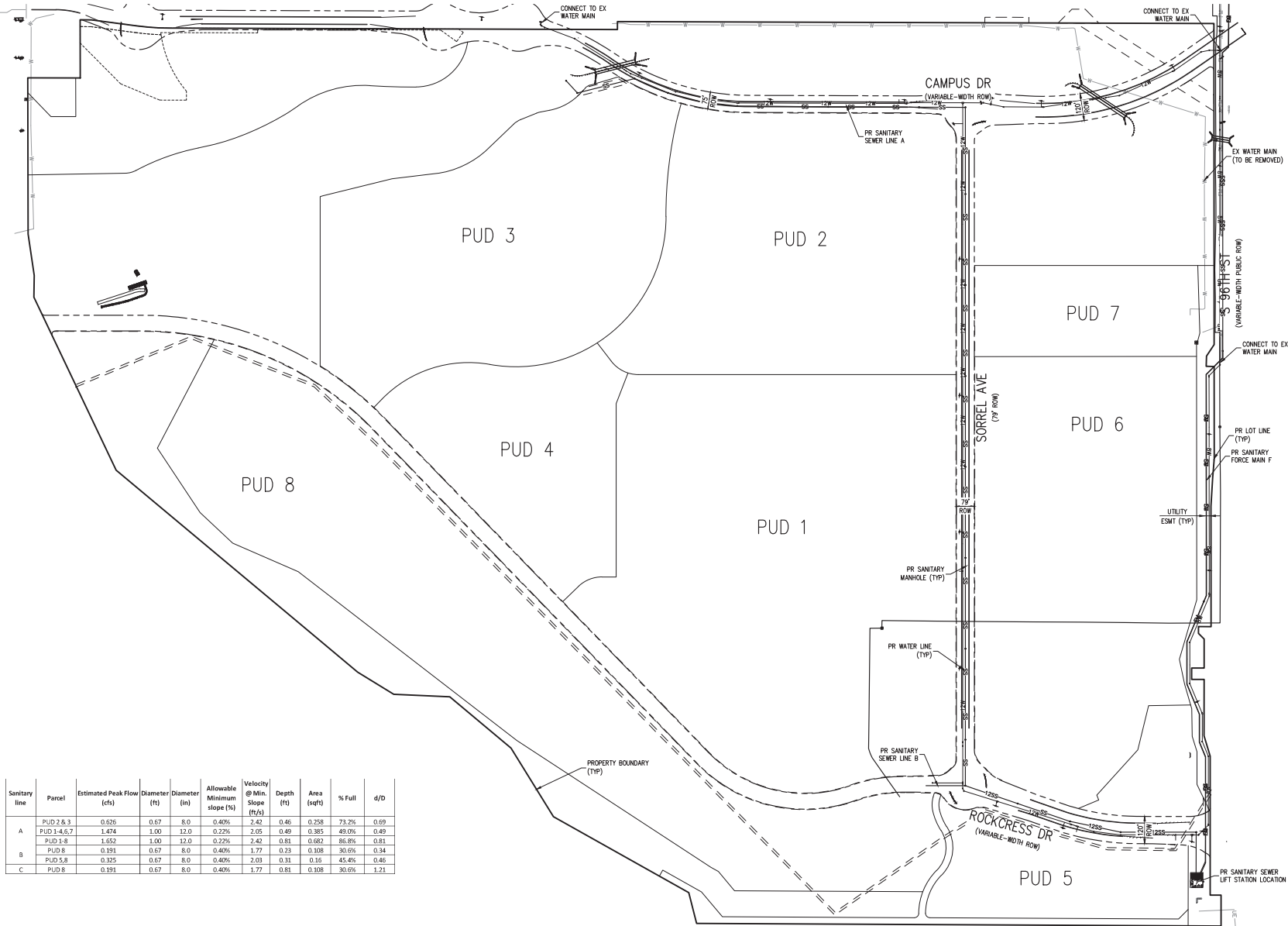
Per our discussion regarding fire flow requirements, it is my interpretation of Appendix B, Table B105.2 that a 75% reduction in fire flow is allowed in sprinkled buildings. With that said, I would like to see only a 50% reduction in fire flows verses the 75% the code allows. Please feel free to call me at 303-666-8809 or email me at cmestas@louisvillefire.com if you would like to discuss this further.

Sincerely,

Chris Mestas
Fire Marshal

APPENDIX F – Utility Plan, Conceptual Utility Layouts

NO CHANGES ARE TO BE MADE TO THIS DRAWING WITHOUT THE WRITTEN APPROVAL OF HARRIS KOCHER SMITH



Sanitary line	Parcel	Estimated Peak Flow (cfs)	Diameter (ft)	Diameter (in)	Allowable Minimum slope (%)	Velocity @ Min. Slope (ft/s)	Depth (ft)	Area (sqft)	% Full	d/D
A	PUD 2 & 3	0.636	0.67	8.0	0.40%	2.42	0.46	0.258	73.2%	0.69
	PUD 1-4,6,7	1.474	1.00	12.0	0.22%	2.05	0.49	0.385	49.0%	0.49
	PUD 1-8	1.652	1.00	12.0	0.22%	2.42	0.81	0.682	86.8%	0.81
B	PUD 8	0.191	0.67	8.0	0.40%	1.77	0.23	0.108	30.6%	0.34
	PUD 5,8	0.325	0.67	8.0	0.40%	2.03	0.31	0.135	45.4%	0.46
C	PUD 8	0.191	0.67	8.0	0.40%	1.77	0.81	0.108	30.6%	1.21

RETAIL RIDGE PHASE 1 UTILITY PLAN
DESIGNED BY: MJS
CHECKED BY: THH
DRAWN BY: MJS
11/20/2023 10:10 AM
11/20/2023 10:10 AM
11/20/2023 10:10 AM



CALL 8 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG. GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



DESIGNED BY: MJS
CHECKED BY: THH
DRAWN BY: MJS

HKS HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80202
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com



REDTAIL RIDGE
PHASE 1 UTILITY PLAN

ISSUE DATE: 03/03/2020		PROJECT #: 190108	
DATE	REVISION	COMMENTS	
03-03-2020	1	PER CITY OF LOUISVILLE COMMENTS	
03-04-2020	2	PER CITY OF LOUISVILLE COMMENTS	
11-09-2023	3	PER CITY OF LOUISVILLE COMMENTS	

PRELIMINARY
NOT FOR
CONSTRUCTION

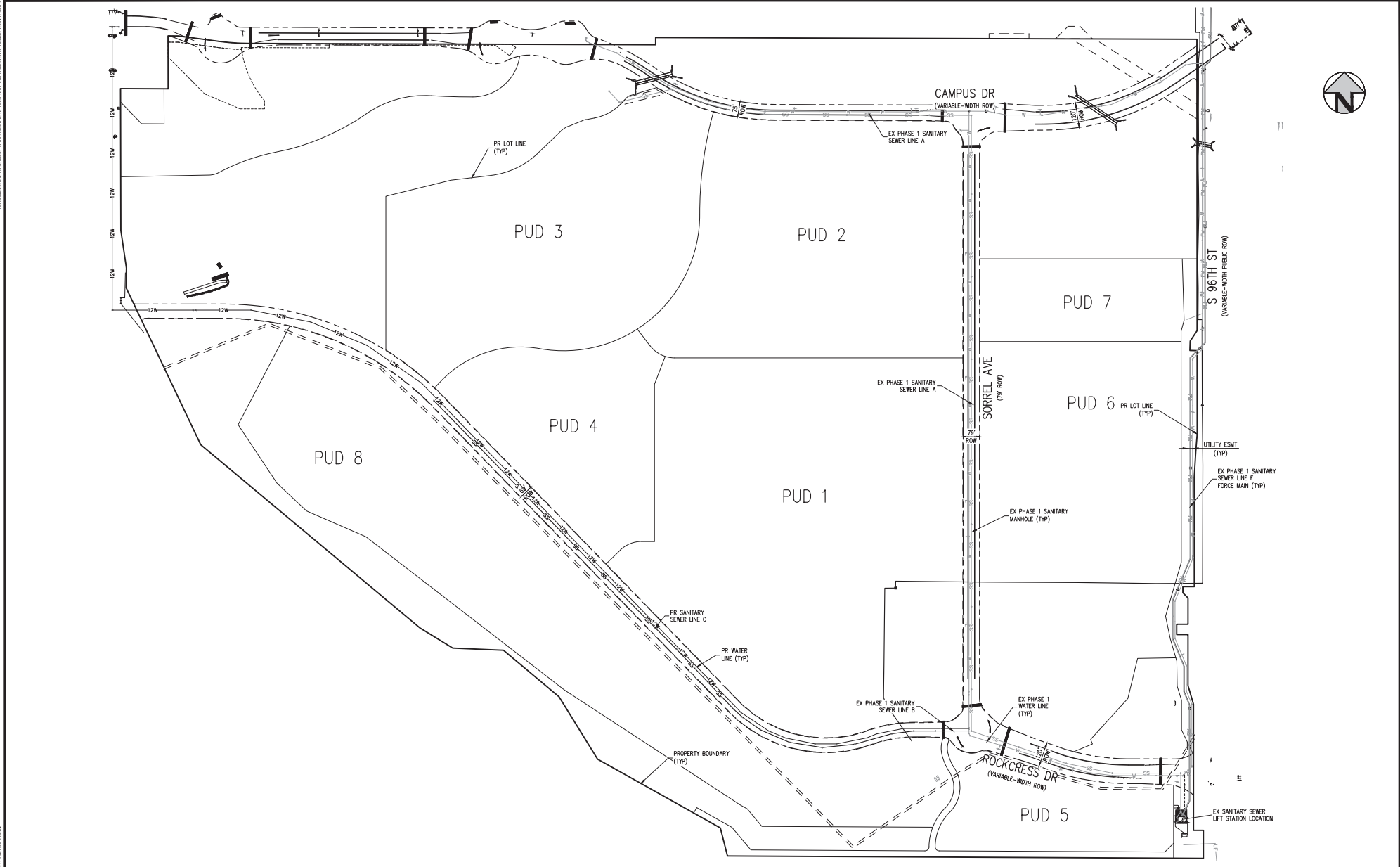
SHEET NO.

1

1 OF 2

NO CHANGES ARE TO BE MADE TO THIS DRAWING OR TO THE INFORMATION CONTAINED HEREIN WITHOUT THE WRITTEN CONSENT OF HARRIS KOCHER SMITH.

ALL WORK IS TO BE COMPLETED WITHIN THE SPECIFIED TIME FRAME. ANY DELAYS OR CHANGES TO THE SCHEDULED WORK SHALL BE THE RESPONSIBILITY OF THE CLIENT. THE CLIENT SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE CLIENT SHALL BE RESPONSIBLE FOR THE MARKING OF UNDERGROUND UTILITIES. THE CLIENT SHALL BE RESPONSIBLE FOR THE MARKING OF UNDERGROUND UTILITIES.



CALL 8 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG. GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



DESIGNED BY: MJS
CHECKED BY: TEH
DRAWN BY: MJS

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REDTAIL RIDGE
PHASE 2 UTILITY PLAN

ISSUE DATE: 03/03/2020		PROJECT #:
DATE	REVISION	COMMENTS
03-03-2020	PER CITY OF LOUISVILLE COMMENTS	
03-06-2020	PER CITY OF LOUISVILLE COMMENTS	
11-09-2020	PER CITY OF LOUISVILLE COMMENTS	

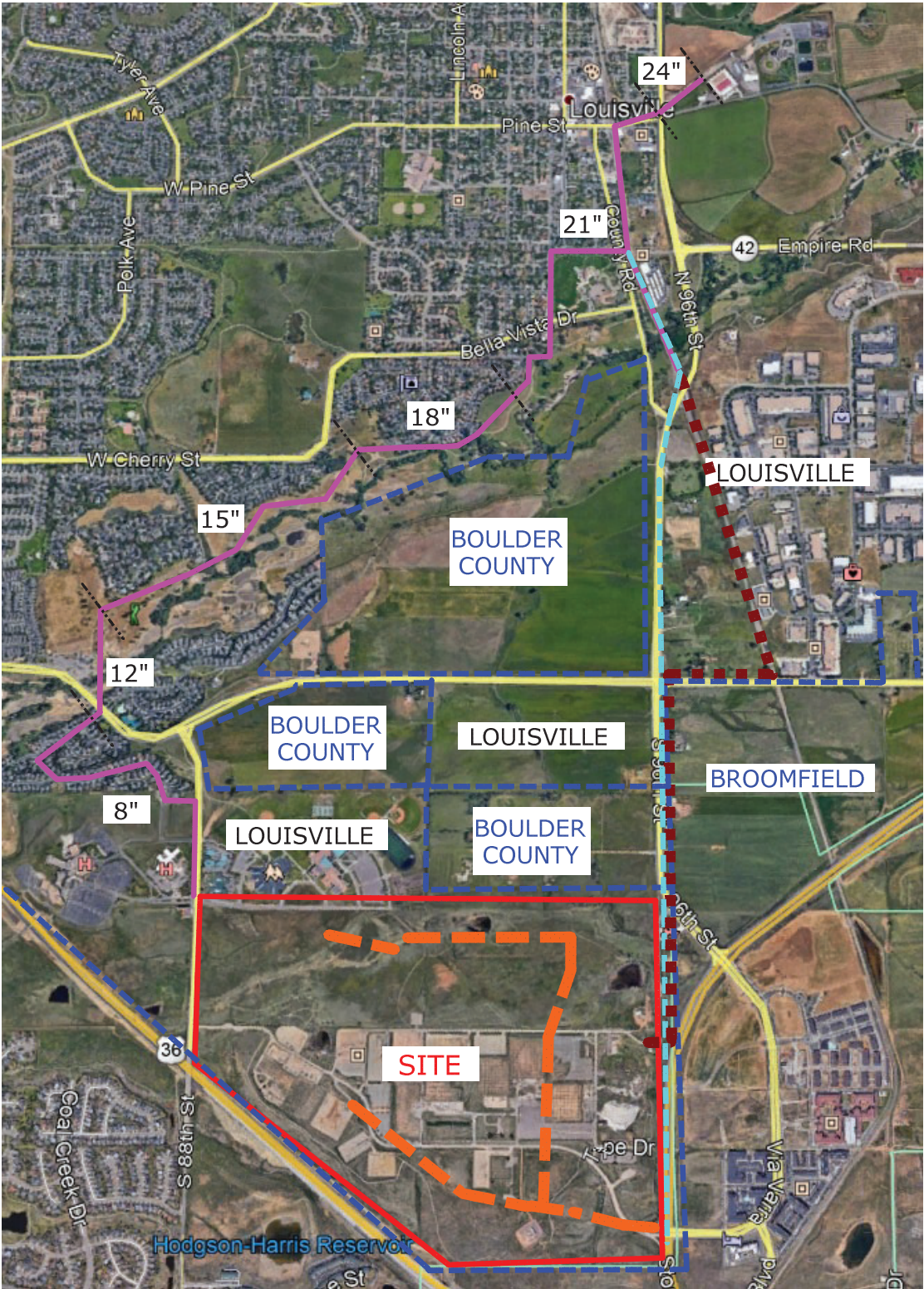
PRELIMINARY
NOT FOR
CONSTRUCTION

SHEET NO.

2

2 OF 2

EXISTING SANITARY MAIN UTILITY MAP



- EX SANITARY SEWER
- MUNICIPALITY BOUNDARY
- PROPOSED SANITARY MAIN
- PIPE DIAMETER CHANGE
- EX SANITARY SEWER
FORCE MAIN
- PR SANITARY SEWER
FORCE MAIN

EXISTING WATER MAIN UTILITY MAP



EXISTING WATER MAIN



MUNICIPALITY BOUNDARY



PROPOSED WATER MAIN



PIPE DIAMETER CHANGE

