Planning Commission

November 08, 2022 at 1:15 PM
1001 11th Avenue, City Center South, Greeley, CO 80631

Agenda

1. Call to Order
2. Roll Call
3. Approval of the Agenda

EXPEDITED AGENDA

The following items are routine in nature, fully described in the accompanying reports, And therefore staff summary presentations will be suspended unless requested by the Commission or member of the public in attendance at the meeting.

4. Public Hearing to consider a Use By Special Review request to allow for up to 23 oil and gas wells to be constructed on one pad with associated production facility equipment, known as the Bypass 1-23 Oil and Gas facility. The proposed subject site is located south of US Highway 34, approximately ¾ mile west of 83rd Avenue, and east of 95th Avenue in the Holding Agriculture zoning district (USR2022-0006).

5. Public hearing to consider a request for a Preliminary Subdivision to plat 212 Lots, 10 Outlots, and dedication of Rights-of-Way on 51.436 acres of land, know as the Lake Bluff Subdivision Filing No. 1. The property is located north of 10th Street (US Highway 34 Business), West of 95th Avenue, and East of Missile Silo Road (SUB2022-0015).

END OF EXPEDITED AGENDA

6. Public hearing to consider an update to the Water & Sewer Design Standards and Specifications - Chapter 6 commercial landscape criteria.
7. Staff Report
8. Adjournment

Planning Commission Agenda Summary

November 8th, 2022

Key Staff Contact: Michael Franke, Planner I, (970) 350-9782

Title:
Public Hearing to consider a Use by Special Review request to allow for up to 23 oil and gas wells to be constructed on one pad with associated production facility equipment, known as the Bypass 1-23 Oil and Gas facility. The proposed subject site is located south of US Highway 34, approximately ¾ mile west of 83rd Avenue, and east of 95th Avenue in the Holding Agriculture zoning district. (Project: USR2022-0006).

Summary:
The City of Greeley is considering a request by the application, Tammy Waters and Paul Montville, on behalf of PDC Energy, for approval of a USR (Use by Special Review) to allow for a new oil and gas development containing up to 23 wells with associated production facility equipment on one pad in the H-A (Holding Agriculture) zoning district. The subject site is located south of US Highway 34, approximately ¾ mile west of 83rd Avenue, and east of 95th Avenue. The subject site parcel is 78.68-acres in size. The subject site is currently used for other oil and gas well production and dry crop farmland. The operation plan for the proposed development consists of a construction & drilling phase, completion phase, production phase, and plugging and abandonment phase. The City of Greeley Development Code states oil and gas development is permitted within all zoning districts upon approval of the USR process due to the highly regulated nature for oil and gas production.

Recommended Action:
Approval:
Based on the application received and the preceding analysis, the Planning Commission finds that the proposed Use by Special Review for an oil and gas operation that consists of 23 oil and gas wellheads and associated production facility equipment in the H-A (Holding Agriculture) zoning district is consistent with the Development Code criteria of Section 24-206 (Items 1-8) and the proposed oil and gas operations will meet the provisions contained in Section 24-1102, Oil and Gas; and therefore, approve the Use by Special Review.

Attachments:
Staff Report
Attachment A – Aerial & Vicinity Map
Attachment B – Existing Zoning Map
Attachment C – Narrative and Operations Plan
Attachment D – Overall Site Plan
Attachment E – Environmental and Safety Plan
Attachment F – Traffic Impact Study
Attachment G – Tactical Response Plan

Attachment H – Noticing Boundary Area

PLANNING COMMISSION SUMMARY

ITEM: Use by Special Review (USR) for Oil and Gas Production Facility in the H-A (Holding-Agriculture) Zoning District

FILE NUMBER: USR2022-0006

PROJECT: Bypass State 1-23 Pad/Facility Oil and Gas Use by Special Review

LOCATION: South of US Hwy 34, approximately ¾ mile west of 83rd Avenue, and east of 95th Avenue

APPLICANT: Tammy Waters and Paul Montville, on behalf of PDC Energy.

CASE PLANNER: Michael Franke, Planner I

PLANNING COMMISSION HEARING DATE: November 8th, 2022

PLANNING COMMISSION FUNCTION:
Review the proposal for compliance with Section 24-1102, Oil and Gas Operations, and Section 24-206, Review Criteria/Uses by Special Review, of the City of Greeley Development Code and either approve, approve with conditions, or deny the request.

EXECUTIVE SUMMARY
The City of Greeley is considering a request by Tammy Waters and Paul Montville, on behalf of PDC Energy, for approval of a Use by Special Review (USR) to allow up to 23 horizontal oil and gas wells and construct temporary and permanent facilities needed for supporting drilling, completion, and production operations. The proposed project would be on a property located south of US Hwy 34, approximately ¾ mile west of 83rd Avenue, and east of 95th Avenue (*Attachment A – Aerial & Vicinity Map and Attachment D – Overall Site Plan*). The subject site is approximately 78.68 acres in size and is zoned H-A (Holding Agriculture).

A. REQUEST

The applicant is requesting approval of a USR to allow for an oil and gas operation for up to 23 oil and gas wellheads and production facility on approximately 20.9 acres of the 78.68-acre site (*Attachment D – Overall Site Plan and Attachment C – Narrative*).

B. STAFF RECOMMENDATION

Approval.

C. LOCATION

Current Zoning:

H-A (Holding Agriculture) (*see Attachment B – Existing Zoning Map*)

Abutting Zoning:

North: H-A (Holding Agriculture)
South: H-A (Holding Agriculture)
East: H-A (Holding Agriculture) and I-L (Industrial Low Intensity)
West: H-A (Holding Agriculture) and R-E (Residential Estate)

Surrounding Land Uses:

North: Dry Crop Farming, Oil & Gas, and Residential
South: Dry Crop Farming and Oil & Gas
East: Drop Crop Farmland and Utilities
West: Dry Crop Farmland, Oil & Gas, and Residential

Site Characteristics:

The site is primarily utilized for dry crop farming and oil & gas production. There are one existing oil and gas well on the site. with the status of Shut-in (Kettler 1-18). The well does include storage tanks on the property as well. The remaining and majority of the parcel's land is vacant and utilized for farming activity and natural, open, area.

D. BACKGROUND

The subject site was annexed into the City of Greeley and zoned H-A, in 2017, as part of the 1034 Enclave Annexation (Reception No. 4303716 and 4291881) (File No. A 12:16 and Z 12:16). The subject site has remained undeveloped, other than oil and gas operations since its annexation. The subject site does not have an associated subdivision. CDOT owns the entirety of the right-of-way of US Highway 34 along the north side of the property.

E. OPERATION PLAN

The Operating Plan is divided into the Drilling Phase and Protection of Water Formations, the Completion Phase, the Production Phase, and the Plugging and Abandonment Phase.

All phases of operations including drilling, completion, production, abandonment, and reclamation are designed to adhere to the Rules and Regulations of the COGCC, especially COGCC 300 Series (Permitting Process), 400 Series (Operations and Reporting), 600 Series (Safety and Facility Operations), 900 Series (Environmental Impact Prevention), 1000 Series (Reclamation), 1100 Series (Flowlines), and 1200 Series (Protection of Wildlife Resources). Enclosed flares shall be utilized during the drilling, completion, recompletion, reworking, production, repair, and maintenance of the pad site. PDC will use Best Management Practices during all phases of operations.

PDC Energy intends to horizontally drill 23 proposed wells using facilities, equipment, on approximately 78.68 acres of land, with a footprint of approximately 20.9 acres (*Attachment C – Narrative and Operations Plan*).

PDC will use Best Management Practices during all phases of operations.

Drilling Phase and Protection of Water Formations:

The proposed drill site will be approximately 20.9 acres in size and construction of this site will include leveling the pad to accommodate the drilling rig. Sound walls to mitigate sound and light will be installed after the pad is constructed, prior to the commencement of drilling. Once the pad is completed, a small surface drilling rig will be brought onto location and rigged up to drill the surface portion of the well for the 23 wells on the pad. This will take approximately 24 hours per well. Drilling operations, which run twenty-four (24) hours a day until completed, will commence after the rig is "rigged up". A 13-1/2-inch surface hole will be drilled to approximately 1750 feet using fresh water. Surface casing 9-5/8 inches in diameter will then be run and cemented to surface to protect any shallow freshwater zones. Surface casing setting depth is determined from subsurface ground water maps prepared by the State Engineer and supplemented by the latest data available from offsetting wells. A baseline water sample will be obtained from water wells within ½ mile of the proposed location to ensure water quality. When all 23 wells have surface casing set, the surface rig will move off the Bypass location. It is estimated to take one day per well to drill and set surface casing.

Once the location is clear from the surface rig, a liner is set on the pad where the drilling rig will be rigged up to contain and prevent any potential fluid from hitting the ground. In addition, wooden matting boards will be placed over the liner as a secondary containment for fluids and stability for the drilling rig. Once the location is prepped, the drilling rig will move in and rig up on the first well on location. The Blowout Preventer Equipment (BOPE) will be installed and tested prior to drilling. After testing, the drilling of the production hole will commence. A bit and directional tools comprise the bottomhole assembly (BHA). (*Attachment C – Narrative and Operations Plan*).

The directional tools are placed behind the bit to steer the assembly, and continuously survey and send data to the surface to monitor the wellbores 3D position spatially, and to track in the targeted formation. The 8-1/2-inch bit and BHA will drill-out of the surface casing shoe and drill the "vertical" portion of the hole in which angle is built to separate wells into their planned slots. Once the vertical portion of the hole is drilled, the curve will be initiated. The curve will take approximately 1,000 feet to drill and will then place the wellbore at approximately 90° in order to enter the targeted hydrocarbon bearing zone. The wells will be drilled horizontally or parallel to the surface for approximately 1.5 miles at a vertical depth of 6,800-7,200 feet below the ground. The total Measured Depth (MD) for the proposed wells is approximately 15,000 feet.

Once the horizontal section of the wellbore is drilled, a string of production casing will be run into the wellbore. This casing will be 5-1/2 inches in outer diameter and weigh 20 pounds per linear foot. The cement sheath will isolate the entire casing string from the total depth of the well back to surface.

Completion Phase:
The completion phase typically begins when the drilling equipment is transported off the location. There will be no intentional rest period between drilling and completion operations. Lag time could be encountered dependent on vendor availability. Completion operations are conducted twenty-four (24) hours per day intermittently over a period of several weeks. The site may be regraded to accommodate the completion operations and anchors may be set for the completion operations. For horizontal wells, multiple fracture stages are induced along the length of the wellbore in the respective formation that the well has been drilled.

During hydraulic fracturing, water and some additives are pumped at high rates and pressures that exceed the minimum in-situ rock stresses and hydraulically fracture the formation. Sand is then pumped into the created fracture to allow gas and oil to flow freely from the formation into the well bore. The fracturing equipment will consist of one Modular Large Volume Tank (MLVT) for freshwater storage that will fully comply with COGCC's MLVT policy, multiple flowback tanks, pressure pumps, blending and bulk material trucks with other necessary equipment. After fracturing is completed, the mobile equipment is removed, excluding tanks that are used to retain the water that is produced during flowback and testing operations. No water is allowed to accumulate or be disposed of on surface. All water is hauled to approved disposal sites or recycled for stimulation use. The flowback tanks will remain on location until the well is rerouted through standard production equipment.

It takes approximately 2-3 days to hydraulically fracture each well for a total of 45-60 days on this location COGCC regulations give the operator three months to complete restoration activities, but restoration may occur sooner than three months. (*Attachment C – Narrative and Operations Plan*).

Production Phase:
The production equipment for the Bypass State 1-23 Well Pad/Facility will be located adjacent to the wells. The equipment on this site will consist of the following components: 6 temporary oil tanks, 6 temporary water tanks, 2 permanent maintenance tanks, 2 permanent steel water tanks, 1 permanent partially buried water vault, 7 combustors, 1 temporary water tank combustor, 2 tank/surge vapor recovery unit, (1) 2-phase vertical separator, 5 oxygen destruction system, 1 unloading separator, 3 separator LP vapor recovery units, (1) 2-phase separator, 1 communication tower, 3 instrument air skids, 3 surge vessels, 3 oil LACT, 2 water LACT, 23 production separators, 1 meter area, 2 gas lifts skids.

If needed, a temporary generator will be used before connecting to electric lines; a short noise control fence will be installed or other agreeable measures to mitigate the noise from this generator. Tanks and facilities shall be painted per COGCC Rules. The steel berm ring around the facility will hold 150% of the capacity of the largest tank within the berm. Flowlines will be installed but will not leave the oil and gas operations area. Additionally, all flowlines will be pressure tested at least annually to verify integrity and will remain in full compliance with COGCC 1100 Series Rules.

Connecting the well pad to pipeline is anticipated by 3rd quarter 2025. An PDC employee or contractor called a "lease operator," then begins monitoring the well on a scheduled basis. The lease operator reports the tank measurements of the oil, gas sales, and pressure readings. Much of this production information is compiled and submitted to the COGCC monthly. In addition, the lease operator will inspect the site for hazards and weed control, maintaining the appearance of the Bypass State 05N66W18 1-23 Pad/Facility. For the first few months, water and oil will be hauled daily from the location. As volumes decline, water and oil hauling will also decline. (*Attachment C – Narrative and Operations Plan*).

Plugging / Abandonment Phase:
At the time the wells become sub-economic to operate, PDC or PDC's successors will engage the services of a plugging rig to remove production equipment from the wellbores and plug the productive zones with a combination of bridge plugs and cement plugs in accordance with COGCC Rules and Regulations. If the separators and tanks on the surface of the land are no longer needed for other wells, they will be removed. Surface restoration will involve removal of any above-ground casing and the installation of regulation markers that will not interfere with subsequent surface use.

After all production equipment is removed, the surface will be restored to the original grade with reseeding in accordance with COGCC Rules and Regulations. This may be waived with the permission of the surface owner at the time of final restoration if there has been further land engineering that would conflict with the drill site being restored as described herein.

All transmission and/or flow lines shall be completely removed from the ground upon entering the abandonment phase. No underground lines that can or may contain any flammable product shall remain in the ground after the facility is abandoned. (*Attachment C – Narrative and Operations Plan*).

APPROVAL CRITERIA

Use by Special Review: Uses by Special Review possess characteristics which require a public hearing to determine if a proposed use has the potential to adversely affect other land uses, transportation systems, public facilities, or the like in the surrounding neighborhood. The Planning Commission may require conditions of approval necessary to eliminate or mitigate, to an acceptable level, any potentially adverse effects of the

proposed use.

Section 24-206.b of the Development Code contains eight criteria that are used to evaluate Uses by Special Review:

1. All criteria for site plan review in Section 24-207

Staff Comment: The proposed project satisfies the requirements of Section 24-207 of the Development Code. The applicant has addressed all staff comments and included all required materials to satisfy the criteria for a Site Plan Review and for the Use by Special Review. (*Attachment D – Overall Site Plan*).

The proposal complies with this criterion

2. The application furthers the intent of the proposed zoning district, does not conflict with the intent of any abutting districts, and is otherwise determined to be consistent with the Comprehensive Plan.

The following Imagine Greeley Comprehensive Plan policies apply to this request:

- **NR-3.6 Resource Extraction**
  To the extent possible, minimize negative impacts from the extraction of sand, gravel, oil and gas, and other natural resources on the environment and surrounding land uses. Encourage the thoughtful reclamation of land that has been mined.

- **NR-3.11 Oil and Gas Operations**
  Encourage the co-location of oil and gas facilities, where possible, to minimize the overall footprint of affected areas and impacts on adjacent land uses and the environment.

- **TM-4.1 Truck Impacts**
  Establish and enforce appropriate truck routes to and through the city, including for hazardous materials. Encourage the co-location of oil and gas facilities in order to minimize impacts of transporting these resources on the community.

  Staff Comment: The Comprehensive Plan encourages the colocation of oil and gas well facilities. PDC Energy proposes to cluster 23 wells onto one pad site, complying with co-location standards of item NR-3.11. Both the cluster concept and the horizontal drilling, allow the operator to reach resources desired, while reducing the oil

and gas footprint on the surface. The drilling operations would allow the owner or lessee of the mineral estate to recover hydrocarbons prior to surface development. This site, because of horizontal drilling, has the potential to reduce the cumulative number of smaller independent sites and plug and abandon sites throughout the area. The proposal allows for access to below-grade mineral rights in a larger geographic area where surface development has already been completed.

PDC will utilize access road, 95th Ave/County Road 25, off US Highway 34 for all traffic associated with construction and production of the wells proposed for the Bypass State Pad. The access roads would be constructed to accommodate local emergency vehicles. The drill pad shall have two access roads during drilling and completion phases of the project. Both accesses would be constructed as shown on the construction plans. During the production phase the north access is required to be restricted for use by emergency vehicles only and must be gated. All routine production traffic would use the south access only. The roads would be required to be maintained for access. Traffic will be routed to minimize local interruption. (*Attachment D – Overall Site Plan and Attachment F – Traffic Study*).

The proposal complies with this criterion.

3. **Any associated site development or construction complies with requirements of this code, including any conditions or additional requirements identified for the particular use.**

Staff Comment: The proposed project complies with all development code requirements for site development and construction standards. Additional requirements, such as visual, noise, air quality, environmental, etc. mitigation have been provided within the narrative, operation plans, and submitted studies. Various city departments, external agencies, and abutting municipalities have reviewed the project proposal and have expressed no concern with the proposal as it meets all requirements for site design, site construction, and production of oil and gas goods.

The proposal complies with this criterion.

4. **Compatibility with the area in terms of operating characteristics such as hours of operation, visible and audible impacts, traffic patterns, intensity of use, and other potential impacts on adjacent property. The cumulative impact of a concentration of similar existing uses may be considered as part of the impact of a particular use.**

Staff Comment: The operating characteristics of the proposed project are within normal standards for the site location and abutting properties. The site location is experienced with other oil and gas operations to the same standards as the proposed project. The surrounding uses of dry crop farmland, oil and gas production, create similar impacts to the proposed project and are not unusual for this area of the city.

PDC Energy has conducted several studies and submitted each to the city for review, such as an Emergency Action Plan (EAP and Tactical Response Plan (TRP), Traffic Study, Final Drainage and Erosion Control Reports and Plans, Light Mitigation Plan, Environmental Study, etc. PDC Energy must continuously monitor conditions of the site to comply with various mitigation standards. Upon review, staff found all submitted mitigation and response plans to be in compliance with City, County, State, and COGCC requirements.

Traffic impacts would be the greatest during the construction and drilling phases. PDC Energy would utilize the lease access road, 95th Avenue and US Highway 34 for all traffic associated with construction and production of the wells proposed for the Bypass project. Ninety-fifth Avenue is design for oil and gas production traffic as well as farming equipment traffic. US Highway 34 is equipped for large travel volumes and truck travel. PDC Energy is required to obtaining all required Colorado Department of Transportation (CDOT) permits. Approximately 50% of the incoming traffic would be from US Highway 34 and 50% from 95th Avenue. The same goes for outgoing traffic, 50% would be routed north to US Highway 34 and 50% would be routed south on 95th Avenue. The project does not propose any traffic impacts unusual to the site and abutting properties. (*Attachment F - Traffic Impact Study, and Attachment C – Narrative and Operation Plan*).

The proposal complies with this criterion.

5. **The site is physically suitable for the proposed use, and whether any additional site specific conditions are necessary for the use to be appropriate and meet these criteria.**

Staff Comment: The 78.68-acre site is currently dry crop farmland with oil and gas wells and storage tank facilities. The site is adjacent to unoccupied parcels to the east and south. The nearest structure to the facility is equipment used for utility production/transmission shed that is unoccupied and access irregularly by associated employees. The equipment is over 600 feet away from the edge of the site boundary. To the west, there is an occupied single-family residence in the form of an estate lot/farmhouse. The residence is located approximately 1,200 feet away from the proposed site. Staff has not received any concerns from the property owner regarding the proposed project. There is other existing oil and gas operations nearby the residence, so this proposal does not alter the site suitability.

All wellheads and on-site production equipment are required to be at least 150 feet from any other wells or associated production equipment in the low-density areas of the city and at least 200' from any occupied building. The proposed wells are located at least, if not more than, 150 feet from any occupied building. The COGCC requires setbacks of at least 500 feet from any occupied building and at least 2,000 feet from any school facility or childcare center. The proposed project complies with the COGCC regulations. The site is physically suitable for oil and gas operation and the proposed development meets or exceeds the setback requirements required by the city and the COGCC. *(Attachment D – Overall Site Plan)*

The proposal complies with this criterion

6. **Whether a limited time period for the permit is reasonably necessary to either limit the duration of the use, assess the use against changing conditions in the area, or ensure periodic reporting and ongoing enforcement of the permit.**

Staff Comment: It is not necessary to limit the duration of the use. A limited time period for the permit operation is not proposed, other than the natural timeline proposed for the project. The estimated schedule for operational phases of the project begins with pad

construction approximately March of 2023, with production phase beginning approximately August of 2024. After the production phase begins, wells and production equipment would likely continue to operate until deemed economically unviable. At such time, the wells would be plugged and abandoned as appropriate. Once all wells are plugged and abandoned, including flowline abandonment, permanent and final reclamation of the land shall take place. Currently, there are no development plans in this area that would propose changing conditions in the area.

Periodic reporting and ongoing enforcement is required to be provided by PDC Energy to agencies such as the COGCC for compliance with mitigation regulations. If necessary, City of Greeley Fire Department shall work with the applicant to address any issues violating municipal requirements for oil and gas operations. PDC Energy must continuously monitor the project site. A PDC Energy employee are required to visit the site daily. PDC Energy staff shall address any aspects of the project that may fall out of compliance to meet regulatory requirements at the local, state, and federal levels.

The proposal complies with this criterion.

7. **The long-range plans for the surrounding area are not negatively impacted considering the permanence of the proposed use, the permanence of existing uses in the area, and any changes in character occurring in the area.**

Staff Comment: The subject area is proposed as a mixed-use high intensity area, surrounded by suburban uses and community separator land according to Greeley's Land Use Guidance Map within the Imagine Greeley Comprehensive Plan. The mixed-use designation is to maximize the land value and opportunity adjacent to US Highway 34 and 95th Avenue. At this time, there are not any anticipated development plans that would occur in this area to cause changing conditions from current. Projected long range uses of this site area could include development plans for a mixture of commercial development with residential development integrated or surrounding the commercial uses. However, no development of that nature is proposed. The proposed project is placed as far south as possible, away from US Highway 34, where any potential future mixed-use

development may occur in the future. Existing uses in the area are similar and suitable for oil and gas development, including dry crop farmland, vacant land, and other existing oil and gas operations. Mitigation measures are proposed to reduce impacts, or the cumulative effects associated with continuous oil and gas development within the area.

In general, staff has seen an increase in oil and gas activity on the western and southern sides of the city as operators look to identify locations that support multiple wells, meet COGCC setback and spacing requirements, and provide accessibility to resources located underdeveloped portions of the city. As these sites would operate for several years, staff has encouraged operators to locate away from tracts with potential for residential development and provide some improvements based on the nexus of rough proportionality for each site, which staff finds to be applicable for the Bypass project.

The proposal complies with this criterion.

8. **The recommendations of professional staff or other technical reviews associated with the application.**

Staff Comment: The following departments and agencies have reviewed the proposed project submittal:

- City of Greeley: Planning, Engineering Development Review, MS4, Fire, and Traffic.
- Agencies: Colorado Department of Transportation (CDOT) and Colorado Department of Parks and Wildlife (CPW).

No formal comment letters were received by CDOT expressing concern regarding the project. The review bodies listed above have all been involved in the review of the proposed project as planned due to compliance with required standards of local, state, and federal policies for oil and gas development and production. PDC Energy has submitted the proposed project to the COGCC for review and hearing approval.

The proposal complies with this criterion

Oil and Gas Operations

Applications for Uses by Special Review for oil and gas operations are subject to the provisions of Section 24-1102, Oil and Gas. Sections 24-1102.c through Section 24-1102.h address well and production facility setbacks, disposal of production waste, seismic

operations, signage, access roads, environmental requirements, recordation of flow lines, reclamation of the site, abandonment and plugging of wells, well operations in high density areas, compliance with COGCC, review criteria, and inspection requirements.

Staff Comment: A review of information submitted by the applicant indicates compliance with Sections 24-1102.c through 24-1102.h. These design and operational requirements are reflected in the site plan, landscape plan and standards attached for potential approval (*Attachment D – Overall Site Plan, Attachment E – Environmental and Safety Plan, and Attachment C – Narrative and Operations Plan*).

This proposal complies with this criterion.

F. PHYSICAL SITE CHARACTERISTICS

1. HAZARDS

There is one existing oil and gas wells on the subject parcel (Kettler 1-18 #322621), however, the Kettler well has a status of "Shut-In". Staff is unaware of any additional hazardous conditions or events that have occurred on the site to date.

2. WILDLIFE

The subject site is not within the City's Ecological Significance Areas. For this reason, the applicant was not required to submit an Environmental Report of the site; however, the applicant did submit an Environmental Study for review. Nonetheless, the Colorado Department of Parks and Wildlife (CPW) was assigned a review for the project. CPW provided comments to the city. CPW noted if the nearby eagle nest is occupied and/or active, there should be no surface occupancy (NSO) and no ground disturbance (NGD) year-round within 0.25 miles of an active nest. The proposed project site is beyond the 0.25-mile buffer of a nesting site and causes no disturbance to the nest. No permitted or authorized human activities within 0.5 miles of an active nest from December 1st, through July 31st. Pre-construction surveys should be conducted by the applicant (oil and gas operator in this case) prior to any surface disturbance/occupancy.

The Development Code indicates that if there are black-tailed prairie dogs inhabiting portions of the site, they must be properly removed as indicated in Section 24-1102 (e) (2) and destruction of prairie dog towns many do not occur during the nesting season (May 15 – September 15) due to the potential presence of the burrowing owl. If burrowing owls are actively nesting on the site or brood-rearing is present, a plan shall be developed by the applicant and approved by the City and/or the Colorado Division of Wildlife. It must be implemented before development occurs. Staff finds the applicant has worked with appropriate agencies and coordinated strategies for ecological mitigation. No activity for the proposed project shall disturb any ecologically significant lands nearby. The applicant shall work to mitigate against any impacts to ecologically significant areas.

3. FLOODPLAIN

The subject site is not located in the floodplain or floodway according to Federal Emergency Management Administration (FEMA) flood data.

4. DRAINAGE AND EROSION

A drainage report was submitted by the applicant and reviewed by the Engineering Development Review Division, which indicates Changes in natural drainage patterns are not anticipated. The well site will be monitored during the drilling and completion phases for any stormwater erosion or sedimentation concerns. Necessary measures would be required to be taken to correct any problems, immediately in most cases. Once the drilling and completion phases are complete, the drill site is required to be restored as near as practical, to its original grade and vegetation planted as required by COGCC regulations and surface use agreements. PDC must continue to monitor the site until all applicable regulatory requirements for re-vegetation have been met. PDC uses a closed loop or "pitless" system for drilling and fluid management and does not construct a reserve pit. The drilling company would actively manage the area around the rig equipment such that any minor fluid spills would be diverted and drained to small pumps strategically located and from there, if only water, would be pumped into the drilling fluid system. If the fluid is contaminated by fluids other than water, it would be required to be pumped into a separate container and removed from the site to an approved disposal facility

5. TRANSPORTATION

PDC would utilize access road, 95th Ave/County Road 25, off US Highway 34 for all traffic associated with construction and production of the wells proposed for the Bypass State Pad. The access road must be constructed at a minimum of 24 to 30 foot wide (based on location on the site, see Site Plans for details), with a minimum 13.5 feet of overhead clearance. All access roads are required to be constructed of 1 and ½ in crushed road base over 6 inches of 95% compacted subgrade and aggregate base course. The access roads would be properly graded for adequate drainage and maintained to prevent dust and mud; culverts shall be utilized where necessary. PDC has submitted an access permit application to CDOT and is working through the permit requirements. A transportation study/memo has been prepared by a traffic consultant. (see Attachment F – Traffic Study).

G. SERVICES

1. WATER

All of the water used for drilling and completion operations would be fresh water. The optimum water source during drilling operations would be determined by PDC prior to drilling of the wells. It is anticipated that the water used during the completion operations for fracture stimulation would be provided by Noble Midstream Partners and would be transferred to location by means of pipes and pumps and not delivered from an offsite source by means of tanker trucks. It is estimated that for each of the horizontal wells, the

estimated number of truckloads of water and associated truck traffic that can be eliminated by virtue of transferring water by pipe and pumps could be up to approximately 1,300 truckloads per well. If all 23 horizontal wells are drilled that could mean the elimination of over 41,600 truckloads.

2. SANITATION

Portable sanitary facilities that comply with COGCC Rules and Regulations would be provided and maintained on the location during the drilling and completion phases of the operation. Because no personnel are on the location for an extended period of time, no city services or sanitary services of any kind would be required or provided after the well begins to produce. An PDC employee or contractor must visit the site every day and will be responsible for picking up and disposing of any debris.

3. EMERGENCY SERVICES

The property would be served by the City of Greeley's Police and Fire Departments as it serves the residences along US Highway 34 corridor, east of State Highway 257. The nearest fire station to the site is Greeley Fire Department Station No. 6, approximately 1 mile from the site. Additionally, an Emergency Response and Fire Protection Plan (ERFPP), also called Tactical Response Plan, was reviewed by the Greeley Fire Department and complies with City standards (*see Attachment G – Tactical Response Plan*).

As the emergency response agency, that would be called to mitigate an incident, the Greeley Fire Department has implemented strategies to mitigate the risks associated with potential incidents related to oil and gas facilities, just as they do with the vast array of other risks in the community. These strategies consists of identifying the hazards associated with oil and gas drilling/operations, developing a mitigation strategy, updating the strategy as the risks change, implementing the plan when necessary (response), and then reviewing and making corrections as necessary after an incident.

Some highlights of this strategy include the Greeley Fire Department being actively involved in the review and permitting of oil and gas operations; training and equipping members of their department to be prepared to fight flammable liquids fires; command staff attending courses on handling oil and gas well emergencies; incorporating oil and gas well response into the required training program for all firefighters; reviewing local incidents outside the Departments response area and sharing critique information with all personnel. The Fire Department uses a fire suppression foam trailer to improve flammable liquid fire mitigation response time.

4. PARKS/OPEN SPACES

The City of Greeley's *Parks, Trails, and Open Lands Master Plan* (PTOL) does not identify the area having any future parks or trails that would intersect the proposed project

parcel or site. No open space or parks is required with this development; however, sufficient open space (not usable) would be present during the production phase.

5. SCHOOLS

This project would have no impact on area schools. No schools are proposed or located within the site.

H. NEIGHBORHOOD IMPACTS

1. VISUAL

The production facilities would be painted in accordance with the COGCC Rule 804 regarding Visual Mitigation, which states: "Production facilities, regardless of construction date, which are observable from any public highway shall be painted with uniform, non-contrasting, non-reflective color tones (similar to the Munsell Soil Color Coding System), and with colors matched to but slightly darker than the surrounding landscape". PDC has reduced the overall size of the disturbance, moving the location further away from both residential and highway sight lines. With the reduction in size and rural landscape of the surrounding area, PDC believes recontouring to natural grade and seeding with native grasses will adequately mitigate any potential visual impacts associated with the location. No additional landscaping is proposed due to the remoteness of the site location and visual mitigation efforts

During drilling, lighting would be utilized on site to facilitate a 24-hour drilling schedule. A temporary sound wall will be installed around the northerly and westerly edges of the well pad. The walls are 32 feet high, with LED lights placed 8-10 feet below the top of the wall. These lights are placed every 200-300 feet along the wall, directed downward to mitigate any outside exposure to unwanted lighting. The drilling phase includes 8 lights around the walls while the completion phase will require 14 lights to be installed. These are only temporary and not permanent. During the drilling and completions phases lights will be pointed inward and downward and screened by sound walls. During the production phase, lights are required to be pointed inward and downward and will be switch-controlled and only in use while PDC personnel are present on location. (*Attachment E – Environmental and Safety Plan*).

2. NOISE

Any operations involving the use of a drilling rig, workover rig, or fracking, and any equipment used in the drilling, completion, or production of a well are subject to and must comply with the noise regulations set forth by the City of Greeley, wherein compliance will be met by abiding by state environmental and noise requirements set forth in COGCC Rule 423. PDC's contract drilling company will comply with COGCC Rules and Regulations for noise abatement. In addition to following the COGCC Rules and Regulations, PDC, whenever possible, will schedule deliveries and construction

traffic to and from the site during daylight hours. PDC will perform all of the following to mitigate noise from the operation:

- A noise model from a qualified third-party noise consultant would be conducted on the drilling and hydraulic fracturing equipment prior to commencing operations to determine potential sensitive areas, which includes an ambient survey. Additional source-based noise mitigation will be implemented as required to address the results of the model.
- Sound walls are required to be installed around the northerly and westerly edges of the well pad, as well as a portion of the northeast corner, in order to mitigate sound and light. Installation would be after the pad is constructed, prior to the commencement of operations. Sound walls will remain in place approximately 8 months, more or less, and taken down after the completion phase, prior to production.
- An internal process has been developed to quickly address any potential noise issues that arise during operations.
- In addition to sound walls, the operator would further reduce noise from completions operations by using a frac fleet consisting of the latest sound mitigation technology available to the operator. Containerized sand delivery and storage will also be used for further noise reduction.

Mitigation of potential impacts, such as noise, would be handled in accordance with COGCC regulations, along with applicable Municipal Code standards. Staff finds the project plans as proposed provide adequate noise mitigation in relation to the surrounding land uses and oil and gas development.

I. PUBLIC NOTICE AND COMMENT

A neighborhood meeting took place on September 21st, 2022 at 5:00 PM. The meeting was held virtually due to the remoteness of the proposed project site, existing land uses, and minimal impacts to the surrounding area. The virtual platform provides greater accessibility for public participation through flexibility of participation. No members of the community attended the meeting. No phone calls, emails, or letters were received by the City of Greeley or PDC Energy expressing concerns regarding the project.

Letters, per Development Code requirements, regarding the public hearing for the proposed Use by Special Review were mailed on October 20th, 2022 to property owners within 1,000 feet of the site. Signs were posted on the site on October 20th, 2022. To date, November 2nd, 2022, no comments have been received (*see Attachment K – Noticing Boundary Area*).

J. MINERIAL ESTATE OWNER NOTIFICATION

Mineral notice is required for a public hearing. The applicant is the sole owner of the minerals for the subject site; therefore, a thirty (30) days' notice was not required.

K. PLANNING COMMISSION RECOMMENDED MOTION

Approval:

Based on the application received and the preceding analysis, the Planning Commission finds that the proposed Use by Special Review for an oil and gas operation that consists of 23 oil and gas wellheads and associated production facility equipment in the H-A (Holding Agriculture) zoning district is consistent with the Development Code criteria of Section 24-206 (Items 1-8) and the proposed oil and gas operations will meet the provisions contained in Section 24-1102, Oil and Gas; and therefore, approve the Use by Special Review.

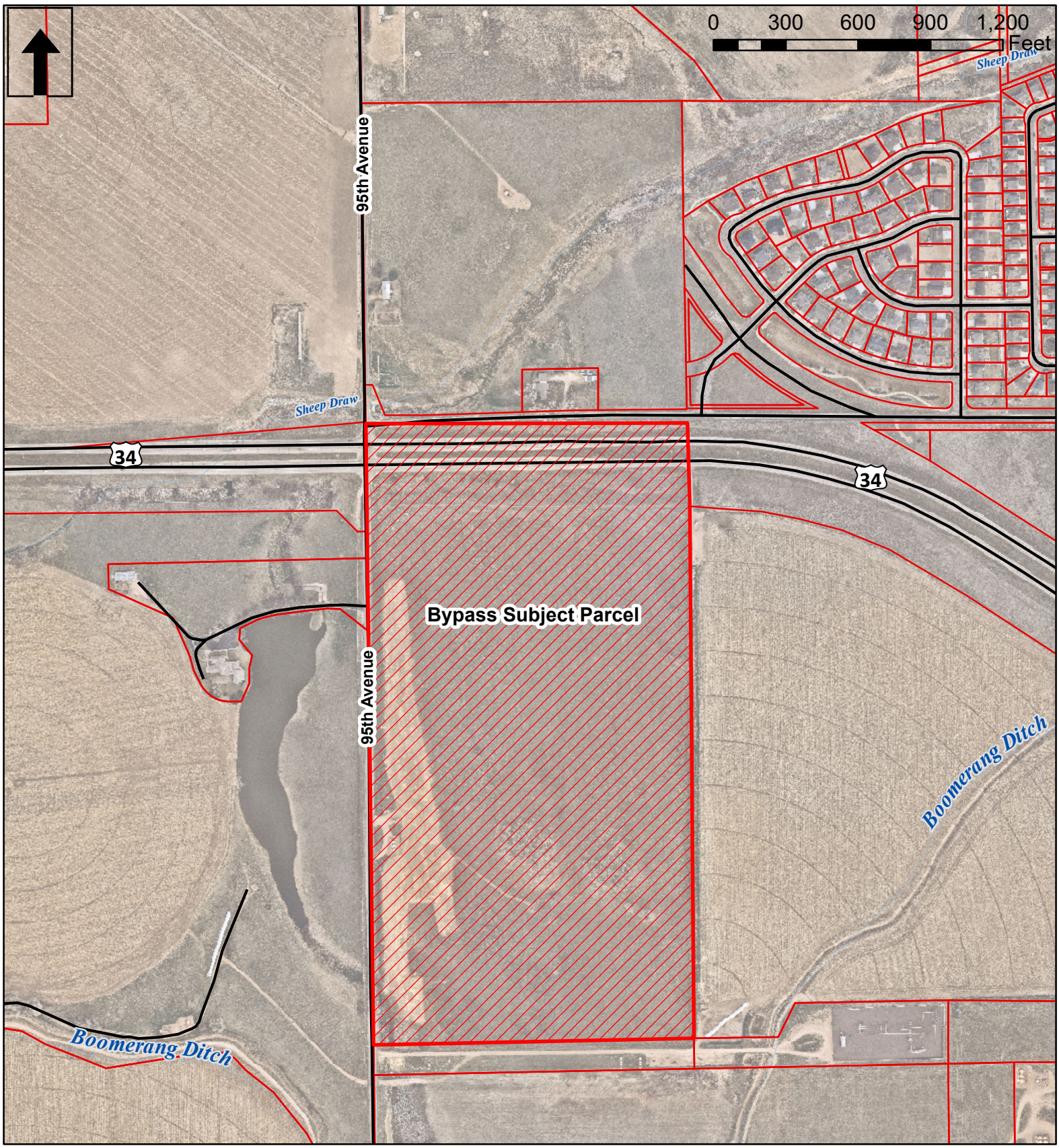
Denial:

Based on the application received and the preceding analysis, the Planning Commission finds that the proposed Use by Special Review for an oil and gas operation that consists of 23 oil and gas wellheads and associated production facility equipment in the H-A (Holding Agriculture) zoning district is not consistent with the Development Code criteria of Section 24-206 (Items 1-8) and the proposed oil and gas operations will not meet the provisions contained in Section 24-1102, Oil and Gas; and therefore, deny the Use by Special Review.

ATTACHMENTS

Attachment A – Aerial & Vicinity Map
Attachment B – Existing Zoning Map
Attachment C – Narrative and Operations Plan
Attachment D – Overall Site Plan
Attachment E – Environmental and Safety Plan
Attachment F – Traffic Impact Study
Attachment G – Tactical Response Plan
Attachment H – Noticing Boundary Area

Attachment A - Bypass Oil & Gas Well and Production Facility Vicinity Map



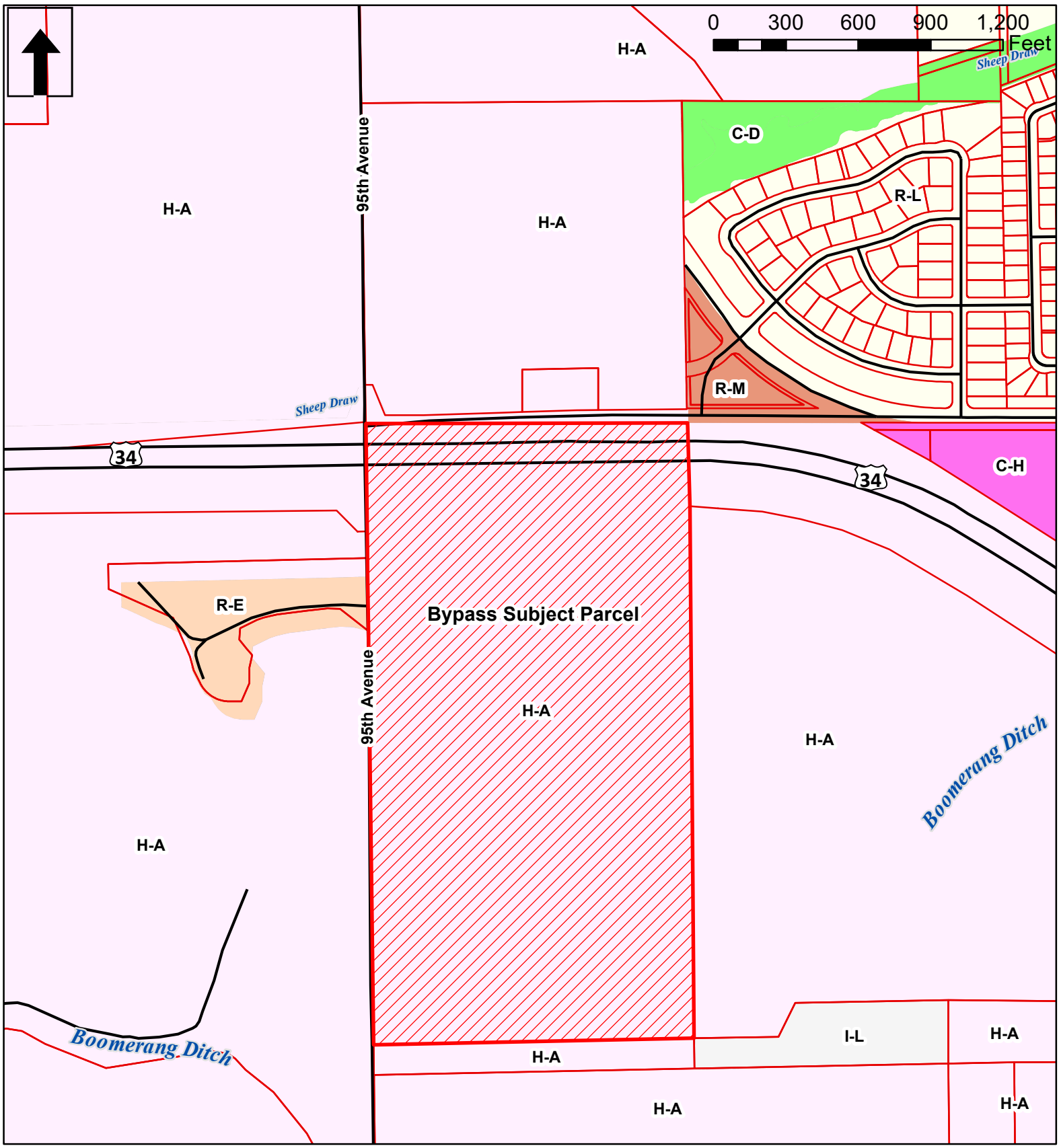
Greeley Parcels

Bypass Subject Parcel

City of Greeley Colorado | COMMUNITY DEVELOPMENT

Attachment B - Bypass Oil & Gas Well and Production Facility Vicinity and Existing Zoning

City of Greeley Colorado | COMMUNITY DEVELOPMENT



- Greeley Parcels
- Bypass Subject Parcel
- Conservation District**
- Commercial Low Intensity
- Commercial High Intensity
- Holding Agriculture
- Industrial Low Intensity
- Industrial Medium Intensity
- Industrial High Intensity
- Planned Unit Development
- Residential Estate
- Residential Low Density
- Residential Medium Density
- Residential High Density
- Residential Mobile Home

CITY OF GREELEY
LAND USE APPLICATION/USE BY SPECIAL REVIEW
USR2022-0006 (formerly USR2018-0024)

APPLICANT:

PDC ENERGY

1775 SHERMAN STREET, SUITE 3000
DENVER, COLORADO 80203

PROPOSED OIL AND GAS LOCATION AND WELLS:
W/2NW SECTION 18, TOWNSHIP 5 NORTH, RANGE 66 WEST, 6TH P.M.
BYPASS STATE 05N66W18 1-23 PAD/FACILITY
BYPASS STATE 01N, BYPASS STATE 02N, BYPASS STATE 03N, BYPASS STATE 04N, BYPASS STATE 05N, BYPASS STATE 06N, BYPASS STATE 07N, BYPASS STATE 08N, BYPASS STATE 09N, BYPASS STATE 10N, BYPASS STATE 11N, BYPASS STATE 12N, BYPASS STATE 13N, BYPASS STATE 14N, BYPASS STATE 15N, BYPASS STATE 16N, BYPASS STATE 17N, BYPASS STATE 18N, BYPASS STATE 19N, BYPASS STATE 20N, BYPASS STATE 21N, BYPASS STATE 22N, BYPASS STATE 23N
23 WELLS

SUBMITTAL NOVEMBER 2, 2018
RESUBMITTAL MARCH 22, 2019
RESUBMITTAL APRIL 1, 2022
RESUBMITTAL JUNE 29, 2022

SUBMITTED BY:

ASCENT GEOMATICS SOLUTIONS

8620 Wolff Court
Westminster, Colorado 80031

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BYPASS STATE 05N66W18 1-23 PAD/FACILITY

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Exhibits

- Exhibit A Land Use Application
- **Exhibit B Use by Special Review and Construction Drawings**
- Exhibit C Drainage Report
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- Exhibit I Area Showing Well Locations in Section
- Exhibit J Photos of Equipment to be Used
- Exhibit K Above-ground Equipment Specs
- Exhibit L State Issued Stormwater Discharge Permit
- Exhibit M Stormwater Management Plan
- Exhibit N Oil and Gas Lease
- Exhibit O Sound Wall Design Specifications – Confidential Business Information
- Exhibit P Modular Large Volume Tank (MLVT) Specifications
- Exhibit Q Rig Layout Diagram
- Exhibit R Native Seed Mix
- Exhibit S Tactical Response Card
- Exhibit T Water Assurance
- **Exhibit U Environmental Study**
- Exhibit V Site Safety and Emergency Action Plan
- Exhibit W City of Greeley Roadway Maintenance Agreement
- Exhibit X Traffic Direction
- Exhibit Y Proof of Ownership
- **Exhibit Z Operations and Maintenance Manual**

Project Narrative: Overview of Use by Special Review

Description of Intended Use

PDC Energy, Inc. (PDC) submits this application for a Use by Special Review for the proposed Bypass State 05N66W18 1-23 Pad/Facility, located in the west half of the northwest quarter (W/2NW) of Section 18, Township 5 North, Range 66 West of the 6th P.M. within the City of Greeley limits. More specifically, the proposed project is located approximately one-third of a mile south of the intersection of Highway 34 Bypass and County Road 25/95th Avenue, on the southeast corner of the 78.68-acre parcel of land owned by Greeley Ranch and Farm LLC. Please refer to Exhibit B Use by Special Review and Construction Drawings for the exact location. PDC proposes to drill twenty-three (23) horizontal wells and construct temporary and permanent facilities needed to support drilling, completion, and production operations.

In general, the proposed project is a multiple oil and gas well and a facilities pad, located on the southern edge of the parcel and will be operated by PDC. The proposed well and facility pad will include 23 horizontally drilled wells, 23 single phase separators, 6 temporary oil tanks, 6 temporary water tanks, and other equipment. These wells and production facilities will be built in a cluster arrangement. This layout allows for a smaller footprint with centralized facilities for the proposed 23 wells. The cluster concept and horizontal drilling essentially eliminate the need to develop additional well pads, thus reducing the footprint on the surface.

A pre-application meeting with City of Greeley personnel was held on August 29, 2018, and the preliminary siting of the project was given approval to move forward with the USR process.

This application for a Use by Special Review permit pursuant to Chapters 18.20 and 18.56 of the Greeley Municipal Code includes a full description of the drilling, completion, production, and maintenance processes related to the 23 proposed wells.

Familiarity with City of Greeley and State of Colorado Regulations

PDC is familiar with the Colorado Oil and Gas Conservation Commission (COGCC) Rules and Regulations as well as the City of Greeley's regulations as they relate to oil and gas operations. PDC is aware of the drilling, operation maintenance, and abandonment procedures that are established by the COGCC and the City of Greeley.

It is PDC's intent to develop the Bypass State 05N66W18 1-23 Pad/Facility in a manner that is not detrimental to the public health, safety, welfare, the environment, and wildlife resources, or detrimental to the character of the surrounding area. The proposed use shall be consistent with the Imagine Greeley Comprehensive Plan. The location, site, design, and operation characteristics of the proposed use shall be compatible with the existing and future land uses within the general area in which the proposed use is to be located, and will not create significant noise, traffic or other conditions or situations that may be objectionable or detrimental to other permitted uses in the vicinity. PDC understands that reasonable conditions may be placed on uses by special review to protect public health, safety, welfare, the environment, and wildlife resources. The site shall be physically suitable for the type and intensity of the proposed land use. The proposed land use shall not adversely affect traffic flow or parking in the neighborhood.

PDC is a responsible operator and will abide by all setbacks by placing wellheads, production tanks and/or associated on-site production equipment at the required distance per COGCC Rules and Regulations, and City of Greeley Code standards.

All exploration and production waste, including drilling mud or other drilling fluids, will be stored, handled, transported, treated, recycled, or disposed of in accordance with COGCC regulations, to prevent any significant adverse environmental impact on air, water, soil, or biological resources. (Ord. 27, 1998 §1).

PDC will abide by State law and regulations concerning noise abatement (Title 25, Article 12, C.R.S.), together with applicable local government ordinances, rules, or regulations. PDC has detailed its plans in this Land Use Application for addressing all nuisance impacts in Section III. Environmental and Safety Plan, and all safety impacts in Section IV. Emergency Response and Fire Protection Plan.

Imagine Greeley Comprehensive Plan

The proposed use shall be consistent with the Imagine Greeley Comprehensive Plan. PDC has and will continue to demonstrate responsible stewardship of natural resources and the environment within the City of Greeley limits, as well as Weld County and the State of Colorado. PDC acknowledges the City of Greeley's wish to continue to build and expand upon existing efforts as they relate to the environment and protection of natural resources, as well as its continuing efforts to develop new ways to preserve open lands. PDC's focus on water and air quality is consistent with the City of Greeley's in the face of the City's future growth.

PDC designed the landscape plan for the Bypass State 05N66W18 1-23 Pad/Facility in an effort to stay consistent with other use by special review locations within the City of Greeley. PDC feels the proposed plan allows for optimal screening, reduces the overall footprint, and allows a substantial amount of land to be restored back to farmable ground after interim reclamation is complete.

List of Property Owners within 500 feet of the Proposed Well Site

PDC ENERGY, INC.
1775 SHERMAN STREET
SUITE 3000
DENVER, COLORADO 802034341
WELD COUNTY PARCEL 09591820009

CHISMAR MATTHEW J TRUST
3051 TALIESIN WAY
FORT COLLINS, COLORADO 805249383
WELD COUNTY PARCEL 095918000005

LUNDVALL LLC
2015 CLUBHOUSE DR STE 101
GREELEY, COLORADO 806343651
WELD COUNTY PARCEL 095713101002

LUNDVALL SIX LLC
2015 CLUBHOUSE DR STE 101
GREELEY, COLORADO 806343651
WELD COUNTY PARCEL 095918200010

POUDRE VALLEY RURAL ELEC ASSN
PROPERTY TAX DEPARTMENT
PO BOX 272550
FORT COLLINS, COLORADO 805272550
WELD COUNTY PARCELS 095918200008, 095918201001

WELL SITE SURFACE OWNER:
PDC ENERGY, INC.
1775 SHERMAN STREET
SUITE 3000
DENVER, COLORADO 80203

Operator and Surface Owner Information

Operator:
PDC Energy, Inc.
1775 Sherman Street
Suite 3000
Denver, Colorado 80203

Surface Owner
PDC Energy, Inc.
1775 Sherman Street
Suite 3000
Denver, Colorado 80203

Project Plan prepared by:
Ascent Geomatics Solutions
8620 Wolff Court
Westminster, Colorado 80031
(303) 928-7128

Operating Plan

The Operating Plan is divided into the Drilling Phase and Protection of Water Formations, the Completion Phase, the Production Phase, and the Plugging and Abandonment Phase.

This location is not considered an Urban Mitigation Area, as described by the Colorado Oil and Gas Conservation Commission (COGCC) Rules and Regulations – Definitions (100 Series).

All phases of operations including drilling, completion, production, abandonment and reclamation are designed to adhere to the Rules and Regulations of the COGCC, especially COGCC 300 Series (Permitting Process), 400 Series (Operations and Reporting), 600 Series (Safety and Facility Operations), 900 Series (Environmental Impact Prevention), 1000 Series (Reclamation), 1100 Series (Flowlines), and 1200 Series (Protection of Wildlife Resources).

Enclosed flares shall be utilized during the drilling, completion, recompletion, reworking, production, repair, and maintenance of the pad site.

PDC will use Best Management Practices during all phases of operations.

Routine fire inspections are required during the different phases of operation and, at a minimum, an annual inspection, upon completion of the wells and production facilities. The Greeley Fire Department will coordinate and schedule these inspections.

Drilling Phase and Protection of Water Formations

The proposed drill site will be approximately 20.9 acres in size and construction of this site will include leveling the pad to accommodate the drilling rig. Sound walls to mitigate sound and light will be installed after the pad is constructed, prior to the commencement of drilling. Once the pad is completed, a small surface drilling rig will be brought onto location and rigged up to drill the surface portion of the well for the 23 wells on the pad. This will take approximately 24 hours per well.

Drilling operations, which run twenty-four (24) hours a day until completed, will commence after the rig is “rigged up”. A 13-1/2-inch surface hole will be drilled to approximately 1750 feet using fresh water. Surface casing 9-5/8 inches in diameter will then be run and cemented to surface to protect any shallow freshwater zones. Surface casing setting depth is determined from subsurface ground water maps prepared by the State Engineer and supplemented by the latest data available from offsetting wells. A baseline water sample will be obtained from water wells within ½ mile of the proposed location to ensure water quality. When all 23 wells have surface casing set, the surface rig will move off the Bypass location. It is estimated to take one day per well to drill and set surface casing.

Once the location is clear from the surface rig, a liner is set on the pad where the drilling rig will be rigged up to contain and prevent any potential fluid from hitting the ground. In addition, wooden matting boards will be placed over the liner as a secondary containment for fluids and stability for the drilling rig. Once the location is prepped, the drilling rig will move in and rig up on the first well on location. The Blowout Preventer Equipment (BOPE) will be installed and tested prior to drilling. After testing, the drilling of the production hole will commence. A bit and directional tools comprise the bottomhole assembly (BHA).

The directional tools are placed behind the bit to steer the assembly, and continuously survey and send data to the surface to monitor the wellbores 3D position spatially, and to track in the targeted formation. The 8-1/2-inch bit and BHA will drill-out of the surface casing shoe and drill the "vertical" portion of the hole in which angle is built to separate wells into their planned slots. Once the vertical portion of the hole is drilled, the curve will be initiated. The curve will take approximately 1,000 feet to drill and will then place the wellbore at approximately 90° in order to enter the targeted hydrocarbon bearing zone. The wells will be drilled horizontally or parallel to the surface for approximately 1.5 miles at a vertical depth of 6,800-7,200 feet below the ground. The total Measured Depth (MD) for the proposed wells is approximately 15,000 feet.

Once the horizontal section of the wellbore is drilled, a string of production casing will be run into the wellbore. This casing will be 5-1/2 inches in outer diameter and weigh 20 pounds per linear foot. The grade will be P110IC, which has a collapse rating of 12,100 psi and an internal yield rating of 12,630 psi. This casing will be cemented into place to isolate the productive zones of the reservoir. The cement sheath will isolate the entire casing string from the total depth of the well back to surface.

PDC's drilling rigs are equipped with a closed loop system, therefore, the drilling mud is recycled and re-used, and reserve pits will not be constructed. The drilling rig will be on location for approximately 4-5 days per horizontal well for a total of approximately 90-110 days. At the end of the drilling phase, the drilling rig will be moved off location.

Best industry practices shall be utilized during drilling operations to prevent fluids from reaching the flare during a "kick" or upset conditions.

Completion Phase

The completion phase typically begins when the drilling equipment is transported off the location. There will be no intentional rest period between drilling and completion operations. Lag time could be encountered dependent on vendor availability. Completion operations are conducted twenty-four (24) hours per day intermittently over a period of several weeks. The site may be regraded to accommodate the completion operations and anchors may be set for the completion operations. For horizontal wells, multiple fracture stages are induced along the length of the wellbore in the respective formation that the well has been drilled.

During hydraulic fracturing, water and some additives are pumped at high rates and pressures that exceed the minimum in-situ rock stresses and hydraulically fracture the formation. Sand is then pumped into the created fracture to allow gas and oil to flow freely from the formation into the well bore. The fracturing equipment will consist of one Modular Large Volume Tank (MLVT) for freshwater storage that will fully comply with COGCC's MLVT policy, multiple flowback tanks, pressure pumps, blending and bulk material trucks with other necessary equipment. After fracturing is completed, the mobile equipment is removed, excluding tanks that are used to retain the water that is produced during flowback and testing operations. No water is allowed to accumulate or be disposed of on surface. All water is hauled to approved disposal sites or recycled for stimulation use. The flowback tanks will remain on location until the well is rerouted through standard production equipment.

It takes approximately 2-3 days to hydraulically fracture each well for a total of 45-60 days on this location.

COGCC regulations give the operator three months to complete restoration activities, but restoration may occur sooner than three months.

Production Phase

The production equipment for the Bypass State 05N66W18 1-23 Well Pad/Facility will be located adjacent to the wells. The equipment on this site will consist of the following components:

6 temporary oil tanks, 6 temporary water tanks, 2 permanent maintenance tanks, 2 permanent steel water tanks, 1 permanent partially buried water vault, 7 combustors, 1 temporary water tank combustor, 2 tank/surge vapor recovery unit, (1) 2-phase vertical separator, 5 oxygen destruction system, 1 unloading separator, 3 separator LP vapor recovery units, (1) 2-phase separator, 1 communication tower, 3 instrument air skids, 3 surge vessels, 3 oil LACT, 2 water LACT, 23 production separators, 1 meter area, 2 gas lifts skids.

If needed, a temporary generator will be used before connecting to electric lines; a short noise control fence will be installed or other agreeable measures to mitigate the noise from this generator. Tanks and facilities shall be painted per COGCC Rules. The steel berm ring around the facility will hold 150% of the capacity of the largest tank within the berm.

Flowlines will be installed but will not leave the oil and gas operations area. Additionally, all flowlines will be pressure tested at least annually to verify integrity and will remain in full compliance with COGCC 1100 Series Rules.

Connecting the well pad to pipeline is anticipated by 3rd quarter 2025. An PDC employee or contractor called a “lease operator,” then begins monitoring the well on a scheduled basis. The lease operator reports the tank measurements of the oil, gas sales, and pressure readings. Much of this production information is compiled and submitted to the COGCC on a monthly basis.

In addition, the lease operator will inspect the site for hazards and weed control, maintaining the appearance of the Bypass State 05N66W18 1-23 Pad/Facility. For the first few months, water and oil will be hauled daily from the location. As volumes decline, water and oil hauling will also decline.

Plugging and Abandonment Phase

At the time the wells become sub-economic to operate, PDC or PDC’s successors will engage the services of a plugging rig to remove production equipment from the wellbores and plug the productive zones with a combination of bridge plugs and cement plugs in accordance with COGCC Rules and Regulations. If the separators and tanks on the surface of the land are no longer needed for other wells, they will be removed. Surface restoration will involve removal of any above-ground casing and the installation of regulation markers that will not interfere with subsequent surface use.

After all production equipment is removed, the surface will be restored to the original grade with reseeding in accordance with COGCC Rules and Regulations. This may be waived with the permission of

the surface owner at the time of final restoration if there has been further land engineering that would conflict with the drill site being restored as described herein.

All transmission and/or flow lines shall be completely removed from the ground upon entering the abandonment phase. No underground lines that can or may contain any flammable product shall remain in the ground after the facility is abandoned.

Water Resources for Drilling Activities

All of the water used for drilling and completion operations will be fresh water. The optimum water source during drilling operations will be determined by PDC prior to drilling of the wells. It is anticipated that the water used during the completion operations for fracture stimulation will be provided by Noble Midstream Partners and will be transferred to location by means of pipes and pumps and not delivered from an offsite source by means of tanker trucks. It is estimated that for each of the horizontal wells, the estimated number of truckloads of water and associated truck traffic that can be eliminated by virtue of transferring water by pipe and pumps could be up to approximately 1,300 truckloads per well. If all 23 horizontal wells are drilled that could mean the elimination of over 41,600 truckloads.

Compatibility with Surrounding Property Uses

The site does not interfere with the existing use of the area. The parcel is zoned as vacant land and remains compatible with the area as surrounding parcels are zoned Agricultural (H-A) and vacant land.

Above-ground equipment will be painted a neutral brown “sand” or similar color to best blend in with the surroundings.

Employees and Hours of Operation

There are no permanent employees on this site. The site will be visited by an PDC pumper on a daily basis. The employee is typically not on site for longer than one to two hours at a time.

The location will produce oil and gas 24 hours a day 7 days a week. On average one employee will visit the site once each day in a pick-up truck. Trucks will haul product from the location as needed, and will steadily decline.

Site Maintenance

All disturbed areas shall be kept free of noxious weeds and debris. If necessary, a third party weed control service will be contracted annually to prevent and control the reoccurrence of noxious or excessive weed growth. Weeds that cannot be controlled by this method will be sprayed as needed with a systemic herbicide. Any additional weed control required to maintain the site free of weeds will be implemented if the standard plan is not sufficient.

Description of Water and Sewer

This is an unmanned facility; therefore, no water or sewer will be needed. Due to the lack of employees permanently on site, a water connection is not necessary. Bottled water will be available during construction and during operations.

Proposed Landscaping

PDC will be reseeding the entire location with Native Seed Mix. No landscaping is proposed for this site. Through a recent re-design of this location, PDC has reduced the overall size of the disturbance, moving the location further away from both residential and highway sight lines. With the reduction in size and rural landscape of the surrounding area, PDC believes recontouring to natural grade and seeding with native grasses will adequately mitigate any potential visual impacts associated with the location.

Timing/Phases of Operations:

Bypass Pad – Row 1 - 12 Wells

• Construction Phase 1	3/1/2023	Lasting +/- 60 days
• Construction Phase 2	5/4/2023	Lasting +/- 14 days
• Drilling Phase	9/13/2023	Lasting +/- 80-90 days
• Completion Phase	3/1/2024	Lasting +/- 80-90 days
• Flowback Phase	6/30/2021	Lasting +/- 45-60
• Production Phase	8/15/2021	

Bypass Pad – Row 2 - 11 Wells

• Construction Phase 1	will be done with Row 1	Lasting +/- 60 days
• Construction Phase 2	will be done with Row 1	Lasting +/- 14 days
• Drilling Phase	11/12/2023	Lasting +/- 80-90 days
• Completion Phase	3/1/2024	Lasting +/- 80-90 days
• Flowback Phase	6/30/2024	Lasting +/- 45-60
• Production Phase	8/15/2024	

*Dates referenced above are subject to change depending on drilling schedule and rig availability

The Drilling Phase, Completion Phase, and Production Phase will operate with two 12-hour shifts.

Environmental and Safety Plan

Setbacks

The proposed Bypass State 05N66W18 1-23 Pad/Facility will comply with City of Greeley setback standards and COGCC Rules and Regulations for cultural setbacks.

Air and Water Quality

Emission Control System: Test separators and associated flow lines and sand traps shall be installed on-site to accommodate green completions techniques pursuant to COGCC Rules and Regulations. In the anticipated absence of a viable gas sales line, the flowback gas shall be thermally oxidized in an emissions control device (ECD), which will be installed and kept in operable condition for at least the first ninety (90) days of production pursuant to CDPHE rules. The ECD shall have an adequate capacity for 1.5 times the largest flowback within a 10-mile radius, will be flanged to route gas to other or permanent oxidizing equipment, and shall be provided with the equipment needed to maintain combustions where non-combustible gases are present. A closed-loop system will be utilized at this site.

In an effort to continue to reduce and mitigate the impacts of installing tanks, PDC is committed to using Lease Automatic Custody Transfer (LACT) Units. Advantages to utilizing LACT Units include: LACT pumps are electric and enclosed, reducing noise; less likely to have spills because of improved connections; truck loading times are two times faster, reducing the amount of time a truck is on location; truck vent lines are sent to the emission control devices, which are 95% efficient destruction of VOCs; and oil haulers no longer need to climb to the top of tanks and open thief hatches to gauge tanks, thus eliminating emissions from blowing down tanks and exposure to tank vapors.

The COGCC sets forth specific requirements for casing setting depths necessary to protect ground water sources, and all drilling permits ensure that those setting depths are achieved.

In order to ensure the protection of all freshwater resources, 9-5/8” steel surface casing will be set to a depth at least fifty (50) feet below the base of the deepest water well within one mile of the surface location as required by the COGCC and will be cemented from the bottom of the pipe up to surface. The COGCC reviews all drilling permits for adequate surface casing setting depths and cementing programs based on subsurface ground water maps prepared by the State Water Engineer and offset well data.

Noise Control

Any operations involving the use of a drilling rig, workover rig, or fracking, and any equipment used in the drilling, completion, or production of a well are subject to and will comply with the noise regulations set forth by the City of Greeley, wherein compliance will be met by abiding by state environmental and noise requirements set forth in COGCC Rule 423. PDC’s contract drilling company will comply with COGCC Rules and Regulations for noise abatement. In addition to following the COGCC Rules and Regulations, PDC, whenever possible, will schedule deliveries and construction traffic to and from the site during daylight hours. PDC will perform all of the following to mitigate noise from the operation:

- A noise model from a qualified third-party noise consultant will be conducted on the drilling and hydraulic fracturing equipment prior to commencing operations to determine potential sensitive areas, which includes an ambient survey. Additional source-based noise mitigation will be implemented as required to address the results of the model.
- Sound walls will be installed around the northerly and westerly edges of the well pad, as well as a portion of the northeast corner, in order to mitigate sound and light. Installation will be after the pad is constructed, prior to the commencement of operations. Sound walls will remain in place approximately 8 months, more or less, and taken down after the completion phase, prior to production.
- An internal process has been developed to quickly address any potential noise issues that arise during operations.
- In addition to sound walls, the operator will further reduce noise from completions operations by using a frac fleet consisting of the latest sound mitigation technology available to the operator. Containerized sand delivery and storage will also be used for further noise reduction.

Visual Impacts

The production facilities will be painted in accordance with the COGCC Rule 804 regarding Visual Mitigation, which states: "Production facilities, regardless of construction date, which are observable from any public highway shall be painted with uniform, non-contrasting, non-reflective color tones (similar to the Munsell Soil Color Coding System), and with colors matched to but slightly darker than the surrounding landscape."

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During drilling, lighting will be utilized on site to facilitate a 24-hour drilling schedule. A temporary sound wall will be installed around the northerly and westerly edges of the well pad. The walls are 32 feet high, with LED lights placed 8-10 feet below the top of the wall. These lights are placed every 200-300 feet along the wall, directed downward to mitigate any outside exposure to unwanted lighting. The drilling phase includes 8 lights around the walls while the completion phase will require 14 lights to be installed. These are only temporary and not permanent. **During the drilling and completions phases lights will be pointed inward and downward and screened by sound walls. During the production phase, lights will be pointed inward and downward and will be switch-controlled and only in use while PDC personnel are present on location.**

Odor and Dust

All requirements applicable in COGCC regulations related to odor and dust will be adhered to by PDC. No noxious, prolonged, or unusually high amounts of odor are expected from the proposed drilling of the wells. Oil and gas facilities and equipment shall be operated in such a manner that odors and dust do not constitute a nuisance or hazard to public welfare. PDC shall employ practices for control of fugitive dust caused by operations, which may include but are not limited to treating roads and location with water, the use of speed restrictions, regular road maintenance, and silica dust controls when handling sand used in hydraulic fracturing operations.

Access Roads

PDC will maintain all access roads in compliance with the City of Greeley Municipal Code and Weld County regulations. The access roads will be constructed to accommodate local emergency vehicles. The roads will be maintained for access at all times. Traffic will be routed to minimize local interruption. Please see Exhibit B Use by Special Review and Construction Drawings for ingress/egress location. The drill pad shall have two access roads during drilling and completion phases of the project as depicted on Sheet S4 of this exhibit. **Both accesses will be constructed as shown on the construction plans. During the production phase the North access will be restricted for use by emergency vehicles only and will be gated. All routine production traffic will use the South access only. This has been added to the Narrative included with this resubmittal.**

Waste Disposal

PDC will dispose of all wastes in accordance with COGCC and/or the Colorado Department of Public Health and Environment rules and regulations. For exploration and production waste, the COGCC requires that a waste management plan be included with the Form 2A Oil and Gas Location Assessment permit application. PDC can provide the City of Greeley with copies of all waste management reports, if requested. PDC will be utilizing offsite/commercial disposal methods on this site.

Sanitary Facilities

Portable sanitary facilities that comply with COGCC Rules and Regulations will be provided and maintained on the location during the drilling and completion phases of the operation. Because no personnel are on the location for an extended period of time, no city services or sanitary services of any kind will be required or provided after the well begins to produce. An PDC employee or contractor will visit the site every day and will be responsible for picking up and disposing of any debris.

Well Site Restoration

Interim Reclamation for the Bypass State 05N66W18 1-23 Pad/Facility will be approximately 13.9 acres. Reclamation will be conducted under company supervision in accordance with COGCC Rules and Regulations. Following drilling operations, all drilling mud and cuttings will be removed from any reserve/retention area using trucks, pumps, and mechanical squeezing with a dozer. The mud and cuttings will be trucked offsite to an approved commercial disposal site, per COGCC regulations. The pad will be backfilled with soils in the reverse order removed and capped with the separated topsoil. Subsoils will be mechanically compacted while backfilling.

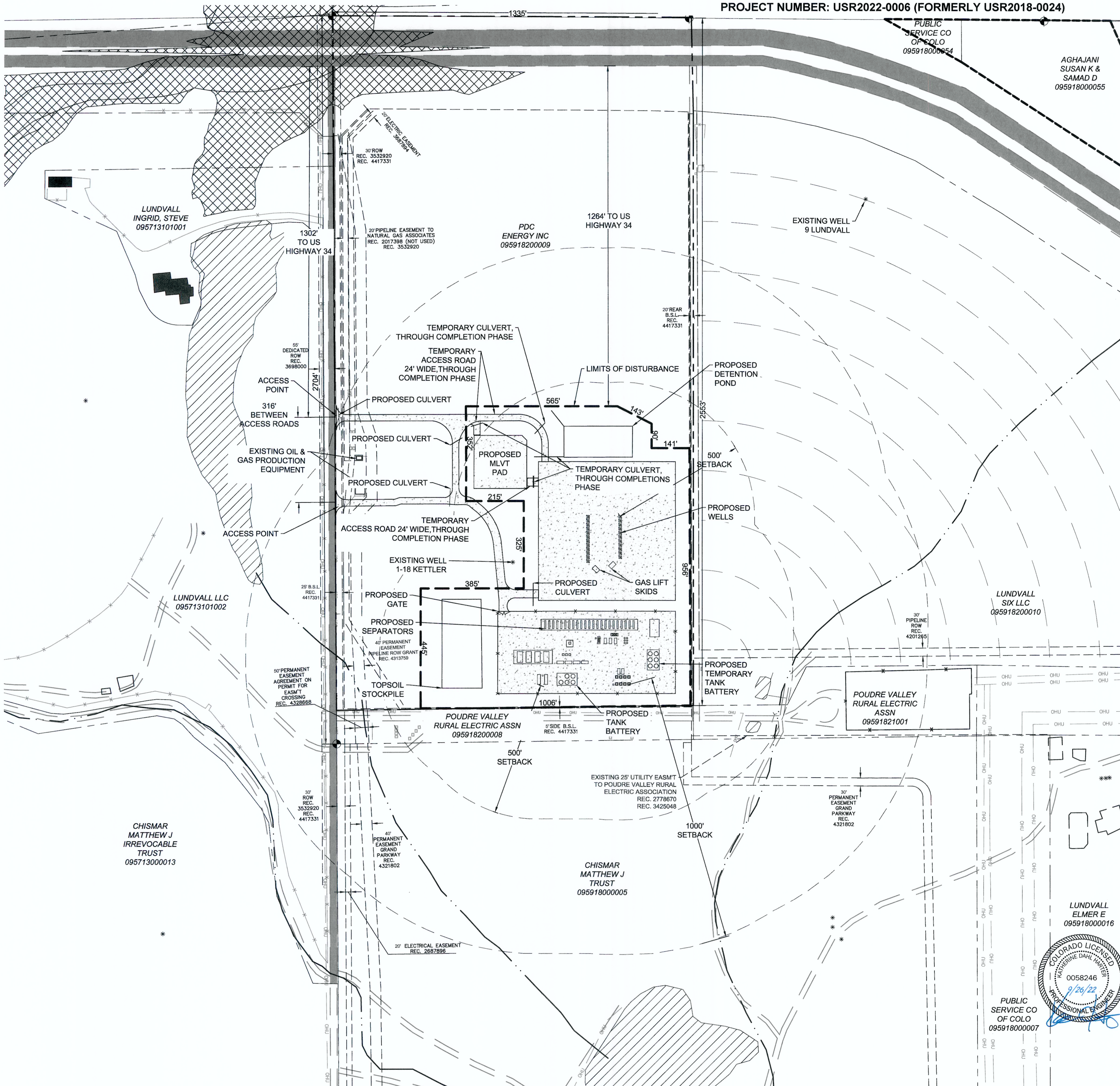
All tanks and equipment, lines and roads will be removed from the entire Bypass State 05N66W18 1-23 Pad/Facility. All reseeding shall be done with grasses consistent with the Rocky Mountain native mix or other grasses reasonably requested by the surface owner and during planting period suggested by owner. When the area is no longer farmed, the seed mixture will be planted. All surface restoration shall be accomplished and completed to the reasonable satisfaction of the surface owner, as soon as practical after installation (weather permitting), and in accordance with regulatory agencies' standards. All site reclamation will be in conformance with the City of Greeley as well as COGCC regulations.

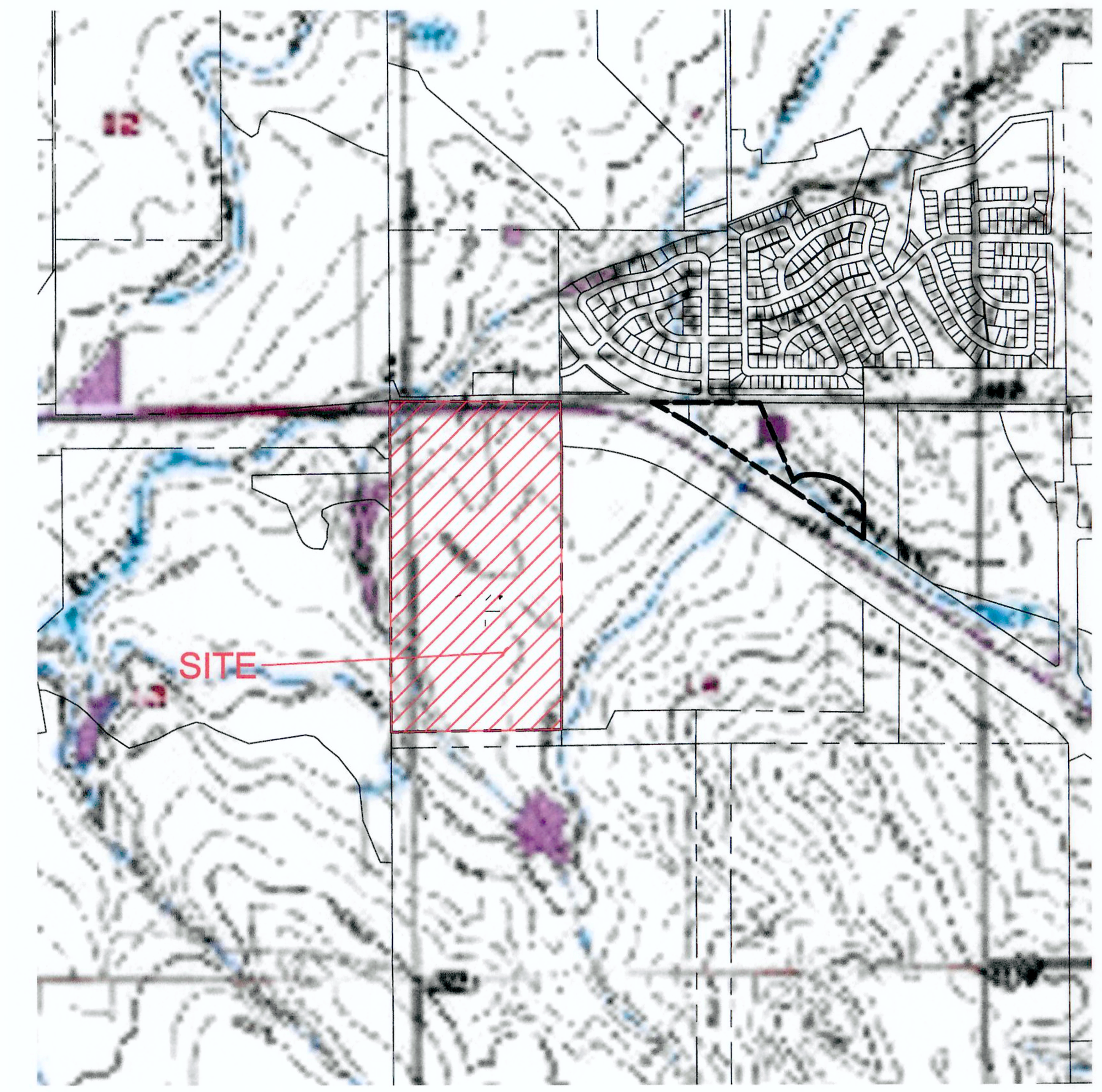
Weed Control

All disturbed areas shall be kept reasonably free of noxious weeds and undesirable species as practicable. When a well is completed for production, all disturbed areas no longer needed will be restored and re-vegetated as soon as practicable. A third party weed control service will be contracted annually, if necessary, to prevent and control the reoccurrence of noxious or excessive weed growth. PDC will drag the lease roads and the production site as needed with a "drag" designed to remove weeds. Weeds that cannot be controlled with this method will be sprayed as needed with a systemic herbicide. Any additional weed control required to maintain the site free of weeds will be implemented if the standard plan is not sufficient. PDC will comply with COGCC Rules and Regulations regarding weed control.

Attachment D

BYPASS STATE 05N66W18 1-23 PAD
USE BY SPECIAL REVIEW AND CONSTRUCTION DRAWINGS
TOWNSHIP 5 NORTH, RANGE 66 WEST, 6TH P.M., SECTION 18
CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO
20.90 ACRES
PROJECT NUMBER: USR2022-0006 (FORMERLY USR2018-0024)





VICINITY MAP
SCALE: 1" = 1000'

LEGEND
- = OPERATIONS AREA
- = COMPACTED CLASS 6 ROAD BASE
- = SUBJECT PARCEL
- = SETBACK - PROPOSED OIL & GAS FACILITY
- = EXISTING FACILITY
- = EXISTING FLOODPLAIN
- = EXISTING PAVED ROAD
- = EXISTING UNDERGROUND GAS LINE
- = EXISTING UNDERGROUND FIBER OPTIC LINE
- = EXISTING UNDERGROUND ELECTRIC LINE
- = EXISTING OVERHEAD UTILITY LINE
- = PARCEL LINE
- = PROPOSED EDGE OF ROAD
- = EXISTING EDGE OF ROAD
- = PROPOSED FENCE
- = EXISTING FENCE
- = EXISTING DITCH
- = EXISTING PIPELINE CENTERLINE
- = PROPOSED WELL
- = PRODUCING WELL
- = EXISTING MONUMENT
- = PROPOSED GATE
- = SECTION LINE
- = EXISTING EDGE OF EASEMENT
- = EXISTING UNDERGROUND TELEPHONE
- = EXISTING POND
- = BUILDING UNIT

SCALE: 1"=200' (1"= 400' @ 50%)

NOTE: ASCENT GEOMATICS SOLUTIONS WAS NOT PROVIDED A TITLE REPORT FOR THIS SITE. ALL RECORDED DOCUMENTS REFERENCED ON THESE PLANS WERE DOWNLOADED FROM RESEARCH VIA THE WELD COUNTY CLERK AND RECORDER. ASCENT GEOMATICS SOLUTIONS MAKES NOT GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED, TO THE COMPLETENESS OF ENCUMBRANCES TO THE SUBJECT PROPERTY.

COLORADO LICENSED PROFESSIONAL ENGINEER 0058246 9/26/22

This plot does not represent a monumented land survey and should not be relied upon to determine boundary lines, property ownership or other property interests. Parcel lines, if depicted have not been field verified and may be based upon publicly available data that also has not been independently verified.

DATA SOURCES:
-PARCELS: WELD COUNTY ASSESSOR

PUBLICLY AVAILABLE DATA SOURCES HAVE NOT BEEN INDEPENDENTLY VERIFIED BY ASCENT.

PREPARED BY:
ASCENT GEOMATICS SOLUTIONS
Ascent Geomatics Solutions
8620 Wolff Court
Westminster, CO 80031

PREPARED FOR:
PDC ENERGY
PDC ENERGY INC.
1775 SHERMAN STREET, SUITE 3000
DENVER, CO 80203
(303) 860-5800

SHEET NAME: OVERALL SITE PLAN

SURFACE LOCATION: SECTION 18, TOWNSHIP 5 NORTH, RANGE 66 WEST OF THE 6TH PRINCIPAL MERIDIAN WELD COUNTY, COLORADO

NO.	DATE:	REVISION DESCRIPTION	INT.
0	09-26-22	ISSUED FOR CONSTRUCTION	DP

FIELD DATE: 08-16-2018
DRAWING DATE: 08-18-2021
DRAFTED BY: CSG
SHEET NO. S2
02 OF 21

BYPASS STATE 05N66W18 1-23 PAD
USE BY SPECIAL REVIEW AND CONSTRUCTION DRAWINGS
TOWNSHIP 5 NORTH, RANGE 66 WEST, 6TH P.M., SECTION 18
CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO
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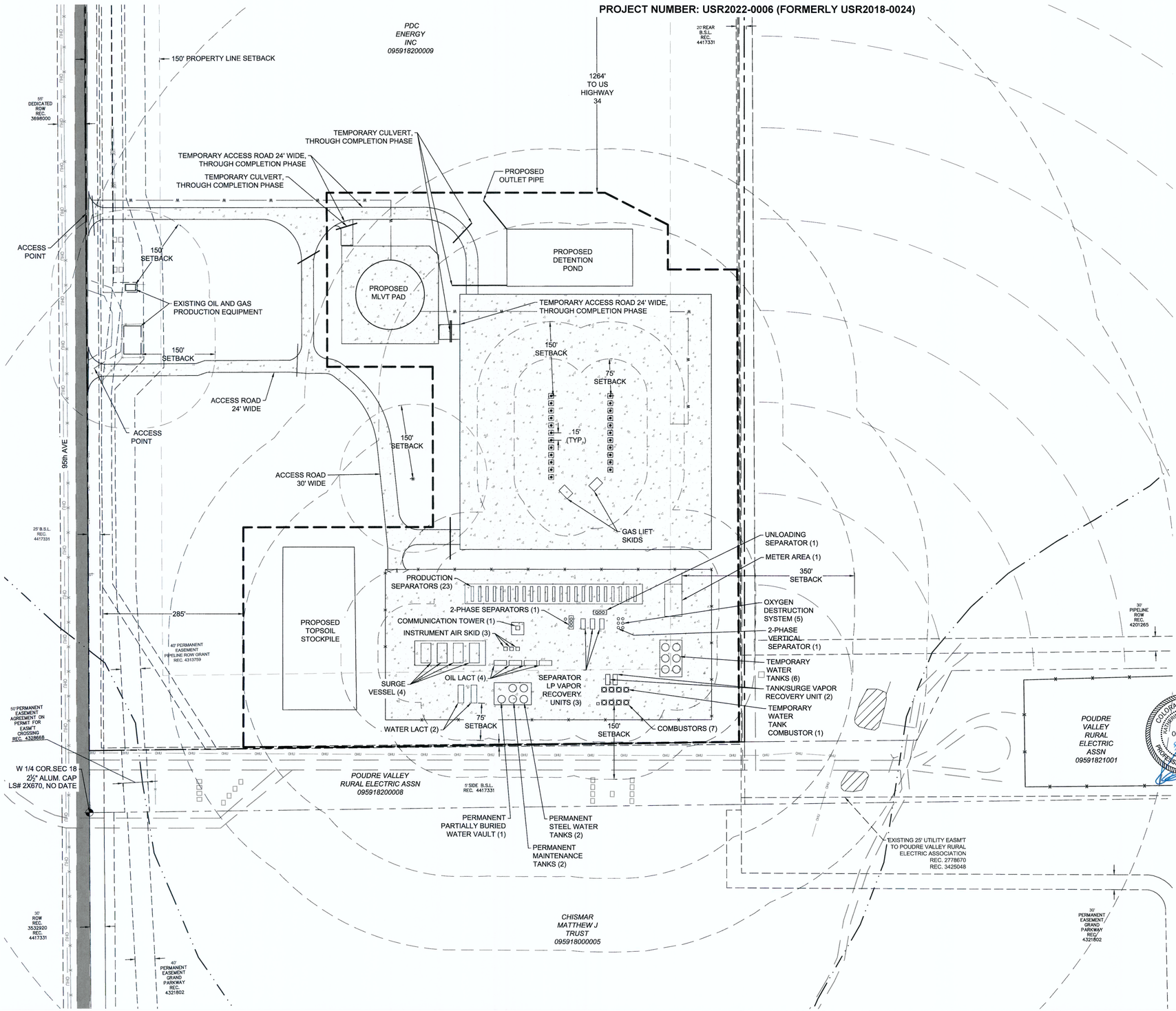

LEGEND

- = OPERATIONS AREA
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- = SETBACK - PROPOSED OIL & GAS FACILITY
- = SETBACK - EXISTING OIL & GAS FACILITY
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- = EXISTING MONUMENT
- = PROPOSED GATE

GENERAL NOTES:

1. ELECTRICITY WILL INITIALLY BE PROVIDED BY A DIESEL AND/OR NATURAL GAS (NGL) POWERED GENERATOR, UNTIL PERMANENT UTILITY CAN BE INSTALLED. PDC ENERGY EXPECTS PERMANENT UTILITY TO BE INSTALLED WITHIN ONE (1) YEAR OF THE START OF PRODUCTION.

BEST MANAGEMENT PRACTICES:

1. THE OPERATION SHALL COMPLY WITH THE CITY OF GREELEY NOISE REGULATIONS, IN ACCORDANCE WITH TITLE 12, CHAPTER 6, ARTICLE II OF THE CITY OF GREELEY MUNICIPAL CODE AS IS CONSISTENT WITH THE RULES AND REGULATIONS OF THE COLORADO OIL AND GAS CONSERVATION COMMISSION (COGCC).

COLORADO LICENSED PROFESSIONAL ENGINEER KATHERINE DAHL PARKER 0058246 9/26/22

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NO.	DATE:	REVISION DESCRIPTION	INT.
0	09-26-22	ISSUED FOR CONSTRUCTION	DP

FIELD DATE: 08-16-2018
DRAWING DATE: 08-18-2021
DRAFTED BY: CSG
SHEET NO. S3
03 OF 21

Environmental and Safety Plan

Setbacks

The proposed Bypass State 05N66W18 1-23 Pad/Facility will comply with City of Greeley setback standards and COGCC Rules and Regulations for cultural setbacks.

Air and Water Quality

Emission Control System: Test separators and associated flow lines and sand traps shall be installed on-site to accommodate green completions techniques pursuant to COGCC Rules and Regulations. In the anticipated absence of a viable gas sales line, the flowback gas shall be thermally oxidized in an emissions control device (ECD), which will be installed and kept in operable condition for at least the first ninety (90) days of production pursuant to CDPHE rules. The ECD shall have an adequate capacity for 1.5 times the largest flowback within a 10-mile radius, will be flanged to route gas to other or permanent oxidizing equipment, and shall be provided with the equipment needed to maintain combustions where non-combustible gases are present. A closed-loop system will be utilized at this site.

In an effort to continue to reduce and mitigate the impacts of installing tanks, PDC is committed to using Lease Automatic Custody Transfer (LACT) Units. Advantages to utilizing LACT Units include: LACT pumps are electric and enclosed, reducing noise; less likely to have spills because of improved connections; truck loading times are two times faster, reducing the amount of time a truck is on location; truck vent lines are sent to the emission control devices, which are 95% efficient destruction of VOCs; and oil haulers no longer need to climb to the top of tanks and open thief hatches to gauge tanks, thus eliminating emissions from blowing down tanks and exposure to tank vapors.

The COGCC sets forth specific requirements for casing setting depths necessary to protect ground water sources, and all drilling permits ensure that those setting depths are achieved.

In order to ensure the protection of all freshwater resources, 9-5/8” steel surface casing will be set to a depth at least fifty (50) feet below the base of the deepest water well within one mile of the surface location as required by the COGCC and will be cemented from the bottom of the pipe up to surface. The COGCC reviews all drilling permits for adequate surface casing setting depths and cementing programs based on subsurface ground water maps prepared by the State Water Engineer and offset well data.

Noise Control

Any operations involving the use of a drilling rig, workover rig, or fracking, and any equipment used in the drilling, completion, or production of a well are subject to and will comply with the noise regulations set forth by the City of Greeley, wherein compliance will be met by abiding by state environmental and noise requirements set forth in COGCC Rule 423. PDC’s contract drilling company will comply with COGCC Rules and Regulations for noise abatement. In addition to following the COGCC Rules and Regulations, PDC, whenever possible, will schedule deliveries and construction traffic to and from the site during daylight hours. PDC will perform all of the following to mitigate noise from the operation:

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Weed Control

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MEMORANDUM

TO: Land Department – Mr. Paul Montville

FROM: Zack Liesenfeld, EHS

DATE: April 15, 2021

SUBJECT: A review for Waters of the United States, FEMA 100-Year Floodplain, Soils, Regulated Species and Critical Habitat, Social Considerations, Wildlife Management Areas, Special Recreation Areas, Cultural Resources, Stormwater Permitting, Air, and Initial On-Site Conditions in order to comply with the requirements of the COGCC 1200 Series-Form 2A rules that took effect January 15, 2021: **Bypass 5N66W18** proposed Project site

Summary

A review of environmental resources was completed for the proposed **Bypass 5N66W18** (Project) site. The proposed Project is to construct a production site in **Township 5 North, Range 66 West, Section 18** in Weld County, Colorado. The following items have been reviewed: wetlands, floodplains, soils, regulated species and critical habitat, social considerations, wildlife management areas, special recreation areas, cultural resources, stormwater permitting, air emissions, preliminary on-site conditions, and compliance with the requirements of the COGCC 1200 Series-Form 2A rules that took effect January 15, 2021, of a proposed production facility and well pad.

1. **Waters of the United States (WOUS) Review**

   A WOUS review was conducted on **4/14/2021**, which for the purpose of this review included an initial assessment of:

   - Aerial and topographic imagery of the proposed site
   - Natural Resources Conservation Service (NRCS) soil survey and hydric soils (NRCS 2021)
   - United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) (2021)
   - Federal Emergency Management Agency (FEMA) 100-Year floodplain review
   - Weld County 100-Year floodplain review (County responsible for mapping)

Location Review Results: The northwest corner of the Project area is located within the FEMA 100-year flood zone. The NWI data depict a freshwater emergent wetland along an unnamed tributary in the southwest corner of the Project area. The Loup-Boel loamy sands, 0 to 3% soil type is listed in the National Hydric Soils List for Weld County, Colorado.

Location Review Recommendations: A site visit is recommended to confirm the NWI mapped data. If wetlands or WOUS will be impacted by the Project, Section 404 permitting under the Clean Water Act (CWA) may be required. The Project may fall under a U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP)-39 for commercial and institutional developments, which requires pre-construction notification (PCN) for all activities (and PCNs require completion of cultural or Section 106 survey and documentation). Under NWP-39, impacts cannot result in the loss of greater than 0.50 acre of WOUS; compensatory mitigation is required if impacts are greater than 0.10 acre of WOUS. If PDC Energy is unable to perform the work under NWP-39, an individual Section 404 permit will be required.

The presence of hydric soils within the Project area should be considered in the design of the Project.

Endangered and Threatened Species and Critical Habitat Review (Regulated Species of Concern)

A review of species and their habitat was conducted on **4/14/2021,** which for the purpose of this review, included an initial assessment of:

- Colorado Parks and Wildlife (CPW) Non-Disclosure Agreement (NDA) data (2021); and
- USFWS Information Planning and Consultation (IPaC) tool-generated list of federal-listed species (IPaC 2021).

Location Review Results: There are no CPW mapped raptor nests or bald eagle winter roost sites within 0.50 mile of the Project area. The Project is within bald eagle winter range.

Location Review Recommendations: CPW does not have recommended buffer zones or seasonal restrictions for bald eagle winter range. An on-site investigation is recommended to determine the presence of migratory bird nests within the Project area one week prior to construction if construction is scheduled to occur within the nesting season (i.e., April 1 through August 31).

2. **COGCC 1200 Series-Form 2A**

A Review of the COGCC 1200 Series, Protection of Wildlife Resources, was conducted on **4/14/2021** relative to the assessment of High Priority Habitat - Colorado Oil and Gas Information System (COGIS) and CPW.

Review Result (High Priority Habitats under COGCC Rule 1202.c include):

- ☐ Columbian sharp-tailed grouse (within 0.6 miles of the lek site)
- ☐ Greater prairie chicken (within 0.6 miles of the lek site)
- ☐ Greater sage-grouse (within 1.0 miles of the lek site)
- ☐ Gunnison sage-grouse (within 1.0 miles of the lek site)
- ☐ Lesser prairie chicken (within 1.25 miles of the lek site)
- ☐ Plains sharp-tailed grouse (within 0.4 miles of the lek site)
- ☐ Bald eagle (within 0.25 miles of an active nest)
- ☐ Ferruginous hawk (within 0.5 miles of an active nest)
- ☐ Golden eagle (within 0.25 miles of an active nest)
- ☐ Northern goshawk (within 0.5 miles of an active nest)
- ☐ Peregrine falcon (within 0.5 miles of an active nest)
- ☐ Prairie falcon (within 0.5 miles of an active nest)
- ☐ Least tern production area
- ☐ Piping plover production area
- ☐ Townsend's big-eared bat, Mexican free-tailed bat, and myotis (within 350 feet of winter hibernacula)
- ☐ Bighorn sheep production area
- ☐ Waters identified by CPW as "Gold Medal" (within 500 feet of ordinary high water mark [OHWM])
- X Cutthroat trout designated crucial habitat and native fish and other native aquatic species conservation waters (within 500 feet of OHWM)
- ☐ Sportfish management waters not identified by CPW as "Gold Medal" (within 500 feet of OHWM)
- ☐ CPW-owned State Wildlife Areas and State Parks

Review Result (High Priority Habitats under Rule 1202.d include):

- ☐ Bighorn sheep migration corridors and winter range
- ☐ Elk migration corridors, production areas, severe winter range, and winter concentration areas
- ☐ Mule deer migration corridors, severe winter range, and winter concentration areas
- ☐ Pronghorn migration corridors and winter concentration areas
- ☐ Greater sage-grouse priority habitat management areas
- ☐ Columbian sharp-tailed grouse production areas
- ☐ Greater prairie chicken production areas
- ☐ Gunnison sage-grouse occupied habitat and production areas
- ☐ Lesser prairie chicken focal areas
- ☐ Plains sharp-tailed grouse production areas

Location Review Results: The Project area is within mapped High Priority Habitat under COGCC rule 1202.c (native fish and other native aquatic species conservation waters [within 500 feet of OHWM]). The Project area is not within any mapped High Priority Habitat under COGCC rule 1202.d.

Location Review Recommendations: recommends coordination with CPW and COGCC before moving forward with the Project unless High Priority Habitat listed under COGCC rule 1202.c (native fish and other native aquatic species conservation waters within 500 feet of an OHWM) can be avoided. High Priority Habitat is identified by the COGCC as habitat areas identified by CPW where measures to avoid, minimize, and mitigate adverse impacts to wildlife have been identified to protect breeding, nesting, foraging, migrating, or other uses by wildlife. New ground disturbance and well work, including access road and pad construction, drilling and completion activities, and flowline/utility corridor clearing and installation activities proposed within High Priority Habitats listed under COGCC Rule 1202.c requires coordination with CPW and a Wildlife Mitigation Plan (and additional requirements may be applicable).

3. **Social & Cultural-State Historical Preservation Office / Tribal Historic Preservation Office (SHPO/THPO)**

   Melanie Medeiros, Principal Investigator, SWCA Environmental Consultants, conducted a cultural resource file review on **4/15/2021**, which for the purpose of this review included an initial search of the Colorado Office of Archeology and Historic Preservation (OAHP) on-line database of cultural resources (COMPASS), the National Register of Historic Places (NRHP), and U.S. Geological Survey Historical Map Topographic Explorer.

Location Review Results: The closest NRHP-listed historic property to the Project is the Von Trotha-Firestien Farm (5WL5983), that was listed in the NRHP in 2009 (Reference No. 09000291) under the Multiple Property Documentation Form Historic Farms and Ranches of Weld County. Six cultural resource surveys have been previously conducted in the section containing the Project. Four cultural resources have been previously recorded in the section associated with the Project and include the Loveland Greeley Canal (5WL898), two segments of the Boomerang Ditch (5WL2254.3 and 5WL2254.6), and a pre-historic isolated find (5WL2255). A review of the Loveland Greeley Canal records suggests this canal is not actually present in Section 18 and is mislocated in the COMPASS records.

A review of historic USGS quadrangles and aerial imagery indicates that one historic farm, the remains of a historic building, a power/transmission line, the Boomerang Ditch (see above), and U.S. Highway 34 are present within the section containing the Project. U.S. Highway 34 trends east along the northern edge of the section before curving southeast into the section and continuing southeast/east. One east-trending improved road trends

and two north-trending improved roads border the section containing the Project. Although these roads are unnamed on the historic quadrangles, today the roads are known as Weld County Road (WCR) 25 / West 20th Street, 95th Avenue, and 83rd Avenue, respectively.

Location Review Recommendations: The Von Trotha-Firestien Farm is approximately northeast of the Project and will not be physically or non- physically affected by the Project. Of the six cultural resource surveys that have been previously conducted in the section containing the Project: WL.CH.R27 overlaps the very northern portion of the Project area and was completed in 1996 along U.S. Highway 34; and the other five projects were conducted between 1998 and 2007 for pipeline projects, a transmission project, and a fiber optic project. None of these five surveys overlap the Project area.

The Boomerang Ditch is currently considered not eligible for listing in the NRHP, although the ditch was recorded pre-2000, when the methodology for recording and assessing ditches in Colorado changed and it is likely the ditch would be assessed as eligible under modern methodology. However, neither previously recorded segment of the Boomerang Ditch is present within the Project area, and the unrecorded portion of the ditch also does not extend into the Project area. The pre-historic isolated find, which is not eligible for listing in the NRHP, is also not within the Project area. The Project team does not anticipate physical effects to these resources as a result of the Project.

The historic farm, historic building remains, and power/transmission line have not been previously recorded as cultural resources and have not been evaluated for eligibility for listing in the NRHP. These resources are outside of the proposed development area and based on the current design, the Project will not physically affect these resources.

U.S. Highway 34 has been previously recorded but not in Weld County. In Larimer County, the highway is unevaluated for the NRHP; in Yuma County, the highway is eligible for listing in the NRHP. U.S. Highway 34 may provide access to the Project but no physical effect to the roads is anticipated. WCR 25 / West 20th Street, 95th Avenue, and 83rd Avenue have not been previously recorded as cultural resources or assessed for NRHP eligibility. WCR 25 / West 20th Street and 95th Avenue may provide general access to the Project but no physical effect to the roads is anticipated.

The Project may indirectly affect the viewshed and setting of these historic resources. The setting near the Project is still relatively rural, especially to the north, west, and south, with a nearby small well pad and a modern substation present. Substantial modern development east of the area has compromised the viewshed and setting of the noted historic resources to a moderate degree. The Project team does not anticipate any adverse visual effects to the farm, ditch, or roads as a result of the Project. No historic properties are present within the Project area, although three cultural resources are present within the section containing the Project. Based on the results of this desktop review, no physical and no adverse non-physical (e.g., visual) effects to historic properties are anticipated.

If the Project develops a federal nexus, additional cultural resources work beyond this desktop review may be required to satisfy the requirements of Section 106 of the National Historic Preservation Act. As with all PDC Energy projects, if any cultural resources are encountered during construction, those activities should cease until a qualified archaeologist or historian has had an opportunity to evaluate the significance of the cultural materials.

4. **Social and Management Unit Review**
   Review of social considerations and management units was conducted on **4/14/2021** by Olsson.

Location Review Results: The proposed Project site is in undeveloped pastureland with one residence located to the northeast. The proposed Project site falls within the Larimer, Adams, and Weld Game Management Unit (GMU).

Location Review Recommendations: No direct social effects are anticipated from the proposed Project, although negligible to minor social impacts may result to the viewshed and traffic depending on final design details for the Project site. Construction-related social impacts would be short term and temporary. No hunting should be permitted on the Project site due to the nature of the development.

5. **Stormwater Permitting Review**
   Stormwater permitting with the Colorado Department of Public Health and Environment (CDPHE) is required for projects in which the proposed disturbance will impact one acre or greater.

Location Review Results: The Project requires stormwater permitting.

Location Review Recommendations: PDC Energy should obtain a stormwater permit through the CDPHE unless PDC Energy has a permitted field-wide plan that the disturbance activities can be covered under.

6. **Air Emissions Review**
   A review for air permitting and emissions was conducted on **8/28/2021**.

Location On-Site Review Results: The proposed Bypass pad (23 wells) will not have to be aggregated with any existing or proposed horizontal facilities. If the Kettler 1-18 vertical pad is still producing when Bypass TILs, the two pads will need to be aggregated. Loadout control, surge vessel, tank VRU, instrument air, produced water tank control, and line power will all be required. At a minimum, there needs to be enough line power on site to power the LACTs, ODS systems, instrument air compressors, on-site instrumentation and either electric tank VRUs, electric separator VRUs, or electric separator heaters. If gas lift is required on site, power needs will be higher.

Location Review Recommendations: At a minimum, there needs to be enough line power on site to power the LACTs, ODS systems, instrument air compressors, on-site instrumentation and either electric tank VRUs, electric separator VRUs, or electric separator heaters. If gas lift is required on site, power needs will be higher.

7. **Initial On-Site Review**
   An initial site visit of pad location was conducted on **4/8/2021**

Location On-Site Review Result: On site review noted tall vegetation and trees on the proposed location. Recommend removing vegetation and trees outside of season nesting restrictions. Vegetative removal should be conducted between September 1st and December 31st to avoid impacts or hazards to raptors and migratory birds. A site review is recommended 6 months prior to construction.

Location Review Recommendations:

A site visit is recommended to confirm the NWI mapped data. If wetlands or WOUS will be impacted by the Project, Section 404 permitting under the CWA may be required. The Project may fall under an USACE NWP-

39 for commercial and institutional developments, which requires PCN for all activities (and PCNs require completion of cultural or Section 106 survey and documentation). Under NWP-39, impacts cannot result in the loss of greater than 0.50 acre of WOUS; compensatory mitigation is required if impacts are greater than 0.10 acre of WOUS. If PDC Energy is unable to perform the work under NWP-39, an individual Section 404 permit will be required.

The presence of hydric soils within the Project area should be considered in the design of the Project.

An on-site investigation is recommended to determine the presence of migratory bird nests within the Project area one week prior to construction if construction is scheduled to occur within the nesting season (i.e., April 1 through August 31).

Olsson recommends coordination with CPW and COGCC before moving forward with the Project unless High Priority Habitat listed under COGCC rule 1202.c (native fish and other native aquatic species conservation waters within 500 feet of an OHWM) can be avoided. High Priority Habitat is identified by the COGCC as habitat areas identified by CPW where measures to avoid, minimize, and mitigate adverse impacts to wildlife have been identified to protect breeding, nesting, foraging, migrating, or other uses by wildlife. New ground disturbance and well work, including access road and pad construction, drilling and completion activities, and flowline/utility corridor clearing and installation activities proposed within High Priority Habitats listed under COGCC Rule 1202.c requires coordination with CPW and a Wildlife Mitigation Plan (and additional requirements may be applicable).

TECHNICAL MEMORANDUM

TO: **Zack Liesenfeld, EHS Professional, PDC Energy**

FROM: **Jenna Friesen, Olsson**

DATE: **April 15, 2021**

SUBJECT: **Desktop Review of PDC Energy's Bypass 5N66W18 Proposed Project Site**

Olsson completed a desktop review (DTR) of environmental resources for PDC Energy's proposed **Bypass 5N66W18** (Project) site. The site is located in Township 5 North, Range 66 West, Section 18 in Weld County, Colorado, on private land (parcel 09591820009; the owner is Greeley Ranch and Farm LLC). The results of our DTR are presented below. Per Olsson's approved scope of services, this review excluded an on-site reconnaissance and air emissions review.

Overview

This DTR was based on review of the following files transmitted to us by PDC Energy:

- Bypass Map 2 PDF;
- BypassProject_Field Report_180516 PDF; and
- 180515_BypassProjectDesktop_CJ PDF files.

A spatial data search was conducted on April 14, 2021, to evaluate the following resources:

- Waters of the United States (WOUS) and soils;
- Federal Emergency Management Agency (FEMA) 100-year floodplains in Weld County;
- Regulated species listed by the Federal Endangered Species Act (ESA) for Weld County and by the Colorado Oil and Gas Conservation Commission (COGCC) for High Priority Habitat;
- Wildlife management areas and special recreation areas;
- Cultural resources; and
- Social considerations.

Additionally, stormwater permitting requirements were assessed.

WOUS, Soils, and FEMA Review

A review of WOUS, soils, and FEMA data was conducted on April 14, 2021, for the purpose of this DTR and included an initial assessment of the following:

- Aerial imagery of the proposed Project site;
- Natural Resources Conservation Service (NRCS) soil survey and hydric soils (NRCS 2021);
- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI 2021);

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FAX 303.237.2659 www.olsson.com

- FEMA 100-year floodplain review; and
- Weld County 100-year floodplain review (County responsible for mapping).

Aerial imagery depicts the Project area as in pastureland and surrounding areas as agricultural land with US Highway 34 bordering the northern property line (**Figure 1**). A topographic map review corresponds with the aerial imagery and indicates the Project area is relatively flat, sloping slightly north (**Figure 2**). The NWI data depict a freshwater emergent wetland along an unnamed tributary in the southwest corner of the Project area. The unnamed tributary flows north to Sheep Draw which is north and west of the Project area (**Figure 1**). If wetlands or WOUS will be impacted by the Project, Section 404 permitting under the Clean Water Act (CWA) will be required. This Project may fall under a U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP)-39 for commercial and institutional developments, which requires pre-construction notification (PCN) for all activities (and PCNs require completion of a cultural or Section 106 survey and documentation). Under NWP-39, impacts cannot result in the loss of greater than 0.50 acre of WOUS; compensatory mitigation is required if impacts are greater than 0.10 acre of WOUS. If PDC Energy is unable to perform the work under NWP-39, an individual Section 404 Permit will be required. If wetlands and WOUS are avoided, no Section 404 permitting will be required. A site visit is recommended to confirm NWI reported data for the Project area. The northwestern corner of the Project area is located within the FEMA 100-year flood zone. W Weld County Floodplain Development Permit will be required if any development is proposed in that area of the site. Seven soil types were identified through the NRCS search within the Project area (**Figure 1**): Loup-Boel loamy sands, 0 to 3% slopes; Olney fine sandy loam, 1 to 3% slopes; Otero sandy loam, 3 to 5% slopes; Otero sandy loam, 5 to 9% slopes; Tassel fine sandy loam, 5 to 20% slopes; Vona loamy sand, 5 to 9% slopes; and Vona sandy loam, 1 to 3% slopes. The Loup-Boel loamy sands, 0 to 3% soil type is listed in the National Hydric Soils List for Weld County, Colorado (NRCS 2021). The presence of hydric soils within the Project area should be considered in the design of the Project.

There may be stormwater drainages/culverts located along roads within the Project area. These would not be considered jurisdictional and would not require permitting with the USACE.

Regulated Species Review

A review of species and their habitat was conducted on April 14, 2021, for the purpose of this DTR and included an initial assessment of the following:

- High Priority Habitat - Colorado Oil and Gas Information System (COGIS) and Colorado Parks and Wildlife (CPW);
- CPW Non-Disclosure Agreement (NDA) data (2021); and
- USFWS Information Planning and Consultation (IPaC) tool-generated list of federal-listed species (IPaC 2021).

A total of seven federally listed threatened, endangered, or candidate species are listed for Weld County, Colorado (see **Attachment**). Habitat for federally listed species was reviewed using the abovementioned spatial data. Critical habitat has been designated for three of the listed species potentially occurring in Weld County: Preble's meadow jumping mouse (*Zapus hudsonius preblei*), piping plover (*Charadrius melodus*), and whooping crane (*Grus americana*). Critical habitat has not been designated by the USFWS for Ute ladies'-tresses (*Spiranthes diluvialis*), western prairie fringed orchid (*Platanthera praeclara*), pallid sturgeon (*Scaphirhynchus albus*), or eastern black rail (*Laterallus jamaicensis* ssp. *jamaicensis*). The Project area does not contain any mapped critical habitat for the aforementioned species.

Given the agricultural nature of the Project area, the area does not contain suitable habitat for any of the federally listed species with the potential to occur in Weld County. However, if the Project results in consumptive use of waters from the Platte River basin, federally listed species associated with the Platte River may be impacted by the Project.

There are no CPW mapped raptor nests or bald eagle winter roost sites within 0.50 mile of the Project area. The Project is within bald eagle winter range. CPW does not have recommended buffer zones or seasonal restrictions for bald eagle winter range.

High Priority Habitat is identified by the COGCC as habitat areas identified by CPW where measures to avoid, minimize, and mitigate adverse impacts to wildlife have been identified to protect breeding, nesting, foraging, migrating, or other uses by wildlife. Proposed oil and gas operations on new or amended oil and gas locations requiring a new Form 2A, Oil and Gas Location Assessment Outside of High Priority Habitat, require a Wildlife Protection Plan that includes a description of the Rule 1202.a operating requirements applicable to the location. Wildlife Protection Plans may address multiple oil and gas locations if supplemental site-specific information is provided as needed to meet Rule 1202.a operating requirements at each location. Wildlife Protection Plans do not require CPW consultation or approval. Oil and gas locations within High Priority Habitat require a Wildlife Mitigation Plan describing the implementation of operating requirements pursuant to Rules 1202.a, 1202.b, and 1202.c, as well as any mitigation requirements pursuant to Rules 1202.d and 1203. New ground disturbance and well work, including access road and pad construction, drilling and completion activities, and flowline/utility corridor clearing and installation activities are generally not allowed within High Priority Habitats listed under COGCC Rule 1202.c. Oil and gas locations within High Priority Habitat listed under COGCC Rule 1202.d require compensatory mitigation to offset any direct and unavoidable adverse indirect impacts to wildlife resources pursuant to Rule 1203.b. If the oil and gas location causes the density of oil and gas locations to exceed one per square mile within High Priority Habitat listed under COGCC Rule 1202.d (and if the total density of oil and gas locations is less than 5 per square mile), additional compensatory mitigation may be required. A list of species with mapped COGCC High Priority Habitat under COGCC Rules 1202.c and 1202.d within the Project area is presented in **Table 1**.

Table 1. List of Species with High Priority Habitat under COGCC Rules 1202.c and 1202.d within the Project Area for the PDC Energy Bypass 5N66W18 Site

Common Name	COGCC Ruling	Potential Impact
Columbian sharp-tailed grouse	*1202.c and 1202.d*	A
Greater prairie chicken	*1202.c and 1202.d*	A
Greater sage-grouse	*1202.c and 1202.d*	A
Gunnison sage-grouse	*1202.c and 1202.d*	A
Lesser prairie chicken	*1202.c and 1202.d*	A
Plains sharp-tailed grouse	*1202.c and 1202.d*	A
Bald eagle	*1202.c*	A
Ferruginous hawk	1202.c	A
Golden eagle	*1202.c*	A
Northern goshawk	*1202.c*	A
Peregrine falcon	*1202.c*	A
Prairie falcon	*1202.c*	A
Least tern production area	*1202.c*	A
Piping plover production area	*1202.c*	A
Bat winter hibernacula	*1202.c*	A
Bighorn sheep production area	*1202.c and 1202.d*	A
Gold medal waters (within 500 feet of OHWM)	*1202.c*	A
Cutthroat trout designated crucial habitat (within 500 feet of OHWM)	*1202.c*	A
Native fish and other native aquatic species conservation waters (within 500 feet of OHWM)	*1202.c*	B
Sportfish management waters not identified by CPW as Gold Medal (within 500 feet of OHWM)	*1202.c*	A
CPW-owned State Wildlife Areas and State Parks	*1202.c*	A
Elk	*1202.d*	A
Mule deer	*1202.d*	A
Pronghorn	*1202.d*	A

Notes:
A – No mapped High Priority Habitat within the Project area.
B – Mapped High Priority Habitat is present within the Project area.
OHWM – ordinary high water mark

The Project area is within mapped High Priority Habitat under COGCC rule 1202.c (native fish and other native aquatic species conservation waters within 500 feet of an ordinary high water mark [OHWM]). Olsson recommends consultation with CPW and COGCC before moving forward with the Project unless High Priority Habitat can be avoided (**Figure 3**). The Project area is not within High Priority Habitat under COGCC rule 1202.d.

An on-site investigation is recommended to determine the presence of migratory bird nests within the Project area one week prior to construction if construction is scheduled to occur within the nesting season (i.e., April 1 through August 31).

Cultural Resources

This DTR included an initial review of cultural resource records through the Colorado Office of Archaeology and Historic Preservation's (OAHP's) on-line database of cultural resources (COMPASS), the National Register of Historic Places (NRHP), and U.S. Geological Survey (USGS) Historical Map Topographic Explorer.

Forty (41) historic properties are listed in the NRHP in Weld County, Colorado. Two of these properties are archaeological districts (Keota Stone Circles Archaeological District and West Stoneham Archaeological District), and one is a Rural Historic Landscape (Von Gohren-Thompson Homestead/Gerry Farm). The vast majority of these properties (n = 28) are of historic age.

The closest NRHP-listed historic property to the Project is the Von Trotha-Firestien Farm (5WL5983), that was listed in the NRHP in 2009 (Reference No. 09000291) under the Multiple Property Documentation Form Historic Farms and Ranches of Weld County. The Von Trotha-Firestien Farm is approximately northeast of the Project and will not be physically or non- physically affected by the Project.

Six cultural resource surveys have been previously conducted in the section containing the Project. WL.CH.R27 overlaps the very northern portion of the Project area and was completed in 1996 along U.S. Highway 34. The other five projects were conducted between 1998 and 2007 for pipeline projects, a transmission project, and a fiber optic project. None of these five surveys overlap the Project area.

Four cultural resources have been previously recorded in the section associated with the Project and include the Loveland Greeley Canal (5WL898), two segments of the Boomerang Ditch (5WL2254.3 and 5WL2254.6), and a pre-historic isolated find (5WL2255). A review of the Loveland Greeley Canal records suggests this canal is not actually present in Section 18 and is mislocated in the COMPASS records. The Boomerang Ditch is currently considered not eligible for listing in the NRHP, although the ditch was recorded pre-2000, when the methodology for recording and assessing ditches in Colorado changed and it is likely the ditch would be assessed as eligible under modern methodology. However, neither previously recorded segment of the Boomerang Ditch is present within the Project area, and the unrecorded portion of the ditch also does not extend into the

Project area. The pre-historic isolated find, which is not eligible for listing in the NRHP, is also not within the Project area. The Project team does not anticipate physical effects to these resources as a result of the Project.

A review of historic USGS quadrangles and aerial imagery indicates that one historic farm, the remains of a historic building, a power/transmission line, the Boomerang Ditch (see above), and U.S. Highway 34 are present within the section containing the Project. The farm, building remains, and power/transmission line have not been previously recorded as cultural resources and have not been evaluated for eligibility for listing in the NRHP. These resources are outside of the proposed development area and based on the current design, the Project will not physically affect these resources.

U.S. Highway 34 trends east along the northern edge of the section before curving southeast into the section and continuing southeast/east. U.S. Highway 34 has been previously recorded but not in Weld County. In Larimer County, the highway is unevaluated for the NRHP; in Yuma County, the highway is eligible for listing in the NRHP. U.S. Highway 34 may provide access to the Project but no physical effect to the roads is anticipated.

One east-trending improved road trends and two north-trending improved roads border the section containing the Project. Although these roads are unnamed on the historic quadrangles, today the roads are known as Weld County Road (WCR) 25 / West 20th Street, 95th Avenue, and 83rd Avenue, respectively. None of these roads have been previously recorded as cultural resources or assessed for NRHP eligibility. WCR 25 / West 20th Street and 95th Avenue may provide general access to the Project but no physical effect to the roads is anticipated.

The Project may indirectly affect the viewshed and setting of these historic resources. The setting near the Project is still relatively rural, especially to the north, west, and south, with a nearby small well pad and a modern substation present. Substantial modern development east of the area has compromised the viewshed and setting of the noted historic resources to a moderate degree. The Project team does not anticipate any adverse visual effects to the farm, ditch, or roads as a result of the Project.

No historic properties are present within the Project area, although three cultural resources are present within the section containing the Project. Based on the results of this desktop review, no physical and no adverse non-physical (e.g., visual) effects to historic properties are anticipated.

If the Project develops a federal nexus, additional cultural resources work beyond this desktop review may be required to satisfy the requirements of Section 106 of the National Historic Preservation Act.

As with all PDC Energy projects, if any cultural resources are encountered during construction, those activities should cease until a qualified archaeologist or historian has had an opportunity to evaluate the significance of the cultural materials.

Social Considerations

The proposed Project area falls within the Larimer, Adams, and Weld Game Management Unit (GMU). CPW specifies areas and times for which certain wildlife species may be taken in the GMU. No hunting should be permitted on the Project site due to the nature of the development. The proposed Project site is in pastureland surrounded by agricultural land and US Highway 34 to the north. There is one residence to the northwest, but no direct social effects are anticipated from the proposed Project, although negligible to minor social impacts may result to the viewshed and traffic depending on final design details for the Project site. Construction-related social impacts would be short term and temporary.

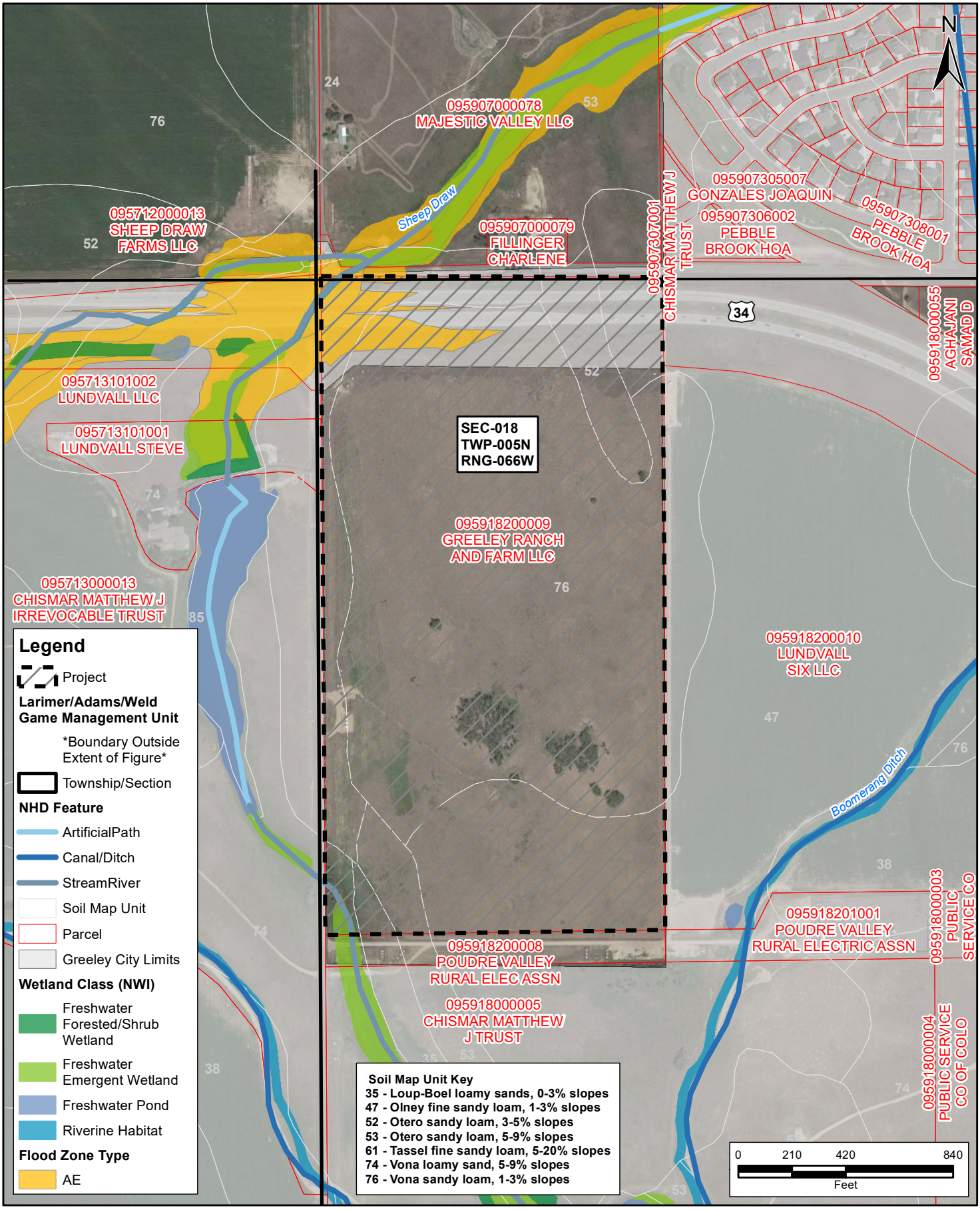
Stormwater Permitting

This Project requires stormwater permitting with the Colorado Department of Public Health and Environment (CDPHE) (unless PDC Energy has a permitted field-wide plan that the disturbance activities can be covered under) as the proposed disturbance would impact greater than one acre.

Disclosure

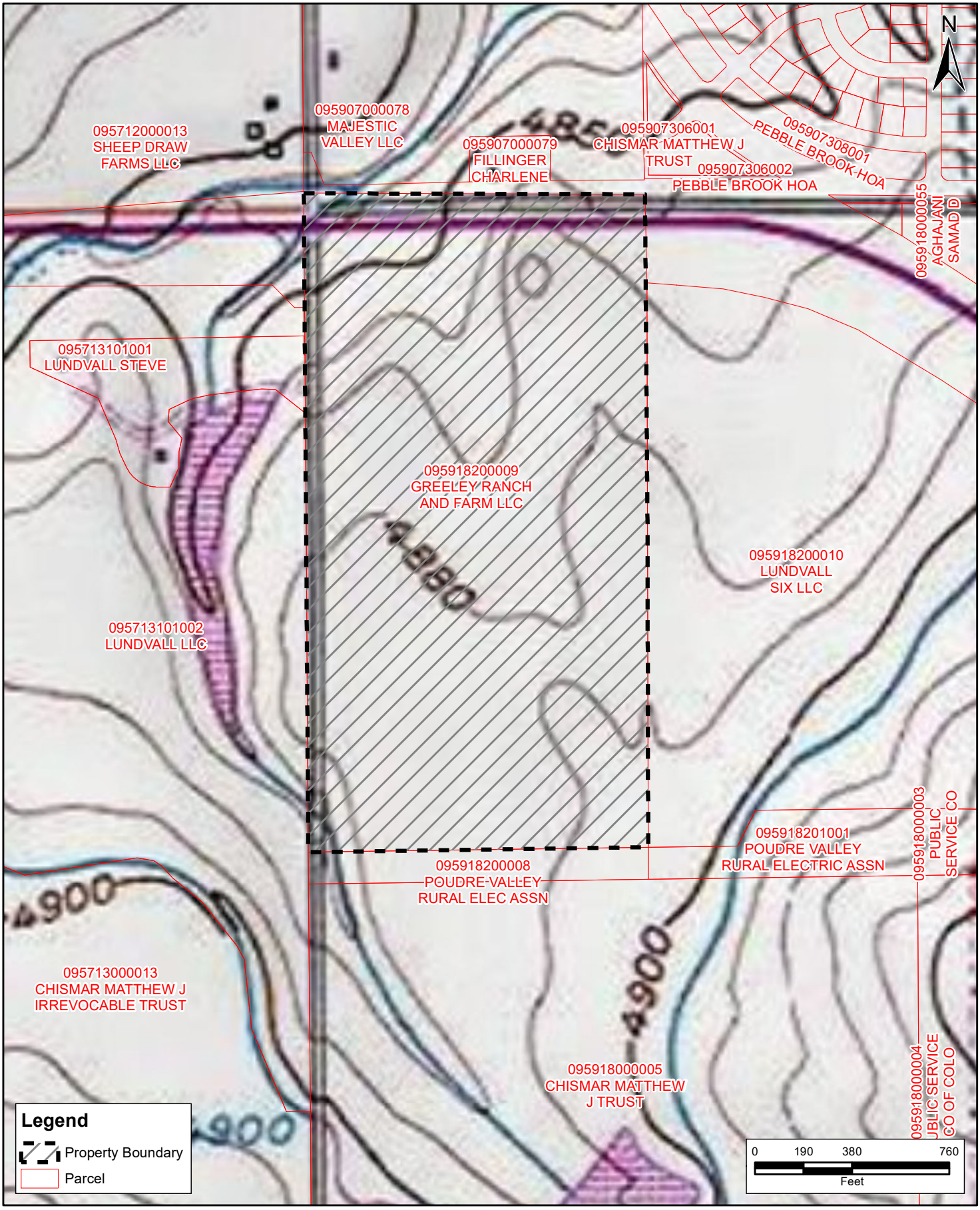
This evaluation was completed using readily available existing and published data and did not include coordination with any public agencies. We recommend qualified PDC Energy staff visit the site to confirm the reported and mapped data. *PDC Energy should not rely solely on the mapped data without field verification*. If PDC Energy would like Olsson to perform an on-site review, such review will be scoped and costed separately for PDC Energy's consideration and authorization. If PDC Energy has questions about the DTR results presented herein, please contact Paige Koutelas at pkoutelas@olsson.com or 913.660.2432.

FIGURES



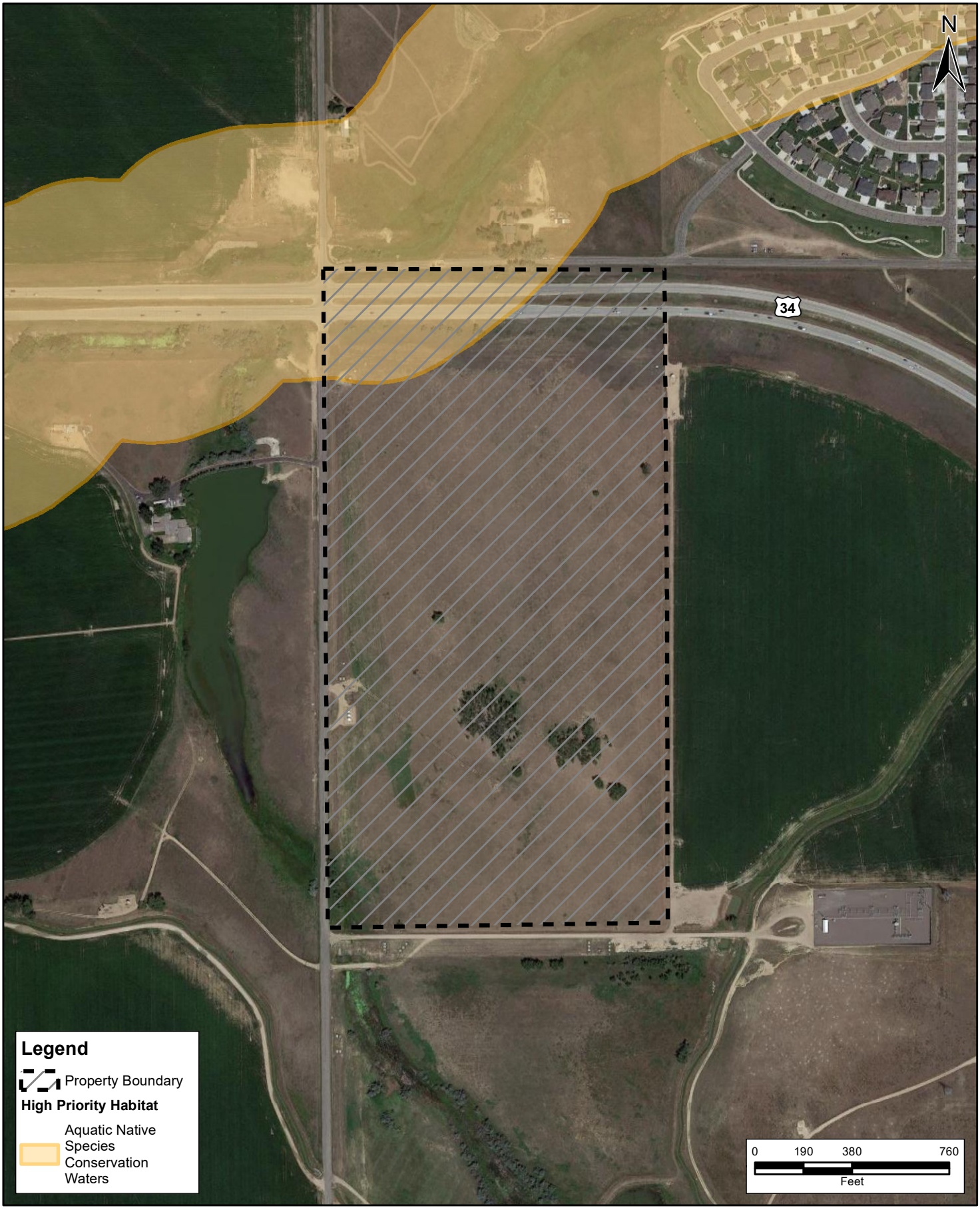
C:\Users\jfriesen\Documents\PDC\Bypass\Figure 1 PDC Energy Bypass.mxd

PROJECT: 018-2718	**Bypass 5N66W18** PDC Energy Planning Map Weld County, CO	FIGURE
DRAWN BY: J. Friesen		59
DATE: April 14, 2021		



C:\Users\jfriesen\Documents\PDC\Bypass\Figure 2 PDC Energy Bypass.mxd

PROJECT: 018-2718		**Bypass 5N66W18** PDC Energy Planning Map Weld County, CO	FIGURE
DRAWN BY:	J. Friesen		60
DATE: April 14, 2021			



PROJECT: 018-2718		**Bypass 5N66W18** PDC Energy Planning Map Weld County, CO	FIGURE
DRAWN BY:	J. Friesen		61
DATE: April 14, 2021			

C:\Users\jfriesen\Documents\PDC\Bypass\Figure 3 PDC Energy Bypass.mxd

ATTACHMENT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Colorado Ecological Services Field Office
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486
Phone: (303) 236-4773 Fax: (303) 236-4005
http://www.fws.gov/coloradoES
http://www.fws.gov/platteriver

In Reply Refer To:
Consultation Code: 06E24000-2021-SLI-0720
Event Code: 06E24000-2021-E-01876
Project Name: PDC Energy Bypass_entire parcel

April 14, 2021

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Colorado Ecological Services Field Office
Denver Federal Center
P.O. Box 25486
Denver, CO 80225-0486
(303) 236-4773

Project Summary

Consultation Code: 06E24000-2021-SLI-0720
Event Code: 06E24000-2021-E-01876
Project Name: PDC Energy Bypass_entire parcel
Project Type: OIL OR GAS
Project Description: Oil and Gas
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@40.40332325,-104.82989609635788,14z

Counties: Weld County, Colorado

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 4 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Preble's Meadow Jumping Mouse *Zapus hudsonius preblei*	Threatened

There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/4090
General project design guidelines:
https://ecos.fws.gov/docs/tess/ipac_project_design_guidelines/doc6861.pdf

Birds

NAME STATUS

Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/10477

Piping Plover *Charadrius melodus* Threatened

Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.
There is **final** critical habitat for this species. The location of the critical habitat is not available.
This species only needs to be considered under the following conditions:

- Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska.

Species profile: https://ecos.fws.gov/ecp/species/6039

Whooping Crane *Grus americana* Endangered

Population: Wherever found, except where listed as an experimental population
There is **final** critical habitat for this species. The location of the critical habitat is not available.
This species only needs to be considered under the following conditions:

- Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska.

Species profile: https://ecos.fws.gov/ecp/species/758

Fishes

NAME STATUS

Pallid Sturgeon *Scaphirhynchus albus* Endangered

No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:

- Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska.

Species profile: https://ecos.fws.gov/ecp/species/7162

Flowering Plants

NAME STATUS

Ute Ladies'-tresses *Spiranthes diluvialis* Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/2159

Western Prairie Fringed Orchid *Platanthera praeclara* Threatened

No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:

- Project includes water-related activities and/or use in the N. Platte, S. Platte, and Laramie River Basins which may affect listed species in Nebraska.

Species profile: https://ecos.fws.gov/ecp/species/1669

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the

FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

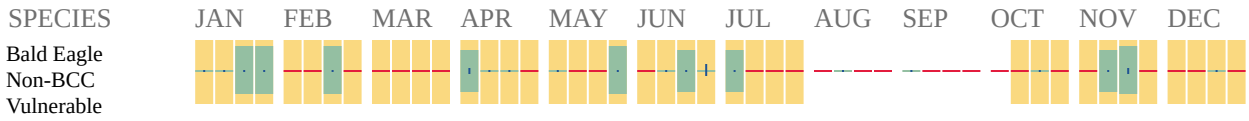
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1Fh

RIVERINE

- R5UBH

1889 York Street
Denver, CO 80206
(303) 333-1105
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TRANSPORTATION
CONSULTANTS, INC.

March 15, 2019

Ms. Kristi McRedmond
Petroleum Field Services, LLC
dba Ascent Geomatics Solutions
7535 Hilltop Circle
Denver, CO 80221

Re: SRC Master
Traffic Impact Analysis
Greeley, CO
LSC #190190

Dear Ms. McRedmond:

In response to your request, LSC Transportation Consultants, Inc. has prepared this Master Traffic Impact Analysis for five proposed SRC well sites in Greeley, Colorado, known as the Bost Farms Pad, the Bypass Pad, the Denali Pad, the Ridge Pad, and the Stugart 16 Pad. Figure 1 shows a vicinity map of the well site locations.

REPORT CONTENTS

The report contains the following: the existing roadway and traffic conditions in the vicinity of the site including the lane geometries, traffic controls, etc.; the existing weekday peak-hour traffic volumes; the existing daily traffic volumes in the area; the typical weekday site-generated traffic volume projections for six different phases of each site development; the assignment of the projected traffic volumes to the area roadways for the eight highest combinations of phases from 2019 to 2022; the projected total traffic volumes on the area roadways for these eight scenarios; the site's projected traffic impacts; and any recommended roadway improvements to mitigate the traffic impacts from the five sites. The estimated timing of each site and overall combination of phases is the best information available today but is subject to change over time.

LAND USE AND ACCESS

The five sites are proposed as oil and gas operations with a varying number of well heads per site. Full movement access is proposed to 77th Avenue (Two Rivers Parkway), 83rd Avenue, and 95th Avenue via private access roads. There is adequate sight distance in each direction from the proposed access points.

Each of the areas will generally be developed in six phases as follows:

1. Construction Phase 1 (earthwork of site and access road) 20 days +/-
2. Construction Phase 2 (finishing work of site and access road) 10 days +/-
3. Drilling Phase 80 - 90 days +/-
4. Completion Phase 80 - 90 days +/-
5. Flow Back Phase 45 - 60 days +/-
6. Production/Operations Phase Ongoing

The estimated combination of phases is shown in a very detailed Gantt Chart included in the appendix. The eight highest trip-generating combinations of phases are shown in the following table:

Year	Scenario	Construction 2	Drilling	Completion	Flowback	Production/ Operations
2019	Scenario 1	Bost Farms (S) Pad A Bost Farms (S) Pad B		Bost Farms (NW)		
2019	Scenario 2	Ridge		Bost Farms (S) Pad A		Bost Farms (NW)
2020	Scenario 3		Bost Farms (NE) Bost Farms (S) Pad B	Denali (Row 1) Bypass (Row 1)		Ridge Bost Farms (NW) Bost Farms (S) Pad A
2020	Scenario 4		Bost Farms (S) Pad B	Bypass (Row 1) Bost Farms (NE)	Denali (Row 1)	Ridge Bost Farms (NW) Bost Farms (S) Pad A
2020	Scenario 5	Stugart 16		Bost Farms (S) Pad B	Bypass (Row 1) Bost Farms (NE)	Ridge Denali (Row 1) Bost Farms (NW) Bost Farms (S) Pad A
2021	Scenario 6		Denali (Row 2)	Stugart 16		Ridge Denali (Row 1) Bypass (Row 1) Bypass (Row 2) Bost Farms (NW) Bost Farms (NE) Bost Farms (S) Pad A Bost Farms (S) Pad B
2021	Scenario 7		Bypass (Row 2)		Denali (Row 2)	Ridge Stugart 16 Denali (Row 1) Bypass (Row 1) Bost Farms (NW) Bost Farms (NE) Bost Farms (S) Pad A Bost Farms (S) Pad B
2022	Scenario 8				Bypass (Row 2)	Ridge Stugart 16 Denali (Row 1) Denali (Row 2) Bypass (Row 1) Bost Farms (NW) Bost Farms (NE) Bost Farms (S) Pad A Bost Farms (S) Pad B

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.

- **US Highway 34** is an east-west, four-lane highway passing through the study area. It is classified as an Expressway (E-X) by CDOT. The intersection with 83rd Avenue is signalized with auxiliary turn lanes and the intersection with 95th Avenue is unsignalized with auxiliary turn lanes. The posted speed limit is 65 mph near the study area.

- **US Highway 34 (Business)** is an east-west, four-lane highway passing north of the study area. Is is classified as Non-Rural Highway (NR-A) by CDOT. The intersection with 95th Avenue is stop-sign controlled with auxiliary turn lanes. The posted speed limit is 65 mph near the study area.

- **W. 37th Street** is an east-west, two-lane paved roadway south of the study area. The intersection with 77th Avenue (Two Rivers Parkway) is stop-sign controlled with some auxiliary lanes. The intersection with 95th Avenue is stop-sign controlled with no auxiliary lanes. The posted speed limit in the vicinity of the site is 45 mph near 95th Avenue and reduces to 35 mph at 77th Avenue (Two Rivers Parkway).

- **77th Avenue (Two Rivers Parkway)** is a north-south, two-lane roadway passing through the study area. The intersection with W. 37th Street is stop-sign controlled with some auxiliary lanes. The posted speed limit is 45 mph near the Stugart 16 Pad and reduces to 35 mph at W. 37th Street.

- **83rd Avenue** is a north-south, two-lane roadway passing through the study area. The intersection with US Highway 34 is signalized with auxiliary turn lanes. The posted speed limit in the vicinity of the site is 55 mph near US Highway 34.

- **95th Avenue** is a north-south, two-lane paved roadway passing through the study area. The intersections with US Highway 34 (Business) and W. 37th Avenue are stop-sign controlled with auxiliary turn lanes. No speed limit is posted in the vicinity of the site.

- **Existing or Proposed Private Access Roads** are gravel roadways that will provide access to the various sites from the public roadway network. They will be maintained to accommodate construction traffic.

Existing Traffic Conditions

Figure 2 shows the existing weekday traffic volumes, existing lane geometry, the existing traffic controls, and the posted speed limits in the vicinity of the site. The weekday peak-hour traffic volumes and average daily traffic volumes are from the attached traffic counts conducted by Counter Measures in August, 2017 and July and September, 2018.

2019, 2020, 2021, and 2022 Background Traffic

Figures 3a through 3d show the 2019, 2020, 2021, and 2022 background traffic volumes based on an annual growth rate of about three percent based on the CDOT 20-year growth factor of 1.78. The CDOT straight line diagram for US Highway 34 is attached.

Existing, 2019, 2020, 2021, and 2022 Background Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A is indicative of little congestion or delay and LOS F is indicative of a high level of congestion or delay. Attached are specific level of service definitions for signalized and unsignalized intersections.

The intersections in the study area were analyzed to determine the existing, 2019, 2020, 2021, and 2022 background levels of service using Synchro. Table 1 shows the level of service analysis results. The level of service reports are attached.

- **US Highway 34 (Business)/95th Avenue:** The northbound and southbound left/through movements currently operate at LOS "F" during the morning and afternoon peak-hours and are expected to do so through 2022. All other movements are expected to operate at LOS "C" or better during both peak-hours through 2022.

- **US Highway 34/95th Avenue:** The northbound and southbound approaches currently operate at LOS "F" during the morning and afternoon peak-hours and are expected to do so through 2022. All other movements currently operate at LOS "D" or better are expected to operate at LOS "E" or better during both peak-hours through 2021 with the eastbound left-turn movement operating at LOS "F" by 2022 in the afternoon peak-hour.

- **95th Avenue/W. 37th Street:** All movements at this stop-sign controlled intersection currently operate at LOS "C" or better during both peak-hours and are expected to do so through 2022.

- **US Highway 34/83rd Avenue**: This signalized intersection currently operate at an overall LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour and is expected to do operate at LOS "D" during both peak-hours through 2022. There are individual movements expected to operate at LOS "E" or "F".

- **77th Avenue (Two Rivers Parkway)/W. 37th Street:** The northbound and southbound approaches currently operate at LOS "E" or "F" during the morning and/or afternoon peak-hours and are expected to do so through 2022. All other movements are expected to operate at LOS "A" during both peak-hours through 2022.

TRIP GENERATION

Table 2 shows the estimated average weekday daily and peak-hour trip generation by vehicle type based on information provided by the applicant. Estimates are given for six different phases of the project including:

1. Construction Phase 1 - earthwork of site and access road (36 one-way trips per day)
2. Construction Phase 2 - finishing work of site and access road (84 one-way trips per day)
3. Drilling Phase (50 one-way trips per day)
4. Completion Phase (82 one-way trips per day)
5. Flow Back Phase (24 one-way trips per day)
6. Production/Operations Phase (22 one-way trips per day)

The truck traffic generated by Construction Phase 2 is heavily dependent on the length of the access road being constructed. As many as 30 additional gravel trucks per day (60 trips) are expected while the site is being prepared and the access road is being finished.

The truck traffic generated by the Completion Phase is heavily dependent on how water is delivered to the site. The preferred delivery method is via a temporary overland pipeline which results in minimal trucks per day. Occasionally water has to be delivered via trucks which can increase the number of trucks per day from 20 (40 trips) to as many as 120 (240 trips). The water delivery method for this site will be via pipeline.

The impact will be highest in Scenarios 1 through 8 as shown in the following table.

One-Way Trips Per Day						
			AM Peak		PM Peak	
		ADT	In	Out	In	Out
2019	Scenario 1	126	7	7	7	7
2019	Scenario 2	128	7	7	7	7
2020	Scenario 3	190	12	12	12	12
2020	Scenario 4	164	10	10	10	10
2020	Scenario 5	182	11	11	11	11
2021	Scenario 6	106	6	6	6	6
2021	Scenario 7	90	6	6	6	6
2022	Scenario 8	42	2	2	2	2

TRIP DISTRIBUTION

Figures 4a through 4e show the estimated haul routes and directional distribution of the site-generated traffic volumes on the area roadways based on coordination with the project team to minimize impacts to the surrounding roadway network.

TRIP ASSIGNMENT

The eight highest daily trip-generating scenarios were analyzed as follows:

Scenario 1 - Figure 5a shows the estimated 2019 site-generated traffic volumes expected to occur when the Bost Farms (S) Pads A & B are in Construction Phase 2 and the Bost Farms (NW) Pad is in the Completion Phase.

Scenario 2 - Figure 5b shows the estimated 2019 site-generated traffic volumes expected to occur when the Ridge Pad is in Construction Phase 2, the Bost Farms (S) Pad A is in the Completion Phase, and the Bost Farm (NW) Pad is in the Production/Operations Phase.

Scenario 3 - Figure 5c shows the estimated 2020 site-generated traffic volumes expected to occur when the Bost Farms (NE) Pad and the Bost Farms (S) Pad B Pad are in the Drilling Phase, the Denali (Row 1) Pad and the Bypass (Row 1) Pad are in the Completion Phase, and the Ridge Pad, the Bost Farms (S) Pad A, and the Bost Farm (NW) Pad are in the Production/ Operations Phase.

Scenario 4 - Figure 5d shows the estimated 2020 site-generated traffic volumes expected to occur when the Bost Farms (S) Pad B is in the Drilling Phase, the Bypass (Row 1) Pad and the Bost Farms (NE) Pad are in the Completion Phase, the Denali (Row 1) Pad is in the Flowback Phase, and the Ridge Pad, the Bost Farms (NW) Pad, and the Bost Farms (S) Pad A are in the Production/Operations Phase.

Scenario 5 - Figure 5e shows the estimated 2020 site-generated traffic volumes expected to occur when the Stugart 16 Pad is in Construction Phase 2, the Bost Farms (S) Pad B is in the Completion Phase, the Bypass (Row 1) Pad and the Bost Farms (NE) Pad are in the Flowback Phase, and the Ridge Pad, the Denali (Row 1) Pad, the Bost Farms (NW) Pad, and the Bost Farms (S) Pad A are in the Production/Operations Phase.

Scenario 6 - Figure 5f shows the estimated 2021 site-generated traffic volumes expected to occur when the Denali (Row 2) Pad is in the Drilling Phase, the Stugart 16 Pad is in the Completion Phase, and the Ridge Pad, the Denali (Row 1) Pad, the Bypass (Row 1) Pad, the Bypass (Row 2) Pad, the Bost Farms (NW) Pad, the Bost Farms (NE) Pad, the Bost Farms (S) Pad A, and the Bost Farms (S) Pad B are in the Production/Operations Phase.

Scenario 7 - Figure 5g shows the estimated 2021 site-generated traffic volumes expected to occur when the Bypass (Row 2) Pad is in the Drilling Phase, the Denali (Row 2) Pad is in the Flowback Phase, and the Ridge Pad, the Stugart 16 Pad, the Denali (Row 1) Pad, the Bypass (Row 1) Pad, the Bost Farms (NW) Pad, the Bost Farms (NE) Pad, the Bost Farms (S) Pad A, and the Bost Farms (S) Pad B are in the Production/Operations Phase.

Scenario 8 - Figure 5h shows the estimated 2022 site-generated traffic volumes expected to occur when the Bypass (Row 2) Pad is in the Flowback Phase and the Ridge Pad, the Stugart 16 Pad, the Denali (Row 1) Pad, the Denali (Row 2) Pad, the Bypass (Row 1) Pad, the Bost Farms (NW) Pad, the Bost Farms (NE) Pad, the Bost Farms (S) Pad A and the Bost Farms (S) Pad B are in the Production/Operations Phase.

TOTAL TRAFFIC

Scenario 1 - Figure 6a shows the 2019 total traffic volumes expected to occur in Scenario 1.

Scenario 2 - Figure 6b shows the 2019 total traffic volumes expected to occur in Scenario 2.

Scenario 3 - Figure 6c shows the 2020 total traffic volumes expected to occur in Scenario 3.

Scenario 4 - Figure 6d shows the 2020 total traffic volumes expected to occur in Scenario 4.

Scenario 5 - Figure 6e shows the 2020 total traffic volumes expected to occur in Scenario 5.

Scenario 6 - Figure 6f shows the 2021 total traffic volumes expected to occur in Scenario 6.

Scenario 7 - Figure 6g shows the 2021 total traffic volumes expected to occur in Scenario 7.

Scenario 8 - Figure 6h shows the 2022 total traffic volumes expected to occur in Scenario 8.

PROJECTED LEVELS OF SERVICE

The intersections in the study area were analyzed as appropriate to determine the total levels of service during the various scenarios. Table 1 shows the level of service analysis results. The level of service reports are attached.

- **US Highway 34 (Business)/95th Avenue:** The northbound and southbound left/through movements are expected to operate at LOS "F" during the morning and afternoon peak-hours through 2022 with or without development of the sites. All other movements are expected to operate at LOS "C" or better during both peak-hours through 2022.

- **95th Avenue/Bost Farms Access**: All movements at this unsignalized intersection are expected to operate at LOS "A" during both peak-hours through 2020.

- **US Highway 34/95th Avenue:** The northbound and southbound approaches are expected to operate at LOS "F" during the morning and afternoon peak-hours and is expected to do so through 2022. All other movements are expected to operate at LOS "E" or better during both peak-hours through 2021 with the eastbound left-turn movement operating at LOS "F" by 2022 in the afternoon peak-hour, with or without development of the sites.

- **95th Avenue/Bypass Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both peak-hours through 2020.

- **95th Avenue/Denali Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "A" during both peak-hours through 2020.

- **95th Avenue/W. 37th Street:** All movements at this stop-sign controlled intersection are expected to operate at LOS "C" or better during both morning and afternoon peak-hours and are expected to do so through 2022.

- **US Highway 34/83rd Avenue**: This signalized intersection is expected to operate at an overall LOS "D" or better during both morning and afternoon peak-hours through 2022. There are individual movements expected to operate at LOS "E" or "F" with or without development of the sites.

- **77th Avenue (Two Rivers Parkway)/W. 37th Street:** The north and south approaches are expected to operate at LOS "E" or "F" during the morning and/or afternoon peak-hours

through 2022 with or without development of the sites. All other movements are expected to operate at LOS "A" during both peak-hours through 2022.

- **83rd Avenue/Ridge Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better during both peak-hours through 2019.

- **77th Avenue (Two Rivers Parkway)/Stugart 16 Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better during both peak-hours through 2020.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The impact will be highest at about 190 trips per day in Scenario 3.

2. The long-term impact will be minimal due to product being removed from the sites via pipeline.

Projected Levels of Service

3. All movements at the unsignalized intersections analyzed are expected to operate at LOS "D" or better during both morning and afternoon peak-hours through 2022 with the following exceptions: The northbound and southbound approaches of 77th Avenue (Two Rivers Parkway) to W. 37th Street, 95th Avenue to US Highway 34 (Business), and 95th Avenue to US Highway 34 are expected to continue to operate at LOS "F" during the peak-hours with or without development of the sites. The eastbound left-turn movement from US Highway 34 to 95th Avenue is expected to operate at LOS "F" in the 2022 afternoon peak-hour with or without development of the sites.

4. The signalized US Highway 34/83rd Avenue intersection is expected to operate at an overall LOS "D" with some individual movements operating at LOS "E" or "F" with or without the addition of site traffic.

Conclusions

5. The impact of the five proposed SRC well sites known as the Bost Farms Pad, the Bypass Pad, the Denali Pad, the Ridge Pad, and the Stugart 16 Pad can be accommodated by the existing and planned roadway network with the following recommendations.

Recommendations

6. Signing should be provided on the roadways approaching each site during the construction phases to notify motorists of the site access intersection. An example sign would be the intersection warning sign (W2-2).

7. The haul routes shown in Figures 4a through 4e were carefully chosen by the project team to avoid the more difficult movements to make in the study area. Following these recom-

mended haul routes will minimize the overall impacts to the surrounding roadway network. Adjustments to these routes should be considered if significant changes to existing traffic patterns occur prior to 2022.

* * * * *

We trust our findings will assist you in gaining approval of the proposed SRC well sites development. Please contact me if you have any questions or need further assistance.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By_____
Christopher S. McGranahan, PE, PTOE
Principal

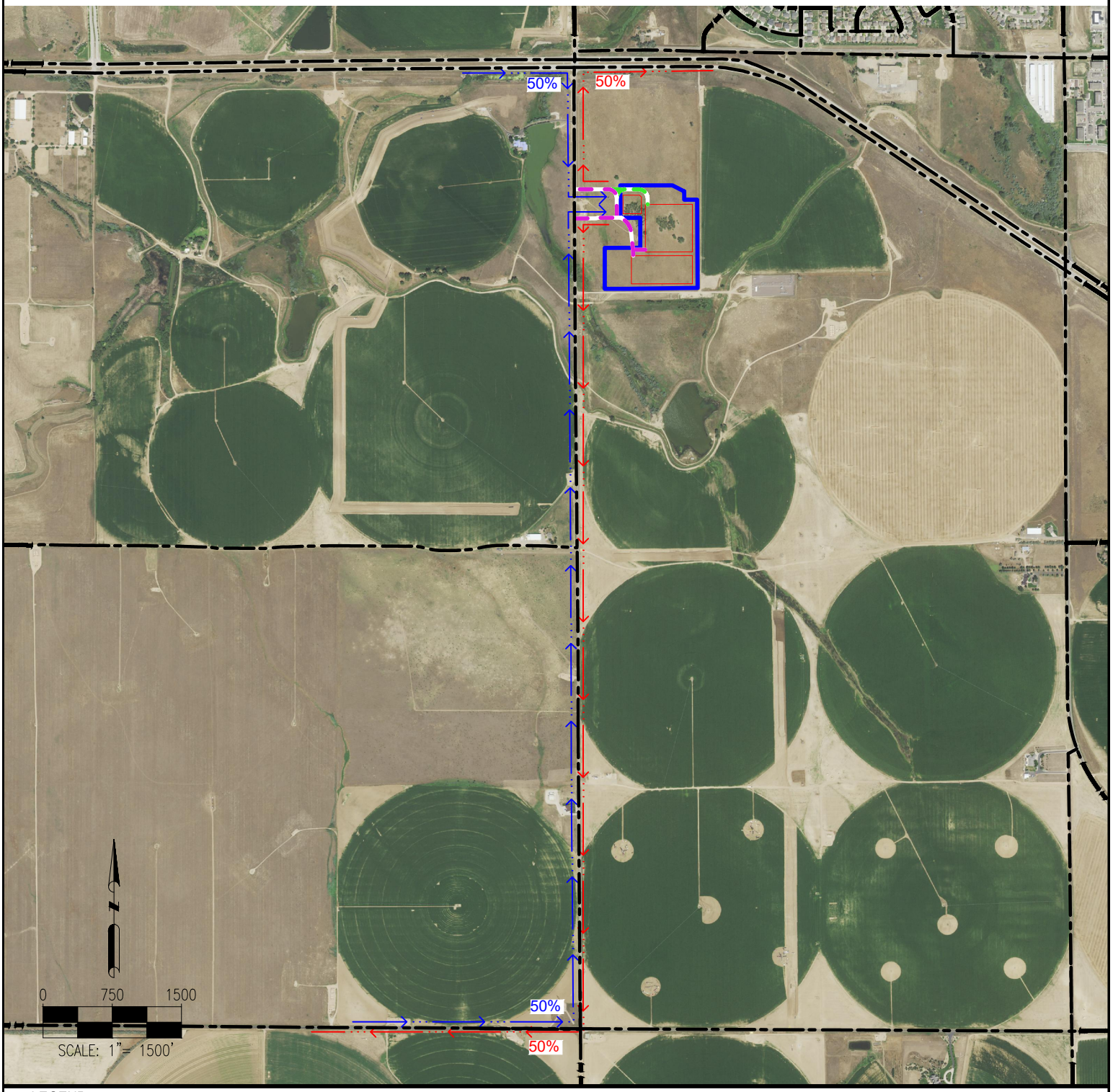
COLORADO LICENSED
CHRISTOPHER S. MCGRANAHAN
39018
PROFESSIONAL ENGINEER
3-15-19

CSM/wc

Enclosures: Tables 1 and 2
Figures 1 - 6h
Gantt Chart
Traffic Count Reports
CDOT Straight Line Diagram
Level of Service Definitions
Level of Service Reports

Z:\LSC\Projects\2019\190190-SRC-MasterTIA\Report\SRC-MasterTIA-031519.wpd

BYPASS STATE 05N66W18 1-23 PAD
TRAFFIC DIRECTION EXHIBIT



LEGEND:

= PROPOSED PERMANENT ACCESS ROAD
= PROPOSED TEMPORARY ACCESS ROAD
= PROPOSED DISTURBANCE AREA
= PROPOSED PAD
= INCOMING TRAFFIC
= OUTGOING TRAFFIC

DISCLAIMER:
THIS PLOT DOES NOT REPRESENT A MONUMENTED LAND SURVEY AND SHOULD NOT BE RELIED UPON TO DETERMINE BOUNDARY LINES, PROPERTY OWNERSHIP OR OTHER PROPERTY INTERESTS. PARCEL LINES, IF DEPICTED HAVE NOT BEEN FIELD VERIFIED AND MAY BE BASED UPON PUBLICLY AVAILABLE DATA THAT ALSO HAS NOT BEEN INDEPENDENTLY VERIFIED.

DATA SOURCE:
AERIAL IMAGERY: NAIP 2019

PUBLICLY AVAILABLE DATA SOURCES HAVE NOT BEEN INDEPENDENTLY VERIFIED BY ASCENT.

ASCENT GEOMATICS SOLUTIONS
8620 Wolff Court
Westminster, CO 80031
(303) 928-7128
www.ascentgeomatics.com

FIELD DATE: 08-16-18	SITE NAME: BYPASS STATE 05N66W18 1-23 PAD
DRAWING DATE: 03-28-22	SURFACE LOCATION: LOT 2 NW 1/4 SEC. 18, T5N, R66W, 6TH P.M. WELD COUNTY, COLORADO
BY: IJM / CHECKED BY: CSG	PREPARED FOR: PDC ENERGY

Emergency Response and Fire Protection Plan

A comprehensive and complete Emergency Response Plan will be submitted to the City of Greeley, which is a site-specific review of the risks to structures and land uses in the immediate vicinity, and addresses the risks presented by the proposed facility while considering the setbacks or distances. PDC will comply with all applicable sections of the 2018 International Fire Code, as amended and adopted by the City of Greeley and Greeley Fire Protection District:

Section 5706.1	General	Section 5706.3.2	Waste Control
Section 5706.3	Well Drilling and Operating	Section 5706.3.3	Sumps
Section 5706.3.1	Location	Section 5706.3.4	Prevention of Blowouts
Section 5706.3.1.1	Storage tanks and sources of Ignition	Section 5706.3.5	Storage Tanks
		Section 5706.3.6	Soundproofing
Section 5706.3.1.2	Streets and Railways	Section 5706.3.7	Signs
Section 5706.3.1.3	Buildings	Section 5706.3.8	Field Loading Racks
COGCC Rule 912	Spills and Releases		

Per the Greeley Fire Department:

- City of Greeley Code Section 18.56.110: Sound walls or similar acoustical insulating materials shall be of a non-combustible material. A spec sheet of the proposed sound wall is submitted herewith as Exhibit O Sound Wall Design Specifications.
- City of Greeley Code Section 18.56.110: All wells shall be equipped with a blowout preventer during drilling operations at this location.
- Enclosed flares shall be utilized during the drilling, completion, recompletion, reworking, production, repair, and maintenance of the pad site.
- Routine fire inspections are required during the different phases of operation and, at a minimum, an annual inspection, upon completion of the wells and production facilities. The Greeley Fire Department will coordinate and schedule these inspections.

The road leading to the Bypass State 05N66W18 1-23 Pad/Facility and those contained within the pad will be designed and maintained to support fire apparatus and shall be provided with a surface to accommodate all weather driving capabilities. A circular turnaround shall be provided on site that is capable of allowing the turning around of all fire apparatus.

In addition to the above-referenced rules and regulations, PDC is also subject to COGCC Rules and Regulations pertaining to Fire Prevention and Protection.

PDC has support personnel in the field or on call at all times to provide technical assistance in fire prevention and elimination.

The following individuals may be notified at these numbers:

DESIGNATED OPERATOR	PDC 24 Hour Emergency Hot Line 877-350-0169
PDC Energy, Inc.	Brian DeRose, Surface Land Supervisor (970) 342-0135

(A) GENERAL INFORMATION

The purpose of the Emergency Response Plan is to provide procedures to cover emergency conditions that may arise during the development of oil and gas resources. The procedures contain the policies applicable to facility emergencies.

The following information can be vital during emergencies. It may be used by outside agencies as well as company employees and contract labor to help secure a speedy recovery from an emergency situation:

PDC Office Address
PDC Energy, Inc.
1775 Sherman Street, Suite 3000
Denver, Colorado 80203

Landman, Operations Manager, Safety Manager
Brian DeRose, Surface Land Supervisor (970) 342-0135
Paul Montville, Surface Landman (970) 459-7766
Wes Hudkins, Production Manager (970) 573-0408
Jason Thron, EH&S Manager (303) 831-3900

Type of Facility
Oil and Gas Production Facility

Location
W/2NW Section 18, Township 5 North, Range 66 West, 6th P.M.
Weld County, Colorado

The location will be accessed as follows:
Traffic for drilling, completions, flowback, and initial production operations will be routed 50% to the north on County Road 25/95th Avenue, and routed 50% to the south on County Road 25/95th Avenue.

Operator
PDC Energy, Inc.
1775 Sherman Street, Suite 3000
Denver, Colorado 80203
Brian DeRose, Surface Land Supervisor
Cell: (970) 342-0135

Corporate Manager in Charge of Facility
PDC Energy, Inc.
1775 Sherman Street, Suite 3000
Denver, Colorado 80203
Wes Hudkins
970-573-0408

Tank and Piping Inspections

All tanks and above ground piping are visually inspected on a daily basis for leakage, malfunction of seals, and other problems. Inspections of all storage tanks are made by PDC personnel or contractors and reported to its headquarters. All storage tank material and construction comply with API specifications for hydrocarbon storage. All tanks shall be appropriately labeled indicating the material contained within the tank(s).

Spill Containment

Tank berms are steel berm rings and are sized to contain 150% of the volume of the largest tank in the containment area. The inside of the tank berms are lined with impermeable and sealed material to prevent any leaks from leaving the containment. PDC operators or contract operators are equipped with spill cleanup kits for minor spills. Minor and major spills will be immediately reported to the Operations Superintendent and President of PDC in accordance with the SPCC plan. Berms will be inspected on a weekly basis and within forty-eight (48) hours of a precipitation event.

Entrance/Exit Driveways

The access to the Bypass State 05N66W18 1-23 Pad/Facility will serve as both the entrance and exit. The fire code official shall have the authority to require an increase in the minimum access widths where they are inadequate for fire or rescue operations.

All access roads with two access points are 24 feet in width, with two (2) permanent access points on County Road 25/95th Avenue. Access roads with only one access point are 30 feet in width. The lease access roads will be constructed of a class 6 road base with a minimum depth of 4 inches at 80% compaction and surfaced so as to provide all-weather driving capabilities. The turnaround for the tank battery will be approximately 30 feet on the north side, 60 feet on the east side, 30 feet on the south side and 60 feet on the west side. These dimensions allow for safe access of tanker trucks and emergency equipment. The access road shall be graded to provide simple drainage from the roadway and allow for cross drainage by means of an adequate culvert pipe. The lease road shall be maintained so as to provide a roadway passable for emergency vehicles and shall be generally rut free. Measures will be taken to control mud on local roadways.

Signs will be posted in accordance with the City of Greeley, the Greeley Fire District, and the COGCC.

Security

All proper warning signs and equipment guards will be installed. At this time there are no plans to have locked security gates. If the need should arise in the future a lockbox with a key will be on location so that the fire district has access in an emergency.

(B) TRAINING

All facility personnel are trained in the operation and maintenance of equipment to prevent or control spills and are versed in the applicable pollution control laws, rules, and regulations. Company vehicles that visit the location will be equipped with shovels and materials necessary to contain spills.

(C) EMERGENCY CONTACT LIST

Following is a list of PDC personnel and emergency organizations that may be contacted in the event of an emergency occurring at the proposed Bypass State 05N66W18 1-23 Pad/Facility.

All emergencies shall be reported immediately to the appropriate Supervisor. In the event the Manager(s) cannot be reached, any of the following may be notified at their office number during normal working hours or at their home/cell number if during other than normal working hours.

Name	**Phone**
PDC Emergency Hotline	877-350-0169 – 24 Hour
Brian DeRose	(970) 342-0135

City and County Agencies	Emergency
Greeley Fire Department Non-Emergency (970) 350-9600	911
Greeley Police Department Non-Emergency (970) 350-9600 To report emergencies, call 911 for fires or spills that cannot be contained by employees.	911
Weld County Office of Emergency Management 970-304-6540	911
Weld County Sheriff Department Non-Emergency (970) 356-4015	911 - Contact as emergencies dictate.
Tri-County Health Department Office: (303)220-9200	Product or Wastewater Spill

State Agencies	**Emergency**
Colorado Oil & Gas Conservation Commission (303) 894-2100	As needed
Colorado Department of Public Health and Environment Office: (303) 377-6326 Emergency: (877)518-5608	As needed
Division of Oil and Public Safety Office: (303)318-8547	As needed
Colorado Public Utilities Commission Gas Pipeline Safety Division Office: (303)894-2851	As needed

Colorado State Highway Patrol Non-Emergency (970) 506-4999	911

Federal Agencies	**Emergency**
Environmental Protection Agency - Region VIII Emergency Response Number: (303) 293-1788 (24 hours)	As needed
National Response Center Emergency Response Number: (800)424-8802	As needed

(D) EMERGENCY RESPONSE PROCEDURES

PDC has an Emergency Plan. A copy is available at their Headquarters. The Safety Supervisor and the Operations Manager are to assume full responsibility for implementing the Emergency Response Plan. Implementation will depend upon the type of emergency.

(E) CONTINGENCY PROCEDURES/SPCC PLANS

A Spill Prevention Control and Countermeasure (SPCC) Plan is maintained at PDC's Headquarters. This would be referred to if a major product or produced water release occurs.

(F) RELEASE OF INFORMATION

Release of information is the responsibility of PDC's Headquarters.

Name	Office Phone
Brian DeRose	(970) 342-0135

WOGLA Emergency Plan Checklist

Per Weld County Code Sec. 21-5-3320 of the1041 Weld Mineral Resource Oil and Gas) Area (WOGLA) permitting process, both an Emergency Action Plan (EAP) and Tactical Response Plan (TRP) are required for a 1041 WOGLA Permit. The EAP template and the supporting Tactical Response Plan (TRP) also are designed to comply with the Colorado Oil and Gas Conservation Commission (COGCC) FORM 2 A and Rule 602. J Emergency Response Plan, Guidance Plan Elements.

The WOGLA Emergency Response Plan Checklist is for Oil and Gas Operators who use their own document formatting as long as the table of contents and information requested in the EAP template are utilized in the order provided. In addition, an Operator may submit their company Emergency Response Plan with the WOGLA Emergency Action Plan Checklist completed, however, site specific information will still need to be submitted with a TRP.

- Note: Submitting an area-wide ERP will also require site-specific information typically not covered in a company ERP, which focuses on a company's ER management system. Operators will still need to submit site-specific information and a TRP.

WOGLA Emergency Plan Checklist

			Yes	No	Pg. #	TRP	COGCC Element
1.							
	a.	Approval Signatures					Element 2
2.	**THE PLAN IDENTIFIES THE FACILITY(S)**						
	a.	The plan includes the Facility Name*					602.j.a. (2)
	b.	The plan includes ingress and egress information					Element 4
	c.	The plan includes the Facility Street Address/Physical Address and GPS Coordinates					Element 3
	d.	The plan includes the Latitude/Longitude for the facility(s)*					Element 5
	e.	The plan lists Emergency Muster/Assembly point(s)					Element 4
	f.	Location of personal/visitor log sign-in sheets, JSA, safety forms					N/A
3.	**THE PLAN IDENTIFIES THE LIST OF COMPANY AND CONTRACTOR EMERGENCY CONTACTS**						
	a.	**Company Contact Information** i.) Corporate Contact and Address (*may be in-or-out of state*) ii.) Field Office and Address iii.) On-Call 24/7 Company Emergency Number iv.) EHS Supervisor/Manager v.) EHS Safety Representative/Advisor vi.) EHS Environmental Representative/Advisor					Element 6
	b.	**Company Community/Media Relations Contact Information**					N/A
	c.	**First Responder Contact Information** i.) Fire Department serving this jurisdiction (*may require 1-2 Fire Station contacts)* ii.) County Sheriff iii.) Colorado Highway State Patrol (*responsible for Spill/Hazmat*) iv.) Local Police Department					Element 1
	d.	**Local, State, and Federal Contacts** i.) Weld County O&G Energy Department ii.) Weld County Office of Emergency Management (OEM) iii.) Colorado Oil and Gas Commission (COGCC) iv.) Colorado Department of Public Health & Environment (CDPHE) v.) Colorado Parks and Wildlife (CPW) vi.) National Response Center (NRC)					N/A
	e.	**Nearest Medical Facilities/Hospital**					N/A
	f.	**Spill Response Organization Contact Information** i. Contracted Spill Response Company(s) (*HAZMAT Oil Spill Response*)					N/A
	g.	**Loss of Well Control** ii. Contracted Well Control, e.g., *Wild Well Control or Boots & Coots*					N/A

WOGLA Emergency Plan Checklist

			Yes	No	Pg. #	TRP	COGCC Element
	h.	**Railroad Emergency Response (If applicable)** i.) Union Pacific ii.) BNSF iii.) Great Western Railway/Omni Trax					N/A
	i.	**Mutual Aid**					Element 7 & 8
4.	**THE PLAN IDENTIFIES SITE SPECIFIC INFORMATION**						
	a.	Site Description i. Number of oil and gas wells, storage tanks, and produced water tanks					Element 9, 10, 11
	b.	The plan identifies nearby Schools and other High-Occupancy Buildings/Dwellings					Element 9, 10, 11
	c.	The plan lists Site Safety Requirements; i.) Minimum PPE to enter facility ii.) EHS Statement for contract personnel; understand and abide by Company EHS policies and procedures iii.) Primary Hazards of the Facility location					Element 9, 10, 11
	d.	Location of SDS Sheets					N/A
5.	**THE PLAN IDENTIFIES MAPS AND DRAWINGS**						
	a.	**Site Map** i.) Project Area Maps ii.) Project Access Map and Muster Point(s) iii.) Truck Haul Route Map iv.) 2500' (*800 meter*) Buffer Zone (*ERG Evacuation Radius*)					Element 9, 10, 11
6.	**THE PLAN LISTS SPILL RESPONSE CLEAN UP AND REPORTING CRITERIA**						
	a.	Spill Response process statement for how the company manages a release/spill during oil and gas production and exploration.					Element 14 & 15
	b.	Spill Reporting process for notifying COGCC, CDPHE, and local authorities (*if applicable*) i.) Include reporting thresholds (e.g., *inside and outside secondary containment*) ii.) Reporting timeframe/deadline for initial notification iii.) Company commitment statement for Spill Reporting					Element 12 & 13
6.	**THE PLAN LISTS REPORTABLE STORAGE QUANTITY'S ON SITE**						
	a.	Quantity(s) of chemicals stored on site.					Element 11
	b.	Tier II Reporting Requirements; Notes if the facility meets threshold requirements, and date submitted to the State of Colorado each Year (March 1st)					Element 11
7.	**EVACUATION INFORMATION**						
	a.	Evacuation plan procedures (public) i.) Process for how emergency evacuation, notifications and coordination with local authorities					N/A

WOGLA Emergency Plan Checklist

			Yes	No	Pg. #	TRP	COGCC Element
8.	**EVACUATION INFORMATION**						
	a.	Evacuation Plan procedures (public)					N/A
9.	**TRAINING AND EXERCISES**						
	a.	Statement with commitment the company will schedule training and exercises with County OEM and first responders.					Element 16
10.	**COORDINATION WITH FIRST RESPONDER AGENCIES**						
	a.	Statement with commitment the company will communicate drill spud, completion operations and Production Turn-In-Line dates to County OEM					Element 1
11.	**Plan Review**						
	a.	Statement on how the company will coordinate with County OEM and First responders on updating the WOGLA EAP and TRP					602.j.a. (2)
	b.	Operator has coordinated with local Fire Districts on applicable jurisdictional fire codes					N/A

Per Weld County Code Sec. 21-5-3320 of the1041 Weld Mineral Resource Oil and Gas) Area (WOGLA) permitting process, both an Emergency Action Plan (EAP) and Tactical Response Plan (TRP) are required for a 1041 WOGLA Permit. The EAP template and the supporting Tactical Response Plan (TRP) also are designed to comply with the Colorado Oil and Gas Conservation Commission (COGCC) FORM 2 A and Rule 602. J Emergency Response Plan, Guidance Plan Elements.

The EAP is designed to assist local agencies with critical information that may aid first responders and company personnel during an emergency. Local agencies may include but are not limited to, fire department(s), emergency medical service(s) (EMS), law enforcement agencies (LE), and City or County Office of Emergency Management (OEM). State and Federal agencies consisting of COGCC, Colorado Department of Public Health and Environment (CDPHE), and the Environmental Protection Agency (EPA), may also reference the EAP.

The intent of the WOGLA EAP is for emergency planning between Local agencies and Oil and Gas Operators. If applicable, all fire code requirements shall be coordinated with the fire district having jurisdiction. As the final approval signatory, Weld OEM will not delay signing an EAP due to fire code related issues or concerns. Weld County encourages Oil and Gas Operators to work with the local fire districts to ensure they are meeting their adopted fire codes and if applicable, their local jurisdictions permitting requirements.

WOGLA EAP and TRP Instructions

Upon submission of your WOGLA permit, submit the completed following Emergency Planning documents:

- Site-specific Emergency Action Plan (EAP) & site-specific Tactical Response Plan (TRP) for the phases of oil & gas construction and development, up to transitioning to production.
    - Once the facility has transitioned into production, the operator is required to implement and utilize an area-wide company ERP for all-hazards emergencies.
    - In alignment with COGCC guidelines 602ja, (sec. 1-2), facilities which are in production, shall submit an area-wide plan annually if there are changes in contact information or change in response strategy.

WOGLA Emergency Response Plan Checklist; Oil and Gas Operators may use their own formatting as long as the table of contents and information requested in this template are utilized in the order provided. In addition, an Operator may submit their company Emergency Response Plan with the WOGLA Emergency Action Plan Checklist completed, however, site specific information will still need to be submitted with a TRP.

- Note: Submitting an area-wide ERP will also require site-specific information typically not covered in a company ERP, which focuses on a company's ER management system. Operators will still need to submit site-specific information and a TRP.

The WOGLA EAP and TRP permitting requirement also satisfies the Colorado Oil & Gas Conservation Commission (COGCC), *Rule 304.b.(8) Emergency Response Plan, Form 2 A and Rule 602. J Emergency Response Plan Guidance.*

SITE SAFETY AND EMERGENCY ACTION PLAN

PDC Energy, Inc.

District Office

1775 Sherman Street, Suite 3000

Denver, Colorado 80203

Bypass State 05N66W18 1-23 Pad

Address: TBD

Weld County, Colorado

Proposed Spud Date: 3rd Quarter 2023

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SECTION 1 – APPROVAL SIGNATURES

Instructions: Company Representative to sign with concurrence review by local Fire District in alignment with COGCC *FORM 2 A and Rule 602. J Emergency Response Plan, Guidance Plan Element 2.*

PDC Energy, Inc.			
Name	**Signature**	**Title**	**Date**
Fire District			
Name	**Signature**	**Title**	**Date**

Weld County Office of Emergency Management

Digitally Signed

SECTION 2 – SITE ADDRESS AND DIRECTIONS

a) Directions:

From The North:

From the intersection of State Hwy 34 Bypass and 95th Avenue, drive South .25 miles, turn East onto facility access road and drive .1 miles East into location.

From the South:

From the intersection of Weld County Road 54 and Weld County Road 25, drive North on WCR 25 (which becomes 95th Avenue) 1.7 miles, turn East onto facility access road and drive .1 miles East into location.

b) Ingress and Egress information:

All traffic into and out of the BYPASS 05N66W18 1-23 PAD will check-in and check-out with security. All ingress and egress routes will be clearly identified and kept clear from parked/staged vehicles at all times.

c) Physical Address and GPS coordinates

- **API#** – Pending COGCC Permit Approval
- **Legal Description** – Weld County, Colorado Parcel #095918200009, Lot 2, West Half of the Northwest Quarter, Section 18, Township 5 North, Range 66 West, 6th P.M., County of Weld, State of Colorado.
- **Address -** * Address Pending *(Weld OEM will provide physical address for 911 dispatching)*
- **Town, CO, Zip –** Greeley, Colorado 80634
- **Lat/Long:** Lat: 40.401409°N Long: -104.828457°W

d) Emergency Evacuation/Muster Assembly point(s)

For incidents were remaining in a particular area could pose a hazard to personnel onsite, such as a fire or hazardous material release, evacuation may be required to ensure the safety of onsite personnel. In the event of an emergency, site personnel will initially be evacuated to pre-designated muster assembly points.

- The Muster assembly point is identified on the Facility Access and Muster Point map in this plan, and noted on the site-specific TRP.
- The Muster assembly points will be identified during all site safety briefings for visitors, employees, and contract personnel.
- **Sign-In Sheets:** During drilling and completion activities all employees and approved visitors to the **BYPASS STATE 05N66W18 1-23 PAD** will be required to enter through a manned security checkpoint. Upon checking in, employees and visitors will be provided a detailed safety briefing of current operations, all safety precautions that must be adhered to, and the site emergency evacuation plan. In addition, all personnel who enter the location must sign-out upon their departure. Security or Supervisory personnel are required to account for all persons entering or leaving during active operations and in the event of an incident.
- Once drilling and completion activities are finalized, the site will transition to its production phase and no unauthorized personnel will be allowed on location without first contacting a company representative.

SECTION 3 – LIST OF EMERGENCY CONTACTS

a) PDC Energy, Inc.

Name	Office Phone	Emergency/Cell
Corporate Office: 1775 Sherman Street Denver, CO 80203	303-860-5800	877-350-0169
Field Office: 4000 Burlington Avenue Evans, CO 80620	970-506-9272	877-350-0169
Energy Company EHS on-call Emergency Number	970-506-9272	303-831-3900
EHS Supervisor: Jason Thron	970-506-9272	303-831-3900
EHS: Safety	970-506-9272	303-831-3900
EHS: Environmental	970-506-9272	303-831-3900

b) PDC Energy, Inc. Community/Media Relations

Name	Office Phone	Cell Phone
Courtney Loper	303-831-3997	303-378-4322

c) First Responders (Fire, EMS, HazMat)

Name	Emergency Number	Non-Emergency Number
***All emergency notifications require notification to 911 first**		
Greeley Fire Department	911	970-350-9600
Greeley Police Department	911	970-350-9600
Weld County Sheriff	911	970-356-4015
Colorado State Patrol	911	970-506-4999

d) Local, State, and Federal Contacts

Name	Emergency Number	Non-Emergency Number
Weld County Oil and Gas Energy Department	None	970-400-3580

Weld County Office of Emergency Management	None	970-304-6540
COGCC	None	303-894-2100
CDPHE	None	303-692-2000 800-886-7689
Colorado Parks & Wildlife	None	303-291-7227
National Response Center	800-424-8802	None

e) Medical Facilities *(Nearest locations to site)*

Name	Office Phone
UC Health Greeley Hospital	970-652-2000
Medical Center of the Rockies	970-624-2500
Northern Colorado Medical Facility (Burn Unit)	970-810-4121

f) Spill Response Organization (*Contracted***)**

Name	24/7 Emergency Number	Non-Emergency Number
Tasman Geosciences	303-487-1228	303-487-1228

g) Loss of Well Control

Name	24/7 Emergency Number	Non-Emergency Number
Wild Well Control, Inc. (Contracted Well Specialist)	281-784-4700	81-784-4700

h) Railroad Emergency Response *(if applicable)*

Name	24/7 Emergency Number
Union Pacific Railroad	888-877-7267

i) Mutual-Aid –

All mutual-aid coordination within Weld County will be in accordance with the current Weld County Fire Chiefs Association Mutual-Aid Agreement. In addition, due to the size of Weld County and the large number of Fire Departments that make up the Weld County Fire Chiefs Association's, Mutual-Aid may be a mixture of full-time, combination, and volunteer FD resources responding to an incident at BYPASS STATE 5N66W18 1-23 PAD.

SECTION – 4 SITE SPECIFIC INFORMATION

a) Site Description

The BYPASS STATE 5N66W18 1-23 PAD is a PDC Energy, Inc. oil and gas production facility that will have twenty-three (23) horizontal oil and gas wells along with six (6) temporary 500-barrel crude oil storage tanks, two (2) temporary 400-barrel produced water tanks, two (2) permanent 500-barrel maintenance tanks, two (2) permanent 400-barrel water tanks and one (1) permanent partially buried water vault located inside a lined secondary containment structure.

As part of the Weld County 1041 WOGLA permit process, the following sections of County Code address site layout, site drawings, and identify any sensitive areas and discuss any mitigation measures needed.

- Sec. 21-5-312 – Comprehensive Development Plans (CDPs)
- Section 21-5-320 – Application requirements for 1041 WOGLA Permit

b) Nearby Schools, High Occupancy Buildings, Waterways

- Schools - None within 5,280’ of location.
- High Occupancy Buildings - None within 4,200’ of location.
- Waterways – Ditch 374’ East, Ditch 551’ West.

c) Site Safety Requirements and General Safety Information

The minimum personal protective equipment (PPE) to enter any PDC production location includes hard hat, safety glasses, safety toe boots, fire resistant clothing (FRC), and a 4-gas personal monitor. All contractors and visitors are responsible for providing their employees with the appropriate training on and use of PPE while on any PDC location. In addition, all contract personnel entering a PDC location to perform work must understand and abide by PDC’s contractor expectations relating to environmental, health, and safety requirements.

The primary hazards that any person must be aware of while on a PDC production location include, but are not limited to, the potential for release of hydrocarbon gases and/or liquids from production equipment/tanks, heavy truck and equipment traffic, loud noise, high pressures, and the potential for a flash fire. These hazards can vary depending on the work being performed.

d)

SDS: Depending on the operations taking place on location, chemicals stored on-site may vary. In accordance with 49 CFR 1910.1200, Safety Data Sheets (SDS) will be made available for site personnel performing work and for first responders in a centralized location onsite.

e) Equipment List

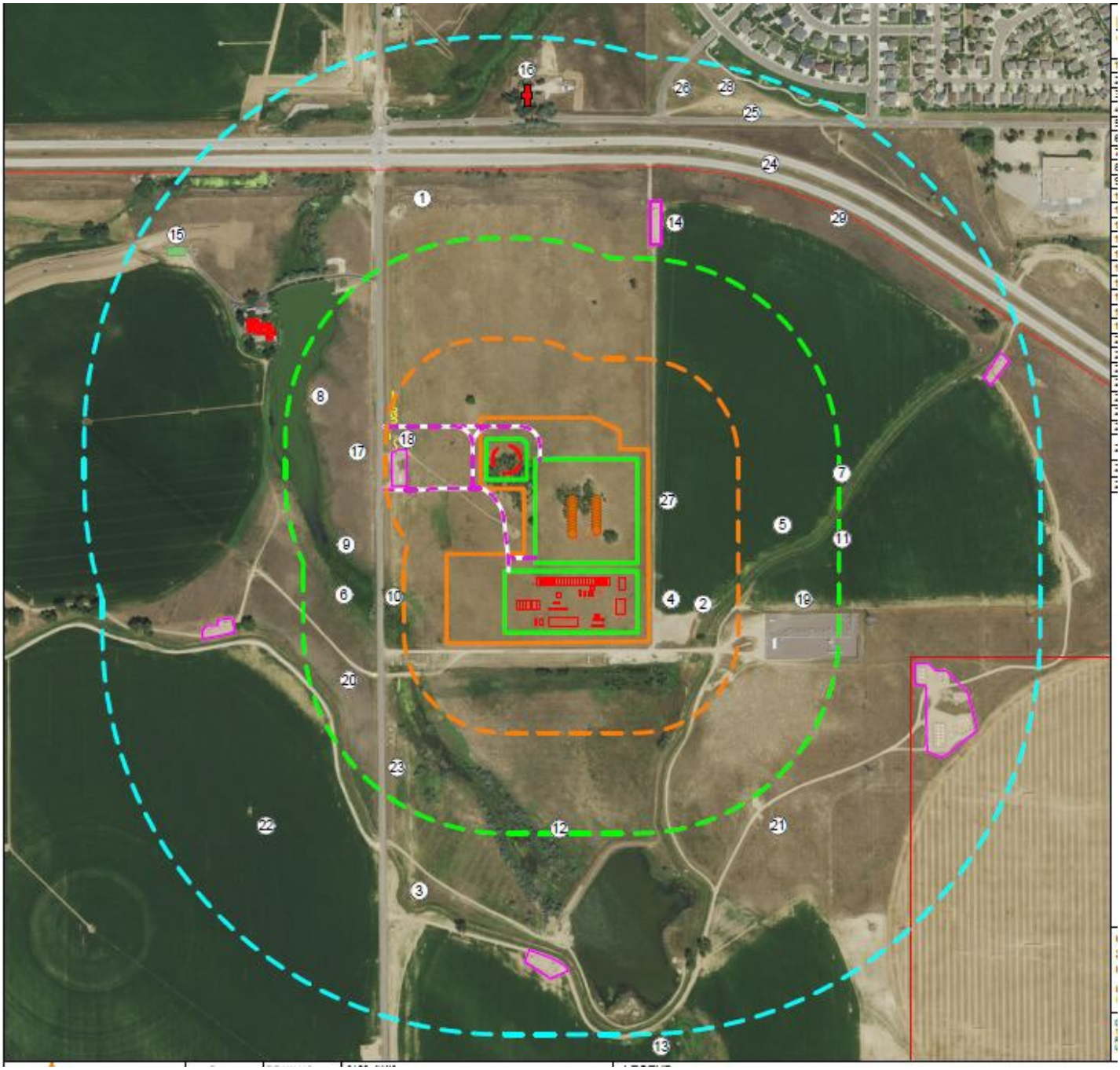
Item Description	Quantity
Horizontal oil and gas wells	23
500-barrel Temporary Crude Oil Storage Tanks	6
400-barrel Temporary Produced Water Storage Tanks	6
500-barrel Long Term Maintenance Tanks	2
400-barrel Long Term Water Storage Tanks	2
Long Term Partially Buried Water Vault	1

f) Chemicals stored on-site (BBLs and Gallons)

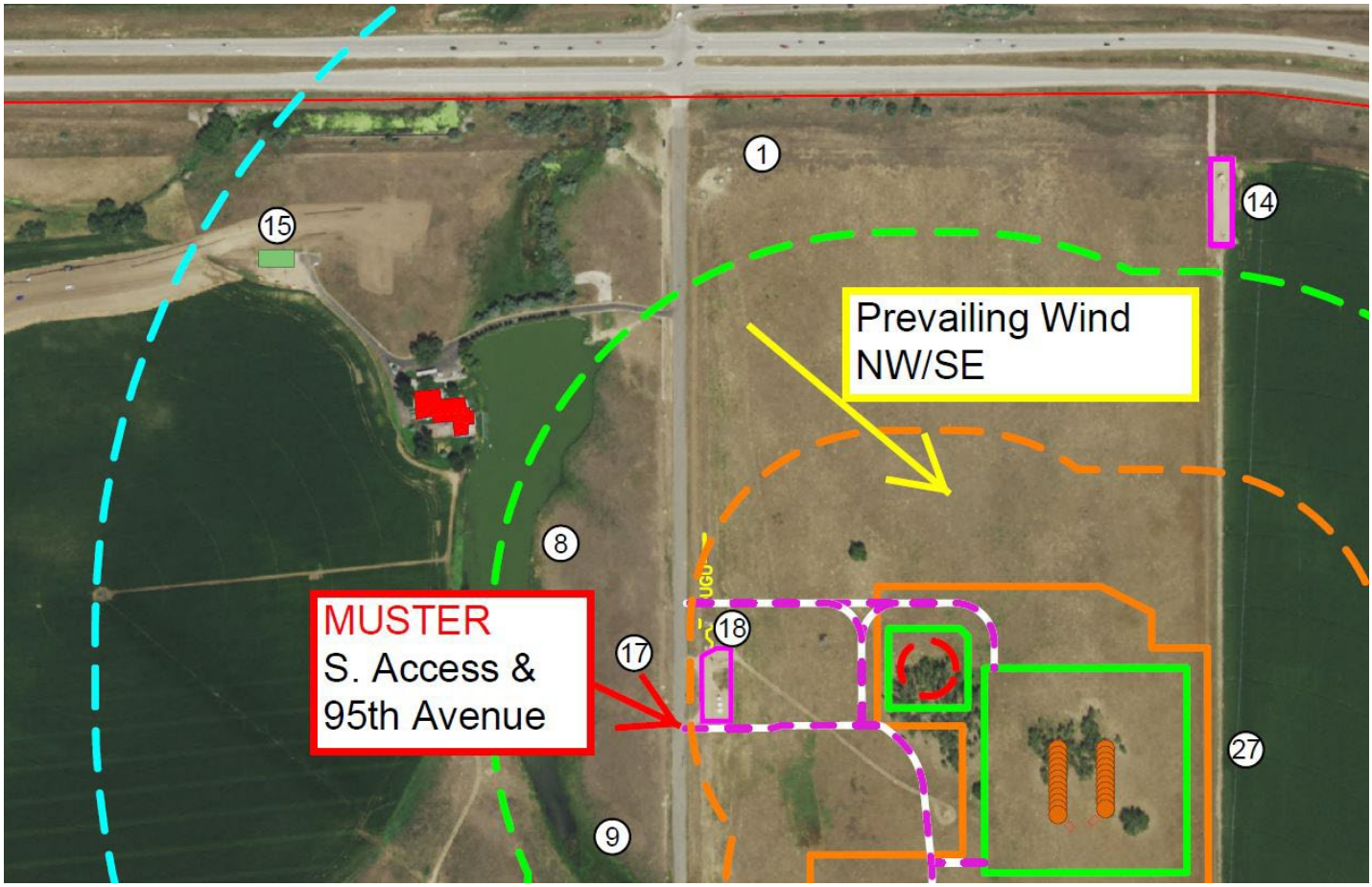
Drilling	Mud Tanks	1800 BBLs x 6 Tanks
	Fuel Tanks	20 BBLs x 2 Tanks
	Boilers	NONE
Completions	Frac Tanks	1500 BBLs x 3
	Chemical Tanks	NONE
Flowback	Open Tanks	1500 BBLs x 3 Tanks
	Sealed Tanks	500 BBLs x 1 Tank
Production	Crude Oil Tanks	500 BBLs x 8 Tanks
	Produced Water Tanks	400 BBLs x 2 Tanks
	Maintenance Tanks	500 BBLs x 2 Tanks

SECTION 5 – MAPS AND DRAWINGS

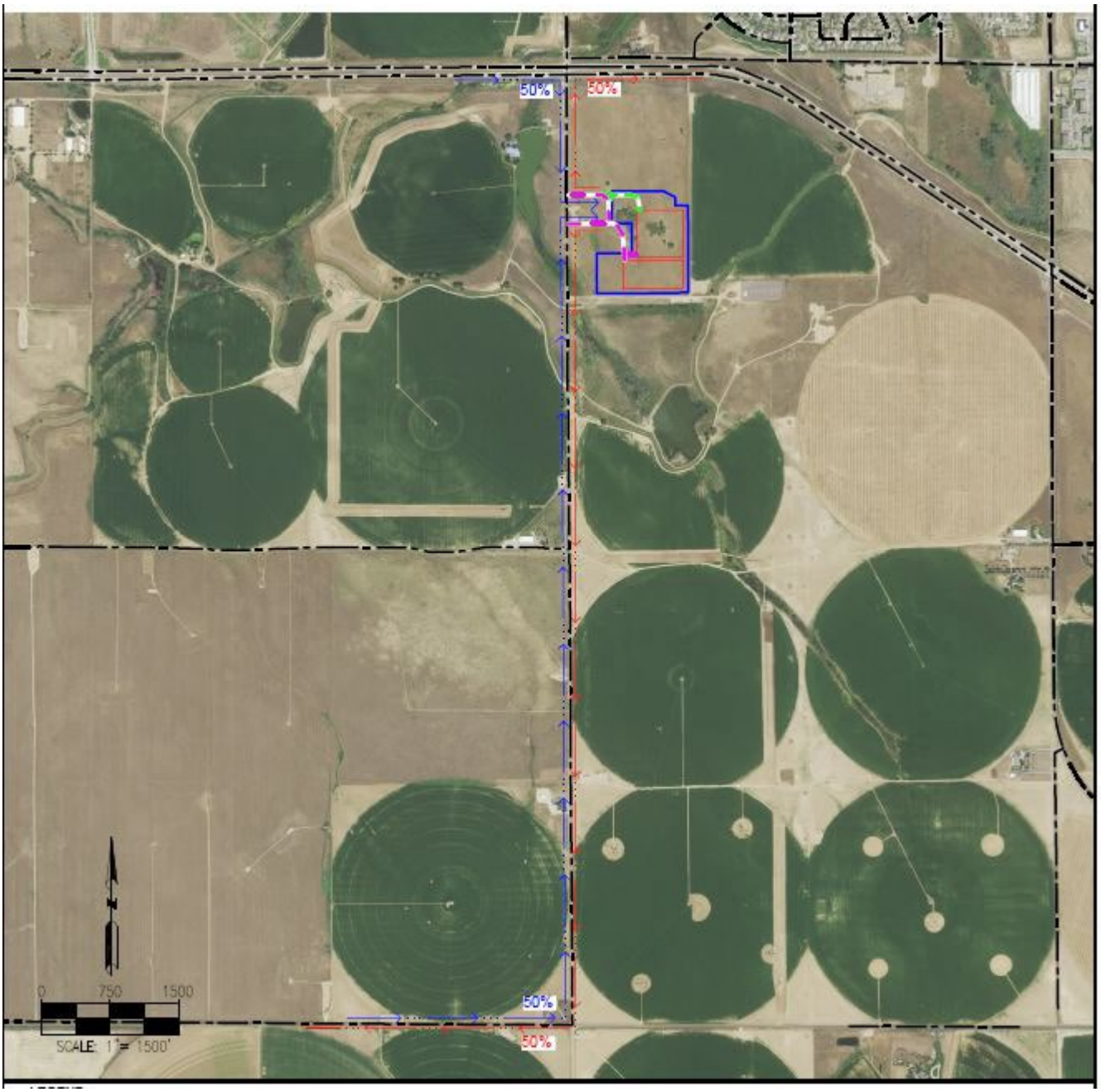
Project Area Map 500', 1,000', 2000' Buffers



Project Location Access Map and Muster Point



Haul Route Map



2500 Foot Buffer Area Map

SECTION 6 – SPILL RESPONSE AND CLEAN-UP

a) Spill Response

There are multiple types of hydrocarbons and or chemicals stored onsite which can be released/spilled during oil and gas production and exploration. Most commonly released are unrefined products such as crude oil and produced water. Refined petroleum products such as diesel, gasoline, produced oils and motor oil spills are less common, but still equally important to mitigate. If a spill is discovered, it will be mitigated in accordance with Colorado Oil and Gas Conservation Commission (COGCC), Colorado Department of Public Health and Environment (CDPHE), and Weld County LEPC requirements.

Once a release has been discovered, it will be immediately stopped and contained if possible and is safe to do so. When containing a spill; a combination of sorbent rolls, pads, mats, socks, or containment boom may be deployed, or earthen berms will be constructed around the release to keep spilled material contained and from spreading. These materials will be provided by PDC and/or the contract company and kept on-site during all construction phases. During a spill, efforts will be made to minimize contact with live vegetation, nearby drainage, rivers, creeks, or streams. If the release is outside of secondary containment or poses a threat to flow off site, or impact environmentally sensitive areas, the spill response contractor should be notified for cleanup assistance, if needed, and for removal and disposal of spilled materials and contaminated areas.

In the event of a large incident requiring outside assistance/cascading resources, PDC has contracted with a Tasman Geosciences. Tasman Geosciences possesses a working knowledge of oil and gas operations, emergency response and the Incident Command System (ICS). Once notified Tasman Geosciences personnel can be on location within 12 hours.

b) Spill Reporting

The person reporting a spill may be required to supply the minimum spill assessment information to provide as a complete understanding of the incident as possible to local, state, or federal agencies if applicable. Some initial spill response actions and information that may be reported are presented below:

- A spill/release will be reported to the COGCC if released material is property of PDC and meets the COGCC reporting thresholds (see below), an example would be crude oil released from a separator or produced water from a water vault.
- A spill/release will be reported to the Weld County LEPC if released material is property of PDC and meets the COGCC reporting thresholds (see below) Mandated by Section 304 of the Emergency Planning and Community Right-To-Know Act (EPCRA).

A spill/release will be reported to the CDPHE if released material is in the custody of a third party for spills meeting CDPHE reporting thresholds or are of any size that impact or threaten to impact waters of the state, a residence or occupied structure, livestock or public byway. An example would be an oil hauler over filling a truck and spills product onto the ground next to a flowing irrigation ditch.

Spills are reportable to the COGCC and/or to Weld County LEPC in the following circumstances:

A. The spill or release impacts or threatens to impact any waters of the state, a residence or occupied structure, livestock, or a public byway.
B. Spill or release in which 1 barrel or more is released outside of berms or other secondary containment.
C. Any spill or release of 5 barrels or more. If the spill impacts or threatens to impact waters of the state (which include surface water, ground water and dry gullies or storm sewers leading to surface water), it must also be reported immediately to CDPHE (25-8-601 CRS). Petroleum releases of 25 gallons or more.

Once a spill is determined reportable, there is a 24-hour deadline to make initial notification to the COGCC/LEPC or CDPHE depending on the product ownership. Spills/releases in the custody of PDC will be reported by a Company representative. Spills/releases in the custody of a third party will be reported by the responsible company's EHS Department to the appropriate agency and to PDC.

These regulatory guidelines will be strictly followed by PDC and any contractors operating under PDC guidance during all activities at the **BYPASS STATE 5N66W18 1-23 PAD**.

SECTION 7 – REPORTABLE QUANTITIES

a) Reportable Quantities

Mandated by Section 312 of the Emergency Planning and Community Right-To-Know Act (EPCRA) – also known as SARA Title III – the Tier II form captures information about the types, quantities, and locations of hazardous chemicals at a given facility. The form also lists contact information for the facility's designated emergency point-of-contact.

- Any facility that is required to maintain MSDSs (or SDSs) under the Occupational Safety and Health Administration (OSHA) 49 CFR 1910.1200 regulations for hazardous chemicals stored or used in the workplace.
- Facilities with chemicals in quantities that equal or exceed the lists of lists thresholds must report.
- Propane, benzene, propane and methane are on the lists of lists and are known to be in crude oil. In addition, diesel is on the lists of lists and may be stored on oil and gas sites during construction and development.

b. Reportable Requirements

Instructions: If your facility will meet the requirements under 40 CFR Part 370, you must submit your Tier II report to the State of Colorado every year before March 1st.

These regulatory requirements will be strictly followed by PDC and any contractors operating under PDC during all activities at the **BYPASS STATE 5N66W18 1-23 PAD.**

SECTION 8 – EVACUATION INFORMATION

a. Evacuation Plan Procedures (public)

The procedure to be used in alerting the public in the event of than incident which could pose a threat to life or property will be arranged and coordinated with first responders and Weld County Emergency Management.

In the event of an actual emergency, the following steps will be immediately taken:

1. The PDC representative will immediately notify first responders (911), to warn the public of a potential chemical exposure.
2. First responders may conduct door to door evacuation notices in addition to reverse 911 and utilizing the Integrated Public Alert and Warning System (IPAWS).
3. The Energy Company responsible for employees and contract personnel will monitor essential and non-essential personnel traffic on or near the incident site.
4. General:
    a. The area included within the radius of exposure is considered to be the zone with the maximum potential hazard, per the Emergency Response Guide (ERG). When it is determined that conditions exist which create an additional area (beyond the initial zone of maximum potential hazard) vulnerable to possible

hazard, public areas in the additional hazardous area will be evacuated.

b. In the event of an incident, after the public areas have been evacuated and traffic stopped, it is expected that local civil authorities will have arrived and within a few hours will have assumed direction of and control of the public, including all public areas.

c. PDC will cooperate with these authorities to the fullest extent and will exert every effort by careful advice to such authorities to prevent panic or rumors.

PDC will dispatch appropriate personnel to the disaster site as soon as possible. The company's personnel will cooperate with and provide such information to civil authorities as they might require.

SECTION – 9 TRAINING AND EXERCISES

TRAINING: The National Incident Management System (NIMS) guides all levels of government, nongovernmental organizations and the private sector to work together to prevent, protect against, mitigate, respond to and recover from incidents.

NIMS provides stakeholders across the whole community with the shared vocabulary, systems and processes to successfully deliver the capabilities described in the National Preparedness System. NIMS defines operational systems that guide how personnel work together during incidents.

PDC plays a vital role in the Incident Management System. PDC has a significant impact on local, regional, and national economic recovery, and is part of the whole community and essential to the function of the Community Lifelines.

To maximize PDC's impact and willingness to participate in incident operations, PDC will coordinate and integrate with first responders into a Unified Command (UC) on an as needed basis — including but not limited to planning, training, and preparedness exercises. In addition, it is also recommended all PDC employees who will respond to an incident have training in ICS 100, ICS 200, and ICS 700 at a minimum, for company and agency emergency response interoperability to manage a response.

EXERCISES: Exercises are an important component to test an organization's response readiness, training and familiarity with various emergency response scenarios, participation and engagement with local and or state agencies, and to develop lessons learned to improve emergency response capabilities. Per COGCC guidance number 16, a proposed schedule and type of exercises are provided below:

SECTION – 10 COORDINATION WITH FIRST RESPONDERS

a) PDC will communicate site construction, drill spud, completion operations and Production Turn-In-Line dates to the Weld County Office of Emergency Management for coordination/communication with local first responders. These start dates will be provided a minimum of 7 business days prior to commencement or change in oil and gas development operations.

b) In the event of an emergency requiring First Responders, Unified Command will be established between the PDC appointed company man on location and First Responders present. Unified Command post will be established based on conditions present at time of incident.

c) PDC EHS representative and first responders identified in this Emergency Action Plan and Tactical Response Plan have reviewed both documents and have discussed coordination efforts in the event of an emergency situation requiring first responder assistance.

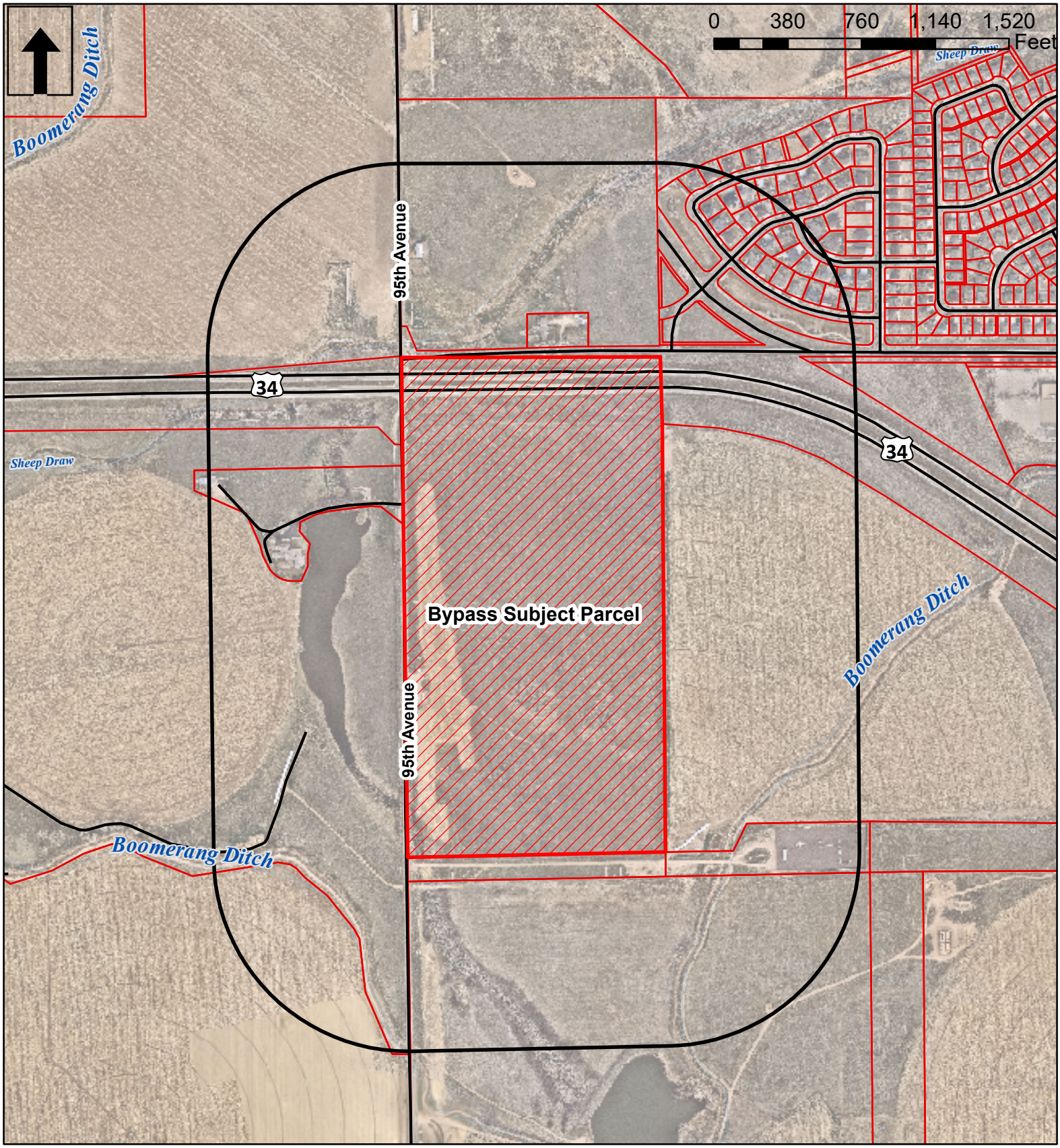
d) **Industry Mutual-Aid:** Energy companies operating in Weld County are encouraged to be members of the Colorado Preparedness Response Network (CPRN), to support mutual-aid collaboration between industry and public emergency response organizations to achieve a coordinated and effective response to an all-hazards event.

SECTION – 11 Plan Review and Update Procedures

a) Multi-year plan review and update:
After development operations are complete and the wells are in production, the Bypass State location will fall under PDC's Basin Wide Emergency Response Plan. This plan is reviewed annually and updated accordingly.

b) Post incident plan review and update:
Any reportable or recordable incident that occurs within this area will be recorded with PDC's internal incident reporting system. These incidents will be reviewed by PDC management to identify areas of improvement or updates.

Attachment H - Bypass Oil & Gas Well and Production Facility Noticing Boundary Map



Greeley Parcels

Bypass Subject Parcel

City of Greeley Colorado

COMMUNITY DEVELOPMENT

Planning Commission Agenda Summary

November 8, 2022

Key Staff Contact: Darrell Gesick, Planner III, 970-350-9822

Title:
Public hearing to consider a request for a Preliminary Subdivision to plat 212 Lots, 10 Outlots, and dedication of Rights-of-Way on 51.436 acres of land located north of 10th Street (US Highway 34 Business), West of 95th Avenue, and East of Missile Silo Road (SUB2022-0015).

Summary:
The City of Greeley is considering a request for approval of a preliminary subdivision of 51.436 acres of land into 211 lots that would consist of single-family, One lot for a future school site, 10 Outlots that would be a park, pedestrian access, or utility easements, and dedication of rights-of-way.

Recommended Action:
Approval -
Based on the application received and the preceding analysis, the Planning Commission finds that the proposed preliminary subdivision plat is in compliance with Development Code Section 24-203(b)(1), and therefore, approves the preliminary subdivision plat as presented.

Denial -
Based on the application received and the preceding analysis, the Planning Commission finds that the proposed preliminary subdivision plat is not in compliance with Development Code Section 24-203(b)(1), and therefore, denies the preliminary subdivision plat.

Attachments:
Staff Report
Attachment A – Zoning/Vicinity Map
Attachment B – Photo Aerial
Attachment C – Project Narrative
Attachment D – Preliminary Plat
Attachment E – Preliminary Landscaping Plan
Attachment F – Notice Boundary

PLANNING COMMISSION SUMMARY

ITEMS: Preliminary Subdivision for 211Single-Family Lots, One Lot for a Future School Site, 10 Outlots, and Dedication of Rights-of-Way in a PUD (Planned Unit Development) Zone District

FILE NUMBER: SUB2022-0015

PROJECT: Lake Bluff, Filing No. 1, Preliminary Subdivision

LOCATION: North of 10th Street (US Highway 34 Business), West of 95th Avenue, and East of Missile Silo Road

APPLICANT: Gary Floyd, Lamp Rynearson, on behalf of Greeley-Roth, LLC, and Meritage Homes

CASE PLANNER: Darrell Gesick, Planner III

PLANNING COMMISSION HEARING DATE: November 8, 2022

PLANNING COMMISSION FUNCTION:
The Planning Commission shall consider the staff report, along with testimony and comments made by the applicant and the public and shall then make a motion to approve, approve with conditions, or deny the request in the form of a finding based on the review criteria in Section 24-203(b)(1) of the Development Code.

EXECUTIVE SUMMARY
The City of Greeley is considering a request for approval of a preliminary subdivision of 51.436 acres of land into 211 single-family lots, one lot for a future school site, 10 Outlots that would be a park, pedestrian access, or utility easements, and dedication of rights-of-way. The subject property is located north of 10th Street, also known as US Highway 34 Business, west of 95th Avenue, and east of Missile Silo Road (see Attachments A, B, C, and D).

A. REQUEST
The applicant is requesting approval of a preliminary subdivision plat for the purpose of creating a residential development, school site, and dedication of rights-of-way (see Attachments C and D).

B. STAFF RECOMMENDATION
Approval (see Section J).

C. LOCATION
The subject site is located north of 10th Street (US Highway 34 Business), west of 95th Avenue, and east of Missile Park Road

Current Zoning: PUD (Planned Unit Development)

Abutting Zoning:
North: PUD (Planned Unit Development)
South: PUD
East: PUD
West: PUD

Abutting Land Use:
North: Undeveloped Lake Bluff PUD
South: Undeveloped Lake Bluff PUD
East: Undeveloped Lake Bluff PUD
West: Undeveloped Lake Bluff PUD

Site Characteristics:
The site is largely undeveloped agricultural land within the Lake Bluff PUD. There are oil and gas operations located on the eastern side of the PUD adjacent to 95th Avenue. A natural bluff area, known as the Poudre Bluffs, is located on the northern boundary of the Lake Bluff PUD. This subdivision is centrally located within the PUD.

D. BACKGROUND
In 1985 a 1,701-acre property was annexed into the City of Greeley, known as the Golden Triangle Second Annexation (Ordinance 1:85), which included the subject property. The entire annexed area was zoned PUD with a Conceptual PUD for a variety of approved land uses including residential, commercial, industrial, recreation, and open space uses. In 1997, an application was approved to divide the 1,70l-acre Golden Triangle PUD into six separate PUD tracts (PUD 11:97) while maintaining all of the underlying land uses. The subject site was included in the Golden Triangle PUD #3.

The Lake Bluff PUD went through Preliminary PUD approvals in 2009, and again in 2013. These iterations were not finalized through a Final PUD process and thus expired.

The most recent Lake Bluff Preliminary PUD (PUD2018-0010) was approved by City Council on March 3, 2020 (Ordinance 03, 2020). The Preliminary PUD provided land uses, including a mix of residential and commercial with an approximate 10.9-acre school site provided within proposed Tract C. Parks and trails are also committed for the project, including two park sites totaling 10.2 acres to be dedicated to the City of Greeley.

A preliminary plat was approved by Planning Commission on January 11, 2022 (File No. SUB2021-0026). A final subdivision was completed a few months after the preliminary plat approval (File No. SUB2021-0034).

With this application, the applicant requests approval of a preliminary subdivision of 51.436 acres of land into 211single-family lots, one lot for a future school site, 10 Outlots that would be a park, pedestrian access, or utility easements, and dedication of rights-of-way.

E. APPROVAL CRITERIA

Standards for a Preliminary Subdivision Plat:

In reaching recommendations and decisions on a preliminary subdivision plat, the Planning Commission shall apply the following standards of Section 24-203.b.1. of the current Development Code.

(a) **The application is in accordance with the Comprehensive Plan, or any other specific plan created under that plan, and in particular, the physical development patterns and design concepts of the plan.**

Staff Comment: The City's Comprehensive Plan designates this area as "Mixed Use," which allows for residential land uses. This application is also in accordance with the approved Lake Bluff PUD plan.

Consistency with the Land Use Chapter of the Comprehensive Plan.

The following Comprehensive Plan goals are met with this Preliminary Plat proposal:

- EH-2: Integrate healthy living into community planning and development.
  - The proposal provides open space and recreational amenities for future residents of the development.
- EH-4: Support and collaborate with the City's school districts.
  - The proposal would dedicate land to the Windsor-Severance School District for a future school site, which would be formally dedicated with the approval of the final plat.
- CG-2: Promote a balanced mix and distribution of land uses.
  - The preliminary plat follows the vision of the Lake Bluff PUD plan and offers residential lots.
- HO-2: Encourage a broad diversity of housing options.
  - The preliminary plat provides a variety of housing types including single family detached, single-family attached housing and a future multi-family site.

The request complies with this criterion.

(b) The development and infrastructure is arranged in a manner to minimize impacts of geologic hazards, environmentally sensitive areas, wildlife habitat, or other natural features of the land.

Staff Comment: The proposed subdivision was designed to minimize impacts to the surrounding area. Staff is unaware of any potential hazards that presently exist on the subject site.

The request complies with this criterion.

(c) The arrangement and proposed design of streets, blocks, and open spaces meet the development and design standards of the subdivision regulations and are coordinated with existing or potential development on adjacent property.

Staff Comment: The subdivision design is consistent with the Lake Bluff PUD plan development and design criteria. In instances where the PUD plan is silent, or otherwise noted on the PUD plans, the City's Development Code regulations shall govern.

This request complies with this criterion.

(d) The proposed blocks and lots are capable of meeting all development and site design standards under the applicable zoning district.

Staff Comment: The design is consistent with the Lake Bluff PUD plan development and design criteria, and the Development Code criteria where the PUD plan does not govern. The Lake Bluff PUD plan established specific design criteria including, lot sizes, setbacks, perimeter landscaping and parking.

This request complies with this criterion.

(e) The application demonstrates a preliminary likelihood of being able to meet the design, construction, performance, and maintenance requirements for all required improvements.

Staff Comment: The applicant submitted their preliminary construction plans for concurrent review with the preliminary plat. City staff and referral agencies have reviewed the preliminary construction plans and will work through final details and logistics as part of the final plat submittal if the preliminary plat is approved.

The request complies with this criterion.

(f) Any phasing is clearly indicated and demonstrates a logical and coordinated approach to development, and the timing, location, and construction of amenities is consistent throughout phases.

Staff Comment: The applicant anticipates completing all infrastructure as one phase. Construction of homes would progress through the development to mitigate traffic and ensure a safe environment as residents move in to completed homes. The proposed subdivision is consistent with the approved Lake Bluff PUD.

The request complies with this criterion.

(g) Any impacts identified by specific studies or technical reports, including a review of storm water, are mitigated with generally accepted and sound planning, engineering, and urban design solutions that reflect long-term solutions and sound fiscal investments.

Staff Comment: Staff and referral agencies have reviewed all preliminary plans and studies associated with the project and are comfortable with the applicant moving forward in providing final studies and working through any minor comments as part of the final subdivision plat process.

The request complies with this criterion.

(h) The design does not impede the construction of anticipated or planned future public infrastructure within the area, or deter future development of adjacent property from meeting the goals and policies of the Comprehensive Plan.

Staff Comment: The proposed subdivision would not impede any anticipated future public infrastructure. The applicant is required to construct on-site and appropriate off-site utility and roadway infrastructure to serve the development. The proposed infrastructure would be available for future development in the area. Staff are not aware of any other major infrastructure projects planned for this area.

This request complies with this criterion.

(i) The recommendations of professional staff or any other referral agencies authorized to review the subdivision plan.

Staff Comment: Staff and referral agencies have reviewed all preliminary plans and studies associated with the project and are comfortable with the application as presented. The applicant will finalize all plans and studies as part of the final subdivision plat process if the preliminary plat is approved.

The request complies with this criterion.

F. PHYSICAL SITE CHARACTERISTICS

1. SUBDIVISION HISTORY

A preliminary plat was approved by Planning Commission on January 11, 2022 (File No. SUB2021-0026). A final subdivision was completed a few months after the preliminary plat was approved (File No. SUB2021-0034). This plat is a continuation of the overall Lake Bluff PUD platting process and would be known as Lake Bluff, Filing No. 1. As the PUD develops, more preliminary subdivisions would follow and come before the Planning Commission for approval.

2. HAZARDS

Staff is unaware of any potential hazards that presently exist on the subject site.

3. WILDLIFE

This portion of the overall PUD is not located in an area identified for moderate or high wildlife impacts. There are no known impacts that would occur to wildlife if the site were subdivided.

4. FLOODPLAIN

The subject site is not located within the 100-year floodplain, according to the adopted Federal Emergency Management Administration (FEMA) flood data.

5. DRAINAGE AND EROSION

Increases in stormwater flows from development would be addressed with an on-site detention and water quality pond, which is designed to limit runoff to historical flows in accordance with City of Greeley and State of Colorado requirements.

Erosion control devices would be designed by the developer and reviewed by the city at time of construction to ensure that best management practices are utilized as the project progress.

6. TRANSPORTATION

The subject property would be connecting to the currently under construction 7th Street and the currently under construction 97th Avenue. The provided Traffic Impact Study is in compliance with the Overall Lake Bluff Traffic Impact Study. The traffic for this project has been accounted for in the previously approved Lake Bluff Traffic Study.

G. SERVICES

1. WATER

The Lake Bluff Developer is currently under construction and would be providing water to the site when the construction of this water main is complete. The City would review the interior water main looping and ensure proper water quality is achieved in accordance with City of Greeley Design Criteria.

2. **SANITATION**
The Lake Bluff developer is currently under construction of the Poudre Trunkline to provide sanitary sewer to the subject property. This site would connect to the sanitary sewer main constructed by the overall Lake Bluff Developer. Sanitary sewer flows from this development have been accounted for in the design of the Poudre Trunkline.

3. **EMERGENCY SERVICES**
The property is served by the City of Greeley Police and Fire Department. Fire State #7 is located along 10th Street, approximately 2.3 miles east of Lake Bluff. Fire Station #6 is located within the Promontory PUD, approximately 1.5 miles south of Lake Bluff.

4. **PARKS AND OPEN SPACES**
The applicant is proposing nine outlots that would be used as smaller park areas and pedestrian access points as part of this plat, all constructed and maintained by either the Metropolitan District or a HOA. In addition, one outlot would be dedicated to the City of Greeley for a future city park.

5. **SCHOOLS**
The subject property is located within the Windsor-Severance (WE-4) School District. The applicant is dedicating a 10-acre site to the School District with this platting process.

6. **METROPOLITAN DISTRICT**
The applicant would finance many of the on and off-site improvements for the development through the approved Metropolitan District. The Lake Bluff Metropolitan District 1-3 was approved in 2018 (File No. MD2018-0001).

H. NEIGHBORHOOD IMPACTS

1. **VISUAL**
The proposed subdivision includes a perimeter treatment plan consisting of trees and groundcover, consistent with the approved Lake Bluff PUD (see Attachment E). The perimeter treatment plan would help mitigate any visual impacts created by the proposed development.

2. **NOISE**
Any potential noise created by future development will be regulated by the Municipal Code.

I. PUBLIC NOTICE AND COMMENT

Neighborhood courtesy notices for the hearing were mailed to surrounding property owners within 500 feet on October 17, 2022, and notice was published on the City's website per Development Code requirements. A sign was posted on the site on October 17, 2022. The mineral rights notice requirements to mineral owners and lessee of interest of the property was satisfied during the Lake Bluff PUD process. No comments have been received.

J. PLANNING COMMISSION RECOMMENDED MOTIONS

Based on the application received and the preceding analysis, the Planning Commission finds that the proposed preliminary subdivision plat is in compliance with Development Code Section 24-203(b)(1), and therefore, **approves** the preliminary subdivision plat as presented.

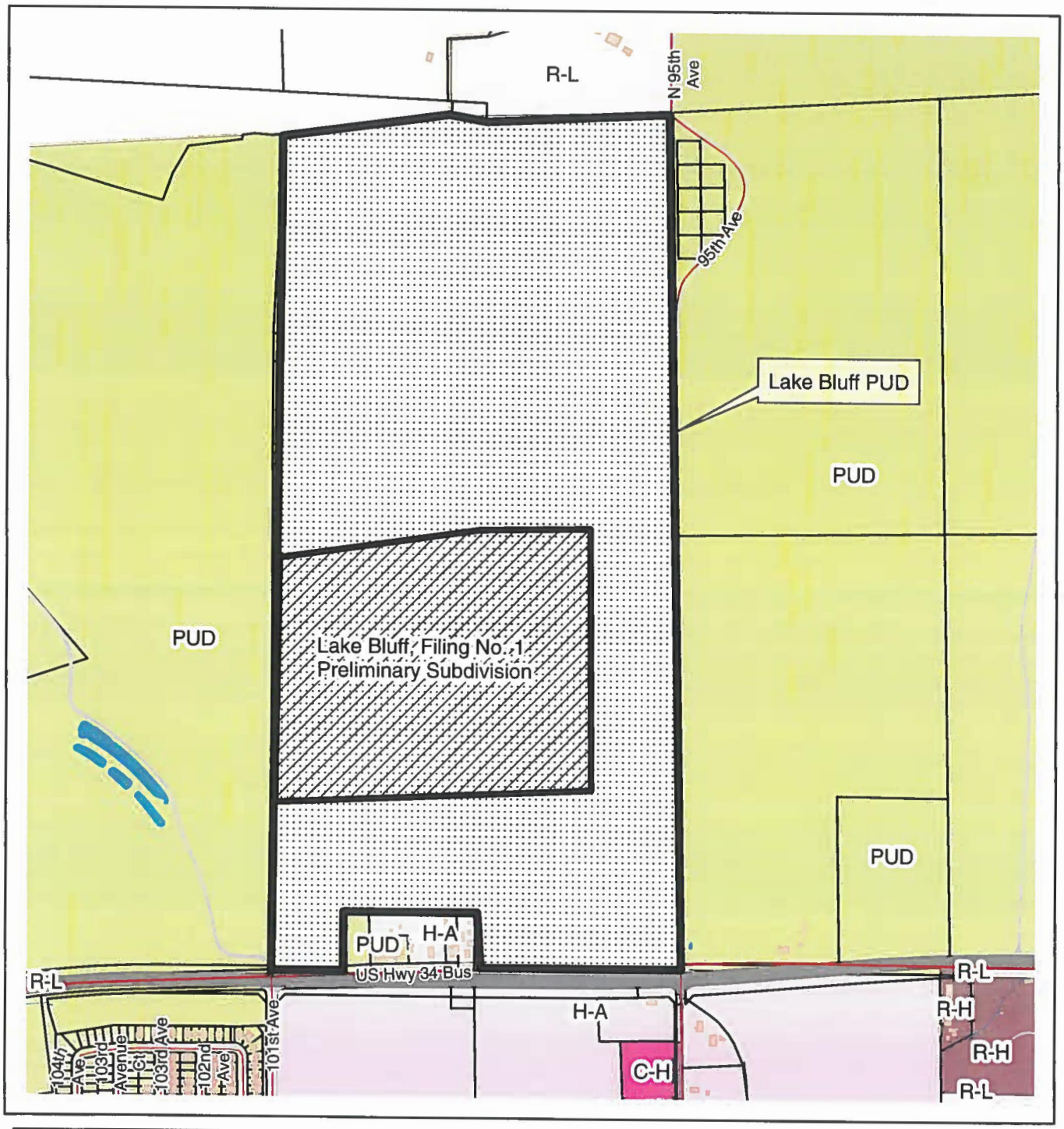
Alternative motion:

Based on the application received and the preceding analysis, the Planning Commission finds that the proposed preliminary subdivision plat is not in compliance with Development Code Section 24-203(b)(1), and therefore, **denies** the preliminary subdivision plat

ATTACHMENTS

Attachment A – Zoning/Vicinity Map
Attachment B – Photo Aerial
Attachment C – Project Narrative
Attachment D – Preliminary Plat
Attachment E – Preliminary Landscape Plan
Attachment F – Notice Boundary

Zoning/Vicinity Map
Lake Bluff, Filing No. 1
Preliminary Subdivision



Legend

- Structure
- FEATURE_SUBTYPE
- Water Body
- Weld Parcels
- Road Centerline
- Roads

SUB2022-0015

0 1,000 2,000 Feet

Zoning/Vicinity Map
Lake Bluff, Filing No. 1
Preliminary Subdivision

SUB2022-0015

LAMP RYNEARSON

4715 Innovation Dr., Ste. 100
Fort Collins, CO 80525
[P] 970.226.0342
[F] 970.226.0879
LampRynearson.com

June 28, 2022

Community Development Department – Planning & Zoning
Darrell Gesick
1100 10th Street
Greeley, CO

RE: Lake Bluff Single Family Tracts (C & E) – Subdivision Application Narrative

Dear Darrell,

On behalf of the Meritage Homes, we would like to convey our appreciation for taking the time and effort to review our Subdivision Application Narrative. The Subdivision Narrative will provide the necessary information needed for staff to understand the vision for these Tracts within the Lake Bluff Subdivision.

Site Location
The property is located within *Phase 1* of the Lake Bluff Subdivision which is generally located at the northwest corner of 95th Avenue and Hwy 34 (10th Street) and is comprised of approximately 146 acres of land zoned for PUD uses. *The phasing as it relates to the Lake Bluff Subdivision as a whole will be referred to in italics to designate the difference between overall subdivision phasing and the phasing of the subject tracts as described within.* The subject tracts (B, C, D, & E) are bordered to the north by 4th Street, to the south by 7th Street, on the west by 101st Avenue and to the east by Tract F (Future Commercial & Currently an Oil & Gas Facility). The proposed development is 30+ acres and is bisected by 97th Avenue. The proposed development is situated in Section 1, Township 5 North, Range 67, West of the 6th PM.

General Description
The goal of this development is to develop portions of Tracts B, C, D, & E for medium density residential use. The Lake Bluff PUD designated MDR for planning areas, PA(17, 24, 25, 29, & 31). Meritage homes would like to develop these areas and those associated with Park designations, PA(26, 28, & 30). The development of these areas will also require ROW dedications, and associated roadway and utility construction.

1. **How the proposed project meets the goals of the Comprehensive Plan, or other specific plans or policies that may impact the application?**
    a. The proposed project meets the goals of the comprehensive plan by adequately complying with the Single Family Detached Residential Land Use Development Standards Matrix as laid out in the PUD document. By developing within the Lake Bluff PUD parameters, the proposed development inherently meets the goals of the Comprehensive Plan.

2. **The applicant's vision and understanding of the market for the proposed project.**
    a. Meritage Home's vision is to create a product that fills a large gap in the single family residential market. The need for quality "Entry Level – Mid Level" homes continues to be a great need as more and more family's look to join suburban life. The demand for these types of homes and experiences they grant is extremely high and Meritage hopes to be able to improve the lives of those who desire.

3. **The proposed uses, general site layout, and conceptual or anticipated design of buildings, including how the project relates to surrounding sites and public spaces?**
    - **a.** Proposed use will be Medium Density Residential (Single Family Detached). The site will be laid out in similar fashion as was planned for in the Lake Bluff PUD. Internal residential roadways will provide front loaded access to the homes and connect to the spine infrastructure that is to be constructed by the Master Developer.
    - **b.** The typical lot size is 40'x105' which allows for Lake Bluff Single Family Detached Residential Land Use Development Standards Matrix to be adequately met.
    - **c.** There will likely be 2-3 building products that will efficiently utilize the lot area. These homes will be front loaded with 2-car garages and full depth driveways. Landscaping and irrigation will be provided for the front yard and front side yard landscaping. Fencing will be in compliance with the PUD.
    - **d.** There are a handful of parks that will be constructed per the PUD. These parks are located strategically to allow for efficient and maximized use. The proximity of the proposed homes to these parks should allow for an enhanced community feel and provide outdoor spaces for residents to enjoy year-round. It is the understanding of the applicant that the 6+ acre park within PA 23 is to be constructed and maintained by the City. All other parks within the proposed development will be developed by the applicant.
    - **e.** An elementary school is planned for Lake Bluff PUD Planning Area PA 27. The location of the school area will provide value to the lots within these areas and further serve the "Entry Level – Mid Level" product that the market is currently lacking.

4. **How the project will fit in and contribute to the area and further the intent of the existing or proposed zoning district?**
    - **a.** West Greeley is projected to grow significantly in the upcoming decade. The general area including the Lake Bluff PUD is planned to contain a significant number of commercial and work opportunities in the near future. As residential units are constructed (as Meritage proposes), commercial development tends to follow closely. Combining the residential uses with the commercial niceties is sure to contribute to West Greeley and Greeley as a whole community continuing to responsibly grow and prosper.
    - **b.** By providing Medium Density Residential in the proposed planning areas, the intent and spirit of the Lake Bluff PUD zoning designations is being met.

5. **Planning and infrastructure impacts, including timing, phasing, or the need for any technical studies or outside agency coordination and review.**
    - **a.** The layout shown in the provided exhibit has accounted for landscape buffers, ROW dedication, intersection spacing, and the need for utilities to serve the properties. The roadway cross sections (54' ROW residential) fits both planning and engineering requirements.
    - **b.** The buildout of the areas will likely start near the end of Q2 2023 and be completed in 2 phases with the earlier phases being constructed west of 97th Avenue.
    - **c.** Phase I (approximately 18-acres) can generally be described as the development from 96th Avenue (eastern limits of the proposed development) to 98th Avenue. Phase II (approximately 14-acres)

can generally be described as the development from 98th Avenue to 101st Avenue (eastern limits of the proposed development).

d. Generally, all infrastructure including pavement, sidewalk, landscaping and utilities will be completed within the phase line as described above. Temporary caps and blowoffs will be installed on the necessary utilities to make the transition from the phases as smooth as possible.

e. Impacts to constructed spine infrastructure roadways should be limited, as utility stubs are planned to be located for convenient connection to the mains.

f. Water, sanitary sewer, and storm sewer will be provided to adequately service the proposed lots. The proposed systems will tie into the existing infrastructure provided by the Lake Bluff spine infrastructure being completed by Master Developer.

g. Detention and water quality is provided by the spine infrastructure.

h. The proposed areas have been planned for in the Lake Bluff spine infrastructure so the need for intense technical studies will be limited. These studies (Drainage Report, Hydraulic Analysis of Water and Sanitary Sewer, Traffic Impact Study) are limited in scope but should show that the proposed development is in-line with the findings in the Lake Bluff PUD studies.

i. It is not anticipated that outside agency coordination/review will be necessary.

6. **Development review processes and review criteria, and in particular whether any special public information and outreach or specific agency or department reviews are necessary.**
    - **a.** It is planned that the proposed development will need to successfully navigate the City of Greeley's Major Subdivision accompanied with a Site Plan review process and review criteria. This includes Preliminary and Final Subdivision documents.
    - **b.** As the proposed development will be in line with the Lake Bluff PUD and Lake Bluff Subdivision requirements, there shouldn't be a need for any special public information or outreach.
    - **c.** Because the project is located relatively close to 10th Street (Hwy 34 Business), there may be a need for ancillary CDOT approval.

7. **Opportunities to improve designs or coordinate the preliminary concepts with other private or public investments in the area.**
    - **a.** As this proposed development will be utilizing infrastructure completed by Master Developer, there is an inherent need to adequately coordinate and develop development agreements with them.
    - **b.** Additional coordination will be required for the development of the school site and *Phase 1* of the Lake Bluff PUD in general.

We look forward to working closely with City staff to provide a mutually beneficial and community changing project.

Sincerely,
LAMP RYNEARSON

Gary Floyd, PE
Project Manager

LAKE BLUFF FILING NO. 1 PRELIMINARY SUBDIVISION

BEING A SUBDIVISION OF TRACTS C AND E, LAKE BLUFF SUBDIVISION, LOCATED IN THE SOUTHEAST QUARTER OF SECTION 1, TOWNSHIP 5 NORTH, RANGE 67 WEST OF THE 6TH P.M., CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO

51.436 ACRES, 212 LOTS, 10 OUTLOTS

SUB2022-0015, PUD2018-0010

STANDARD NOTES

1. STREET MAINTENANCE. IT IS MUTUALLY UNDERSTOOD AND AGREED THAT WILL NOT BE MAINTAINED BY THE CITY UNTIL AND UNLESS THE STREETS SUBDIVISION REGULATIONS IN EFFECT AT THE DATE CONSTRUCTION PLAN CONSTRUCTION OF SAID ROADWAY IS STARTED WITHIN ONE YEAR OF THE CONSTRUCTION PLAN APPROVAL. THE OWNER, DEVELOPER AND/OR SUBDIVIDERS, THEIR SUCCESSORS AND/OR ASSIGNS IN INTEREST, SHALL BE RESPONSIBLE FOR STREET MAINTENANCE UNTIL SUCH TIME AS THE CITY ACCEPTS THE RESPONSIBILITY FOR MAINTENANCE AS STATED ABOVE.

2. DRIVES, PARKING AREAS AND UTILITY EASEMENTS MAINTENANCE. THE OWNERS OF THIS SUBDIVISION, THEIR SUCCESSORS AND/OR ASSIGNS IN INTEREST, THE ADJACENT PROPERTY OWNER, HOMEOWNERS' ASSOCIATION OR OTHER ENTITY OTHER THAN THE CITY IS RESPONSIBLE FOR MAINTENANCE AND UPKEEP OF ANY AND ALL DRIVES, PARKING AREAS AND EASEMENTS (CROSS-ACCESS EASEMENTS, DRAINAGE EASEMENTS, ETC.).

3. DRAINAGE MAINTENANCE. THE PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL DRAINAGE FACILITIES INSTALLED PURSUANT TO THE DEVELOPMENT AGREEMENT. REQUIREMENTS INCLUDE, BUT ARE NOT LIMITED TO, MAINTAINING THE SPECIFIED STORMWATER DETENTION/RETENTION VOLUMES, MAINTAINING OUTLET STRUCTURES, FLOW RESTRICTION DEVICES AND FACILITIES NEEDED TO CONVEY FLOW TO SAID BASINS. THE CITY SHALL HAVE THE RIGHT TO ENTER PROPERTIES TO INSPECT SAID FACILITIES AT ANY TIME. IF THESE FACILITIES ARE NOT PROPERLY MAINTAINED, THE CITY SHALL NOTIFY THE PROPERTY OWNER IN WRITING AND SHALL INFORM THE OWNER THAT CORRECTIVE ACTION BY THE OWNER SHALL BE REQUIRED WITHIN TEN WORKING DAYS OF RECEIPT OF NOTIFICATION BY THE CITY, UNLESS AN EMERGENCY EXISTS, IN WHICH CASE CORRECTIVE ACTION SHALL BE TAKEN IMMEDIATELY UPON RECEIPT OF NOTIFICATION BY THE CITY. IF THE OWNER FAILS TO TAKE CORRECTIVE ACTION WITHIN TEN WORKING DAYS, THE CITY MAY PROVIDE THE NECESSARY MAINTENANCE AND ASSESS THE MAINTENANCE COST TO THE OWNER OF THE PROPERTY.

4. DRAINAGE LIABILITY. THE CITY DOES NOT ASSUME ANY LIABILITY FOR DRAINAGE FACILITIES IMPROPERLY DESIGNED OR CONSTRUCTED. THE CITY REVIEWS DRAINAGE PLANS BUT CANNOT; ON BEHALF OF ANY APPLICANT, OWNER OR DEVELOPER, GUARANTEE THAT FINAL DRAINAGE DESIGN REVIEW AND APPROVAL BY THE CITY WILL RELIEVE SAID PERSON, HIS SUCCESSORS AND ASSIGNS, FROM LIABILITY DUE TO IMPROPER DESIGN. CITY APPROVAL OF A FINAL PLAT DOES NOT IMPLY APPROVAL OF THE DRAINAGE DESIGN WITHIN THAT PLAT.

5. LANDSCAPE MAINTENANCE. THE OWNERS OF THIS SUBDIVISION, THEIR SUCCESSORS AND/OR ASSIGNS IN INTEREST, THE ADJACENT PROPERTY OWNER, HOMEOWNERS' ASSOCIATION OR ENTITY OTHER THAN THE CITY IS RESPONSIBLE FOR MAINTENANCE AND UPKEEP OF PERIMETER FENCING OR WALLS, LANDSCAPING AND LANDSCAPED AREAS AND SIDEWALKS BETWEEN THE PROPERTY LINE AND ANY PAVED ROADWAYS. THE OWNERS OF THIS SUBDIVISION, THEIR SUCCESSORS AND/OR ASSIGNS IN INTEREST OR AN ENTITY OTHER THAN THE CITY, AGREE TO THE RESPONSIBILITY OF MAINTAINING ALL OTHER OPEN SPACE AREAS ASSOCIATED WITH THIS DEVELOPMENT.

6. SIGHT DISTANCE. THE CLEAR VISION ZONE OF A CORNER LOT, AS DETERMINED BY SECTION 24-1146 OF THE DEVELOPMENT CODE, SHALL BE FREE FROM SHRUBS, GROUND COVERS, BERMS, FENCES, SIGNS, STRUCTURES, PARKED VEHICLES OR OTHER MATERIALS OR ITEMS GREATER THAN 36 INCHES IN HEIGHT FROM THE STREET LEVEL.

7. PUBLIC SAFETY. ACCESS, WHETHER FOR EMERGENCY OR NONEMERGENCY PURPOSES, IS GRANTED OVER AND ACROSS ALL ACCESS WAYS FOR POLICE, FIRE AND EMERGENCY VEHICLES. IF ANY OR ALL OF THE ACCESS WAYS IN THIS SUBDIVISION ARE PRIVATE, THE HOMEOWNERS' ASSOCIATION WILL BE RESPONSIBLE FOR ENSURING THAT SUCH ACCESS WAYS ARE PASSABLE, AT ALL TIMES, FOR POLICE, FIRE AND EMERGENCY VEHICLES.

8. DRAINAGE MASTER PLAN. THE POLICY OF THE CITY REQUIRES THAT ALL NEW DEVELOPMENT AND REDEVELOPMENT SHALL PARTICIPATE IN THE REQUIRED DRAINAGE IMPROVEMENTS AS SET FORTH BELOW:
   (I) DESIGN AND CONSTRUCT THE LOCAL DRAINAGE SYSTEM AS DEFINED BY THE FINAL DRAINAGE REPORT AND PLAN AND THE STORMWATER MANAGEMENT PLAT.
   (II) DESIGN AND CONSTRUCT THE CONNECTION OF THE SUBDIVISION DRAINAGE SYSTEM TO A DRAINAGE WAY OF ESTABLISHED CONVEYANCE CAPACITY, SUCH AS A MASTER PLANNED OUTFALL STORM SEWER OR MASTER PLANNED MAJOR DRAINAGE WAY. THE CITY WILL REQUIRE THAT THE CONNECTION OF THE MINOR AND MAJOR SYSTEMS PROVIDE CAPACITY TO CONVEY ONLY THOSE FLOWS (INCLUDING OFF-SITE FLOWS) LEAVING THE SPECIFIC DEVELOPMENT SITE. TO MINIMIZE OVERALL CAPITAL COSTS, THE CITY ENCOURAGES ADJACENT DEVELOPMENTS TO JOIN IN DESIGNING AND CONSTRUCTING CONNECTION SYSTEMS. ALSO, THE CITY MAY CHOOSE TO PARTICIPATE WITH A DEVELOPER IN THE DESIGN AND CONSTRUCTION OF THE CONNECTION SYSTEM.
   (III) EQUITABLE PARTICIPATION IN THE DESIGN AND CONSTRUCTION OF THE MAJOR DRAINAGE WAY SYSTEM THAT SERVES THE DEVELOPMENT AS DEFINED BY ADOPTED MASTER DRAINAGE WAY PLANS OR AS REQUIRED BY THE CITY AND DESIGNED IN THE FINAL DRAINAGE REPORT AND THE STORMWATER MANAGEMENT PLAN.

9. MAINTENANCE EASEMENTS. A MAINTENANCE EASEMENT IS REQUIRED FOR DEVELOPMENTS WITH ZERO SIDE SETBACKS, IF ONE STRUCTURE IS BUILT ON THE LOT LINE. IN ORDER TO MAINTAIN THE STRUCTURE WITH THE ZERO SIDE SETBACK, A MAINTENANCE EASEMENT MAY BE REQUIRED ON THE ADJACENT LOT TO ENABLE MAINTENANCE TO BE PERFORMED ON SAID STRUCTURE FROM THE ADJOINING PROPERTY. EACH LOT OWNER AGREES TO ALLOW ADJACENT LOT OWNERS ACCESS ACROSS THEIR LOT, WITHIN FIVE FEET OF THE COMMON LOT LINE, AS MAY BE NEEDED TO MAINTAIN AND REPAIR THE ADJACENT OWNER'S PRINCIPAL STRUCTURE. EACH ADJACENT OWNER AGREES TO REPAIR ANY DAMAGE WHICH MAY BE CAUSED TO THE LOT OWNER'S PROPERTY FROM THE ADJACENT OWNER'S USE OF THIS MAINTENANCE EASEMENT AND TO TAKE ALL NECESSARY STEPS TO AVOID CAUSING SUCH DAMAGE.

10. STREET LIGHTING. ALL LOTS ARE SUBJECT TO AND BOUND BY TARIFFS WHICH ARE NOW AND MAY IN THE FUTURE BE FILED WITH THE PUBLIC UTILITIES COMMISSION OF THE STATE RELATING TO STREET LIGHTING IN THIS SUBDIVISION, TOGETHER WITH RATES, RULES AND REGULATIONS THEREIN PROVIDED AND SUBJECT TO ALL FUTURE AMENDMENTS AND CHANGES THERETO. THE OWNERS OR THEIR SUCCESSORS AND/OR ASSIGNS IN INTEREST, SHALL PAY, AS BILLED, A PORTION OF THE COST OF PUBLIC STREET LIGHTING IN THE SUBDIVISION IN ACCORDANCE TO APPLICABLE RATES, RULES AND REGULATIONS, INCLUDING FUTURE AMENDMENTS AND CHANGES ON FILE WITH THE PUBLIC UTILITIES COMMISSION.

11. WATER OR SEWER MAIN EASEMENTS. THERE SHALL BE NO PERMANENT STRUCTURES, FENCES, DETENTION PONDS, LANDSCAPING (PLANTINGS OR BERMS) GREATER THAN THREE FEET, TALL MATURE GROWTH, OR OTHER ENCUMBRANCES LOCATED IN WATER OR SEWER MAIN EASEMENTS.

12. WATER OR SEWER MAINS IN PRIVATE ROADS OR EASEMENTS. FOR PUBLIC WATER AND SEWER MAINS LOCATED IN PRIVATE ROADS OR EASEMENTS, FUTURE REPAIR OF PAVING OR OTHER IMPROVED SURFACES SUBSEQUENT TO THE REPAIR OF A WATER OR SEWER MAIN SHALL BE THE RESPONSIBILITY OF THE HOMEOWNERS' OR CONDOMINIUM ASSOCIATION. THE WATER AND SEWER DEPARTMENT WILL SAFELY BACKFILL THE TRENCH TO THE SURFACE, BUT NOT REBUILD ANY SURFACE IMPROVEMENTS.

EASEMENT TABLE			
EASEMENT TYP	USE	EASEMENT GRANT TO	SURFACE MAINTENANCE
DRAINAGE EASEMENT	DRAINAGE FACILITIES	CITY OF GREELEY	LANDOWNER
UTILITY EASEMENT	DRY UTILITIES	CITY OF GREELEY	LANDOWNER

ENGINEER
GARY FLOYD
LAMP RYNEARSON
4715 INNOVATION DRIVE
FORT COLLINS, CO 80525
PHONE: 970-226-0342

SURVEYOR
LAINE LANDAU
LAMP RYNEARSON
4715 INNOVATION DRIVE
FORT COLLINS, CO 80525
PHONE: 970-226-0342

OWNER
OTIS MOORE
GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
4100 E MISSISSIPPI AVE STE 500
GLENDALE, CO 80246
PHONE: 303-984-9800

SUBDIVIDER
CHELSEY GREEN
MERITAGE HOMES
8400 E. CRESCENT PARKWAY, SUITE 200
GREENWOOD VILLAGE, CO 80111
PHONE: 303-406-4312

SURVEYOR CERTIFICATE

I, LAINE A. LANDAU, DO HEREBY CERTIFY THAT I PREPARED THIS PLAT FROM AN ACTUAL AND ACCURATE SURVEY OF THIS LAND, INCLUDING ALL EXISTING RIGHTS-OF-WAY AND EASEMENTS, AND THAT THE CORNER MONUMENTS SHOWN THEREON WERE PROPERLY PLACED UNDER MY SUPERVISION, IN ACCORDANCE WITH THE REGULATIONS OF THE STATE OF COLORADO.

PRELIMINARY

LAINE A. LANDAU COLORADO PLS 31159
ON BEHALF OF LAMP RYNEARSON INC.
EMAIL ADDRESS: LAINE.LANDAU@LAMPRYNEARSON.COM

LAND USE SUMMARY CHART			
PARCEL	SIZE	LAND USE	PERCENTAGE
LOTS 1-211	AVERAGE 4453 SQ. FT. 0.102 AC.	SINGLE FAMILY LOTS	AVERAGE: 0.20%, TOTAL: 41.94%
LOT 212	455,739 SQ. FT. 10.462 AC.	FUTURE DEVELOPMENT & SCHOOL	20.34%
OUTLOT A	26,979 SQ. FT. 0.619 AC.	LANDSCAPE BUFFER	1.20%
OUTLOT B	6,090 SQ. FT. 0.140 AC.	LANDSCAPE BUFFER	0.27%
OUTLOT C	3,045 SQ. FT. 0.070 AC.	LANDSCAPE BUFFER	0.14%
OUTLOT D	5,110 SQ. FT. 0.117 AC.	LANDSCAPE BUFFER	0.23%
OUTLOT E	6,850 SQ. FT. 0.157 AC.	LANDSCAPE BUFFER	0.31%
OUTLOT F	7,267 SQ. FT. 0.167 AC.	LANDSCAPE BUFFER	0.32%
OUTLOT G	2,014 SQ. FT. 0.046 AC.	LANDSCAPE BUFFER	0.09%
OUTLOT H	2,128 SQ. FT. 0.049 AC.	LANDSCAPE BUFFER	0.09%
OUTLOT I	18,707 SQ. FT. 0.429 AC.	LANDSCAPE BUFFER	0.83%
OUTLOT J	407,254 SQ. FT. 9.349 AC.	PARK	18.18%
ROW	359,718 SQ. FT. 8.260 AC.	RIGHT OF WAY	16.06%
TOTAL	2,240,566 SQ FT 51.436 AC	SEE ABOVE	100%

*SEE TABLE ON SHEET 3 FOR AREAS FOR SPECIFIC SINGLE FAMILY LOTS

OUTLOT TABLE				
OUTLOT	PURPOSE	OWNERSHIP	MAINTENANCE	SIZE
OUTLOT A	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	26,979 SQ. FT. 0.619 AC.
OUTLOT B	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	6,090 SQ. FT. 0.140 AC.
OUTLOT C	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	3,045 SQ. FT. 0.070 AC.
OUTLOT D	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	5,110 SQ. FT. 0.117 AC.
OUTLOT E	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	6,850 SQ. FT. 0.157 AC.
OUTLOT F	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	7,267 SQ. FT. 0.167 AC.
OUTLOT G	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	2,014 SQ. FT. 0.046 AC.
OUTLOT H	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	2128 SQ. FT. 0.049 AC.
OUTLOT I	PARK/PEDESTRIAN ACCESS/UTILITY EASEMENT	HOA	HOA	18,707 SQ. FT. 0.429 AC.
OUTLOT J	PARK/DETENTION POND/PEDESTRIAN ACCESS/UTILITY EASEMENT	CITY OF GREELEY	CITY OF GREELEY	407,254 SQ. FT. 9.349 AC.
				TOTAL: 485,445 SQ.FT. 11.144 AC.

PLAT NOTES

1. ACCORDING TO COLORADO LAW (13-80-105 CRS 2016) YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF CERTIFICATION SHOWN HEREON.

2. ALL EASEMENTS AND RIGHTS OF WAY REFERENCED FROM LAND TITLE GUARANTY COMPANY. TITLE COMMITMENT NUMBER ABC25195188, DATED JANUARY 1, 2022 5:00 P.M.

3. TYPICAL LOT EASEMENTS:
   FRONT/STREET: 8' UTILITY EASEMENT
   INTERIOR SIDE: 5' DRAINAGE EASEMENT
   BACK: 10' UTILITY EASEMENT

4. BASIS OF BEARING: THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SECTION 1, T5N, R67W BEARS S87°33'22"W FOR 2583.95 FEET BETWEEN THE SOUTHEAST CORNER OF SECTION 1, MONUMENTED WITH A 2 3/8" ALUMINUM PIPE WITH A 3 1/4" ALUMINUM CAP, PLS 25381, 2010, AND THE SOUTH QUARTER CORNER OF SECTION 1, MONUMENTED WITH A 2 3/8" ALUMINUM PIPE WITH AN ILLEGIBLE 3 1/4" ALUMINUM CAP, BASED ON THE (NAD83) COLORADO NORTH 0501 STATE PLANE COORDINATE SYSTEM.

5. ONSITE DRAINAGE EASEMENTS SHALL BE OWNED AND MAINTAINED BY PROPERTY OWNER.

6. FLOOD INFORMATION:
   UNSHADED ZONE X
   AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN AS ILLUSTRATED BY FLOOD INSURANCE RATE MAP (FIRM), WELD COUNTY, GREELEY, COLORADO.
   MAP NUMBER 08123C1512E
   MAP EFFECTIVE DATE: JANUARY 20, 2016
   COMMUNITY NUMBER: 080184

   FLOOD ZONE REQUIREMENTS MAY BE SUBJECT TO CHANGE OR MODIFICATION BY THE LOCAL GOVERNING AUTHORITY. CONTACT THE LOCAL FLOOD PLAIN MANAGER OR OTHER APPROPRIATE OFFICIAL TO DISCOVER LOCAL ORDINANCES OR CHANGES IN REGULATIONS, FUTURE OR PROPOSED.

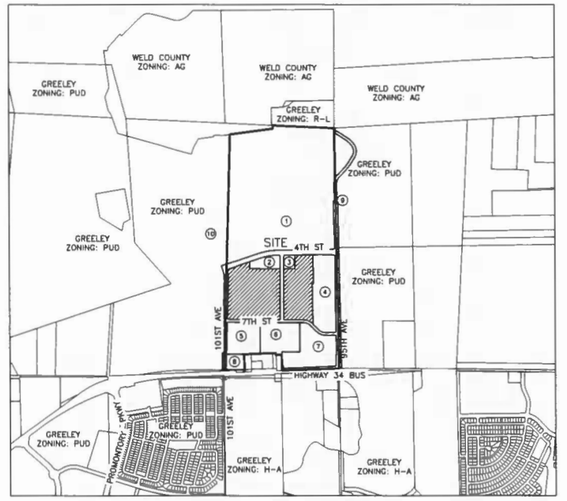
OWNERS OF ADJOINING PARCELS

1. TRACT A, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
2. TRACT B, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
3. TRACT D, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
4. TRACT F, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
5. TRACT G, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
8. TRACT H, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
7. TRACT I, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
8. TRACT J, LAKE BLUFF SUBDIVISION
   GREELEY-ROTHE, L.L.C., A COLORADO LIMITED LIABILITY COMPANY
   4100 E MISSISSIPPI AVE STE 500
   GLENDALE, CO 80246
   ZONING: PUD
9. UNPLATTED
   1813 61ST AVE STE 200
   CACHE LLC
   REC NO 4520928
   ZONING: PUD
10. UNPLATTED
    10925 HW 257 SPUR GREELEY
    DPR GREELEY LLC (43.89%)
    AU'S RENTALS LLC (35.11%)
    POUDRE BAY CAPITAL LLC (11%)
    POUDRE BAY PARTNERS LLC (10%)
    REC NO 4369421
    ZONING PUD

LEGEND

- BOUNDARY LINE
- SECTION LINE
- RIGHT OF WAY
- LOT LINE
- CENTERLINE OF ROAD
- EXISTING EASEMENT
- PROPOSED EASEMENT
- SECTION CORNER (AS DESCRIBED)
- SET 5/8" REBAR WITH 1-1/4" YELLOW PLASTIC CAP, PLS 31159

SCALE: 1"= 1500' U.S. SURVEY FEET



VICINITY/LOCATION MAP

SCALE: 1"= 80' U.S. SURVEY FEET

IF THIS BAR IS NOT 1" LONG, THE DRAWING IS NOT TO SCALE.

LEGAL DESCRIPTION

MERITAGE A COLORADO LIMITED LIABILITY COMPANY, BEING THE SOLE OWNER(S) IN FEE OF:

TRACTS C AND E,
LAKE BLUFF SUBDIVISION, RECORDED AS REC. NO. 4835681,
CITY OF GREELEY,
COUNTY OF WELD,
STATE OF COLORADO, THE PERIMETER OF WHICH IS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE EAST QUARTER CORNER OF SECTION 1, TOWNSHIP 5 NORTH, RANGE 67 WEST OF THE 6TH P.M., THENCE SOUTH 73°57'23" WEST FOR 550.86 FEET TO THE NORTHEAST CORNER OF TRACT E, LAKE BLUFF SUBDIVISION, SAID POINT BEING THE POINT OF BEGINNING TRACT E;
THENCE THE FOLLOWING 11 COURSES ON THE PERIMETER OF SAID TRACT E:
1. THENCE SOUTH 00°48'51" EAST FOR 644.42 FEET;
2. THENCE SOUTH 89°06'40" WEST FOR 29.85 FEET;
3. THENCE SOUTH 00°59'10" EAST FOR 902.19 FEET;
4. THENCE NORTH 48°18'32" WEST FOR 35.89 FEET TO THE BEGINNING OF A TANGENT CURVE TO THE LEFT;
5. THENCE ON THE ARC OF SAID CURVE TO THE LEFT FOR 213.60 FEET, HAVING A RADIUS OF 280.00 FEET, A CENTRAL ANGLE OF 43°42'32", AND BEING SUB-TENDED BY A CHORD BEARING NORTH 68°09'48" WEST FOR 208.46 FEET TO A POINT OF TANGENCY;
6. THENCE SOUTH 89°58'56" WEST FOR 423.65 FEET TO THE BEGINNING OF A TANGENT CURVE TO THE RIGHT;
7. THENCE ON THE ARC OF SAID CURVE TO THE RIGHT FOR 31.55 FEET, HAVING A RADIUS OF 20.00 FEET, A CENTRAL ANGLE OF 90°23'34", AND BEING SUB-TENDED BY A CHORD BEARING NORTH 44°49'17" WEST FOR 28.38 FEET TO A POINT OF TANGENCY;
8. THENCE NORTH 00°22'30" EAST FOR 1114.02 FEET;
9. THENCE SOUTH 89°37'30" EAST FOR 256.00 FEET;
10. THENCE NORTH 00°21'55" EAST FOR 306.76 FEET;
11. THENCE NORTH 89°13'23" EAST FOR 402.87 FEET TO THE POINT OF BEGINNING TRACT E.

AND

COMMENCING AT THE EAST QUARTER CORNER OF SECTION 1, TOWNSHIP 5 NORTH, RANGE 67 WEST OF THE 6TH P.M., THENCE SOUTH 73°57'23" WEST FOR 550.86 FEET TO THE NORTHEAST CORNER OF TRACT E, LAKE BLUFF SUBDIVISION;
THENCE THE FOLLOWING 3 COURSES ON THE PERIMETER OF SAID TRACT E:
1. THENCE SOUTH 89°13'23" WEST FOR 402.87 FEET;
2. THENCE SOUTH 00°21'55" WEST FOR 306.76 FEET;
3. THENCE NORTH 89°37'30" WEST FOR 256.00 FEET;

THENCE CONTINUING NORTH 89°37'30" WEST FOR 80.00 FEET TO THE NORTHEAST CORNER OF TRACT C, LAKE BLUFF SUBDIVISION, SAID POINT BEING THE POINT OF BEGINNING TRACT C;
THENCE THE FOLLOWING 15 COURSES ON THE PERIMETER OF SAID TRACT C:
1. THENCE SOUTH 00°22'30" WEST FOR 1114.85 FEET TO THE BEGINNING OF A TANGENT CURVE TO THE RIGHT;
2. THENCE ON THE ARC OF SAID CURVE TO THE RIGHT FOR 31.28 FEET, HAVING A RADIUS OF 20.00 FEET, A CENTRAL ANGLE OF 89°36'26", AND BEING SUB-TENDED BY A CHORD BEARING SOUTH 45°10'43" WEST FOR 28.19 FEET TO A POINT OF TANGENCY;
3. THENCE SOUTH 89°58'56" WEST FOR 776.81 FEET TO THE BEGINNING OF A TANGENT CURVE TO THE RIGHT;
4. THENCE ON THE ARC OF SAID CURVE TO THE RIGHT FOR 6.55 FEET, HAVING A RADIUS OF 220.00 FEET, A CENTRAL ANGLE OF 01°42'18", AND BEING SUB-TENDED BY A CHORD BEARING NORTH 89°09'55" WEST FOR 6.55 FEET TO A POINT OF TANGENCY;
5. THENCE NORTH 88°18'45" WEST FOR 360.13 FEET TO THE BEGINNING OF A TANGENT CURVE TO THE RIGHT;
6. THENCE ON THE ARC OF SAID CURVE TO THE RIGHT FOR 31.42 FEET, HAVING A RADIUS OF 20.00 FEET, A CENTRAL ANGLE OF 90°00'00", AND BEING SUB-TENDED BY A CHORD BEARING NORTH 43°18'45" WEST FOR 28.28 FEET TO A POINT OF TANGENCY;
7. THENCE NORTH 01°41'15" EAST FOR 916.52 FEET TO THE BEGINNING OF A TANGENT CURVE TO THE LEFT;
8. THENCE ON THE ARC OF SAID CURVE TO THE LEFT FOR 120.67 FEET, HAVING A RADIUS OF 340.00 FEET, A CENTRAL ANGLE OF 20°20'04", AND BEING SUB-TENDED BY A CHORD BEARING NORTH 08°28'47" WEST FOR 120.03 FEET TO A POINT OF TANGENCY;
9. THENCE NORTH 18°38'49" WEST FOR 12.27 FEET;
10. THENCE NORTH 32°59'56" EAST FOR 57.81 FEET;
11. THENCE NORTH 71°21'11" EAST FOR 183.27 FEET;
12. THENCE NORTH 60°02'35" EAST FOR 25.50 FEET;
13. THENCE NORTH 71°21'11" EAST FOR 291.75 FEET;
14. THENCE SOUTH 00°22'30" WEST FOR 151.44 FEET;
15. THENCE SOUTH 89°37'30" EAST FOR 682.00 FEET TO THE POINT OF BEGINNING TRACT C.

THE GROSS AREA OF THE DESCRIBED SUBDIVISION IS 2,240,566 SQUARE FEET, 51.436 ACRES MORE OR LESS.
SAID DESCRIPTION HAS A CLOSURE ERROR OF 0.00 FFET.

LAMP RYNEARSON
LAMPRYNEARSON.COM
OMAHA, NEBRASKA
14710 W. DODGE RD, STE. 100 (402)498.2498
FORT COLLINS, COLORADO
4715 INNOVATION DR., STE. 100 (970)226.0342
KANSAS CITY, MISSOURI
9001 STATE LINE RD., STE. 200 (816)361.5440

LAKE BLUFF FILING NO. 1 PRELIMINARY SUBDIVISION
REPLAT OF TRACTS C AND E, LAKE BLUFF SUBDIVISION
SE 1/4, SECTION 1, T5N, R67W OF THE 6TH P.M.,
CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO

LAKE BLUFF FILING NO. 1
GREELEY, COLORADO

811 Know what's below. Call before you dig.
ALL UTILITIES ARE SHOWN BASED ON THE INFORMATION AVAILABLE TO THE ENGINEER. THERE IS NO GUARANTEE ALL FACILITIES ARE SHOWN OR THAT THE LOCATIONS SHOWN ARE EXACT. IT IS EACH FACILITY IS CORRECT. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES AND SERVICE LINES PRIOR TO CONSTRUCTION.

REVISIONS
JAC 7/8/2022 REVISED PER CITY COMMENTS
JAC 8/10/2022 REC. PER CITY COMMENTS

DESIGNER / DRAFTER
LAINE LANDAU//JOSH CROAK
DATE
08/10/2022
PROJECT NUMBER
0221047
BOOK AND PAGE

SHEET
1 OF 3

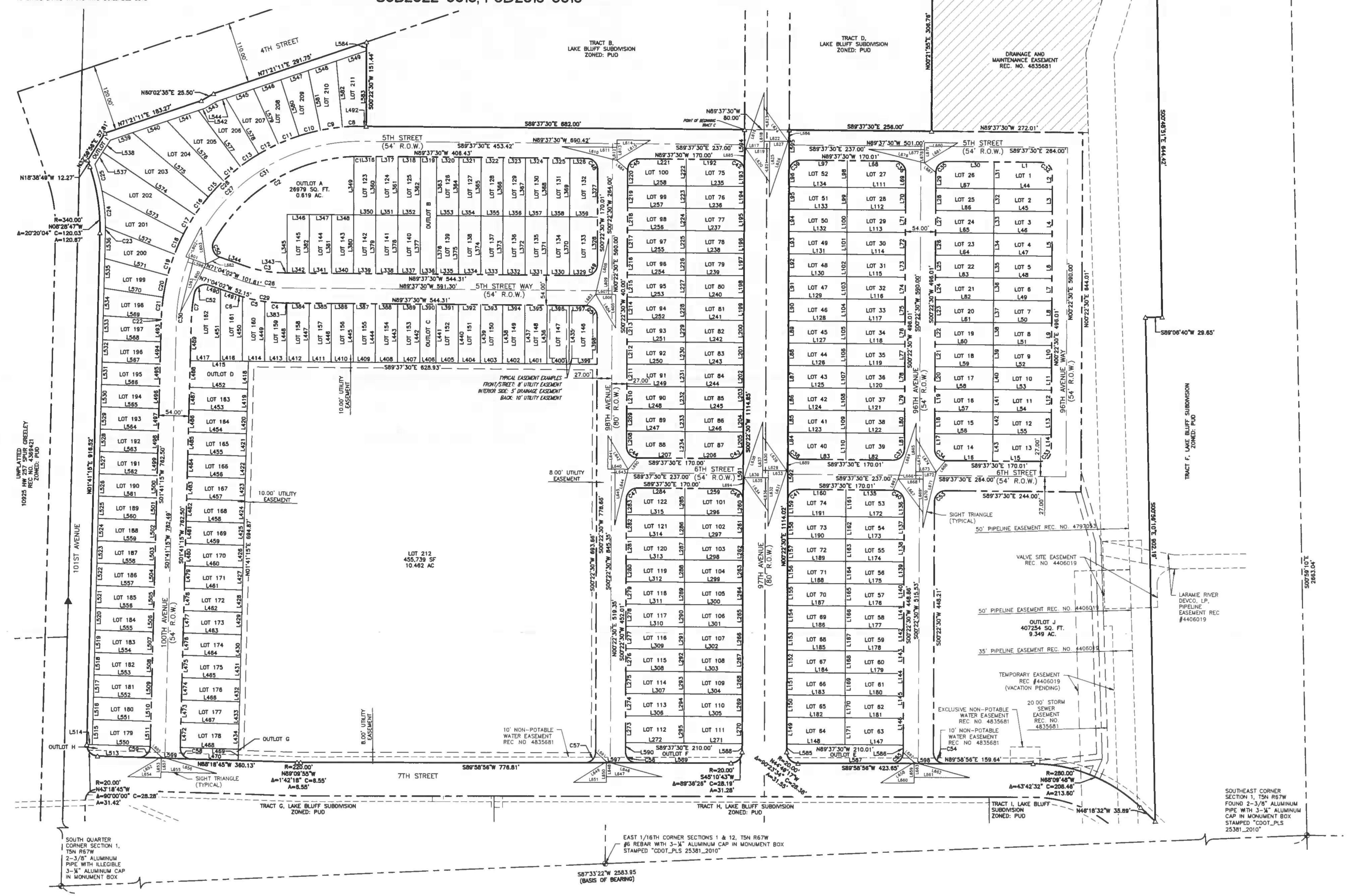
LAKE BLUFF FILING NO. 1 PRELIMINARY SUBDIVISION

BEING A SUBDIVISION OF TRACTS C AND E, LAKE BLUFF SUBDIVISION, LOCATED IN THE SOUTHEAST QUARTER OF SECTION 1, TOWNSHIP 5 NORTH, RANGE 67 WEST OF THE 6TH P.M., CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO

51.436 ACRES, 212 LOTS, 10 OUTLOTS,

SUB2022-0015, PUD2018-0010

PURPOSE STATEMENT
TO DIVIDE LARGE TRACTS INTO BUILDABLE LOTS



SCALE: 1"= 80
U.S. SURVEY FEET
*IF THIS BAR IS NOT 2" LONG, THE DRAWING IS NOT TO SCALE.

LAMP RYNEARSON
LAMPRYNEARSON.COM
OMAHA, NEBRASKA
14710 W. DODGE RD, STE. 100 (402)496.2498
FORT COLLINS, COLORADO
4715 INNOVATION DR., STE. 100 (970)226.0342
KANSAS CITY, MISSOURI
9001 STATE LINE RD., STE. 200 (816)361.0440

SURVEYOR CERTIFICATE
SEE PAGE 1 OF 3 FOR NOTES AND CERTIFICATION.

LAKE BLUFF FILING NO. 1 PRELIMINARY SUBDIVISION
REPLAT OF TRACTS C AND E, LAKE BLUFF SUBDIVISION
SE 1/4, SECTION 1, T5N, R67W OF THE 6TH P.M.,
CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO

LAKE BLUFF FILING NO. 1
GREELEY, COLORADO

811 Know what's below. Call before you dig.
ALL UTILITIES ARE SHOWN BASED ON THE INFORMATION AVAILABLE TO THE ENGINEER. THERE IS NO GUARANTEE ALL FACILITIES ARE SHOWN OR THAT THE LOCATION, DEPTH, AND SIZE OF EACH FACILITY IS CORRECT. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES AND SERVICE LINES PRIOR TO CONSTRUCTION.

REVISIONS
JAC 7/8/2022 REV PER CITY COMMENTS
JAC 8/10/2022 REC. PER CITY COMMENTS

DESIGNER / DRAFTER: LAINE LANDAU/JOSH CROAK
DATE: 08/10/2022
PROJECT NUMBER: 0221047
BOOK AND PAGE

SHEET
2 OF 3

LAKE BLUFF FILING NO. 1 PRELIMINARY SUBDIVISION

BEING A SUBDIVISION OF TRACTS C AND E, LAKE BLUFF SUBDIVISION, LOCATED IN THE SOUTHEAST QUARTER OF SECTION 1, TOWNSHIP 5 NORTH, RANGE 67 WEST OF THE 6TH P.M., CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO

51.436 ACRES, 212 LOTS, 10 OUTLOTS, SUB2022-0015, PUD2018-0010

LINE TABLE

LINE #	LENGTH	DIRECTION
L1	85.00'	N89°37'30"W
L2	28.00'	N00°22'30"E
L3	40.00'	N00°22'30"E
L4	40.00'	N00°22'30"E
L5	40.00'	N00°22'30"E
L6	40.00'	N00°22'30"E
L7	40.00'	N00°22'30"E
L8	40.00'	N00°22'30"E
L9	40.00'	N00°22'30"E
L10	40.00'	N00°22'30"E
L11	40.00'	N00°22'30"E
L12	40.00'	N00°22'30"E
L13	40.00'	N00°22'30"E
L14	28.00'	N00°22'30"E
L15	85.00'	S89°37'30"E
L16	85.00'	S89°37'30"E
L17	28.00'	S00°22'30"W
L18	40.00'	S00°22'30"W
L19	40.00'	S00°22'30"W
L20	40.00'	S00°22'30"W
L21	40.00'	S00°22'30"W
L22	40.00'	S00°22'30"W
L23	40.00'	S00°22'30"W
L24	40.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L25	40.00'	S00°22'30"W
L26	40.00'	S00°22'30"W
L27	40.00'	S00°22'30"W
L28	40.00'	S00°22'30"W
L29	28.00'	S00°22'30"W
L30	85.00'	N89°37'30"W
L31	48.00'	S00°22'30"W
L32	40.00'	S00°22'30"W
L33	40.00'	S00°22'30"W
L34	40.00'	S00°22'30"W
L35	40.00'	S00°22'30"W
L36	40.00'	S00°22'30"W
L37	40.00'	S00°22'30"W
L38	40.00'	S00°22'30"W
L39	40.00'	S00°22'30"W
L40	40.00'	S00°22'30"W
L41	40.00'	S00°22'30"W
L42	40.00'	S00°22'30"W
L43	48.00'	S00°22'30"W
L44	105.00'	N89°37'30"W
L45	105.00'	N89°37'30"W
L46	105.00'	N89°37'30"W
L47	105.00'	N89°37'30"W
L48	105.00'	N89°37'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L49	105.00'	N89°37'30"W
L50	105.00'	N89°37'30"W
L51	105.00'	N89°37'30"W
L52	105.00'	N89°37'30"W
L53	105.00'	N89°37'30"W
L54	105.00'	N89°37'30"W
L55	105.00'	N89°37'30"W
L56	105.00'	S89°37'30"E
L57	105.00'	S89°37'30"E
L58	105.00'	S89°37'30"E
L59	105.00'	S89°37'30"E
L60	105.00'	S89°37'30"E
L61	105.00'	S89°37'30"E
L62	105.00'	S89°37'30"E
L63	105.00'	S89°37'30"E
L64	105.00'	S89°37'30"E
L65	105.00'	S89°37'30"E
L66	105.00'	S89°37'30"E
L67	105.00'	S89°37'30"E
L68	85.00'	N89°37'30"W
L69	28.00'	S00°22'30"W
L70	40.00'	S00°22'30"W
L71	40.00'	S00°22'30"W
L72	40.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L73	40.00'	S00°22'30"W
L74	40.00'	S00°22'30"W
L75	40.00'	S00°22'30"W
L76	40.00'	S00°22'30"W
L77	40.00'	S00°22'30"W
L78	40.00'	S00°22'30"W
L79	40.00'	S00°22'30"W
L80	40.00'	S00°22'30"W
L81	28.00'	S00°22'30"W
L82	85.00'	S89°37'30"E
L83	85.00'	S89°37'30"E
L84	28.00'	S00°22'30"W
L85	40.00'	S00°22'30"W
L86	40.00'	S00°22'30"W
L87	40.00'	S00°22'30"W
L88	40.00'	S00°22'30"W
L89	40.00'	S00°22'30"W
L90	40.00'	S00°22'30"W
L91	40.00'	S00°22'30"W
L92	40.00'	S00°22'30"W
L93	40.00'	S00°22'30"W
L94	40.00'	S00°22'30"W
L95	40.00'	S00°22'30"W
L96	28.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L97	85.00'	N89°37'30"W
L98	48.00'	N00°22'30"E
L99	40.00'	N00°22'30"E
L100	40.00'	N00°22'30"E
L101	40.00'	N00°22'30"E
L102	40.00'	N00°22'30"E
L103	40.00'	N00°22'30"E
L104	40.00'	N00°22'30"E
L105	40.00'	N00°22'30"E
L106	40.00'	N00°22'30"E
L107	40.00'	N00°22'30"E
L108	40.00'	N00°22'30"E
L109	40.00'	N00°22'30"E
L110	48.00'	N00°22'30"E
L111	105.00'	N89°37'30"W
L112	105.00'	N89°37'30"W
L113	105.00'	N89°37'30"W
L114	105.00'	N89°37'30"W
L115	105.00'	N89°37'30"W
L116	105.00'	N89°37'30"W
L117	105.00'	N89°37'30"W
L118	105.00'	N89°37'30"W
L119	105.00'	N89°37'30"W
L120	105.00'	N89°37'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L121	105.00'	N89°37'30"W
L122	105.00'	N89°37'30"W
L123	105.00'	S89°37'30"E
L124	105.00'	S89°37'30"E
L125	105.00'	S89°37'30"E
L126	105.00'	S89°37'30"E
L127	105.00'	S89°37'30"E
L128	105.00'	S89°37'30"E
L129	105.00'	S89°37'30"E
L130	105.00'	S89°37'30"E
L131	105.00'	S89°37'30"E
L132	105.00'	S89°37'30"E
L133	105.00'	S89°37'30"E
L134	105.00'	S89°37'30"E
L135	85.00'	S89°37'30"E
L136	28.00'	S00°22'30"W
L137	40.00'	S00°22'30"W
L138	40.00'	S00°22'30"W
L139	40.00'	S00°22'30"W
L140	40.00'	S00°22'30"W
L141	40.00'	S00°22'30"W
L142	40.00'	S00°22'30"W
L143	40.00'	S00°22'30"W
L144	40.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L145	40.00'	S00°22'30"W
L146	48.00'	S00°22'30"W
L147	105.00'	N89°37'30"W
L148	105.00'	N89°37'30"W
L149	48.00'	S00°22'30"W
L150	40.00'	S00°22'30"W
L151	40.00'	S00°22'30"W
L152	40.00'	S00°22'30"W
L153	40.00'	S00°22'30"W
L154	40.00'	S00°22'30"W
L155	40.00'	S00°22'30"W
L156	40.00'	S00°22'30"W
L157	40.00'	S00°22'30"W
L158	40.00'	S00°22'30"W
L159	28.00'	S00°22'30"W
L160	85.00'	S89°37'30"E
L161	48.00'	S00°22'30"W
L162	40.00'	S00°22'30"W
L163	40.00'	S00°22'30"W
L164	40.00'	S00°22'30"W
L165	40.00'	S00°22'30"W
L166	40.00'	S00°22'30"W
L167	40.00'	S00°22'30"W
L168	40.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L169	40.00'	S00°22'30"W
L170	40.00'	S00°22'30"W
L171	48.00'	S00°22'30"W
L172	105.00'	N89°37'30"W
L173	105.00'	N89°37'30"W
L174	105.00'	N89°37'30"W
L175	105.00'	N89°37'30"W
L176	105.00'	N89°37'30"W
L177	105.00'	N89°37'30"W
L178	105.00'	N89°37'30"W
L179	105.00'	N89°37'30"W
L180	105.00'	N89°37'30"W
L181	105.00'	N89°37'30"W
L182	105.00'	S89°37'30"E
L183	105.00'	S89°37'30"E
L184	105.00'	S89°37'30"E
L185	105.00'	S89°37'30"E
L186	105.00'	S89°37'30"E
L187	105.00'	S89°37'30"E
L188	105.00'	S89°37'30"E
L189	105.00'	S89°37'30"E
L190	105.00'	S89°37'30"E
L191	105.00'	S89°37'30"E
L192	85.00'	N89°37'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L193	28.00'	S00°22'30"W
L194	40.00'	S00°22'30"W
L195	40.00'	S00°22'30"W
L196	40.00'	S00°22'30"W
L197	40.00'	S00°22'30"W
L198	40.00'	S00°22'30"W
L199	40.00'	S00°22'30"W
L200	40.00'	S00°22'30"W
L201	40.00'	S00°22'30"W
L202	40.00'	S00°22'30"W
L203	40.00'	S00°22'30"W
L204	40.00'	S00°22'30"W
L205	28.00'	S00°22'30"W
L206	85.00'	S89°37'30"E
L207	85.00'	S89°37'30"E
L208	28.00'	S00°22'30"W
L209	40.00'	S00°22'30"W
L210	40.00'	S00°22'30"W
L211	40.00'	S00°22'30"W
L212	40.00'	S00°22'30"W
L213	40.00'	S00°22'30"W
L214	40.00'	S00°22'30"W
L215	40.00'	S00°22'30"W
L216	40.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L217	40.00'	S00°22'30"W
L218	40.00'	S00°22'30"W
L219	40.00'	S00°22'30"W
L220	28.00'	S00°22'30"W
L221	85.00'	N89°37'30"W
L222	48.00'	N00°22'30"E
L223	40.00'	N00°22'30"E
L224	40.00'	N00°22'30"E
L225	40.00'	N00°22'30"E
L226	40.00'	N00°22'30"E
L227	40.00'	N00°22'30"E
L228	40.00'	N00°22'30"E
L229	40.00'	N00°22'30"E
L230	40.00'	N00°22'30"E
L231	40.00'	N00°22'30"E
L232	40.00'	N00°22'30"E
L233	40.00'	N00°22'30"E
L234	48.00'	N00°22'30"E
L235	105.00'	N89°37'30"W
L236	105.00'	N89°37'30"W
L237	105.00'	N89°37'30"W
L238	105.00'	N89°37'30"W
L239	105.00'	N89°37'30"W
L240	105.00'	N89°37'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L241	105.00'	N89°37'30"W
L242	105.00'	N89°37'30"W
L243	105.00'	N89°37'30"W
L244	105.00'	N89°37'30"W
L245	105.00'	N89°37'30"W
L246	105.00'	N89°37'30"W
L247	105.00'	S89°37'30"E
L248	105.00'	S89°37'30"E
L249	105.00'	S89°37'30"E
L250	105.00'	S89°37'30"E
L251	105.00'	S89°37'30"E
L252	105.00'	S89°37'30"E
L253	105.00'	S89°37'30"E
L254	105.00'	S89°37'30"E
L255	105.00'	S89°37'30"E
L256	105.00'	S89°37'30"E
L257	105.00'	S89°37'30"E
L258	105.00'	S89°37'30"E
L259	85.00'	S89°37'30"E
L260	28.00'	S00°22'30"W
L261	40.00'	S00°22'30"W
L262	40.00'	S00°22'30"W
L263	40.00'	S00°22'30"W
L264	40.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L265	40.00'	S00°22'30"W
L266	40.00'	S00°22'30"W
L267	40.00'	S00°22'30"W
L268	40.00'	S00°22'30"W
L269	40.00'	S00°22'30"W
L270	48.00'	S00°22'30"W
L271	105.00'	S89°37'30"E
L272	105.00'	S89°37'30"E
L273	48.00'	S00°22'30"W
L274	40.00'	S00°22'30"W
L275	40.00'	S00°22'30"W
L276	40.00'	S00°22'30"W
L277	40.00'	S00°22'30"W
L278	40.00'	S00°22'30"W
L279	40.00'	S00°22'30"W
L280	40.00'	S00°22'30"W
L281	40.00'	S00°22'30"W
L282	40.00'	S00°22'30"W
L283	28.00'	S00°22'30"W
L284	85.00'	S89°37'30"E
L285	48.00'	N00°22'30"E
L286	40.00'	N00°22'30"E
L287	40.00'	N00°22'30"E
L288	40.00'	N00°22'30"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L289	40.00'	N00°22'30"E
L290	40.00'	N00°22'30"E
L291	40.00'	N00°22'30"E
L292	40.00'	N00°22'30"E
L293	40.00'	N00°22'30"E
L294	40.00'	N00°22'30"E
L295	48.00'	N00°22'30"E
L296	105.00'	N89°37'30"W
L297	105.00'	N89°37'30"W
L298	105.00'	N89°37'30"W
L299	105.00'	N89°37'30"W
L300	105.00'	N89°37'30"W
L301	105.00'	N89°37'30"W
L302	105.00'	N89°37'30"W
L303	105.00'	N89°37'30"W
L304	105.00'	N89°37'30"W
L305	105.00'	N89°37'30"W
L306	105.00'	S89°37'30"E
L307	105.00'	S89°37'30"E
L308	105.00'	S89°37'30"E
L309	105.00'	S89°37'30"E
L310	105.00'	S89°37'30"E
L311	105.00'	S89°37'30"E
L312	105.00'	S89°37'30"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L313	105.00'	S89°37'30"E
L314	105.00'	S89°37'30"E
L315	105.00'	S89°37'30"E
L316	26.42'	N89°37'30"W
L317	40.00'	N89°37'30"W
L318	40.00'	N89°37'30"W
L319	29.00'	N89°37'30"W
L320	40.00'	N89°37'30"W
L321	40.00'	N89°37'30"W
L322	40.00'	N89°37'30"W
L323	40.00'	N89°37'30"W
L324	40.00'	N89°37'30"W
L325	40.00'	N89°37'30"W
L326	31.00'	N89°37'30"W
L327	85.00'	S00°22'30"W
L328	85.00'	S00°22'30"W
L329	31.00'	N89°37'30"W
L330	40.00'	N89°37'30"W
L331	40.00'	N89°37'30"W
L332	40.00'	N89°37'30"W
L333	40.00'	N89°37'30"W
L334	40.00'	N89°37'30"W
L335	40.00'	N89°37'30"W
L336	29.00'	N89°37'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L337	40.00'	N89°37'30"W
L338	40.00'	N89°37'30"W
L339	40.00'	N89°37'30"W
L340	40.00'	N89°37'30"W
L341	40.00'	N89°37'30"W
L342	40.00'	N89°37'30"W
L343	4.30'	N89°37'30"W
L344	49.25'	N71°04'02"W
L345	105.00'	N00°22'30"E
L346	40.00'	S89°37'30"E
L347	40.00'	S89°37'30"E
L348	40.00'	S89°37'30"E
L349	104.70'	N00°22'30"E
L350	40.00'	S89°37'30"E
L351	40.00'	S89°37'30"E
L352	40.00'	S89°37'30"E
L353	40.00'	S89°37'30"E
L354	40.00'	S89°37'30"E
L355	40.00'	S89°37'30"E
L356	40.00'	S89°37'30"E
L357	40.00'	S89°37'30"E
L358	40.00'	S89°37'30"E
L359	51.00'	S89°37'30"E
L360	105.00'	S00°22'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L361	105.00'	S00°22'30"W
L362	105.00'	S00°22'30"W
L363	105.00'	N00°22'30"E
L364	105.00'	S00°22'30"W
L365	105.00'	S00°22'30"W
L366	105.00'	S00°22'30"W
L367	105.00'	S00°22'30"W
L368	105.00'	S00°22'30"W
L369	105.00'	S00°22'30"W
L370	105.00'	N00°22'30"E
L371	105.00'	N00°22'30"E
L372	105.00'	N00°22'30"E
L373	105.00'	N00°22'30"E
L374	105.00'	N00°22'30"E
L375	105.00'	N00°22'30"E
L376	105.00'	N00°22'30"E
L377	105.00'	S00°22'30"W
L378	105.00'	N00°22'30"E
L379	105.00'	N00°22'30"E
L380	105.00'	N00°22'30"E
L381	105.00'	N00°22'30"E
L382	105.00'	N00°22'30"E
L383	4.30'	N89°37'30"W
L384	40.00'	N89°37'30"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L385	40.00'	N89°37'30"W
L386	40.00'	N89°37'30"W
L387	40.00'	N89°37'30"W
L388	40.00'	N89°37'30"W
L389	40.00'	N89°37'30"W
L390	29.00'	N89°37'30"W
L391	40.00'	N89°37'30"W
L392	40.00'	N89°37'30"W
L393	40.00'	N89°37'30"W
L394	40.00'	N89°37'30"W
L395	40.00'	N89°37'30"W
L396	40.00'	N89°37'30"W
L397	31.00'	N89°37'30"W
L398	85.00'	S00°22'30"W
L399	51.00'	S89°37'30"E
L400	40.00'	S89°37'30"E
L401	40.00'	S89°37'30"E
L402	40.00'	S89°37'30"E
L403	40.00'	S89°37'30"E
L404	40.00'	S89°37'30"E
L405	40.00'	S89°37'30"E
L406	29.00'	S89°37'30"E
L407	40.00'	S89°37'30"E
L408	40.00'	S89°37'30"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L409	40.00'	S89°37'30"E
L410	40.00'	S89°37'30"E
L411	40.00'	S89°37'30"E
L412	40.00'	S89°37'30"E
L413	40.00'	S89°37'30"E
L414	40.00'	N89°37'30"W
L415	105.03'	S89°37'30"E
L416	40.00'	N89°37'30"W
L417	53.95'	N89°37'30"W
L418	49.87'	N01°41'15"E
L419	40.00'	N01°41'15"E
L420	40.00'	N01°41'15"E
L421	40.00'	N01°41'15"E
L422	40.00'	N01°41'15"E
L423	40.00'	N01°41'15"E
L424	40.00'	N01°41'15"E
L425	40.00'	N01°41'15"E
L426	40.00'	N01°41'15"E
L427	40.00'	N01°41'15"E
L428	40.00'	N01°41'15"E
L429	40.00'	N01°41'15"E
L430	40.00'	N01°41'15"E
L431	40.00'	N01°41'15"E
L432	40.00'	N01°41'15"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L433	40.00'	N01°41'15"E
L434	45.00'	N01°41'15"E
L435	105.00'	S00°22'30"W
L436	105.00'	S00°22'30"W
L437	105.00'	S00°22'30"W
L438	105.00'	S00°22'30"W
L439	105.00'	S00°22'30"W
L440	105.00'	S00°22'30"W
L441	105.00'	N00°22'30"E
L442	105.00'	S00°22'30"W
L443	105.00'	N00°22'30"E
L444	105.00'	N00°22'30"E
L445	105.00'	N00°22'30"E
L446	105.00'	N00°22'30"E
L447	105.00'	N00°22'30"E
L448	105.00'	N00°22'30"E
L449	107.34'	N00°22'30"E
L450	115.66'	N00°22'30"E
L451	128.81'	N00°22'30"E
L452	105.00'	S88°18'45"E
L453	105.00'	S88°18'45"E
L454	105.00'	S88°18'45"E
L455	105.00'	S88°18'45"E
L456	105.00'	S88°18'45"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L457	105.00'	S88°18'45"E
L458	105.00'	S88°18'45"E
L459	105.00'	S88°18'45"E
L460	105.00'	S88°18'45"E
L461	105.00'	S88°18'45"E
L462	105.00'	S88°18'45"E
L463	105.00'	S88°18'45"E
L464	105.00'	S88°18'45"E
L465	105.00'	S88°18'45"E
L466	105.00'	S88°18'45"E
L467	105.00'	S88°18'45"E
L468	105.00'	S88°18'45"E
L469	20.00'	S01°41'15"W
L470	85.00'	N88°18'45"W
L472	45.00'	S01°41'15"W
L473	40.00'	S01°41'15"W
L474	40.00'	S01°41'15"W
L475	40.00'	S01°41'15"W
L476	40.00'	S01°41'15"W
L477	40.00'	S01°41'15"W
L478	40.00'	S01°41'15"W
L479	40.00'	S01°41'15"W
L480	40.00'	S01°41'15"W
L481	40.00'	S01°41'15"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L482	40.00'	S01°41'15"W
L483	40.00'	S01°41'15"W
L484	40.00'	S01°41'15"W
L485	40.00'	S01°41'15"W
L486	40.00'	S01°41'15"W
L487	40.00'	S01°41'15"W
L488	47.46'	S01°41'15"W
L489	70.03'	S01°41'15"W
L490	22.09'	N71°04'02"W
L491	30.06'	N71°04'02"W
L492	8.42'	N89°37'30"W
L493	37.49'	S01°41'15"W
L494	40.00'	S01°41'15"W
L495	40.00'	S01°41'15"W
L496	40.00'	S01°41'15"W
L497	40.00'	S01°41'15"W
L498	40.00'	S01°41'15"W
L499	40.00'	S01°41'15"W
L500	40.00'	S01°41'15"W
L501	40.00'	S01°41'15"W
L502	40.00'	S01°41'15"W
L503	40.00'	S01°41'15"W
L504	40.00'	S01°41'15"W
L505	40.00'	S01°41'15"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L506	40.00'	S01°41'15"W
L507	40.00'	S01°41'15"W
L508	40.00'	S01°41'15"W
L509	40.00'	S01°41'15"W
L510	40.00'	S01°41'15"W
L511	45.00'	S01°41'15"W
L513	75.00'	N88°18'45"W
L514	10.00'	N88°18'45"W
L515	45.00'	S01°41'15"W
L516	40.00'	S01°41'15"W
L517	40.00'	S01°41'15"W
L518	40.00'	S01°41'15"W
L519	40.00'	S01°41'15"W
L520	40.00'	S01°41'15"W
L521	40.00'	S01°41'15"W
L522	40.00'	S01°41'15"W
L523	40.00'	S01°41'15"W
L524	40.00'	S01°41'15"W
L525	40.00'	S01°41'15"W
L526	40.00'	S01°41'15"W
L527	40.00'	S01°41'15"W
L528	40.00'	S01°41'15"W
L529	40.00'	S01°41'15"W
L530	40.00'	S01°41'15"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L531	40.00'	S01°41'15"W
L532	40.00'	S01°41'15"W
L533	43.28'	S01°41'15"W
L534	49.35'	S01°41'15"W
L535	53.32'	S01°41'15"W
L536	45.57'	S01°41'15"W
L537	25.79'	S32°59'56"W
L538	25.92'	S32°59'56"W
L539	42.49'	S71°21'11"W
L540	65.66'	S71°21'11"W
L541	59.25'	S71°21'11"W
L542	12.14'	S71°21'11"W
L543	25.50'	S60°02'35"W
L544	16.82'	S71°21'11"W
L545	53.05'	S71°21'11"W
L546	51.90'	S71°21'11"W
L547	52.05'	S71°21'11"W
L548	53.52'	S71°21'11"W
L549	31.55'	S71°21'11"W
L550	105.00'	N88°18'45"W
L551	105.00'	N88°18'45"W
L552	105.00'	N88°18'45"W
L553	105.00'	N88°18'45"W
L554	105.00'	N88°18'45"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L555	105.00'	N88°18'45"W
L556	105.00'	N88°18'45"W
L557	105.00'	N88°18'45"W
L558	105.00'	N88°18'45"W
L559	105.00'	N88°18'45"W
L560	105.00'	N88°18'45"W
L561	105.00'	N88°18'45"W
L562	105.00'	N88°18'45"W
L563	105.00'	N88°18'45"W
L564	105.00'	N88°18'45"W
L565	105.00'	N88°18'45"W
L566	105.00'	N88°18'45"W
L567	105.00'	N88°18'45"W
L568	105.00'	N88°18'45"W
L569	105.06'	S86°31'27"E
L570	108.26'	S81°33'02"E
L571	117.48'	S75°11'04"E
L572	133.45'	S68°49'06"E
L573	165.87'	S62°27'07"E
L574	200.05'	S56°05'09"E
L575	177.96'	S49°43'11"E
L576	147.19'	S43°21'12"E
L577	125.42'	S36°59'14"E
L578	116.13'	S30°37'16"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L579	108.01'	S24°15'17"E
L580	105.81'	S17°53'19"E
L581	109.39'	S11°31'21"E
L582	118.98'	S05°09'22"E
L583	135.57'	N00°22'30"E
L584	15.87'	N00°22'30"E
L585	14.02'	S00°22'30"W
L586	12.85'	S00°22'30"W
L587	170.00'	N89°58'56"E
L588	14.84'	S00°22'30"W
L589	170.00'	S89°58'56"W
L590	16.01'	S00°22'30"W
L591	94.00'	S00°22'30"W
L592	94.00'	S00°22'30"W
L593	97.23'	S14°22'26"W
L594	74.00'	S00°22'30"W
L595	74.00'	S00°22'30"W
L596	23.57'	N69°23'06"W
L597	94.00'	S89°58'56"W
L598	94.00'	N89°58'56"E
L599	94.00'	N88°18'45"W
L600	97.53'	N28°16'28"E
L601	38.64'	N69°23'06"W
L602	60.00'	N27°13'34"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L603	67.52'	S07°24'58"E
L604	70.25'	N30°57'24"W
L605	59.95'	S00°22'48"W
L606	36.54'	S89°32'13"E
L607	23.51'	N89°37'12"W
L608	102.73'	N13°36'29"E
L609	100.00'	S00°22'48"W
L610	102.72'	N76°23'59"W
L611	100.00'	S89°37'27"E
L612	23.50'	S00°23'17"W
L613	36.50'	N00°23'00"E
L614	60.00'	S89°37'30"E
L615	70.23'	S59°03'49"W
L616	105.36'	N18°37'38"E
L617	33.00'	N89°37'10"W
L618	100.06'	S00°22'30"W
L619	43.00'	S89°37'12"E
L620	73.82'	N35°15'02"W
L621	60.00'	S00°22'30"W
L622	43.00'	N89°37'12"W
L623	60.00'	N00°22'30"E
L624	73.82'	S35°15'02"E
L625	100.06'	N00°22'30"E
L626	105.36'	S18°37'38"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L627	33.00'	S89°37'10"E
L628	73.82'	S35°15'02"E
L629	43.00'	N89°37'12"W
L630	60.00'	N00°22'30"E
L631	105.36'	S18°37'38"W
L632	100.06'	N00°22'30"E
L633	33.00'	S89°37'10"E
L634	73.82'	N35°15'02"W
L635	43.00'	S89°37'12"E
L636	60.00'	S00°22'30"W
L637	100.06'	S00°22'30"W
L638	105.36'	N18°37'38"E
L639	33.00'	N89°37'10"W
L640	36.51'	N89°37'12"W
L641	60.00'	N00°22'48"E
L642	70.23'	S30°56'13"E
L643	23.49'	S89°37'10"E
L644	102.77'	S13°35'42"W
L645	100.04'	N00°22'50"E
L646	103.42'	S74°53'04"E
L647	100.01'	S89°58'56"W
L648	27.00'	N00°21'11"E
L649	70.71'	N58°25'47"E
L650	37.00'	S00°19'45"W

LINE TABLE

LINE #	LENGTH	DIRECTION
L651	60.03'	S89°58'56"W
L652	70.71'	N59°44'57"E
L653	37.00'	S01°38'56"W
L654	60.03'	N88°41'53"W
L655	100.01'	N88°41'53"W
L656	103.42'	S73°33'54"E
L657	27.00'	N01°40'22"E
L658	70.71'	N58°25'47"E
L659	37.00'	S00°19'45"W
L660	60.03'	S89°58'56"W
L661	100.01'	S89°58'56"W
L662	103.42'	S74°53'04"E
L663	27.00'	N00°21'11"E
L664	104.89'	N17°51'03"E
L665	100.05'	S00°22'50"W
L666	31.49'	N89°37'12"W
L667	74.70'	N36°11'30"W
L668	44.51'	S89°37'12"E
L669	59.99'	S00°22'50"W
L670	100.04'	N00°22'50"E
L671	102.77'	S13°35'42"W
L672	23.49'	S89°37'10"E
L673	36.51'	N89°37'12"W
L674	70.23'	S30°56'13"E

LINE TABLE

LINE #	LENGTH	DIRECTION
L675	60.00'	N00°22'48"E
L676	102.72'	N76°23'59"W
L677	100.00'	S89°37'27"E
L678	23.50'	S00°23'17"W
L679	36.50'	N00°23'00"E
L680	60.00'	S89°37'30"E
L681	70.23'	S59°03'49"W
L682	28.49'	S63°23'18"W
L683	26.63'	N40°02'34"E
L684	25.72'	N48°15'22"W
L685	40.55'	N03°12'06"E
L686	20.59'	S06°00'29"W
L687	26.63'	N49°57'26"W
L688	26.63'	S40°02'53"W
L689	40.55'	S03°13'58"W
L690	26.66'	S39°59'53"W
L691	26.43'	S47°29'30"E
L692	28.27'	S47°10'52"E
L693	22.39'	N24°04'40"E
L694	40.55'	N03°12'06"E
L695	27.29'	S47°02'35"E

CURVE TABLE

CURVE #	RADIUS	DELTA	DIRECTION	CHORD	LENGTH
C1	306.00'	2°32'34"	S89°06'13"W	13.58'	13.58'
C2	306.00'	57°40'17"	S58°59'47"W	295.17'	308.01'
C3	220.00'	18°33'28"	N80°20'46"W	70.95'	71.26'
C4	274.00'	7°29'10"	N85°52'55"W	35.78'	35.80'
C5	274.00'	8°33'06"	N77°51'47"W	40.86'	40.90'
C6	274.00'	2°31'12"	N72°19'38"W	12.05'	12.05'
C7	306.00'	9°32'49"	S06°27'39"W	50.93'	50.99'
C8	360.00'	5°31'52"	S87°36'34"W	34.74'	34.75'
C9	360.00'	6°21'58"	S81°39'38"W	39.98'	40.00'
C10	360.00'	6°21'58"	S75°17'40"W	39.98'	40.00'
C11	360.00'	6°21'58"	S68°55'42"W	39.98'	40.00'
C12	360.00'	6°21'58"	S62°33'44"W	39.98'	40.00'
C13	360.00'	6°21'58"	S56°11'45"W	39.98'	40.00'
C14	360.00'	6°21'58"	S49°49'47"W	39.98'	40.00'
C15	360.00'	6°21'58"	S43°27'49"W	39.98'	40.00'
C16	360.00'	6°21'58"	S37°05'50"W	39.98'	40.00'
C17	360.00'	6°21'58"	S30°43'52"W	39.98'	40.00'
C18	360.00'	6°21'58"	S24°21'54"W	39.98'	40.00'
C19	360.00'	6°21'58"	S17°59'55"W	39.98'	40.00'
C20	360.00'	6°21'58"	S11°37'57"W	39.98'	40.00'
C21	360.00'	6°21'46"	S05°16'05"W	39.96'	39.98'
C22	360.00'	0°23'58"	S01°53'13"W	2.51'	2.51'
C23	350.00'	1°44'39"	S00°48'55"W	10.65'	10.65'
C24	350.00'	10°41'22"	S05°24'05"E	65.20'	65.30'
C25	350.00'	8°04'22"	S14°46'56"E	49.27'	49.31'
C26	247.00'	18°33'28"	N80°20'46"W	79.65'	80.00'
C27	333.00'	88°41'15"	S46°01'52"W	465.51'	515.45'
C28	360.00'	88°41'15"	N46°01'52"E	503.25'	557.24'
C29	274.00'	18°33'28"	S80°20'46"E	88.36'	88.75'
C30	333.00'	18°44'26"	N11°03'27"E	108.43'	108.92'
C31	333.00'	69°56'50"	N55°24'05"E	381.75'	406.53'
C32	20.00'	90°00'00"	N44°37'30"W	28.28'	31.42'
C33	20.00'	90°00'00"	N45°22'30"E	28.28'	31.42'
C34	20.00'	89°59'59"	S44°37'29"E	28.28'	31.42'
C35	20.00'	90°00'00"	S45°22'30"W	28.28'	31.42'
C36	20.00'	90°00'00"	S44°37'30"E	28.28'	31.42'
C37	20.00'	90°00'00"	S45°22'30"W	28.28'	31.42'
C38	20.00'	90°00'00"	N44°37'30"W	28.28'	31.42'
C39	20.00'	90°00'00"	N45°22'30"E	28.28'	31.42'
C40	20.00'	90°00'00"	S44°37'30"E	28.28'	31.42'
C41	20.00'	90°00'00"	N45°22'30"E	28.28'	31.42'
C42	20.00'	90°00'00"	N44°37'30"W	28.28'	31.42'
C43	20.00'	90°00'00"	N45°22'30"E	28.28'	31.42'
C44	20.00'	89°59'58"	S44°37'31"E	28.28'	31.42'
C45	20.00'	89°59'58"	S45°22'31"W	28.28'	31.42'
C46	20.00'	90°00'00"	S44°37'30"E	28.28'	31.42'
C47	20.00'	90°00'00"	N45°22'30"E	28.28'	31.42'
C48	20.00'	89°59'56"	S44°37'28"E	28.28'	31.42'
C49	20.00'	90°00'00"	S45°22'30"W	28.28'	31.42'
C50	20.00'	101°13'41"	N20°27'12"W	30.92'	35.34'
C51	20.00'	90°00'00"	S44°37'30"E	28.28'	31.42'
C52	20.00'	97°41'54"	N60°05'01"E	30.12'	34.10'
C53	20.00'	90°00'00"	S45°22'30"W	28.28'	31.42'
C54	20.00'	90°23'34"	S44°49'17"E	28.38'	31.55'
C55	20.00'	89°36'26"	N45°10'43"E	28.19'	31.28'
C56	20.00'	90°23'33"	S44°49'16"E	28.38'	31.55'
C57	20.00'	89°36'26"	N45°10'43"E	28.19'	31.28'
C58	20.00'	89°59'28"	S43°19'02"E	28.28'	31.41'
C59	20.00'	90°00'00"	N46°41'15"E	28.28'	31.42'

AREA TABLE

Lot Number	Square Feet	Acres	Percentage of Total Area
LOT 1	4954	0.114	0.22
LOT 2	4200	0.096	0.19
LOT 3	4200	0.096	0.19
LOT 4	4200	0.096	0.19
LOT 5	4200	0.096	0.19
LOT 6	4200	0.096	0.19
LOT 7	4200	0.096	0.19
LOT 8	4200	0.096	0.19
LOT 9	4200	0.096	0.19
LOT 10	4200	0.096	0.19
LOT 11	4200	0.096	0.19
LOT 12	4200	0.096	0.19
LOT 13	4954	0.114	0.22
LOT 14	4954	0.114	0.22
LOT 15	4200	0.096	0.19
LOT 16	4200	0.096	0.19
LOT 17	4200	0.096	0.19
LOT 18	4200	0.096	0.19
LOT 19	4200	0.096	0.19
LOT 20	4200	0.096	0.19
LOT 21	4200	0.096	0.19
LOT 22	4200	0.096	0.19
LOT 23	4200	0.096	0.19
LOT 24	4200	0.096	0.19
LOT 25	4200	0.096	0.19
LOT 26	4954	0.114	0.22
LOT 27	4954	0.114	0.22
LOT 28	4200	0.096	0.19
LOT 29	4200	0.096	0.19
LOT 30	4200	0.096	0.19
LOT 31	4200	0.096	0.19
LOT 32	4200	0.096	0.19
LOT 33	4200	0.096	0.19
LOT 34	4200	0.096	0.19
LOT 35	4200	0.096	0.19
LOT 36	4200	0.096	0.19
LOT 37	4200	0.096	0.19
LOT 38	4200	0.096	0.19
LOT 39	4954	0.114	0.22
LOT 40	4954	0.114	0.22
LOT 41	4200	0.096	0.19
LOT 42	4200	0.096	0.19
LOT 43	4200	0.096	0.19
LOT 44	4200	0.096	0.19
LOT 45	4200	0.096	0.19
LOT 46	4200	0.096	0.19
LOT 47	4200	0.096	0.19
LOT 48	4200	0.096	0.19
LOT 49	4200	0.096	0.19
LOT 50	4200	0.096	0.19
LOT 51	4200	0.096	0.19
LOT 52	4954	0.114	0.22
LOT 53	4954	0.114	0.22
LOT 54	4200	0.096	0.19
LOT 55	4200	0.096	0.19
LOT 56	4200	0.096	0.19
LOT 57	4200	0.096	0.19
LOT 58	4200	0.096	0.19
LOT 59	4200	0.096	0.19
LOT 60	4200	0.096	0.19
LOT 61	4200	0.096	0.19
LOT 62	4200	0.096	0.19
LOT 63	5040	0.116	0.22
LOT 64	5040	0.116	0.22
LOT 65	4200	0.096	0.19
LOT 66	4200	0.096	0.19
LOT 67	4200	0.096	0.19
LOT 68	4200	0.096	0.19
LOT 69	4200	0.096	0.19
LOT 70	4200	0.096	0.19
LOT 71	4200	0.096	0.19
LOT 72	4200	0.096	0.19
LOT 73	4200	0.096	0.19
LOT 74	4954	0.114	0.22
LOT 75	4954	0.114	0.22
LOT 76	4200	0.096	0.19
LOT 77	4200	0.096	0.19
LOT 78	4200	0.096	0.19
LOT 79	4200	0.096	0.19
LOT 80	4200	0.096	0.19
LOT 81	4200	0.096	0.19
LOT 82	4200	0.096	0.19
LOT 83	4200	0.096	0.19
LOT 84	4200	0.096	0.19
LOT 85	4200	0.096	0.19
LOT 86	4200	0.096	0.19
LOT 87	4954	0.114	0.22
LOT 88	4954	0.114	0.22
LOT 89	4200	0.096	0.19
LOT 90	4200	0.096	0.19
LOT 91	4200	0.096	0.19
LOT 92	4200	0.096	0.19
LOT 93	4200	0.096	0.19
LOT 94	4200	0.096	0.19
LOT 95	4200	0.096	0.19
LOT 96	4200	0.096	0.19
LOT 97	4200	0.096	0.19
LOT 98	4200	0.096	0.19
LOT 99	4200	0.096	0.19
LOT 100	4954	0.114	0.22
LOT 101	4954	0.114	0.22
LOT 102	4200	0.096	0.19
LOT 103	4200	0.096	0.19
LOT 104	4200	0.096	0.19
LOT 105	4200	0.096	0.19
LOT 106	4200	0.096	0.19
LOT 107	4200	0.096	0.19
LOT 108	4200	0.096	0.19
LOT 109	4200	0.096	0.19
LOT 110	4200	0.096	0.19
LOT 111	5040	0.116	0.22
LOT 112	5040	0.116	0.22
LOT 113	4200	0.096	0.19
LOT 114	4200	0.096	0.19
LOT 115	4200	0.096	0.19
LOT 116	4200	0.096	0.19
LOT 117	4200	0.096	0.19
LOT 118	4200	0.096	0.19
LOT 119	4200	0.096	0.19
LOT 120	4200	0.096	0.19
LOT 121	4200	0.096	0.19
LOT 122	4954	0.114	0.22

Lot Number	Square Feet	Acres	Percentage of Total Area
LOT 123	4199	0.096	0.19
LOT 124	4200	0.096	0.19
LOT 125	4200	0.096	0.19
LOT 126	4200	0.096	0.19
LOT 127	4200	0.096	0.19
LOT 128	4200	0.096	0.19
LOT 129	4200	0.096	0.19
LOT 130	4200	0.096	0.19
LOT 131	4200	0.096	0.19
LOT 132	5269	0.121	0.24
LOT 133	5269	0.121	0.24
LOT 134	4200	0.096	0.19
LOT 135	4200	0.096	0.19
LOT 136	4200	0.096	0.19
LOT 137	4200	0.096	0.19
LOT 138	4200	0.096	0.19
LOT 139	4200	0.096	0.19
LOT 140	4200	0.096	0.19
LOT 141	4200	0.096	0.19
LOT 142	4200	0.096	0.19
LOT 143	4200	0.096	0.19
LOT 144	4200	0.096	0.19
LOT 145	4200	0.096	0.19
LOT 146	5269	0.121	0.24
LOT 147	4200	0.096	0.19
LOT 148	4200	0.096	0.19
LOT 149	4200	0.096	0.19
LOT 150	4200	0.096	0.19
LOT 151	4200	0.096	0.19
LOT 152	4200	0.096	0.19
LOT 153	4200	0.096	0.19
LOT 154	4200	0.096	0.19
LOT 155	4200	0.096	0.19
LOT 156	4200	0.096	0.19
LOT 157	4200	0.096	0.19
LOT 158	4200	0.096	0.19
LOT 159	4228	0.097	0.19
LOT 160	4439	0.102	0.20
LOT 161	4885	0.112	0.22
LOT 162	6856	0.157	0.31
LOT 163	4200	0.096	0.19
LOT 164	4200	0.096	0.19
LOT 165	4200	0.096	0.19
LOT 166	4200	0.096	0.19
LOT 167	4200	0.096	0.19
LOT 168	4200	0.096	0.19
LOT 169	4200	0.096	0.19
LOT 170	4200	0.096	0.19
LOT 171	4200	0.096	0.19
LOT 172	4200	0.096	0.19
LOT 173	4200	0.096	0.19
LOT 174	4200	0.096	0.19
LOT 175	4200	0.096	0.19
LOT 176	4200	0.096	0.19
LOT 177	4200	0.096	0.19
LOT 178	4725	0.108	0.21
LOT 179	4725	0.108	0.21
LOT 180	4200	0.096	0.19
LOT 181	4200	0.096	0.19
LOT 182	4200	0.096	0.19
LOT 183	4200	0.096	0.19
LOT 184	4200	0.096	0.19
LOT 185	4200	0.096	0.19
LOT 186	4200	0.096	0.19
LOT 187	4200	0.096	0.19
LOT 188	4200	0.096	0.19
LOT 189	4200	0.096	0.19
LOT 190	4200	0.096	0.19
LOT 191	4200	0.096	0.19
LOT 192	4200	0.096	0.19
LOT 193	4200	0.096	0.19
LOT 194	4200	0.096	0.19
LOT 195	4200	0.096	0.19
LOT 196	4200	0.096	0.19
LOT 197	4372	0.100	0.20
LOT 198	4736	0.109	0.21
LOT 199	5196	0.119	0.23
LOT 200	5859	0.134	0.26
LOT 201	7120	0.163	0.32
LOT 202	9570	0.220	0.43
LOT 203	9845	0.226	0.44
LOT 204	7927	0.182	0.35
LOT 205	6450	0.148	0.29
LOT 206	5625	0.129	0.25
LOT 207	5154	0.118	0.23
LOT 208	4886	0.112	0.22
LOT 209	4922	0.113	0.22
LOT 210	5265	0.121	0.23
LOT 211	6247	0.143	0.28
LOT 212	455739	10.462	20.34
OUTLOTS			
OUTLOT A	26979	0.619	1.20
OUTLOT B	6090	0.140	0.27
OUTLOT C	3045	0.070	0.14
OUTLOT D	5110	0.117	0.23
OUTLOT E	6850	0.157	0.31
OUTLOT F	7267	0.167	0.32
OUTLOT G	2014	0.046	0.09
OUTLOT H	2128	0.049	0.09
OUTLOT I	18707	0.429	0.83
OUTLOT J	407254	9.349	18.18
RIGHT OF WAY			
ROW (WEST)	217309	4.989	9.70
ROW (EAST)	142409	3.269	6.36
TOTALS	2240566	51.436	100.00

LAMP RYNEARSON

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14710 W. DODGE RD, STE. 100 (402)496.2498

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KANSAS CITY, MISSOURI
9001 STATE LINE RD., STE. 200 (816)361.0440

SURVEYOR CERTIFICATE

SEE PAGE 1 OF 3 FOR NOTES AND CERTIFICATION.

0 80

SCALE: 1"= 80'
U.S. SURVEY FEET

*IF THIS BAR IS NOT 1" LONG, THE DRAWING IS NOT TO SCALE.

LAKE BLUFF FILING NO. 1 PRELIMINARY SUBDIVISION
REPLAT OF TRACTS C AND E, LAKE BLUFF SUBDIVISION
SE 1/4, SECTION 1, T5N, R67W OF THE 6TH P.M.,
CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO

LAKE BLUFF FILING NO. 1
GREELEY, COLORADO

811 Know what's below. Call before you dig.

ALL UTILITIES ARE SHOWN BASED ON THE INFORMATION AVAILABLE TO THE ENGINEER. THERE IS NO GUARANTEE ALL FACILITIES ARE SHOWN OR THAT THE LOCATION, DEPTH, AND SIZE OF EACH FACILITY IS CORRECT. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES AND SERVICE LINES PRIOR TO CONSTRUCTION.

REVISIONS
JAC 7/6/2022 REV PER CITY COMMENTS
JAC 8/10/2022 REC. PER CITY COMMENTS

DESIGNER / DRAFTER
LAINE LANDAU/JOSH CROAK
DATE
08/10/2022
PROJECT NUMBER
0221047
BOOK AND PAGE

SHEET
3 OF 3

L:\Engineering\0221047 Lake Bluff Single Family Mortgage\SURVEY\DRAWINGS\EXHIBITS\0221047-MINOR PLAT-EXHIBITS.dwg 8/10/2022 4:05:38 PM JOSHUA A. CROAK LAMP RYNEARSON

LANDSCAPE NOTES

1. THE CONTRACTOR SHALL FOLLOW THE LANDSCAPE PLANS AND SPECIFICATIONS AS CLOSELY AS POSSIBLE. ANY SUBSTITUTION OR ALTERATION SHALL NOT BE ALLOWED WITHOUT APPROVAL OF THE OWNER'S REPRESENTATIVE. OVERALL PLANT QUANTITY AND QUALITY SHALL BE CONSISTENT WITH THE PLANS.
2. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL PLANT QUANTITIES. GRAPHIC QUANTITIES TAKES PRECEDENCE OVER WRITTEN QUANTITIES.
3. THE OWNER'S REPRESENTATIVE RESERVES THE RIGHT TO INSPECT AND TAG ALL PLANT MATERIAL PRIOR TO SHIPPING TO THE SITE. IN ALL CASES, THE OWNER'S REPRESENTATIVE MAY REJECT PLANT MATERIAL AT THE SITE IF MATERIAL IS DAMAGED, DISEASED, OR DECLINING IN HEALTH AT THE TIME OF ONSITE INSPECTIONS OR IF THE PLANT MATERIAL DOES NOT MEET THE MINIMUM SPECIFIED STANDARD IDENTIFIED ON THE PLANS AND IN THE SPECIFICATIONS. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR INSPECTION AND APPROVAL OF ALL MATERIALS AND PRODUCTS PRIOR TO INSTALLATION.
4. THE OWNER'S REPRESENTATIVE MAY ELECT TO UPSIZE PLANT MATERIAL AT THEIR DISCRETION BASED ON SELECTION, AVAILABILITY, OR TO ENHANCE SPECIFIC AREAS OF THE PROJECT. THE CONTRACTOR SHALL VERIFY PLANT MATERIAL SIZES WITH OWNER'S REPRESENTATIVE PRIOR TO PURCHASING, SHIPPING OR STOCKING OF PLANT MATERIALS. SUBMIT CHANGE ORDER REQUEST TO OWNER'S REPRESENTATIVE FOR APPROVAL IF ADDITIONAL COST IS REQUESTED BY THE CONTRACTOR PRIOR TO INSTALLATION. RE-STOCKING CHARGES WILL NOT BE APPROVED IF THE CONTRACTOR FAILS TO SUBMIT A REQUEST FOR MATERIAL CHANGES.
5. THE CONTRACTOR SHALL WARRANTY ALL CONTRACTED WORK AND MATERIALS FOR A PERIOD OF ONE YEAR AFTER SUBSTANTIAL COMPLETION HAS BEEN ISSUED BY THE OWNER'S REPRESENTATIVE FOR THE ENTIRE PROJECT UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS OR SPECIFICATIONS.
6. REFER TO IRRIGATION PLANS FOR LIMITS AND TYPES OF IRRIGATION DESIGNED FOR THE LANDSCAPE. IN NO CASE SHALL IRRIGATION BE EMITTED WITHIN THE MINIMUM DISTANCE FROM BUILDING OR WALL FOUNDATIONS AS STIPULATED IN THE GEOTECHNICAL REPORT. ALL IRRIGATION DISTRIBUTION LINES, HEADS AND EMITTERS SHALL BE KEPT OUTSIDE THE MINIMUM DISTANCE AWAY FROM ALL BUILDING AND WALL FOUNDATIONS AS STIPULATED IN THE GEOTECHNICAL REPORT.
7. LANDSCAPE MATERIAL LOCATIONS SHALL HAVE PRECEDENCE OVER IRRIGATION MAINLINE AND LATERAL LOCATIONS. COORDINATE INSTALLATION OF IRRIGATION EQUIPMENT SO THAT IT DOES NOT INTERFERE WITH THE PLANTING OF TREES OR OTHER LANDSCAPE MATERIAL.
8. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING POSITIVE DRAINAGE EXISTS IN ALL LANDSCAPE AREAS. SURFACE DRAINAGE ON LANDSCAPE AREAS SHALL NOT FLOW TOWARD STRUCTURES AND FOUNDATIONS. MAINTAIN SLOPE AWAY FROM FOUNDATIONS PER THE GEOTECHNICAL REPORT RECOMMENDATIONS. ALL LANDSCAPE AREAS BETWEEN WALKS AND CURBS SHALL DRAIN FREELY TO THE CURB UNLESS OTHERWISE IDENTIFIED ON THE GRADING PLAN. IN NO CASE SHALL THE GRADE, TURF THATCH, OR OTHER LANDSCAPE MATERIALS DAM WATER AGAINST WALKS. MINIMUM SLOPES ON LANDSCAPE AREAS SHALL BE 2%; MAXIMUM SLOPE SHALL BE 25% UNLESS SPECIFICALLY IDENTIFIED ON THE PLANS OR APPROVED BY THE OWNER'S REPRESENTATIVE.
9. PRIOR TO INSTALLATION OF PLANT MATERIALS, AREAS THAT HAVE BEEN COMPACTED OR DISTURBED BY CONSTRUCTION ACTIVITY SHALL BE THOROUGHLY LOOSENED TO A DEPTH OF 8" - 12" AND AMENDED PER SPECIFICATIONS.
10. ALL LANDSCAPED AREAS ARE TO RECEIVE ORGANIC SOIL PREPARATION AT 4 cu.yrds/1,000sf OR AS NOTED IN THE TECHNICAL SPECIFICATIONS.
11. TREES SHALL NOT BE LOCATED IN DRAINAGE SWALES, DRAINAGE AREAS, OR UTILITY EASEMENTS. CONTACT OWNER'S REPRESENTATIVE FOR RELOCATION OF PLANTS IN QUESTIONABLE AREAS PRIOR TO INSTALLATION.
12. THE CENTER OF EVERGREEN TREES SHALL NOT BE PLACED CLOSER THAN 8' AND THE CENTER OF ORNAMENTAL TREES CLOSER THAN 6' FROM A SIDEWALK, STREET OR DRIVE LANE. EVERGREEN TREES SHALL NOT BE LOCATED ANY CLOSER THAN 15' FROM IRRIGATION ROTOR HEADS. NOTIFY OWNER'S REPRESENTATIVE IF TREE LOCATIONS CONFLICT WITH THESE STANDARDS FOR FURTHER DIRECTION.
13. ALL EVERGREEN TREES SHALL BE FULLY BRANCHED TO THE GROUND AND SHALL NOT EXHIBIT SIGNS OF ACCELERATED GROWTH AS DETERMINED BY THE OWNER'S REPRESENTATIVE.
14. ALL TREES ARE TO BE STAKED AND GUYED PER DETAILS FOR A PERIOD OF 1 YEAR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING STAKES AT THE END OF 1 YEAR FROM ACCEPTANCE OF LANDSCAPE INSTALLATION BY THE OWNER'S REPRESENTATIVE. OBTAIN APPROVAL BY OWNER'S REPRESENTATIVE PRIOR TO REMOVAL.
15. ALL TREES INSTALLED ABOVE RETAINING WALLS UTILIZING GEO-GRID MUST BE HAND DUG TO PROTECT GEO-GRID. IF GEO-GRID MUST BE CUT TO INSTALL TREES, APPROVAL MUST BE GIVEN BY OWNER'S REPRESENTATIVE PRIOR TO DOING WORK.
16. ALL TREES IN SEED OR TURF AREAS SHALL RECEIVE MULCH RINGS. OBTAIN APPROVAL FROM OWNER'S REPRESENTATIVE FOR ANY TREES THAT WILL NOT BE MULCHED FOR EXCESSIVE MOISTURE REASONS.
17. SHRUB, GROUNDCOVER AND PERENNIAL BEDS ARE TO BE CONTAINED BY 4" x 14 GAUGE GREEN, ROLL TOP, INTERLOCKING TYPE EDGER, RYERSON OR EQUAL. EDGER IS NOT REQUIRED WHEN ADJACENT TO CURBS, WALLS, WALKS OR SOLID FENCES WITHIN 3" OF PRE-MULCHED FINAL GRADE. EDGER SHALL NOT BE REQUIRED TO SEPARATE MULCH TYPES UNLESS SPECIFIED ON THE PLANS.
18. ALL SHRUB BEDS ARE TO BE MULCHED WITH MIN. 4" DEPTH, 2"-4" ROUNDED RIVER ROCK SPECIFIED GEOTEXTILE WEED CONTROL FABRIC. ALL GROUND COVER AND PERENNIAL FLOWER BEDS SHALL BE MULCHED WITH 4" DEPTH SHREDDED CEDAR MULCH. NO WEED CONTROL FABRIC IS REQUIRED IN GROUNDCOVER OR PERENNIAL AREAS.
19. AT SEED AREA BOUNDARIES ADJACENT TO EXISTING NATIVE AREAS, OVERLAP ABUTTING NATIVE AREAS BY THE FULL WIDTH OF THE SEEDER.
20. EXISTING TURF AREAS THAT ARE DISTURBED DURING CONSTRUCTION, ESTABLISHMENT AND THE MAINTENANCE PERIOD SHALL BE RESTORED WITH NEW SOD TO MATCH EXISTING TURF SPECIES. DISTURBED NATIVE AREAS WHICH ARE TO REMAIN SHALL BE OVER SEEDED AND RESTORED WITH SPECIFIED SEED MIX.
21. CONTRACTOR SHALL OVER SEED ALL MAINTENANCE OR SERVICE ACCESS BENCHES AND ROADS WITH SPECIFIED SEED MIX UNLESS OTHERWISE NOTED ON THE PLANS.
22. ALL SEEDED SLOPES EXCEEDING 25% IN GRADE (4:1) SHALL RECEIVE EROSION CONTROL BLANKETS. PRIOR TO INSTALLATION, NOTIFY OWNER'S REPRESENTATIVE FOR APPROVAL OF LOCATION AND ANY ADDITIONAL COST IF A CHANGE ORDER IS NECESSARY.
23. WHEN COMPLETE, ALL GRADES SHALL BE WITHIN +/- 1/8" OF FINISHED GRADES AS SHOWN ON THE PLANS.
24. SOFT SURFACE TRAILS NEXT TO MANICURED TURF OR SHRUB BEDS SHALL BE CONTAINED WITH 4" x 14 GAUGE GREEN ROLL TOP EDGER, RYERSON OR EQUAL.
25. THE CONTRACTOR IS EXPECTED TO KNOW AND UNDERSTAND THE CITY AND COUNTY SPECIFICATIONS FOR LANDSCAPE AND IRRIGATION. IN CASES OF DISCREPANCIES THE HIGHER OF THE TWO STANDARDS SHALL HAVE PRECEDENCE.

REPRESENTATIVE PLANT LIST

DECIDUOUS CANOPY TREES — 412
ACER NEGUNDO `SENSATION` / SENSATION BOX ELDER MAPLE
CARPINUS BETULUS `FASTIGIATA` / PYRAMIDAL EUROPEAN HORNBEAN
CATALPA SPECIOSA / NORTHERN CATALPA
CELTIS OCCIDENTALIS / COMMON HACKBERRY
GLEDITSIA TRIACANTHOS INERMIS `SHADEMASTER` TM / SHADEMASTER LOCUST
GYMNOCLADUS DIOICA `ESPRESSO` / KENTUCKY COFFEETREE
QUERCUS MACROCARPA / BURR OAK
QUERCUS MUEHLENBERGII / CHINKAPIN OAK
QUERCUS ROBUR / ENGLISH OAK
TILIA AMERICANA `REDMOND` / REDMOND AMERICAN LINDEN
TILIA CORDATA `GREENSPIRE` / GREENSPIRE LITTLELEAF LINDEN
ULMUS AMERICANA `PRINCETON` / AMERICAN ELM

EVERGREEN TREES — 34
JUNIPERUS CHINENSIS `SPARTAN` / SPARTAN JUNIPER
JUNIPERUS SCOPULORUM `MEDORA` / MEDORA JUNIPER
PICEA PUNGENS `ISELI FASTIGIATE` / FASTIGIATE SPRUCE
PICEA PUNGENS GLAUCA `BAKERI` / BAKERI BLUE SPRUCE
PINUS ARISTATA / BRISTLECONE PINE
PINUS HELDREICHII / BOSNIAN PINE
PINUS NIGRA / AUSTRIAN BLACK PINE

ORNAMENTAL TREES — 36
ACER TATARICUM `HOT WINGS` / HOT WINGS TATARIAN MAPLE
MALUS X `RED BARRON` / RED BARRON CRAB APPLE
MALUS X `SPRING SNOW` / SPRING SNOW CRAB APPLE
MALUS X `THUNDERCHILD` / THUNDERCHILD CRAB APPLE
PRUNUS AMERICANA / AMERICAN PLUM
PYRUS CALLERYANA CHANTICLEER / CHANTICLEER PEAR

EVERGREEN SHRUBS — 43
ARCTOSTAPHYLOS X COLORADOENSIS `PANCHITO` / PANCHITO MANZANITA
DAPHNE X BURKWOODII `CAROL MACKIE` / CAROL MACKIE DAPHNE
EUONYMUS FORTUNEI `EMERALD GAIETY` TM / EMERALD GAIETY EUONYMUS
JUNIPERUS HORIZONTALIS `BAR HARBOR` / BAR HARBOR CREEPING JUNIPER
JUNIPERUS SABINA `CALGARY CARPET` TM / CALGARY CARPET JUNIPER
PINUS EDULIS / DWARF PINON PINE
PINUS MUGO `MOPS` / MUGO PINE

ORNAMENTAL GRASSES — 700
BOUTELOUA GRACILIS `BLONDE AMBITION` / BLOND AMBITION BLUE GRAMA GRASS
CALAMAGROSTIS BRACHYTRICHA / KOREAN FEATHER REED GRASS
CALAMAGROSTIS X ACUTIFLORA `KARL FOERSTER` / KARL FOERSTER FEATHER REED GRASS
MISCANTHUS SINENSIS `ADAGIO` / COMPACT MAIDEN GRASS
MISCANTHUS SINENSIS `VARIEGATUS` / VARIEGATED MAIDEN GRASS
NASSELLA TENUISSIMA / MEXICAN FEATHER GRASS
PANICUM VIRGATUM `HEAVY METAL` / BLUE SWITCH GRASS
SCHIZACHYRIUM SCOPARIUM `STANDING OVATION` / STANDING OVATION BLUESTEM GRASS

PERENNIALS — 821
ACHILLEA MILLEFOLIUM / COMMON YARROW
ACHILLEA X `MOONSHINE` / MOONSHINE YARROW
CALLIRHOE INVOLUCRATA / PRAIRIE WINECUPS
JAMESIA AMERICANA / WAXFLOWER
LAVANDULA ANGUSTIFOLIA `MUNSTEAD` / MUNSTEAD ENGLISH LAVENDER
LAVANDULA X INTERMEDIA `PHENOMENAL` / PHENOMENAL LAVENDER
SEDUM X `AUTUMN JOY` / AUTUMN JOY SEDUM
VERONICA LIWANENSIS / TURKISH VERONICA
VINCA MINOR `BOWLES` / BOWLES COMMON PERIWINKLE

PERIMETER LANDSCAPE REQUIREMENTS					
STREET / PERIMETER TYPE	LINEAR FEET	TREES REQ'D	TREES PROVIDED	SHRUBS REQ'D	SHRUBS PROVIDED
101st AVE. / II	1139	13	xx	182	xx
4TH ST / III	545	11 DECID. / 11 EVRGRN	xx	87	xx

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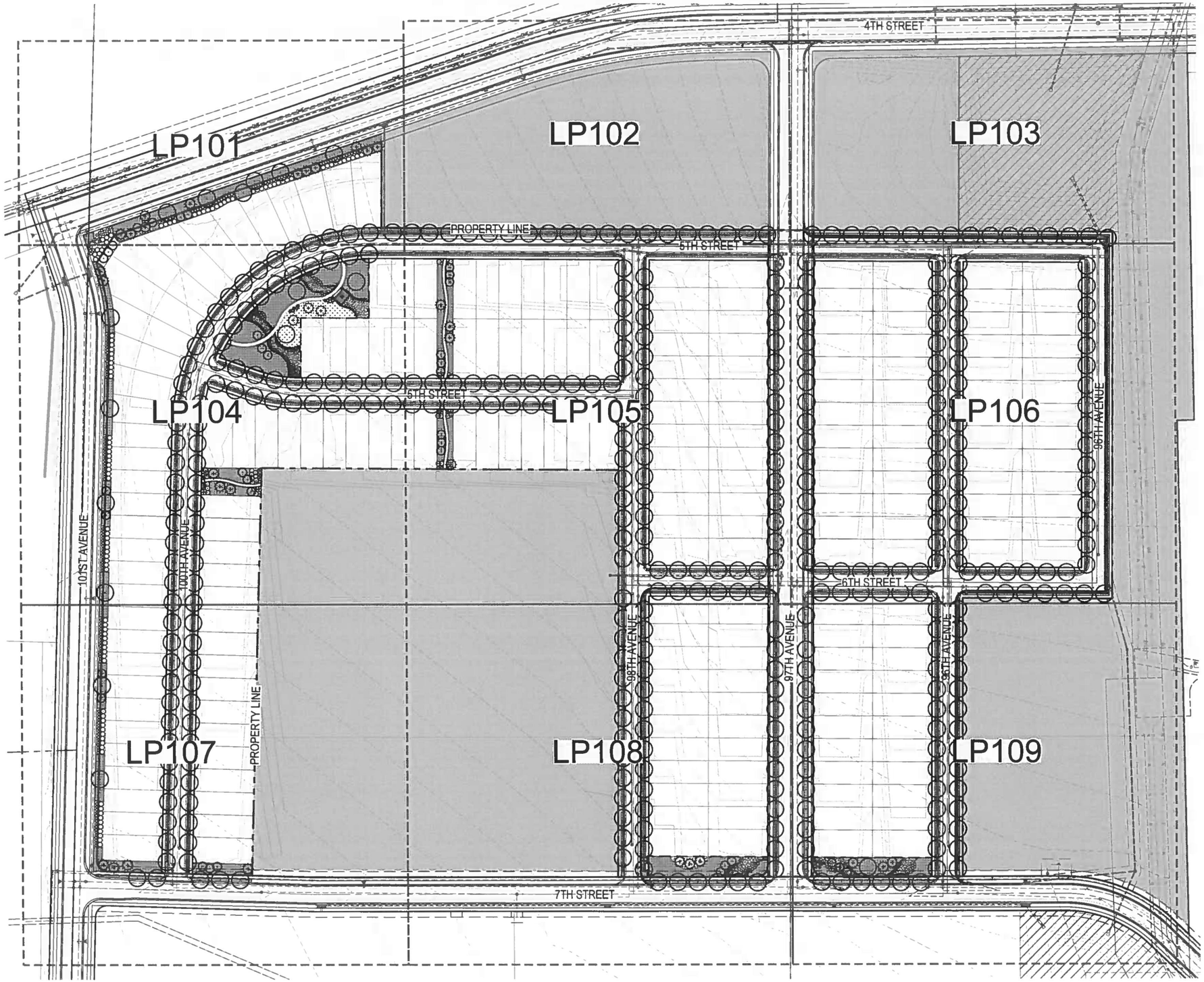
SHEET TITLE:
LANDSCAPE NOTES

LP001



KEY MAP

NORTH

0 40 80 160

SCALE 1" =80'-0"

811

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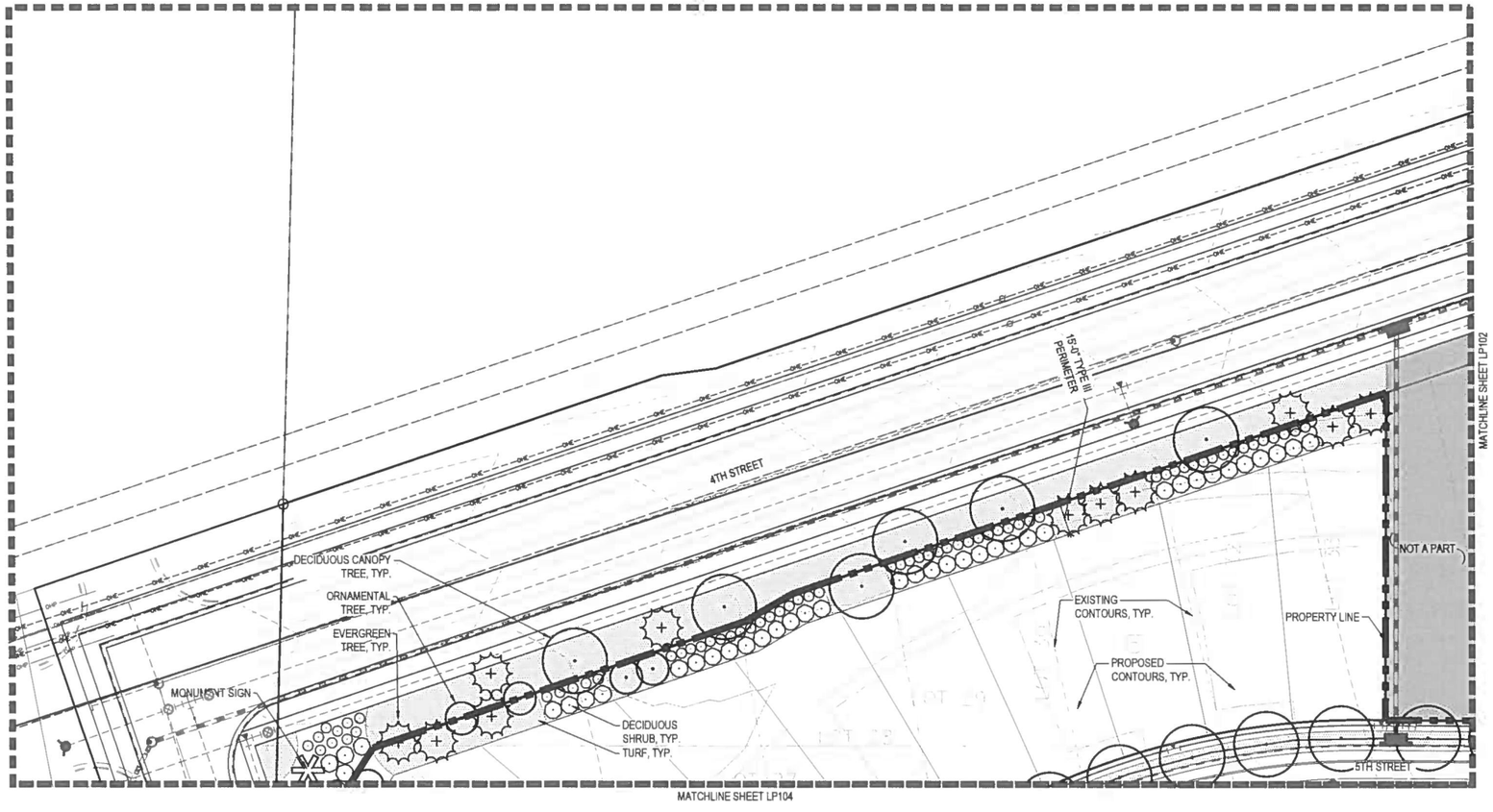
SHEET TITLE:
OVERALL LANDSCAPE PLAN

LP100



KEY MAP

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- METAL EDGER
- CANOPY TREE
- EVERGREEN TREE
- ORNAMENTAL TREE
- PROPOSED DECIDUOUS SHRUBS
- PROPOSED ORNAMENTAL GRASS
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- SWATH PLANTING BED MULCH
- CRUSHER FINES

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SHEET TITLE:
LANDSCAPE PLAN

LP101

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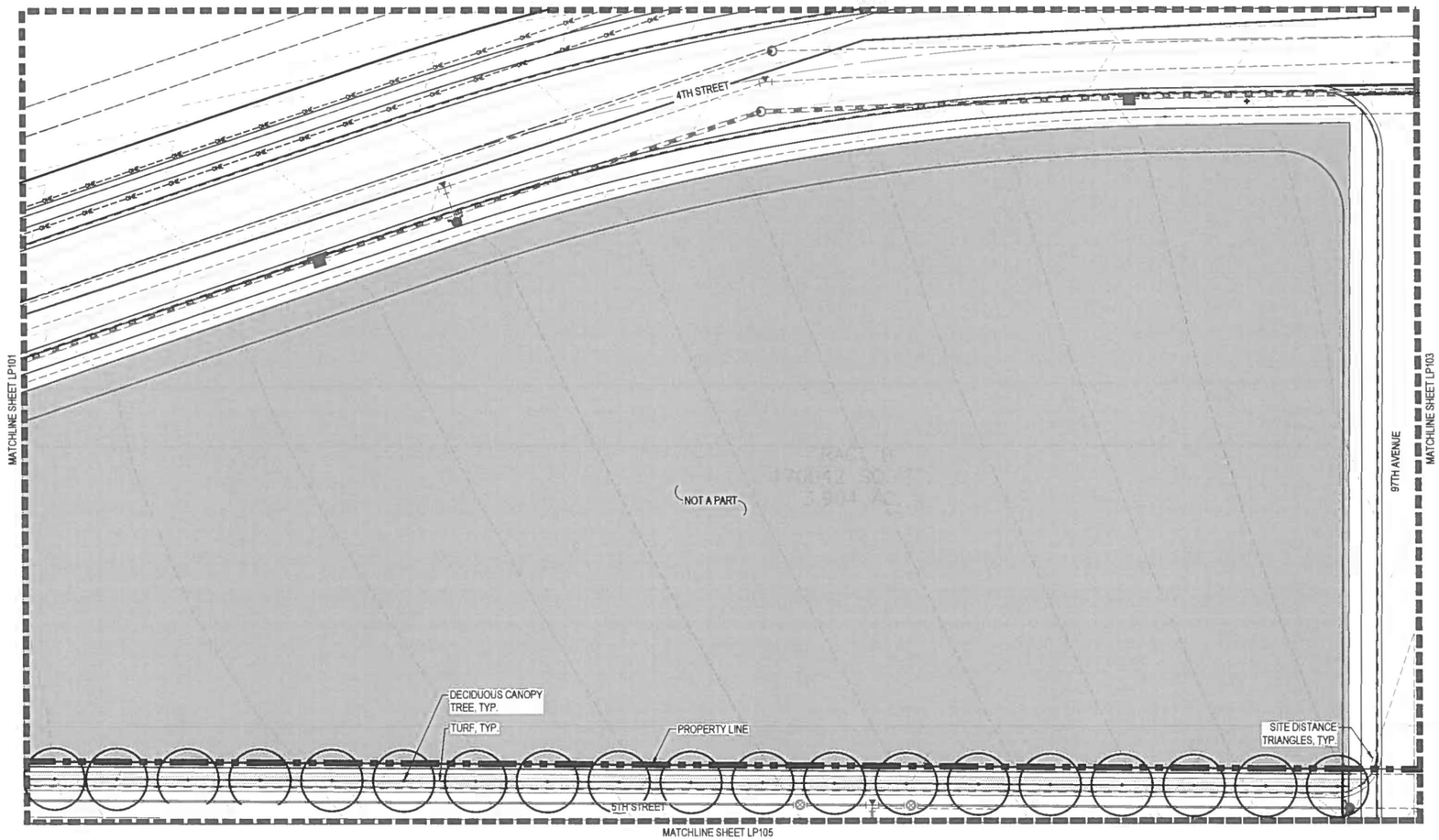
NORTH
0 15 30 60
SCALE 1" = 30'

811



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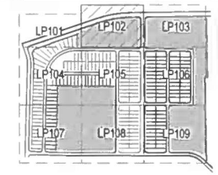

LEGEND

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SHEET TITLE:
LANDSCAPE PLAN

LP102

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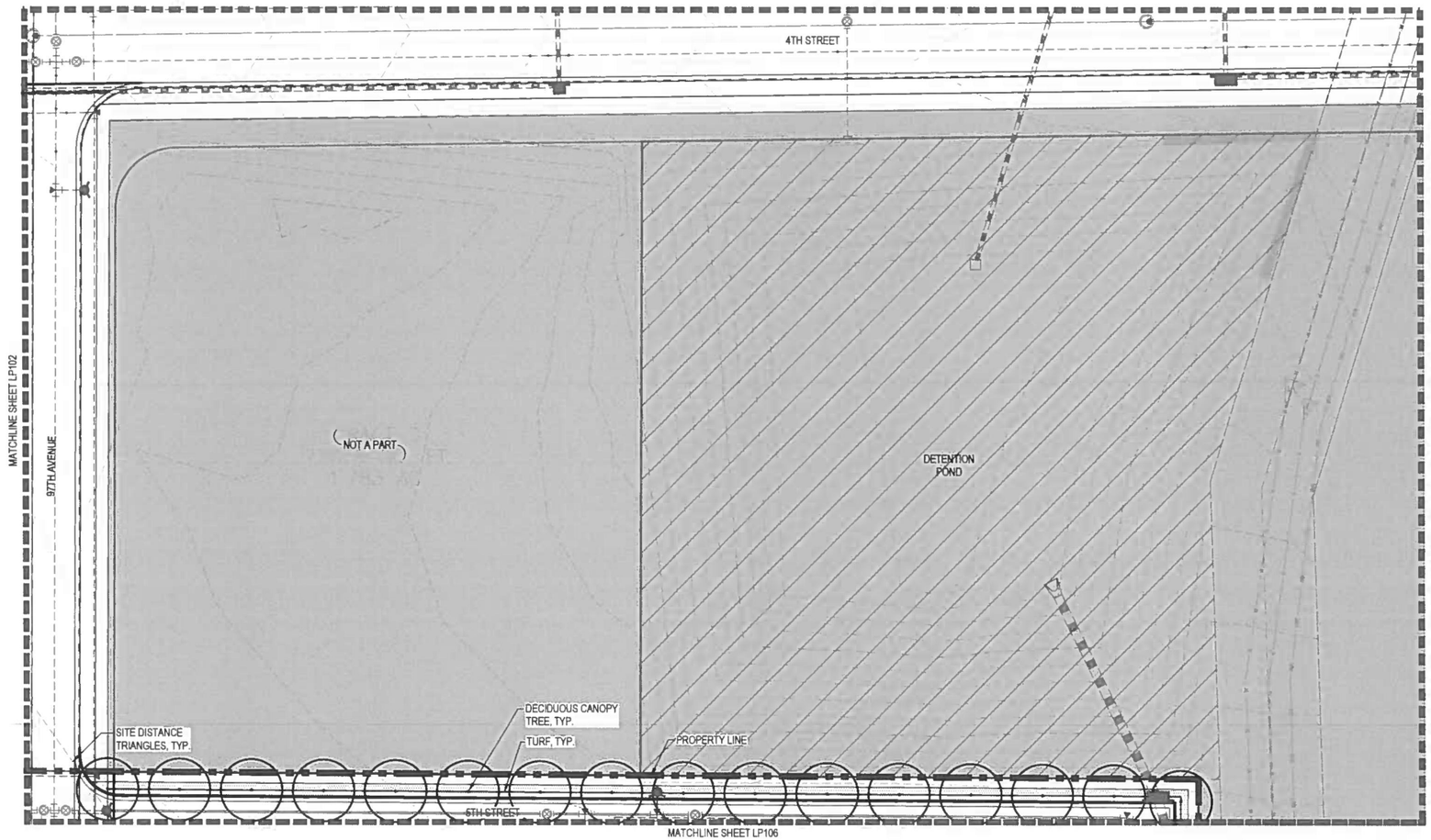
NORTH
0 15 30 60
SCALE 1" = 30'

811



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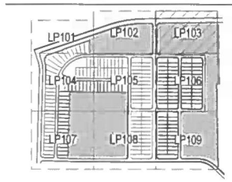

LEGEND

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- CRUSHER FINES

NORTH

0 15 30 60

SCALE 1" = 30'

811

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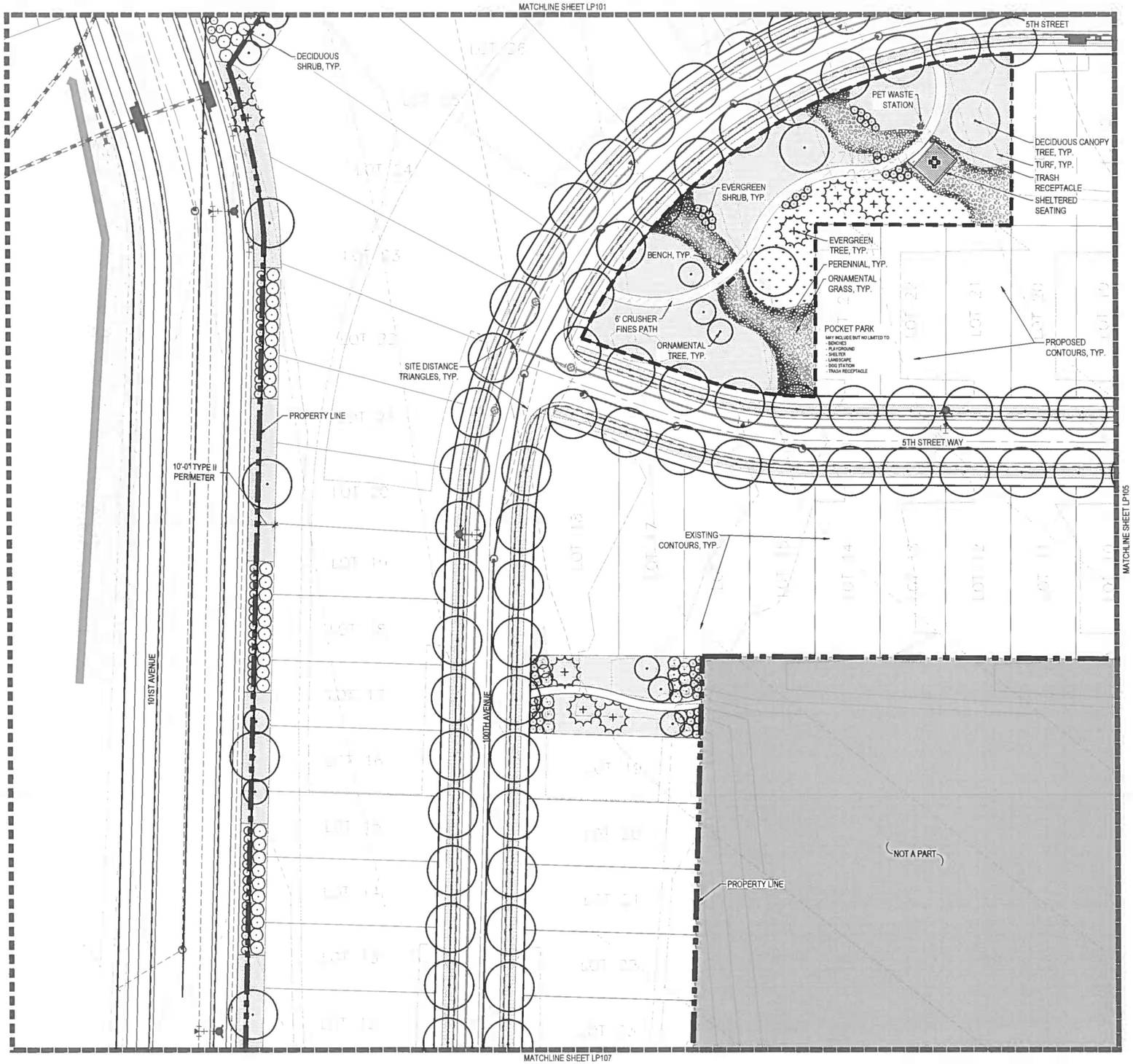
SHEET TITLE:
LANDSCAPE PLAN

LP103



KEY MAP

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NORTH

SCALE 1" = 30'

0 15 30 60

811

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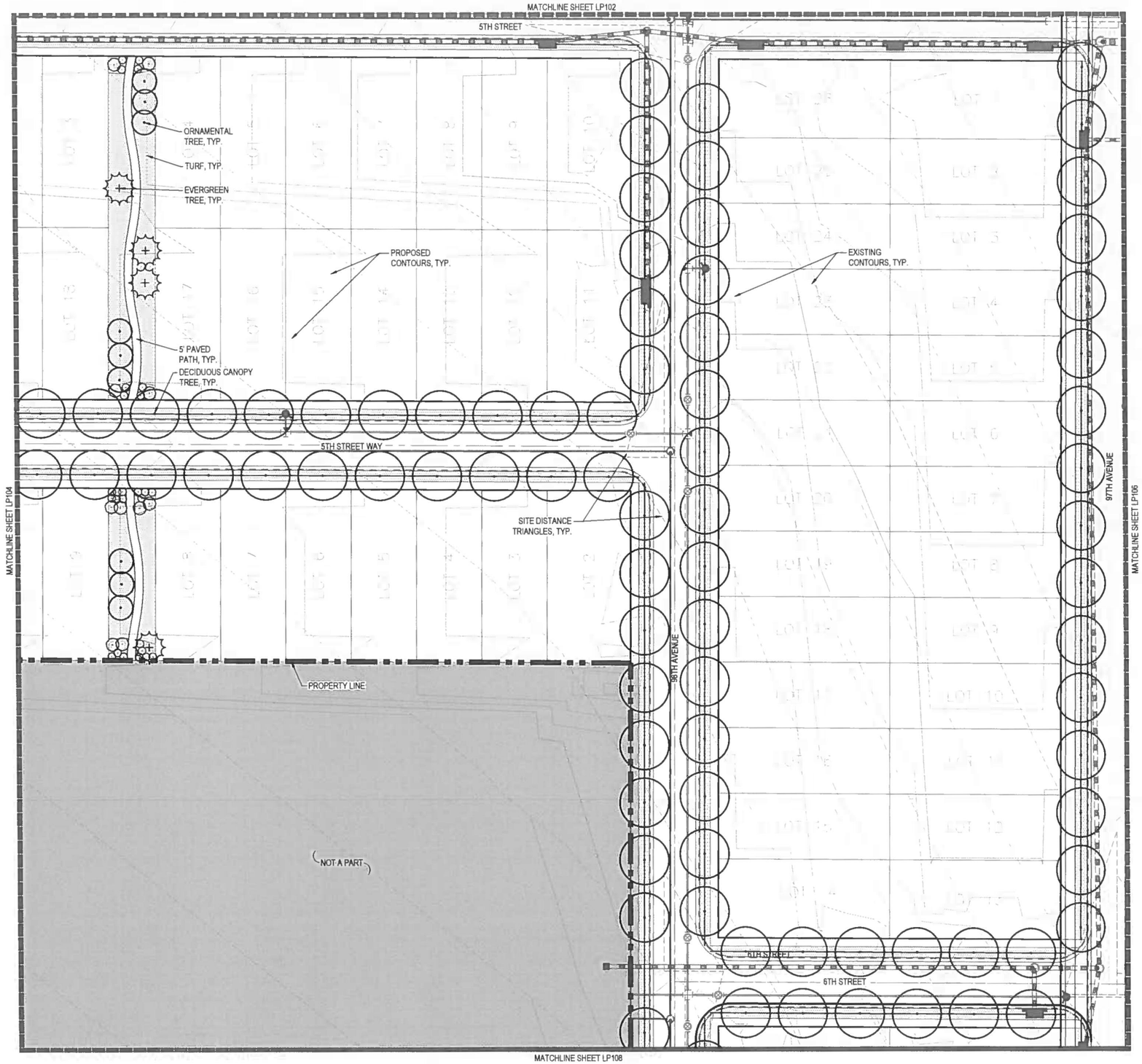
SHEET TITLE:
LANDSCAPE PLAN

LP104



KEY MAP

LEGEND

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NORTH

0 15 30 60

SCALE 1" = 30'

811

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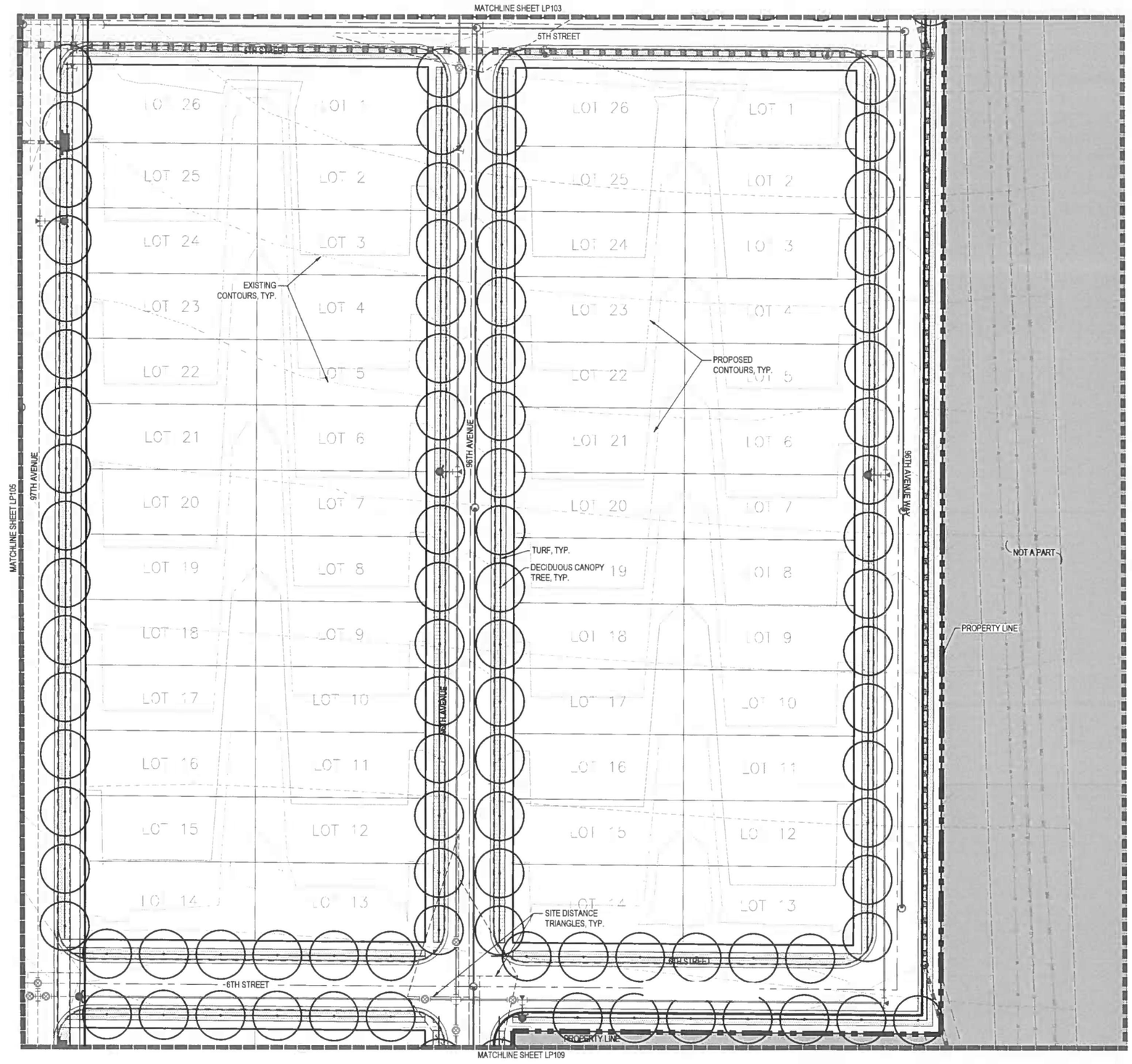
09/07/22 SUBMITTAL

SHEET TITLE:
LANDSCAPE PLAN

LP105



KEY MAP

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NORTH

0 15 30 60

SCALE 1" = 30'

811

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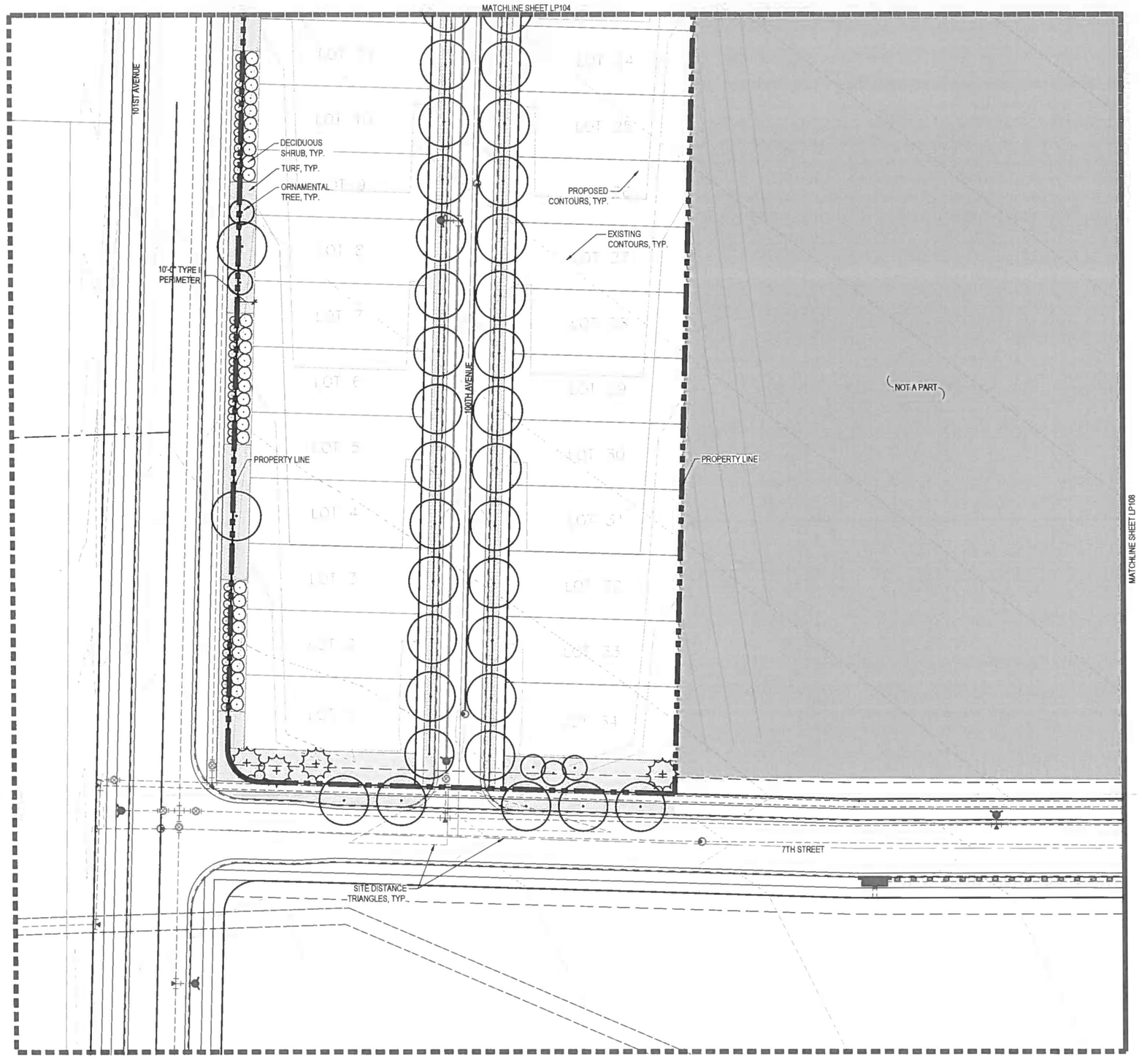
LP106



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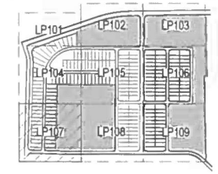

LEGEND

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NORTH

0 15 30 60

SCALE 1" = 30'

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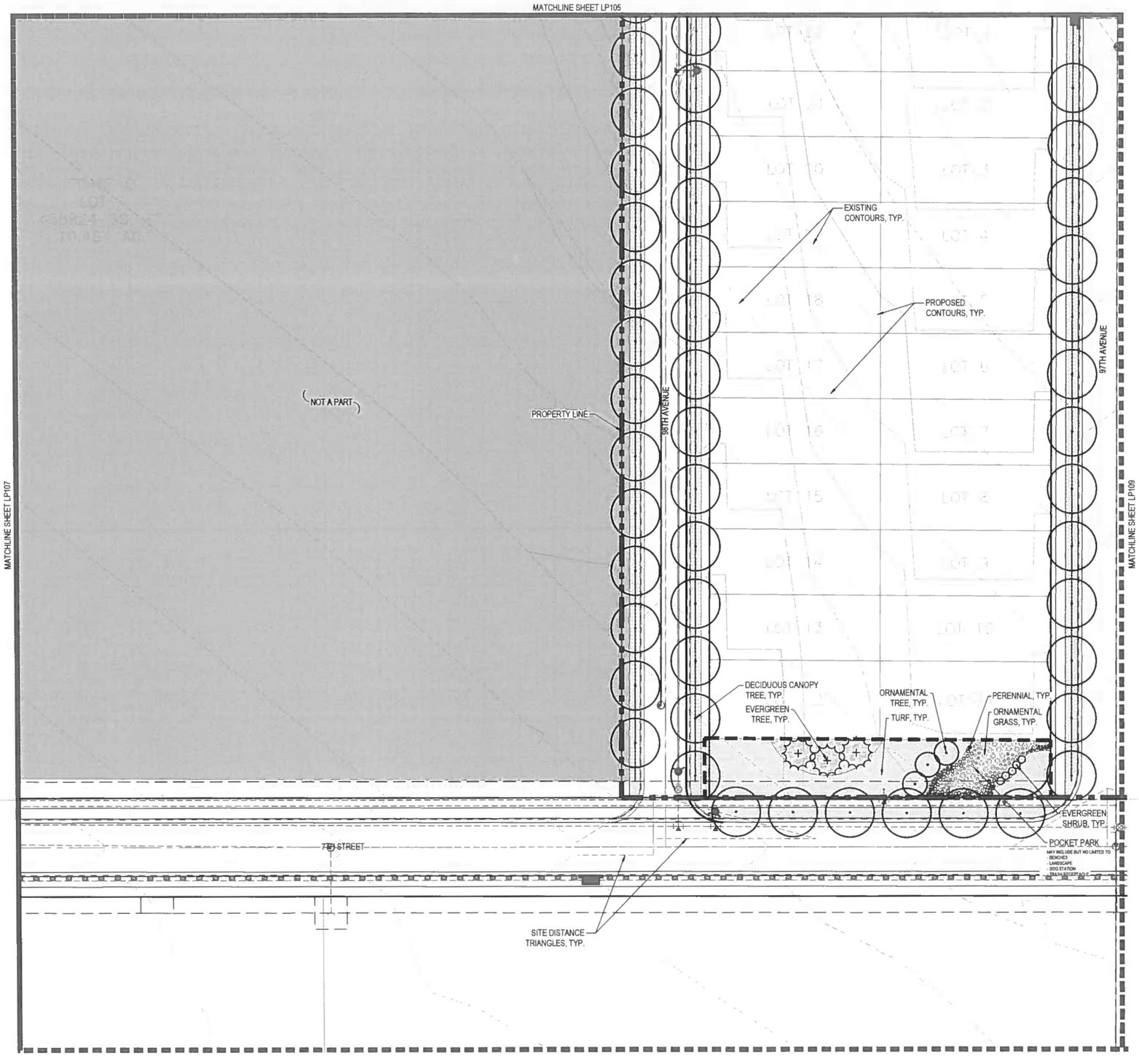
LANDSCAPE PLAN

LP107



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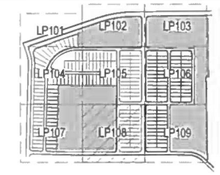

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NORTH

0 15 30 60

SCALE 1" = 30'

811

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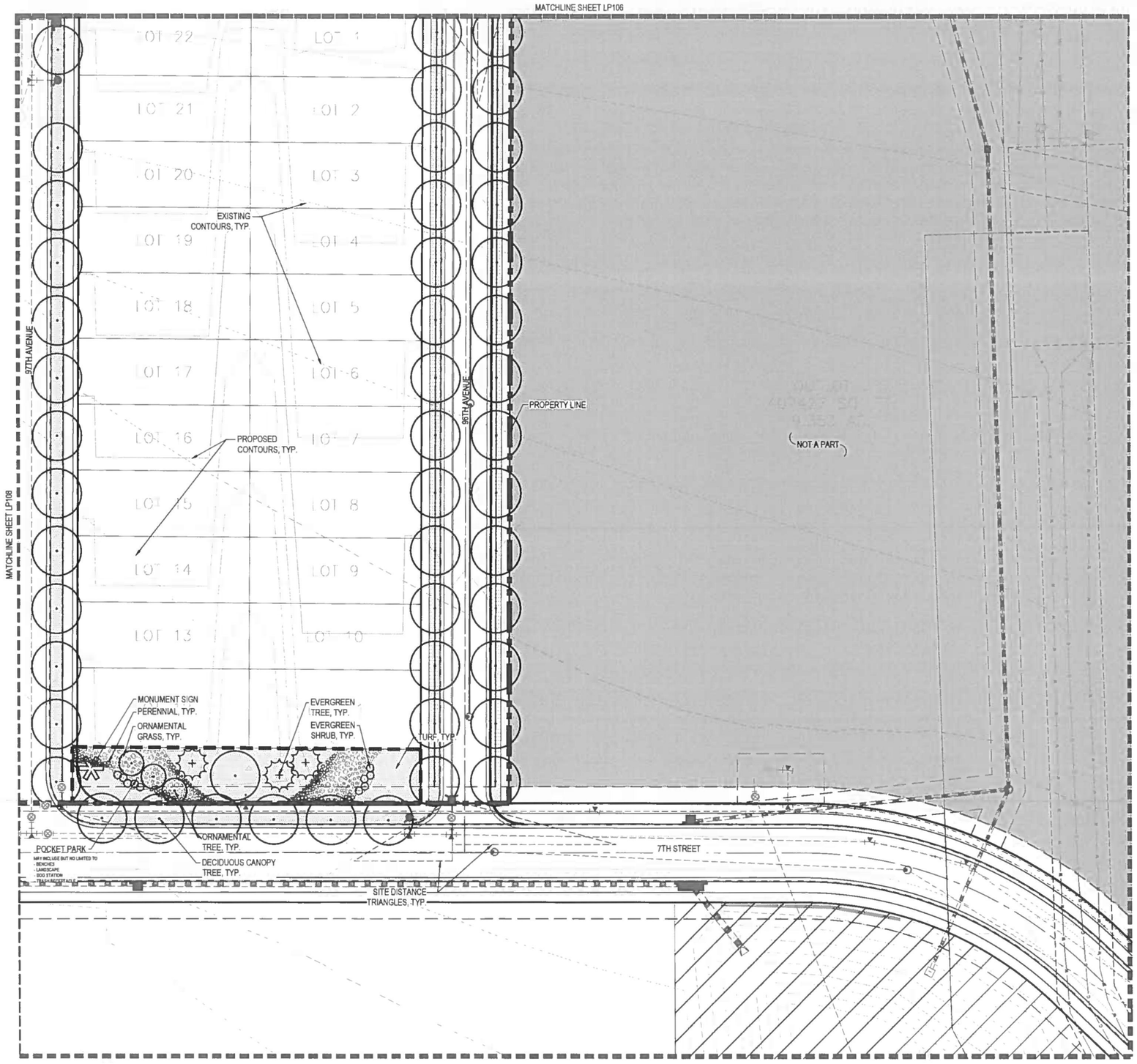
09/07/22 SUBMITTAL

SHEET TITLE:
LANDSCAPE PLAN

LP108



KEY MAP

LEGEND

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NORTH

0 15 30 60

SCALE 1" = 30'

811

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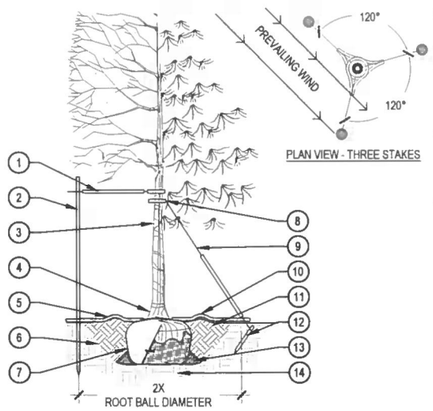
09/07/22 SUBMITTAL

SHEET TITLE:
LANDSCAPE PLAN

LP109

PRUNING NOTES:
1. ALL PRUNING SHALL COMPLY WITH ANSI A300 STANDARDS.
2. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS AND BROKEN BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.

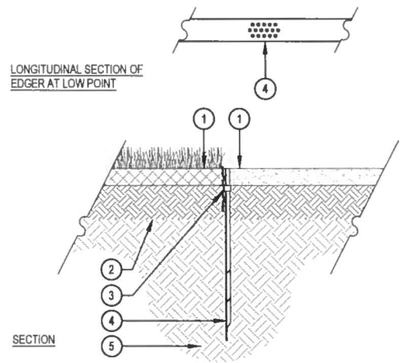
STAKING NOTES:
1. STAKE TREES PER FOLLOWING SCHEDULE, THEN REMOVE AT END OF FIRST GROWING SEASON.
   a. 1-1/2" CALIPER SIZE - MIN. 1 STAKE ON SIDE OF PREVAILING WIND (GENERALLY N.W. SIDE).
   b. 1-1/2" - 3" CALIPER SIZE - MIN. 2 STAKES - ONE ON N.W. SIDE, ONE ON S.W. SIDE (OR PREVAILING WIND SIDE AND 180° FROM THAT SIDE).
   c. 3" CALIPER SIZE AND LARGER - 3 STAKES PER DIAGRAM.
2. WIRE OR CABLE SHALL BE MIN. 12 GAUGE, TIGHTEN WIRE OR CABLE ONLY ENOUGH TO KEEP FROM SLIPPING. ALLOW FOR SOME TRUNK MOVEMENT. NYLON STRAPS SHALL BE LONG ENOUGH TO ACCOMMODATE 1-1/2" OF GROWTH AND BUFFER ALL BRANCHES FROM WIRE.



1. PLACE MINIMUM 1/2" PVC PIPE AROUND EACH WIRE. EXPOSED WIRE SHALL BE MAXIMUM 2" EACH SIDE
2. 6'-0"UNTREATED WOOD POST, MINIMUM 1.5" DIAMETER. ALL SHALL BE DRIVEN OUTSIDE ROOTBALL AND IN UNDISTURBED SOIL
3. TREE WRAP TO BE INSTALLED ONLY FROM OCTOBER 1 THROUGH APRIL 30, DECIDUOUS ONLY, WRAP FROM BASE OF TRUNK TO BOTTOM LIMB
4. PLANT TREE SO THAT TOP MOST MAJOR ROOT IS 1"-2" ABOVE FINISHED GRADE
5. 2'-0" RADIUS MULCH RING, CENTERED ON TRUNK, 3" DEPTH, DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK, FINISHED GRADE REFERENCES TOP OF MULCH
6. 1:1 SLOPE ON SIDES OF PLANTING HOLE
7. ROPES AT TOP OF ROOTBALL SHALL BE CUT, REMOVE TOP 1/3 OF BURLAP, NON-BIODEGRADABLE MATERIAL SHALL BE TOTALLY REMOVED
8. GROMMETED NYLON STRAPS
9. GALVANIZED WIRE, MINIMUM 12 GAUGE CABLE,TWIST WIRE ONLY TO KEEP FROM SLIPPING
10. 4-6" HIGH WATER SAUCER IN NON-TURF AREAS
11. BACKFILL WITH BLEND OF EXISTING SOIL AND A MAXIMUM 20%, BY VOLUME, ORGANIC MATERIAL, WATER THOROUGHLY WHEN BACKFILLING
12. 2'-0" STEEL T-POST, ALL SHALL BE DRIVEN BELOW GRADE AND OUTSIDE ROOTBALL IN UNDISTURBED SOIL
13. PLACE SOIL AROUND ROOT BALL FIRMLY, DO NOT COMPACT OR TAMP, SETTLE SOIL WITH WATER TO FILL ALL AIR POCKETS
14. PLACE ROOT BALL ON UNDISTURBED SOIL TO PREVENT SETTLEMENT

1 TREE PLANTING DETAIL

SCALE: 3/16" = 1'-0"

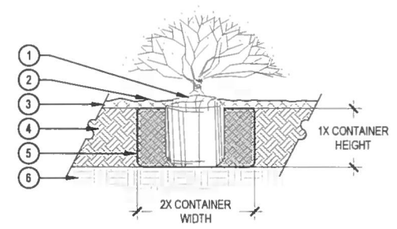


1. FINISHED GRADE, TOP OF SOD THATCH LAYER AND TOP OF MULCH OR CRUSHER FINES SHALL BE FLUSH WITH TOP OF EDGER
2. AMENDED SOIL PER SPECIFICATIONS
3. METAL EDGER, DRILL (16) 1/2" DIAMETER HOLES 1" ON CENTER MINIMUM AT ALL LOW POINTS OR POORLY DRAINING AREAS IN ORDER TO ENSURE ADEQUATE DRAINAGE
4. EDGER STAKE
5. SUBGRADE COMPACTED TO 95% STANDARD PROCTOR DENSITY

NOTES:
1. THERE SHALL BE NO EXPOSED SHARP/ JAGGED EDGES.
2. CONTRACTOR SHALL INSTALL STAKES AS REQUIRED BY THE MANUFACTURER.
3. ENSURE POSITIVE DRAINAGE.

3 METAL EDGER

SCALE: 1" = 1'-0"



1. SET SHRUB ROOT-BALL 1" HIGHER THAN FINISH GRADE
2. FINISH GRADE (TOP OF MULCH)
3. SPECIFIED MULCH, REFER TO MATERIAL SCHEDULE, SHEET L-XXX
4. TILL IN SPECIFIED SOIL AMENDMENT TO A DEPTH OF 6" IN BED
5. BACKFILLED AMENDED SOIL
6. UNDISTURBED SOIL

NOTE:
1. BROKEN OR CRUMBLING ROOT-BALLS WILL BE REJECTED.
2. CARE SHOULD BE TAKEN NOT TO DAMAGE THE SHRUB OR ROOT-BALL WHEN REMOVING IT FROM ITS CONTAINER.
3. ALL JUNIPERS SHOULD BE PLANTED SO THE TOP OF THE ROOT-BALL OCCURS ABOVE THE FINISH GRADE OF THE MULCH LAYER.
4. DIG PLANT PIT TWICE AS WIDE AND AS HIGH AS THE CONTAINER.
5. PRUNE ALL DEAD OR DAMAGED WOOD PRIOR TO PLANTING, DO NOT PRUNE MORE THAN 20% OF LIMBS.

2 SHRUB PLANTING

SCALE: 1 1/2" = 1'-0"

CHECKED BY: CS
DRAWN BY: RE

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GREELEY, CO

OWNER:
MERITAGE HOMES
8400 CRESCENT PKWY
SUITE 200
GREENWOOD VILLAGE, CO 80111
(303) 406-4312

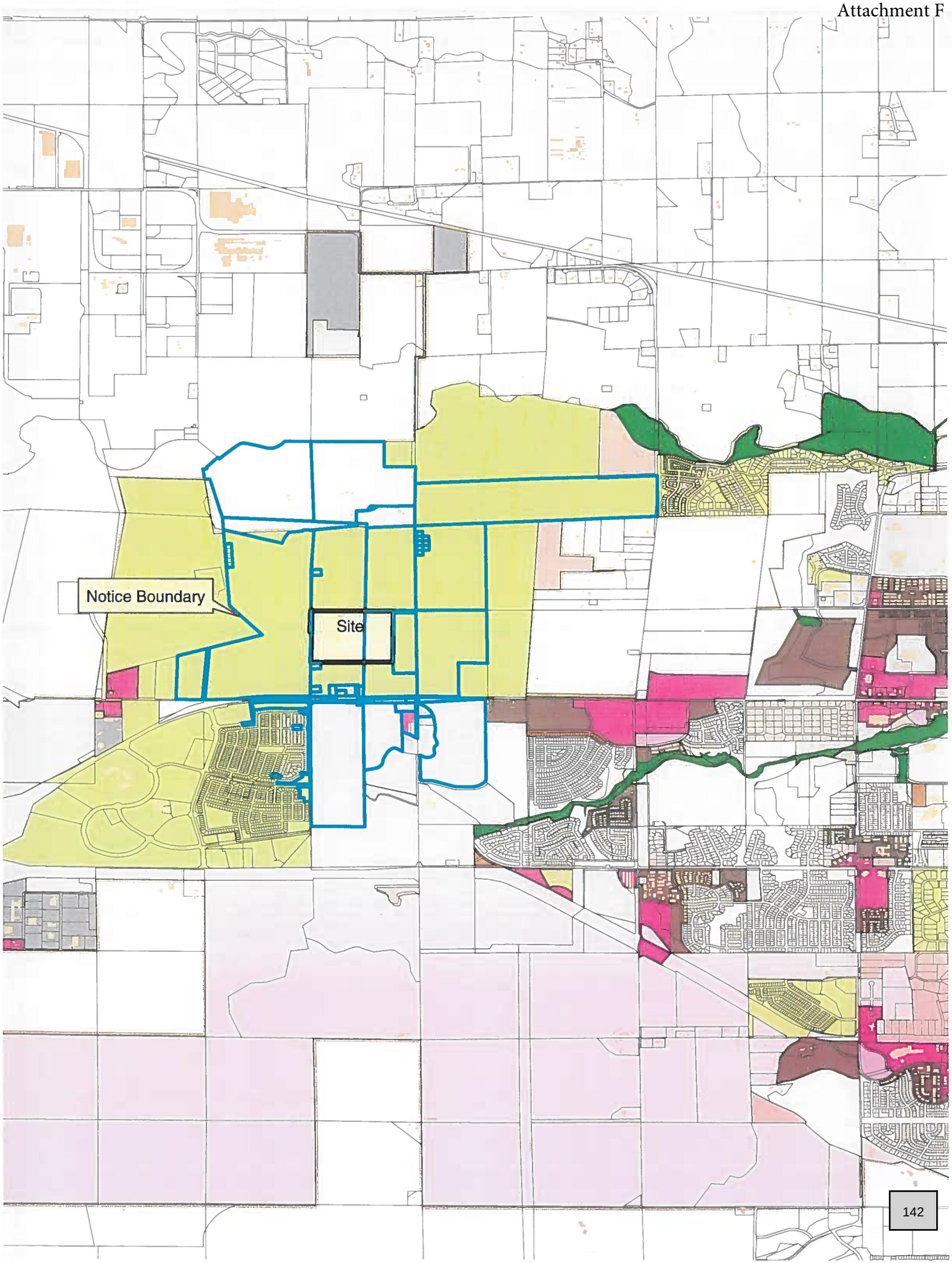
SUB2022-0015
PUD2018-0010

NOT FOR CONSTRUCTION

DATE:
05/23/22 SUBMITTAL
07/08/22 SUBMITTAL
09/07/22 SUBMITTAL

SHEET TITLE:
LANDSCAPE DETAILS

LP200


Notice Boundary
Site

Planning Commission Agenda Summary

November 8, 2022

Key Staff Contact: Sean Chambers, Director Water and Sewer

Title:
Update on Water & Sewer Department Design Criteria & Construction Specification

Summary:
The City of Greeley Water and Sewer Department is updating the current design criteria from 2008 with new standards to accommodate new technologies, techniques, and materials. As you know, the City of Greeley is growing, and updating the design standards will assist in development and ensure quality utility infrastructure into the future. These updates will also facilitate recent non-potable system requirements adopted by City Council in February of 2022, incorporate the Non-Potable Water, Sanitary Sewer, Transmission & Distributions Master Plans that were completed in 2021, and align with the updated development code completed in 2021. As the City is growing at a rapid pace, these updates will help provide long term infrastructure needs to better prepare and accommodate this growth.

The updated design criteria for the potable water distribution, sanitary sewer collection, non-potable irrigation system, and landscape & irrigation will guide developers and engineers in expanding and connecting to the City's utilities. The larger changes include added lift station criteria, changes to the non-potable system criteria, updated criteria to incorporate the new development code changes, compliance with Subsurface Utility Engineering (SUE) law requirements, and the addition of landscape & irrigation design criteria along with many other smaller changes.

The Water and Sewer Department has worked diligently to coordinate with other departments, engineering development review staff for consistency, a presentation and discussion with the Builders, Realtors, & Developer group in July of 2021, review and input from the Planning Commission in March and August of 2022, and we receive comments and questions from engineers, developers, and designers throughout Greeley on details, design criteria, and specifications from April to September of 2022.

Recommended Action:
Approve and Recommend to City Council the Adoption of the January, 2023 Water & Sewer Design Criteria and Construction Specifications.

Attachments:
Attachment A – Ordinance for Adopting new Design Criteria and Construction Specifications
Attachment B – January, 2023 Design Criteria and Construction Specifications

DESIGN CRITERIA
AND
CONSTRUCTION SPECIFICATIONS

VOLUME III

POTABLE WATER DISTRIBUTION,
SANITARY SEWER COLLECTION,
NON-POTABLE IRRIGATION SYSTEMS,
AND LANDSCAPE & IRRIGATION

January 2023

DEPARTMENT OF WATER & SEWER

CITY OF GREELEY, COLORADO

FORWARD

The City of Greeley *Design Criteria and Construction Specifications, Volume III, Potable Water Distribution, Sanitary Sewer Collection, Non-Potable Irrigation Systems, and Landscape Irrigation* documents are intended to provide guidance for the design, review, and construction of those public utility improvements pertaining to water in or under the public right-of-way or dedicated easements.

This document represents an attempt to assist those in the design, review, and construction industry to provide quality and long-lasting public utility improvements and facilities. The document also provides for consistency in the areas of design, review, and construction.

This document is not intended to replace or restrict the function of the design engineer or the innovativeness and expertise of developers and contractors. Users of this document are encouraged to submit their ideas and methods of improving this document.

_____

Sean Chambers
Water and Sewer Director

Effective: January 31, 2023

CITY OF GREELEY, COLORADO

DEPARTMENT OF WATER & SEWER

DESIGN CRITERIA

AND

CONSTRUCTION SPECIFICATIONS

VOLUME III

POTABLE WATER DISTRIBUTION, SANITARY SEWER COLLECTION, NON-POTABLE IRRIGATION SYSTEMS, AND LANDSCAPE & IRRIGATION

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POTABLE WATER DISTRIBUTION, SANITARY SEWER COLLECTION, NON-POTABLE IRRIGATION SYSTEMS, AND LANDSCAPE & IRRIGATION DESIGN CRITERIA

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SECTION 1

GENERAL REQUIREMENTS

1.01 SCOPE

The purpose of the City of Greeley *Design Criteria and Construction Specifications, Volume III, Potable Water Distribution, Sanitary Sewer Collection, and Non-Potable Irrigation Systems and Landscape and Irrigation*, hereafter referred to as the "Criteria", is to present the minimum design and technical criteria for the analysis and design of potable water distribution, sanitary sewer collection, and non-potable irrigation systems for which City of Greeley acceptance is required. The Criteria may be amended as new technology is developed or a need for revision is demonstrated and proven through experience and use. The Design Engineer shall be responsible for compliance with these Criteria as well as other applicable design and construction standards in the preparation of engineering reports, construction drawings, and specifications for City review and acceptance.

1.02 DEFINITIONS AND ABBREVIATIONS

Wherever the following words, phrases, and abbreviations appear in these specifications they shall have the following meaning:

A. ac – acre

B. ac-ft – acre-feet

C. ANSI – American National Standards Institute

D. APPROVED PLAN – The latest revised Construction Drawing(s) accepted by the City of Greeley.

E. APWA – American Public Works Association

F. AS-CONSTRUCTED DRAWINGS – Drawings reflecting actual conditions and information for the project after construction is completed.

G. ASME – American Society of Mechanical Engineers

H. ASTM – American Society for Testing Materials

I. AWWA – American Water Works Association

J. CDOT – Colorado Department of Transportation

K. CDPHE – Colorado Department of Public Health and Environment

L. cfs – cubic feet per second

M. CITY – City of Greeley

N. CONSTRUCTION DRAWINGS – Engineered working drawings including plan, profile, and detail sheets of proposed development and utility improvements accepted by the City.

O. CONTRACTOR – The individual, firm, partnership, corporation, or combination thereof, private, municipal, or public including joint ventures, which, as an independent contractor, has entered into a contract with the Developer/Owner.

P. CRITERIA – City of Greeley *Design Criteria and Construction Specifications, Volume III, Potable Water Distribution, Sanitary Sewer Collection, and Non-Potable Irrigation Systems.*

Q. DESIGN ENGINEER – The partnership, corporation, or individual who is registered as a Professional Engineer, according to Colorado statutes, who is hired by the Developer/Owner to conduct engineering design services and may be empowered by the Developer/Owner to act as his agent for the project.

R. DEVELOPER – The owner, corporation, association, partnership, agency, or individual who or which shall participate in development, has entered into a development agreement with the City and has entered into an agreement with the Design Engineer and Contractor to perform the development work.

S. DEVELOPMENT – Any construction or activity which changes the basic characteristic or use of land on which construction or activity occurs, including but not limited to, any non-natural change to improved or unimproved real estate, substantial improvements to buildings or other structures, installation of utilities, mining, dredging, filling, grading, paving, extraction, or drilling operations.

T. DEVELOPMENT CODE – A section of the City Municipal Code prepared by the City of Greeley Community Development Department which sets forth requirements and standards for land development, land use, and the *Subdivision Regulations*.

U. DIP – Ductile-iron pipe.

V. EASEMENT – A right granted by the property owner permitting a designated part or interest of the property to be used by others for specific use or purpose.

W. EPA – Environmental Protection Agency

X. ft^2 – square feet

Y. ft/s – feet per second

Z. GEOTECHNICAL ENGINEER – A partnership, corporation, or individual who is registered as a Professional Engineer, according to Colorado statutes, proficient in the area of soil mechanics, and who is hired by the Developer/Owner to conduct subsurface soils investigations and evaluations, ground water assessments, and other related engineering services.

AA. gpcd – gallons per capita per day

BB. gpd – gallons per day

CC. gpm – gallons per minute

DD. HP - horsepower

EE. INSPECTOR – Representative of the City of Greeley designated to conduct construction/field observation.

FF. LAND SURVEYOR – A registered Professional Land Surveyor, according to State of Colorado statutes, who is hired by the Developer/Owner to determine the boundaries and elevations of land and/or a structures and other related surveying services.

GG. LIVING UNIT - one or more connected rooms, constituting a separate, independent housekeeping establishment for owner occupancy, or rental or lease as a single unit on a monthly basis or longer, physically separated from any other room or dwelling units which may be in the same structure and served by no more than one gas meter and one electric meter.

HH. MAY – A permissive condition. Where the word "may" is used, no requirement for design or application is intended.

II. NEC – National Electric Code

JJ. NFRWQPA – North Front Range Water Quality Planning Association (regional 208 agency)

KK. NON-POTABLE – Water that is not treated to approved drinking water standards and is not suitable or intended for human consumption, but is produced and delivered for irrigation use.

LL. OSHA – Occupational Safety and Health Administration

MM. OWNER – Any person having title or right of ownership in the surface estate of real property or leasehold interest within.

NN. PGI – PVC Geomembrane Institute

OO. PLANNING COMMISSION – Appointed members to advise the City Council on land use planning and development and to make decisions on land use matters.

PP. PLANS – See CONSTRUCTION DRAWINGS.

QQ. PLC – Programmable Logic Controller

RR. PROFESSIONAL ENGINEER – An engineer registered with the State of Colorado according to State of Colorado statutes.

SS. PROFESSIONAL LAND SURVEYOR – A land surveyor registered with the State of Colorado according to State of Colorado statutes.

TT. psi – pounds per square inch

UU. PVC – Polyvinyl chloride

VV. SDC – City of Greeley *Design Criteria and Construction Specifications, Volume 1, Streets.*

WW. SDDC – City of Greeley *Design Criteria and Construction Specifications, Volume II, Storm Drainage.*

XX. SDR – Standard Dimension Ratio (pipe outside diameter over minimum pipe wall thickness).

YY. SHALL – A mandatory condition. Where certain requirements in the design or application are described with the "shall" stipulation, it is mandatory that these requirements be met.

ZZ. SHOULD – An advisory condition. Where the word "should" is used, it is considered to be advisable usage, but not mandatory. Deviations may be allowed when reasons are given which show that the intent of the standard is met.

AAA. SPECIFICATIONS – The construction specifications portion of the City of Greeley *Design Criteria and Construction Specifications, Volume III, Potable Water Distribution, Sanitary Sewer Collection, and Non-Potable Irrigation Systems.*

BBB. STRUCTURE - Anything constructed or erected on or in the ground, the use of which requires a more or less permanent location on or in the ground, and, including, but not limited to, walls, retaining walls, fences, parking lots, parking slabs and oil and gas production facilities.

CCC. STANDARDS – The design criteria portion of the City of Greeley *Design Criteria and Construction Specifications, Volume III, Potable Water Distribution, Sanitary Sewer Collection, and Non-Potable Irrigation Systems.*

DDD. SUBCONTRACTOR – Any person, firm or corporation, other than the employees of the Contractor, who enters into contract with the Contractor, to furnish labor, materials, or labor and materials.

EEE. SUBDIVISION REGULATIONS – A section of the Development Code prepared by the City of Greeley Community Development Department, which contains requirements for various land use, land development, and subdivision processes.

FFF. UNCC – Utility Notification Center of Colorado.

GGG. UNDERDRAINS – Private line or system that controls or managing any subsurface water on individual foundation lot or lots. No private underdrain systems shall be allow in Water & Sewer easements.

HHH. UTILITY – City of Greeley Water and Sewer Department.

III. UTILITIES – Shall mean all utilities, wet and dry, on site prior to the time of any design and development and all utilities proposed with design. Wet utilities shall include, but are not limited to potable water lines, sanitary sewer lines, non-potable irrigation lines, transmission gas lines, storm water lines, ditches and other runoff conveyance elements. Dry utilities shall include, but are not limited to electric lines, telephone lines, gas service lines, fiber optic lines, and cable television lines.

JJJ. VFD – Variable Frequency Drive

KKK. WATER AND SEWER DIRECTOR – Shall mean the Director of the City of Greeley Water and Sewer Department or their designated representative.

LLL. WQCD – Water Quality Control Division of CDPHE

1.03 MINIMUM STANDARDS

A. The City of Greeley's Community Development Department has Development Code documents that can help define the various processes required for projects within the City.

B. The City's review and acceptance will only be to determine if the plans and specifications conform to the City's requirements. The City's review and acceptance will not relieve the Developer, Design Engineer and Contractor from responsibility for any variation from the City requirements or adequate design standards. The City's review and acceptance shall not constitute any assumption of responsibility or liability for the design or construction. It is the intent and purpose of these standards and specifications to obtain high quality construction throughout, with the completed work complying with the City standards and specifications.

C. All vertical and horizontal control shall be based on the currently adopted City of Greeley vertical and horizontal monumentation. Proposed reference monumentation shall be approved by the City prior to survey. A list of approved monuments may be obtained from the City.

1.04 RELATIONSHIP TO OTHER STANDARDS

A. Whenever a provision of these Criteria and any other provision in any law, ordinance, resolution, rule, policy, or regulation of any kind contain any restrictions covering any subject matter within these Criteria, the most restrictive standard shall apply.

B. The provisions of these Criteria and standards are minimum requirements that do not preclude the use of more restrictive standards by the Design Engineer or City.

C. Adherence to these Criteria does not remove the Developer's responsibility to investigate and obtain any other regulatory permits or approvals, from either local, regional, state, or federal agencies, that may be required for a particular project.

1.05 REVIEW AND ACCEPTANCE

A. All potable water, sanitary sewer, and non-potable irrigation construction plans and specifications submitted to the City for review preliminary and final, comment, and acceptance shall be prepared by, or under the direct supervision of a Professional Engineer. Said Professional Engineer shall be responsible for the design, preparation of the construction drawings and reports, determining material specifications, and reviewing the field survey for accuracy.

B. The construction plan review process for all development as outlined in the *Development Code* shall be followed.

1. The preliminary plan set shall be reviewed by the City for general compliance with these Criteria and the City shall provide comments to the Developer or their agents regarding corrections, additions, and omissions.

2. All submittals to the City shall be done in accordance with the city Development Code.

3. It is the responsibility of the Design Engineer to confirm that submittals are in conformance with these current standards. Any preliminary or final submittal not meeting these criteria may be rejected without review.

4. After final corrections are made and the plans are accepted, the plans set shall be signed by the Water and Sewer Director or designated representative(s). The signing of the plans will constitute acceptance. The acceptance is qualified in that: ***The plans are reviewed and accepted for concept only and the plan acceptance does not imply responsibility by the Water and Sewer Department or the City of Greeley for accuracy and correctness. The plans acceptance does not imply that quantities of items indicated on the plans are the final quantities required. The plans acceptance shall not be construed for any reason as acceptance of financial responsibility by the Water and Sewer Department or City of Greeley for additional items not shown that may be required during the planning or engineering phase and the construction phase.***

C. See Section 6 *Landscape and Irrigation Design Criteria* to determine if additional review and supervision by a registered Landscape Architect is required.

D. If the Design Engineer responsible for the plans disagrees with any requested changes to the submitted plans that may be required by the City for acceptance, such disagreement shall be brought to the attention of the City, and if required by the City, in writing.

E. The Seal of the Design Engineer on plans so corrected and accepted for construction will signify that the Professional Engineer has reviewed, approved, and authorized said corrected plans for construction.

F. No construction shall be undertaken without a City accepted and signed set of Construction Drawings and a recorded plat or required potable water, sanitary sewer, and/or non-potable irrigation easements.

SECTION 2

SUBMITTAL REQUIREMENTS

2.01 GENERAL

Requirements discussed in this section are the minimum for potable water distribution, sanitary sewer collection, and non-potable irrigation systems and are not meant to be all-inclusive. Other requirements may be needed for a complete design. The Design Engineer shall consider the maintenance and operational aspects of the potable water distribution, sanitary sewer collection, and non-potable irrigation systems' infrastructure, as well as constructability in their design.

A. All construction drawings shall be legible and submitted on PDF 22" x 34" or 24" x 36" sheets. Additional sizes may be accepted with prior approval.

B. A legend describing all line types, symbols, and abbreviations shall be shown either on the cover sheet or each individual sheet.

C. Each sheet in the Construction Drawings shall be marked "PRELIMINARY, NOT FOR CONSTRUCTION" with the date of submittal. This statement shall be removed on the final City accepted Construction Drawings.

D. City accepted and signed construction plans are required prior to the City's issuance of construction permits.

2.02 PRELIMINARY CONSTRUCTION PLAN REQUIREMENTS

For Preliminary subdivisions, plans shall be submitted to the City for review and acceptance prior to the preparation of final Construction Drawings. Acceptance of the preliminary submittal shall constitute only a conceptual acceptance and shall not be construed as acceptance of specific design details. The preliminary plans' submittal requirements are outlined below and in the City of Greeley Community Development Department's Construction Plan checklist.

A. Utility Sheet

1. A general overview of the entire project including, but not limited to, streets (complete with names), alleys, lot and block numbers, all proposed and existing utilities on and within 100 feet of the project site, all existing and proposed easement, rights-of-way on and adjacent to the project site, and storm water facilities.

2. The entire project shall be shown on one (1) sheet unless the project is too large to show sufficient detail. City acceptance must be granted to show the project on more than one sheet and a key map to aid in drawing orientation and locating the sheet construction in relation to the overall project will be required on each sheet.

3. Proposed project phasing for utilities and structures.

4. Proposed point(s) of connection for potable water, sanitary sewer, or non-potable irrigation mains to the existing system(s). All existing potable and non-potable water lines shall be labeled with the pipe diameter, type of material, and year of installation

(available from the City). All existing sanitary sewer lines shall show existing manholes, complete with rim and invert elevations, and pipe diameter.

5. Geotechnical bore locations shall be shown in plan view within the utility plans.

6. Any other information deemed necessary by the Design Engineer or City.

2.03 FINAL CONSTRUCTION PLAN REQUIREMENTS

A. Final Construction Plans shall contain the same information as indicated in the Preliminary Construction Plan Requirements section 2.02 of these Criteria with additional requirements as outlined below and in the City of Greeley Community Development Department's Final Construction Plan checklist. After one (1) year from the original acceptance date, the City may require resubmittal of the plans for review and acceptance due to revised or updated City design criteria or construction specifications.

B. City accepted easements or a City accepted final plat must be executed before final Construction Plan acceptance.

C. One set of 22" x 34" or 24" x 36" plans shall be submitted to the City for acceptance signatures when all known issues have been addressed to the satisfaction of the City. Additional sizes may be accepted with prior approval. Once the plans receive City signatures, the Developer or their agents shall make copies of the signed plans and provide them to the City.

D. An electronic version, in a format acceptable to the City, of the final Construction Drawings shall be provided to the City at the time of plan signatures.

E. Potable water, sanitary sewer, and non-potable irrigation main designs shall be provided on separate plan and profile sheets specific to potable water, sanitary sewer, and non-potable irrigation.

F. The Cover Sheet shall contain a signature line for all Ditch Companies, or end user(s) if the ditch is not controlled by a Ditch Company, that have their facilities impacted or modified by the project.

G. All utility verifications shall be in compliance with Colorado Revised Statute 9-1.5 as updated.

H. "Call Utility Notification Center of Colorado (UNCC) at 1-800-922-1987 or dial 811 for utility locates 72 hours prior to any excavation work" shall be put on all drawing sheets.

I. Conduit Plan

1. The conduit plan serves to show all proposed utility conduits crossing public rights-of-way and easements. ***The conduit plan may be a separate sheet from the utility plan as requested by the City.***

2. Provide a general overview of the project including but not limited to street names, street rights-of-way, all proposed and existing utilities, all proposed and existing easements, and lot and block numbers.

3. Show all utility conduits crossing the public rights-of-way and easements and indicate the utility conduit diameter, number of conduits, depth of installation, and name of utility using the conduit.

4. Add the following note to the conduit plan: "All utility conduit crossings of potable water, sanitary sewer and non-potable irrigation lines shall be encased in High Density Polyethylene (HDPE) or fusible C900-16 PVC Pipe, with minimum Standard Dimension Ratio (SDR) 11 across the entire easement or right-of-way width. The encasement joint shall be butt fused. Flexible joints are not allowed."

J. Construction Plan View

1. Clear distance between utilities shall be outside wall to outside wall.

2. Show and label proposed and existing easements, rights-of-way, and property lines.

3. Indicate the proposed method of connection to existing potable water distribution, sanitary sewer collection, and non-potable irrigation systems.

4. Show all proposed and existing potable water, sanitary sewer, and non-potable irrigation services. Indicate the station of service locations on the potable water, sanitary sewer, and non-potable irrigation mains or include a tabular list of stations.

5. Where the minimum cover over sanitary sewer mains provides less than 10 feet of elevation difference between the top of foundation grade and the top of the sewer main, a note shall indicate the lot is served by a "shallow sewer" and appropriate elevation information shall be provided. Shallow sewer is defined in *Section 4* of these Criteria.

K. Pothole information of all water or sewer mainlines and impacted services. At critical locations and as determined by City, with date including month and year, elevation, depth and datum.

L. Construction Profile View

1. Show all existing and proposed utility crossings in compliance with Colorado Revised Statute 9-1.5 as updated. Existing utility crossing locations and elevations shall be obtained from the current project design field survey. Existing utilities shall be potholed as required to perform complete and accurate design prior to construction plan acceptance. Field obtained elevations shall be provided on the Construction Drawings complete with when the field information was gathered, the exact location where it was collected, the Firm that performed the potholing and surveying, and the date the survey was conducted.

   a. Clear distance between utilities shall be outside wall to outside wall.

2. Where the potable water and sanitary sewer mains are within two feet vertically of each other, all water and sewer services that cross a main shall be shown.

3. Provide all pertinent information for existing utilities, refer to checklist for details.

4. Provide pipe slope, manhole inverts in and inverts out (main and service line), and rim

elevations and manhole stationing for proposed sanitary sewer lines.

5. Any other information deemed necessary by the Design Engineer or City.

M. Standard Drawing (Detail) Sheets

1. Include all project applicable City of Greeley Standard Drawings as part of the construction plans set. Water and Sewer Department Standard Drawings are provided in these Criteria. Refer to the Department of Public Works' *SDC* and *SDDC,* latest revision, for other project related details.

2. All City of Greeley Standard Drawings shall contain the City logo in the bottom left corner. If any standard City detail is modified, the City logo shall be removed from the detail and placed on a separate sheet before standard details. All modified detail shall be stamped by design engineer.

3. Where Standard Drawings are not applicable to the work, provide project specific construction details. These shall include construction details of critical connections, atypical crossings, special fittings and appurtenances, and any other details deemed necessary by the Design Engineer or City.

N. Requirements for Changes to Final Accepted Plans

1. Should circumstances warrant changes from the City accepted Construction Plans, acceptance of the changes shall be obtained from the City prior to construction.

2. All modified drawings shall be on 22" x 34" or 24" x 36" sheets. Depending on the extent of the changes, the City will decide if revised plans are required.

O. Wastewater Pumping Station (Lift Station) Final Construction Plans

1. Lift station final construction plan requirements are specific to the design requirements of the lift station in addition to state and regional guidelines. Refer to *Section 4* for lift station requirements.

P. Geotechnical bore logs and groundwater data shall be shown in the Construction Plans.

2.04 FINAL PLAT AND REPLAT REQUIREMENTS

A. Final plats shall adhere to the requirements set forth in the City of Greeley Development Code Chapter 3: *Subdivision Regulations* and the Department of Public Works' *SDC,* latest revision. The following requirements shall also apply:

1. Clearly show, label, and dimension newly dedicated and existing potable water, sanitary sewer, and non-potable irrigation easements.

2. Clearly denote the allocation of any new or existing water dedication credits between the parcels included on the plat.

3. Where minimum cover over sanitary sewer provides less than 10 feet of elevation difference between the finished top of foundation elevation and the invert of the sewer

main, the plat shall indicate that the lot is served by a "shallow sewer". Shallow sewer is defined in *Section 4* of these Criteria.

4. Where a single service is allowed for multiple buildings on a single lot the plat shall indicate that if the lot is ever subdivided the service and main configuration must be brought into alignment with the current City of Greeley Design Criteria.

5. All platted lots shall be adjacent to a public potable water distribution and sanitary sewer collection main. No potable water or sanitary sewer services shall cross lot lines.

B. For all replats where lot lines or street locations change, all existing potable water, sanitary sewer, and non-potable irrigation mains, services, fire hydrants, fire sprinkler lines, etc. shall be relocated to their appropriate location or abandoned. Potable water distribution, sanitary sewer collection, and non-potable irrigation system designs in this replatted area must conform to the current City of Greeley Design Criteria.

2.05 LANDSCAPE PLANS REQUIREMENTS

A. No plant material with mature growth greater than three (3) feet in height shall be planted within potable water, sanitary sewer, or non-potable irrigation easements.

B. No shrubs shall be planted within five (5) feet or trees within ten (10) feet of potable and non-potable water meters, fire hydrants, sanitary sewer manholes, or potable water, sanitary sewer, and non-potable irrigation mains and services.

C. Clearly show and label all proposed and existing potable water and non-potable irrigation meter pits/vaults, mains and services, sanitary sewer mains and services, fire hydrants, and easements on the landscape plans.

D. Show and label all proposed water taps that will be used for landscape irrigation.

E. Provide a table summarizing irrigation water use by area per Section **20-254** of municipal code

F. See Section 6: *Landscape and Irrigation Design Criteria* for additional landscape plan requirements that may apply.

G. Add sections 2.05-A and 2.05-B of these Criteria as notes on the landscape plans.

2.06 EASEMENTS

A. When it is not feasible for potable water, sanitary sewer, or non-potable irrigation main installation to be in a dedicated street right-of-way, the installation shall be made within a dedicated easement. The conditions for allowance of such an exception shall be determined for each individual case. The minimum easement width acceptable to the City is as follows:

1. For a dedicated potable water, sanitary sewer, or non-potable irrigation main easement containing just one (1) main, the width shall be twenty (20) feet or twice the depth to the invert of the pipe, whichever is greater. This easement shall be for the exclusive use by City of Greeley potable water, sanitary sewer, or non-potable irrigation mains. The easement name, which shall be "PERMANENT POTABLE WATER EASEMENT",

"PERMANENT SANITARY SEWER EASEMENT" or "PERMANENT NON-POTABLE WATER EASEMENT", and the easement width shall be labeled on the Construction Drawings and plat.

2. For any combination with two utilities, potable water, sanitary sewer or non-potable irrigation main easements, the total width shall be thirty (30) feet or twice the maximum depth to the invert of each utility, whichever is greater. This easement shall be for the exclusive use by the City of Greeley. The easement name and the easement width shall be labeled on the Construction Drawings and plat.

3. For any combination with three utilities, potable water, sanitary sewer or non-potable irrigation main easements, the total width shall be forty (40) feet or twice the maximum depth to the invert of each utility, whichever is greater. This easement shall be for the exclusive use by the City of Greeley. The easement name and the easement width shall be labeled on the Construction Drawings and plat.

4. Where pipes of diameters greater than sixteen inches (16") are installed additional easement width may be required to account for pipe width.

B. The mains within the easement shall be located as centrally as feasible within the easement while maintaining required separation from other mains and accounting for the depths of mains where necessary.

C. There shall be no detention ponds, berms greater than three (3) feet, permanent structures, fences, trees, shrubs with mature height greater than three (3) feet, or other obstructions that will impede the ability of the City to adequately maintain and service the main(s) located within the easement.

D. Easements not dedicated with a plat, shall be dedicated by separate document and recorded prior to City acceptance of the Construction Drawings. Easement dedication by separate document shall include:

1. Easement Dedication Form. An easement dedication form shall be completed by the Developer. Standard easement dedication forms are available in the appendix. The completed easement dedication form must be signed by the property Owner and notarized.

2. Exhibit Map. An exhibit map (8 ½" x 11") with sufficient description information to establish the legal boundary of the easement shall be provided. The exhibit map shall show and label all existing easements, property lines, and public rights-of-way. The City may request additional information, not listed here, for the exhibit at the city's discretion.

3. A Written Legal Description of the dedicated easement boundary.

4. Funds for Recording. The Developer shall provide cash or a check made out to the **City of Greeley** for the easement recording fees. The City shall provide the recording fee sum once all easement documents are finalized**.** ***The City does not provide the funds for recording easement documents.***

5. Once the easement dedication documents are accepted by the City and the recording fees

have been provided in the appropriate amount, the City shall have the easement documents recorded with Weld County.

2.07 HYDRAULIC REPORT – POTABLE WATER & SANITARY SEWER

A hydraulic analysis for the potable water distribution and sanitary sewer collection systems for a given project shall be submitted by the Design Engineer, as a report, to the City for review and acceptance. The report shall be accepted by the City prior to final Construction Drawing acceptance. The hydraulic analysis report will be reviewed by the City, along with the Construction Drawings, in the same review and acceptance process as outlined in *Section 1*of these Criteria. Projects that move forward to final design without a City accepted potable water distribution and sanitary sewer collection system hydraulic analysis report are subject to possible design changes, including but not limited to, pipe re-alignment, upsizing, extensions, and additional stubouts.

The objective of the hydraulic analysis report is to assist the Design Engineer with designing a project's potable water distribution and sanitary sewer collection systems to adequately serve peak demands while adhering to the design requirements set forth in these Criteria. For the potable water distribution system, the hydraulic analysis report serves as a tool for demonstrating the necessary number of connection points to the existing system for adequate water line looping, system reliability and required pipe sizing. For the sanitary sewer collection system, the hydraulic analysis report evaluates peak flow quantities, flow type, pipe capacity, and flow velocity and establishes appropriate pipe sizing.

Non-potable irrigation system hydraulic and design reports are also required for projects utilizing non-potable water for irrigation purposes; however, since non-potable irrigation systems are unique, the non-potable hydraulic and design report requirements have been provided in section 2.08 of these Criteria.

The written hydraulic report shall include the following information:

A. Title Page

1. Report title.

2. Project name and location.

3. The name, address, and phone number of the Owner, Developer and Design Engineer that prepared the report.

4. Report preparation date.

B. Engineer Certification Sheet

1. The report shall be prepared by or under the supervision of a Professional Engineer, licensed to practice in the State of Colorado, possessing adequate experience in the design of potable water distribution and sanitary sewer collection systems. The report shall contain a certification sheet with the following statement to be signed and sealed by the Design Engineer:

   "I understand the City's acceptance does not relieve the Design Engineer's responsibility for errors, omissions, or design deficiencies for which the City is held harmless.

_____

Registered Professional Engineer

(Affix Seal)

C. Table of Contents

D. Project Description and Location

1. Clearly state the location of the project. Provide a site vicinity map specifying the project's geographical location and the project area in acres. The project acreage shall be the same as on the project plat.

2. Clearly state the land use zoning, estimated number of residential lots or living units, commercial square footages, and the irrigated acreages.

3. Indicate if the project will be phased. Elaborate on the anticipated timing for each project phase and the phase's associated building and infrastructure construction.

4. For multifamily, commercial, or industrial developments, indicate if potable or non-potable water will be used for landscape irrigation.

5. Identify the locations of all potable water, sanitary sewer, and non-potable irrigation connection points to the existing systems.

6. Provide the pipe diameter, pipe material, and year of installation for the existing potable water, non-potable water, and sanitary sewer lines.

E. References and Appendices

1. Provide a page referencing all design criteria, resources, and modeling software used in preparing the hydraulic report.

2. Provide appendices as necessary to include modeling result printouts, copies of demand assumption data, and fire flow test results.

3. Hydrant flow tests results may be available from Greeley Fire Department (970-350-9511). Obtained fire flow test pressures will be evaluated for use by the City on a case by case basis.

F. Potable Water System Report Requirements and Assumptions

1. Provide all used equations, demand assumptions, and essential design requirements, parameters, and constraints.

2. Indicate the software package(s) and version used for the water system modeling.

3. Indicate in which City of Greeley potable water pressure zone the project is located.

4. Provide calculations for estimated population, design flows and velocities, irrigated acreage, irrigation application rates, peaking factors, and any other necessary design

calculations.

5. Provide hydrant fire flow and fire sprinkler system flow requirements.

G. Potable Water System Analysis and Modeling

1. Modeling Scenarios

a. Static. The static scenario shall establish the available water pressure for the site with no demands on the system and serves to check that pressure requirements are maintained.

b. Peak hour demand plus fire flow. This scenario shall include peak hour domestic water use[1] demands plus fire flow[2].

c. Peak hour demand plus fire flow with one (1) water connection closed. While using the determined potable water demands for the peak hour plus fire flow scenario, each connection to the existing potable water system shall be closed, in turn, and modeled. Fire flow shall be placed at a hydrant nearest to the closed connection. This scenario represents a worst-case water demand condition and shall only serve to demonstrate how the potable water distribution system within the development functions during this condition. It is acceptable to have the potable water system velocity requirements violated in this scenario only. The system must maintain a minimum pressure of 20 psi with fire flow.

d. Phasing. Water modeling shall be required for the incomplete potable water system as indicated per the planned phasing on the Construction Drawings, in order to demonstrate that peak hour demand plus fire flow can be met for the interim phased condition.

The hydraulic report shall verify that a proposed potable water system can provide the required water demands for a given development, at an acceptable pressure, and meet the overall potable water system design requirements set forth in these Criteria. At the City's discretion all ultimate connections to existing water mains may be required regardless of development phasing. Upsizing water mains within a development as a means to increase water system capacity in lieu of making a connection to another water source, is not permitted.

If the hydraulic water model demonstrates that a larger main is required to serve the phased condition than would be needed for the full build out condition, the Developer is required to install the larger pipe at their expense and is not eligible for pipe oversizing reimbursement from the City when the larger pipe is no longer needed.

e. Additional scenarios. At the City's discretion, the City may require additional

[1] Domestic water use shall refer to all household and corresponding lot irrigation for single family and applicable multifamily residential potable water use. It shall also refer to all potable water use, including potable irrigation, for commercial and industrial uses.

[2] Fire flow shall be inclusive of fire hydrant and fire sprinkler flow. Residential, commercial, or industrial developments requiring fire sprinkler systems shall have fire sprinkler demands, in addition to hydrant fire flows, placed in the hydraulic water model at appropriate node locations.

scenarios, adjustments to the fire flow placement, reservoir elevations, and existing system connections, revisions to the pipe and node schematic layout, and other model modifications as necessary to verify that the proposed potable water system will meet the design requirements and potable water demands of the development and the City as a whole.

f. At the City's discretion, the hydraulic analysis may be required to extend beyond the limits of the project boundary.

g. Demands for undeveloped parcels shall be calculated based on the higher of the current or anticipated land use or zoning of the property.

h. Model must be compatible and capable of being integrated with City's hydraulic model developed with InfoWater. Model must be provided to Water and Sewer upon request.

2. Modeling Procedure

a. Connections to the existing potable water distribution system are typically denoted as reservoirs with the same hydraulic grade elevation. The City shall provide inflow pressure.

b. Place estimated domestic water, fire sprinkler, and irrigation tap demands at appropriate node locations within the model as they relate within the project.

c. Locate fire flow demands at hydrant locations according to the modeling scenarios in section 2.07-G of these Criteria. The maximum allowable fire flow provided from any one (1) hydrant shall be 1,500 gpm. If the required fire flow is in excess of 1,500 gpm, the next closest hydrant shall be used until the required fire flow is met.

d. Depending on the location of the development, existing potable water system performance and reliability in the area, number of available potable water connections, and surrounding land uses, some of the project's proposed potable water connections may require modeling as a demand point or no connection instead of a water source. The City shall provide additional outflow demands for a development on a case by case basis.

H. Potable Water System Report Results

1. Provide a schematic layout of the potable water distribution system showing and labeling the reservoir connections, pipe network, and demand nodes as presented and analyzed for each water model scenario.

2. Provide a Reservoir Report for the static condition. The Reservoir Report shall include the following information:

a. Reservoir Identification Label

b. Elevation (ft) per City of Greeley datum

3. Provide Pipe Reports for all modeled scenarios. Pipe Reports shall include the following

information.

a. Modeled Scenario Title

b. Pipe Identification Label

c. Pipe Length (ft)

d. Pipe Diameter (in)

e. Pipe Material

f. Hazen-Williams Coefficient

g. Pipe Control Status (open or closed)

h. Pipe Velocity (ft/s)

i. Upstream Calculated Pressure (psi)

j. Headloss (ft)

4. Provide Junction/Node Demand Reports for all modeled scenarios. Junction/Node Demand Reports shall include the following information:

a. Modeled Scenario Title

b. Node Identification Label

c. Node Elevation (ft) per City of Greeley datum

d. Node Demand (gpm)

e. Calculated Hydraulic Grade (ft)

f. Pressure (psi)

I. Potable Water System Design Conclusions

1. Discuss hydraulic analysis results for all modeled scenarios.

2. Confirm that the pipe velocity and pressure requirements during the peak hour demand plus fire flow operating condition are met per *Section 3* of these Criteria.

3. Confirm that the pressure requirements during the peak hour demands plus fire flow operating conditions, with one water connection closed, are met per *Section 3* of these Criteria.

4. Discuss any potable water line oversizing required by the City over and above what is necessary for the development's potable water needs.

5. For phased developments, discuss phased construction of the potable water distribution

system and confirm that potable water pipes are sized and looped appropriately to meet the peak hour, plus fire flow demand velocity and pressure requirements during the interim condition.

J. Sanitary Sewer System Design Requirements and Assumptions

1. Provide all used equations, demand assumptions, and essential design requirements, parameters, and constraints.

2. If a model is required, it must be compatible with the City's InfoSWMM model. Model must be provided to Water and Sewer upon request.

3. Provide calculations for estimated population, design flows, peaking factor(s), hydraulic design, infiltration, flow type, and any other necessary design calculations.

K. Sanitary Sewer Systems Analysis and Modeling

1. If the development is phased, the sanitary sewer system shall be analyzed for full build out. This evaluation shall include the development's sanitary sewer flows and anticipated offsite sanitary sewer flows impacting the sanitary sewer system within the development.

2. Evaluate the development's sanitary sewer sizing for capacity to convey offsite flows.

3. Undeveloped areas shall have sanitary sewer flows calculated based on the higher of the current or anticipated land use or zoning of the property.

4. The City may require additional analysis in order to further verify that the proposed sanitary sewer system will meet the design requirements and needs of the development and the City. The City will evaluate sanitary sewer system hydraulic evaluations on a case by case basis.

L. Sanitary Sewer System Report Results

1. Provide a schematic layout of the sanitary sewer collection system showing and labeling all manholes, design points used for analysis, pipe slopes, and pipe sections.

2. Provide written calculations or printouts of software analysis results for each pipe evaluation including the following information:

   a. Pipe Diameter (in)

   b. Material

   c. Date of installation

   d. Pipe Slope (%)

   e. Sub and Super Critical Calculations, when a model is required

   f. Manning's n Value

g. Pipe Discharge-(gpm)

h. Pipe Flow Velocity (ft/s)

i. Pipe Flow Depth (in)

j. d/D (depth of flow/diameter of pipe)

k. Maximum Capacity at d/D of 50% and/or 80% – (gpm) dependent on date of installation

M. Sanitary Sewer System Conclusions

1. Discuss analysis results for all pipe evaluations.

2. Confirm that acceptable pipe velocities and flow depth criteria are met.

3. If design constraints arise and pipe velocity, flow depth, minimum allowable slope per pipe diameter, or any other Criteria requirements cannot be maintained, the Design Engineer shall provide the City written explanation as to why the Criteria is violated, why the non-standard sewer system design should be accepted, and request a variance to the Criteria. Water & Sewer Department acceptance is required for the variance.

4. Discuss any sanitary sewer main oversizing required by the City over and above what is necessary for the development needs.

5. Indicate if the development is served by "shallow sewer." Shallow sewer is defined in *Section 4* of these Criteria.

6. Discuss potential impacts that future upstream developments may have on the sanitary sewer capacity through the proposed development. Explain the capacity issues within the development and the proposed solutions for resolving them.

N. Supplemental Engineering Calculations

1. These calculations shall include but are not limited to pipe restrained lengths, external pipe load analysis, traffic loadings, casing pipe wall thickness, and air and vacuum release valve sizing.

2. Any calculations deemed necessary by the Design Engineer or City.

O. Wastewater Pumping Stations (Lift Station) Design Report

1. Refer to *Section 4* of these Criteria and CDPHE for lift station design and approval guidelines and lift station design report requirements.

2.08 DESIGN REPORT – NON-POTABLE IRRIGATION SYSTEM

The objective of the non-potable irrigation system design report is to assist the Design Engineer with designing a non-potable irrigation system and storage facility to adequately serve peak season irrigation demands while adhering to the design requirements set forth in these Criteria. Refer to section 2.07 of these Criteria regarding report review and acceptance.

The non-potable irrigation system design report shall include, but is not limited to, the following information:

A. Title Page, Engineer Certification Sheet, and Table of Contents requirements, refer to section 2.07 of these Criteria.

B. Project Description and Location

1. Clearly state the location of the project. Provide a site map identifying the project area and location of the non-potable storage facility (pond), pump station, discharges/fill lines, and overflow works.

2. Indicate if the non-potable system will be phased. Elaborate on the anticipated timing of the project phasing and how it will affect the overall design and construction of the non-potable irrigation system.

3. If connecting to an existing non-potable irrigation system, identify locations of pipe connections. Provide the pipe diameter, pipe material, and year of installation of the existing main.

C. References and Appendices

1. Provide a page referencing all design criteria, resources, and modeling software used in preparing the design report.

2. Provide appendices as necessary to include supplementary information.

D. Non-potable Irrigation System Report Requirements and Assumptions

1. Provide all used equations, assumptions, design methodologies, essential requirements, parameters, and constraints.

2. Indicate any software package(s) and version used for the non-potable pipe system modeling. The model should be compatible with Innovyze InfoWater for incorporation into the City's model.

3. Provide calculations for determining irrigated acreage, required storage volume, pond design including high and low operating elevations, watering requirements, application rates, and design flow.

4. Provide the number and type of pumps, motor horsepower, system head curves, head computations, discharge pressure, and any other pertinent information for the pump system design.

E. Discussion Items

1. Discuss specific design features of the non-potable irrigation system and their requirements, including but not limited to, non-potable/potable water sources and means of delivery into the system, the lining and aeration system, pond shoreline treatment, overflow works, and pond design.

2. General design requirements for the pump station, including but not limited to, power

and electrical requirements, control and monitoring systems, and building requirements.

F. Non-Potable Irrigation System Analysis and Modeling

1. The non-potable irrigation system shall be modeled for the static scenario and the design irrigation demands scenario. Refer to section 2.07 of these Criteria for modeling procedures and report results requirement.

G. Non-potable Irrigation System Design Conclusions

1. Discuss hydraulic analysis results for all modeled scenarios.

2. Confirm that the pipe velocity and pressure requirements during irrigation demand are met per *Section 5* of these Criteria.

H. The City may require electronic copies of the hydraulic models be submitted.

2.09 GEOTECHNICAL SOILS REPORT

A. A geotechnical soils evaluation, prepared by or under the supervision of a Geotechnical Engineer, licensed in the State of Colorado, shall be submitted to the City for review and shall be accepted by the City prior to final Construction Drawing acceptance. The geotechnical soils report shall describe the classifications and characteristics of the soils encountered on the project and include recommended methods of backfilling and compaction. Refer to the Department of Public Works' *SDC,* latest revision, for soils testing and geotechnical soils report requirements.

B. The Geotechnical Engineer shall evaluate groundwater conditions for the site and provide recommendations for sanitary sewer main groundwater barriers.

C. The geotechnical soils evaluations shall include information required to determine potential corrosive soils with pH and resistivity, refer to section 3.11 of these Criteria.

2.10 VERIFICATION SURVEY DRAWING REQUIREMENTS

A. Prior to paving, the Design Engineer shall provide the City with a survey of the installed potable water, sanitary sewer, and non-potable irrigation systems. The purpose of this survey is to verify that the mains and appurtenances were installed per design and within allowable construction tolerances. Once the City has accepted the verification survey, the City shall give the Contractor written notice to proceed with paving construction. ***Verification Survey plans <u>are not</u> As-Constructed Record drawings***. See section 2.11 of these Criteria for As-Constructed Record Drawing requirements.

B. The Verification Survey drawing(s) shall be prepared for easy modification and transition to final As-Constructed Record drawings.

C. The Verification Survey drawings shall be modified from the original construction plan and profile sheets showing the design information as well as the surveyed information. The original design information shall be shown as "lined through" if as constructed conditions differs from approved construction plans. The surveyed information shall be located in the same area as the design information and shall be either "clouded" or made with a heavier line weight than the design information for clear differentiation.

D. Verifications Survey drawings shall be prepared by a Professional Engineer. Surveyed elevations for the Verification Survey shall be obtained by a Colorado Registered Land Surveyor. The Surveyor shall obtain horizontal locations, surveyed elevations and information for the following: To the same precision and datum as design drawings.

1. Potable and non-potable – Horizontal locations of valves, fire hydrants, blow-offs, air/vacuum release valves, and top of pipe elevations at all valves.

2. Sanitary sewer – Horizontal locations of manholes, diameter of manholes, sizes of installed pipe, invert elevations of all mainline pipes and services entering and exiting a manhole, distances between manholes, pipe slopes based on the surveyed invert elevations, and proposed manhole rim elevations.

3. Utilities – Provide horizontal and vertical location of all existing and proposed utility crossings.

4. For potable and non-potable water lines, provide the proposed final ground elevations at all valve boxes. ***Surveyed top of valve nut and valve nut key extension elevations. This information must be used to calculate top of pipe elevation based on the height of the installed valve bonnet, which varies due to pipe diameter and valve manufacturer.***

5. Any other surveyed information as required by the City.

A. Construction tolerances shall be:

1. Water System - Horizontal locations: ± 0.30 feet and Elevations: ± 0.30 feet

2. Sanitary System - Horizontal locations: ± 0.30 feet and Elevations: ± 0.02 feet

B. Survey measurement accuracy shall be:

1. Horizontal locations: ± 0.10 feet

2. Elevations: ± 0.01 feet

2.11 AS-CONSTRUCTED RECORD DRAWING REQUIREMENTS

A. The Contractor and Design Engineer shall be responsible for recording As-Constructed information on a set of Record Drawings kept at the construction site. A representative of the Developer shall monitor construction to assure that changes in construction (as approved in writing) and other pertinent details, such as horizontal location of fittings and manholes, valves, top of pipe elevations, manhole inverts, service tap locations, pipe sizes, depths, etc. are kept current on the As-Constructed Record Drawings.

B. Where the construction is phased with a more than 30-day lapse between phases, As-Constructed Record Drawings shall be submitted to the City after each completed phase. The Construction Drawings for all future phases shall also reflect the "As-Constructed" conditions of the previous phases.

C. At a minimum, the As-Constructed Record Drawings set shall include the following sheets from the original accepted Construction Drawings:

1. Cover Sheet

2. Utility Plan

3. All potable water, sanitary sewer, and non-potable irrigation plan and profile sheets.

4. All construction details and City of Greeley Standard Drawings that were used in the construction of the potable water distribution, sanitary sewer collection, and non-potable irrigation.

5. Landscape plans.

D. The As-Constructed Record Drawings shall show the original design information as well as the As-Constructed information. The original design information shall be shown as "lined through". The As-Constructed information shall be located in the same areas as the design information and shall be either "clouded" and/or made with a heavier line weight as the design information for clear differentiation. The month and year of the construction shall also be noted.

E. A Colorado Registered Land Surveyor shall certify the As-Constructed horizontal locations and surveyed elevations of all items listed in section 2.10 of these Criteria in addition to:

1. Final sanitary sewer manhole rim elevations and Inverts.

2. Final top of water valve box elevations, top of pipe.

3. Construction tolerances shall be evaluated based on original design and City design criteria.

4. Measurement tolerances shall be:

i. Horizontal locations: ± 0.10 feet

ii. Elevations: ± 0.01 feet

F. The project responsible Design Engineer and Land Surveyor shall observe construction, as required, in order to certify the conditions and information recorded on the As-Constructed Record drawings is true and correct.

G. The General Contractor for the project shall sign each drawing sheet of the As-Constructed Record plans set with the following statement:

I, _____, hereby state that this project was constructed to City of Greeley accepted Construction Drawings and standards, as designed by the project Design Engineer, and as field staked by the project Land Surveyor. All deviations to the approved Construction Drawings, standards, design, or survey were so noted on field drawings and these were provided to the project Design Engineer for acceptance and inclusion in the As-Constructed Record Drawings.

_____

Construction Company

_____

Address

_____

Authorized Representative

_____

Title Date

H. A Professional Land Surveyor shall perform or directly supervise all field survey data collection to verify the As-Constructed conditions and shall stamp and seal each drawing sheet in the As-Constructed Record Drawing set with the following statement:

I, _____, hereby state that this project was field staked for construction per City of Greeley accepted Construction Drawings and standards and in accordance with the project design. I certify that the field survey information obtained for the As-Constructed Drawings was obtained in accordance with City current standards and is accurately represented on these As-Constructed Record Drawings.

_____

Registered Professional Land Surveyor

(Affix Seal)

I. A Professional Engineer shall review all the As-Constructed information for compliance with the original approved design and standards and shall stamp and seal each drawing sheet in the As-Constructed Record plan set with the following statement:

I, _____, hereby state that I have reviewed the As-Constructed information provided by the project Contractor and project Land Surveyor. I certify that according to the information provided the As-Constructed Record Drawings are in compliance with the City of Greeley accepted Construction Drawings and standards and will function as designed.

_____

Registered Professional Engineer

(Affix Seal)

J. As-Constructed Record signed and sealed drawings shall be submitted to and accepted by the City prior to issuance of Substantial Completion, in the form of one electronic PDF version and one file package containing GIS spatial data compatible with ESRI ArcGIS using the coordinate system referenced in the most recent City of Greeley Control Points Datasheet. The two (2) year warranty period for the installed potable water, sanitary sewer, and non-potable irrigation systems will begin **after** the Certificate of Substantial Completion has been issued by the City. The request for the Substantial Completion Certificate may be initiated by the City or requested by the Developer, but in all cases is the sole responsibility of the Developer.

K. The City will compare the certified As-Constructed Record Drawing information with the approved Construction Drawings, previously submitted Verification Survey, and information the City may be aware of during the construction process. Any corrections, additions, or omissions to the As-Constructed Record Drawings shall be provided to the Design Engineer who prepared the As-Constructed Drawings for changes.

L. The Certificate of Substantial Completion, will NOT be granted until the As-Constructed Drawings for the potable water, sanitary sewer, and non-potable irrigation systems are accepted by the City. (Ordinance 44, 2002)

M. The Certificate of Final Acceptance occurs at the end of the two year warranty period and final walk through of the project.

2.12 REIMBURSEMENT FOR PUBLIC INFRASTRUCTURE DESIGN AND INSTALLATION COSTS

A. The City may require the Developer to install a potable water, sanitary sewer or lift station, non-potable irrigation main or non-potable pond and pump station larger than is needed to adequately serve development.

B. For the installation of mains the City will reimburse the Developer for the materials costs above that required for the development. The difference in materials costs shall only include the difference in pipe materials, manhole materials, valve materials, and fitting materials. Additional materials costs, if any, shall be agreed upon in writing, prior to commencement of construction.

C. For sanitary sewer collection main oversizing, the City may reimburse the Developer for additional costs due to sanitary sewer main installation excavation depth or width beyond that required for the development.

D. If the City requested oversizing results in significant change to horizontal or vertical alignment, additional reimbursement may be agreed to prior to construction.

E. For the installation of sanitary sewer lift stations and non-potable ponds and pump stations the City will reimburse the Developer for the materials costs above those required by the development on a pro rata basis using the portion of the lift or pump station capacity that is not required for the development. The scope of the reimbursement and the reimbursement ratio shall be agreed upon in writing prior to the commencement of construction.

F. For non-potable pond oversizing, the City may reimburse the Developer for extra excavation and materials costs due to additional depth above that required size for the development.

G. The Developer shall submit a materials list with unit prices, quantities, and, if appropriate, a cost comparison between the two pipe sizes under consideration. Reimbursement will only be paid after the As-Constructed Record Drawings have been accepted by the City. Copies of material invoices for materials delivered to the development site and used in construction shall be provided along with the Developer's request for reimbursement.

H. If the Developer is required to design and construct off site potable water, sanitary sewer, or non-potable irrigation mains in order to serve the development, the Developer may be eligible for design and construction cost reimbursements from other developments that connect to that main. Conversely, if the Developer connects to potable water, sanitary sewer, or non-potable irrigation mains constructed by another Developer or the City, the Developer may be required to participate in the design and construction costs of those lines. Refer to the *City of Greeley Charter and Code, Title 20: Public Services*, sections 20-159, 20-160, 20-161, 20-322, 20-323, and 20-324 for additional reimbursement requirements.

2.13 Subsurface Utility Engineering

A. All new underground facilities, including laterals up to the structure or building being served shall be electronically locatable when installed as required by Colorado Revised Statute 9-1.5-103 as amended

B. All services including potable water, non-potable irrigation water, and sanitary sewer must be locatable up to the structure using tracer wire. See Water & Sewer standard details for the required tracer wire specifications.

C. Potable and non-potable irrigation water mains shall be locatable using tracer wire. See Water & Sewer standard details for the required tracer wire specifications.

D. Sanitary sewer mains do not require tracer wire as they are electronically locatable by other means, including. robots, sonde, and camera systems.

SECTION 3

POTABLE WATER DISTRIBUTION SYSTEM DESIGN CRITERIA

3.01 GENERAL

The purpose of this section is to provide information for the design and layout of a potable water distribution system. Potable water distribution system design shall be in accordance with the City of Greeley *Water Master Plan*, latest revision, and these Criteria.

This section is not intended to be inclusive of all situations and the Design Engineer may be required to use additional engineering judgment to meet the overall design intent for constructability and long-term operations and maintenance. **This Design Criteria typically applies to potable water mains sixteen inches (16") in diameter and smaller.** The City of Greeley Water and Sewer Director reserves the right to make final determinations of the system design based on the best interest of the City's system. Refer to standard detail drawings for additional design information.

3.02 DEFINITIONS

A. Potable Water Distribution Mains

1. A potable water distribution main is a water pipe that primarily serves as a delivery conduit to transport potable water from transmission mains or reservoirs directly to individual water services.

2. Potable water distribution mains within the City are eight inches (8"), twelve-inches (12"), and sixteen-inches (16") in diameter.

B. Potable Water Transmission Mains

1. A potable water transmission main is a water pipe that primarily serves as a delivery conduit to transport potable water directly to the distribution reservoirs and mains.

2. Potable water transmission mains are generally larger than sixteen inches (16") in diameter.

C. Potable Water Services

1. Potable water services include all piping, fittings, and appurtenances used to convey potable water from the distribution main to the customer.

3.03 DESIGN FLOW

A. The potable water distribution system shall be designed to transport peak hour plus fire flow demands in accordance with these Criteria.

B. All water demands used in the design of potable water distribution systems are subject to approval by the City.

C. Design Flow

1. The water demand criteria presented in the following table are minimum criteria and the City reserves the right to modify the Criteria, at any time, for the design of specific projects. Potable water demand criteria for uses not provided in the table shall be determined during system design.

TABLE 3-1: Potable Water Design Flow

Residential			
Zoning based on *City of Greeley Charter and Code*, *Chapter 24.401, Zoning*			
Use	**Units Per Acre***	**Occupancy**	**Peak Hour Demand**
R-E	3	3.1 persons	1.9 gpm/unit
R-L	5	3.1 persons	1.9 gpm/unit
R-M	10	2.7 persons	1.7 gpm/unit
R-H	20	1.7 persons	1.1 gpm/unit
R-MH	15	1.7 persons	1.1 gpm/unit
*Use these unit per acre values unless specific unit counts are known			
Commercial			
Where uses are known, use the specific demand values. Commercial demands based on 1000 ft^2 of building area unless noted otherwise. Otherwise use the appropriate zoning demand values.			
Use	**Average Day Demand without Irrigation**		
C-L	1500 gpd per acre		
C-H	3000 gpd per acre		
I-L & I-M	1500 gpd per acre		
I-H	3000 gpd per acre		
Use	**Average Day Demand**		
Restaurant	500 gpd		
Retail/Office	200 gpd		
Grocery	430 gpd		
Laundry, Dry Cleaning	1000 gpd		
Auto Dealer, Repair/Servic	115 gpd		
Car Wash with Water	1500 gpd		
Hospital	380 gpd		
Hotel/Motel	350 gpd		
Retirement & Nursing	350 gpd		
School	12 gpd/student without showers 36 gpd/student with showers		
Religious Building	300 gpd		

Warehouse (Non-industrial)	25 gpd
Irrigation	25 gpm per acre

2. Irrigation is included in the residential water demand, but not included in the commercial water demand. Irrigation demands for commercial uses shall be determined using the provided irrigation demand criteria and the commercial development's estimated irrigated acreage.

3. For residential demands without irrigation flows, a base flow of 60 gallons per capita per day shall be used.

4. Treat Mixed-Use High Intensity Zoning as 50% R-H and 50% C-H and Mixed-Use Low Intensity Zoning as 50% R-H and 50% C-L unless a more detailed breakdown is known.

5. Due to the extreme variation in water consumption amongst the different types of industry, industrial water demands shall be determined during system design when the industrial use is known.

D. Peaking Factor

1. The peaking factor for indoor water use should align with the peaking factor for sanitary sewer in most situations. Instances where the two peaking factors do not align will require approval by the City of Greeley.

2. A domestic peaking factor shall be obtained from ASCE Peak Flow Curve G[1]:

$$P_f = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where P = Population in thousands (example: P = 2 for population of 2,000)

$$P_f = \frac{18 + \sqrt{\frac{F}{60000}}}{4 + \sqrt{\frac{F}{60000}}}$$

Where F = Flow in gallons per day (based on 60 gpcd in Table 4-1)

E. Fire Flows

1. Contact City of Greeley Fire/Rescue Department (970-350-9510) for the latest adopted fire code and to confirm project fire flow requirements.

2. For design purposes, the maximum allowable fire flow provided from any one (1)

[1] American Society of Civil Engineers (ASCE). 1982. *Gravity Sanitary Sewer Design and Construction. Manuals and Reports on Engineering Practice – No. 60.* Reston, VA: American Society of Civil Engineers.

hydrant is 1,500 gpm. Fire flow may be obtained from more than one (1) fire hydrant providing the additional hydrants are accessible to any possible fire location and meet the spacing requirements and distances from structures as specified in section 3.19 of these Criteria and by the City of Greeley Fire Department.

3.04 PRESSURE REQUIREMENTS

Potable water distribution systems must be designed to provide minimum and maximum system pressures as discussed in the following sections. Water system pressure information for the City's existing system shall be verified by the City.

A. The potable water distribution system in all areas shall be designed for a maximum pressure of 125 psi and a minimum pressure of 40 psi at peak hour demands without fire flow.

B. Twenty (20) psi residual pressure is required at any one (1) hydrant with peak hour demand plus fire flow with one (1) water connection closed.

C. Pressure zones shall conform to existing City of Greeley pressure zones as provided in the *Water Master Plan*, latest revision. Specific information on the pressure zones or to confirm which pressure zone a development or site is actually located may only be obtained from the City. See Table 3.2 for ground elevation ranges for each pressure zone.

D. Pressure regulating valves (PRV) or control valves will be required between pressure zones. The final PRV location shall be determined by the City.

TABLE 3-2: Pressure Zone Elevation Ranges

Zone1: 4740' – 4500'
Zone 2: 4840' – 4740'
Zone 3: 4940' – 4840'
Zone 4: 5060 – 4940'

3.05 HYDRAULIC DESIGN

A. Friction Coefficient

1. Potable distribution mains shall be designed using a Hazen-Williams friction coefficient "C" equal to 120.

B. Velocity

1. All pipes shall be sized for a maximum water velocity of no greater than five (5) feet per second (fps) at peak hour demand and seven (7) fps at peak hour demand plus fire flow.

3.06 POTABLE WATER MAIN SIZE

A. Unless specifically indicated in the *Water Master Plan*, sixteen-inch (16") mains are required every mile and twelve-inch (12") mains are required every half-mile. Other distribution mains shall have a minimum diameter of eight inches (8").

B. Hydrant leads connecting to the potable distribution system shall be six inches (6") in diameter. Other pipe diameters for hydrant leads are prohibited.

3.07 DEPTH OF BURY

A. The minimum depth of cover shall be five (5) feet and the maximum depth of cover should generally not exceed six (6) feet. Design preference is to minimize lowering which can be challenging to locate and maintain.

B. When design or constructability constraints are present, deeper or shallower water main installation may be permitted only with acceptance from the City. Additional design and installation considerations may be required by the City depending on the situation. Design considerations should minimize additional fittings and elevation changes where feasible.

3.08 CONNECTIONS TO THE EXISTING POTABLE WATER SYSTEM

A. Main connections to the existing potable water distribution system shall be made by wet tap or cut in tee. All wet taps and all cut-in tees on mains smaller than 16" diameter shall be made by the Contractor under the direct supervision of the City. It is the Contractor's responsibility to provide all approved tapping materials (tapping sleeves, tapping valves, insulator kit, etc.). Taps for new 8" and 12" main connections to existing 16" or larger mains shall be performed by the City unless otherwise directed.

B. Connections to the existing transmission mains or distribution mains larger than sixteen-inch (16") shall be limited and must be approved by City.

C. For wet taps on existing transmission mains or sixteen-inch (16") and larger distribution mains, manufacturer's shop drawings and specifications for the proposed tapping sleeve shall be submitted to the City for review and acceptance prior to installation of the tapping sleeve by the Contractor.

D. Taps on existing transmission mains or sixteen-inch (16") and larger distribution mains shall require the installation of an insulator kit between the tapping sleeve and tapping valve.

E. Connection to cast iron mains constructed prior to 1950 may require replacement or non-standard fittings which must be reviewed and approved by City of Greeley Water & Sewer department.

F. Construction documents shall include a note for all wet taps: "Contractor to reference specifications for approved tapping materials and prior to installation shall contact Distribution for direct supervision of installation by the City."

3.09 LOCATION AND LOOPING OF POTABLE WATER MAINS

A. Potable water mains shall be located in the center of a dedicated street right-of-way, where feasible, or within a dedicated exclusive easement of appropriate width. If narrow street

sections do not allow the water line to be located in the center of the street right-of-way while maintaining clearances from other utilities and the lip of street gutter, the City may allow the potable water main to be located five (5) feet offset from centerline of the street right-of-way. City approval is required for all other proposed potable water main locations.

B. The centerline of potable water mains shall not be placed closer than five (5) feet to the lip of street gutter without prior acceptance by the City. Preferred location is to maximize distance from lip of gutter.

C. Potable water mains serving a cul-de-sac shall be extended to within ten (10) feet of the lip of street gutter at the end of the cul-de-sac and shall have a hydrant assembly placed on the line.

D. A potable water main serving one (1) lot shall extend all the way across the frontage for that lot.

E. Where non-compliant or private water mains or service lines exist within or adjacent to a new development, replacement of lines or additional connections to those lines may be required.

F. Permanent dead-ends are prohibited without prior approval by Water & Sewer. City preference is no dead-end lines and may require additional infrastructure to meet water quality requirements.

G. Temporary dead-ends with services shall have a fire hydrant or a flushing station with an acceptable discharge point at the end of the line.

H. Temporary dead-ends with no services shall have a closed valve at the point of connection with the active distributions system and will not require a hydrant or flushing station after the valve.

I. For temporary phasing, an adequate number of connections to the existing potable water distribution system as determined through hydraulic modeling and approved by the Water & Sewer shall be provided.

1. Potable water mains shall extend to the extremities of the property or the subdivision served. Extensions shall be in appropriate locations to provide adequate water connections and to maintain looping requirements for adjacent, future developments and to facilitate the completion of the grid described in section 3.06 of these Criteria.

2. Water mains shall be extended offsite when required to tie into the existing distribution system for additional water source connections. Appropriately sized easements shall be provided.

J. In all instances, the City shall determine the potable water system looping, connections, and valving in order to maintain overall water system performance. Ultimately, the required source connections to the existing potable water system shall be solely determined by the Water & Sewer Department.

1. New developments shall have at minimum two separate and distinct connections to the existing system to provide reliability for maximum fire flows in case of pipe failure and

better system circulation to maintain acceptable water quality. Source connections shall be made on opposite sides of the development.

3.10 POTABLE WATER SYSTEM PHASED INSTALLATION AND STUBOUTS

A. Potable water distribution system phasing, if proposed by the Developer, shall be clearly identified on the overall utility plan. Water plan and profile sheets shall clearly show and label the phasing transitions in the potable water line design.

B. The proposed potable water system phasing shall maintain looping integrity within the system as described in section 3.09 of these Criteria.

C. The phased potable water system design shall meet the phased water demands for the development and adhere to all potable water system and hydraulic design requirements provided in these Criteria.

D. Locate line valves and temporary fire hydrant and flushing station at the end of each phase or stub out, as described in section 3.09 of this criteria. The stubout shall be shown on the potable water plan and profile sheets.

E. Phased water line or stubout construction shall be extended a minimum ten (10) feet beyond phased street paving to avoid asphalt removal during excavation for future connections.

F. Phased potable water mains or stubouts intended for future connections shall be valved such that only one (1) valve needs to be closed when the main is extended and no customers are without water service when the line is extended. The valve must be appropriately restrained so it will not "blow off" when the water line is exposed and all thrust blocking is removed for the extension. See section 3.14 of these Criteria regarding pipe restraint.

G. The maximum length of a stubout shall be fifty (50) feet unless otherwise approved by the City.

H. Potable water main stubouts not utilized shall be abandoned. Refer to appendix section *A3 – Policies Impacting Design and Construction* for abandonment procedures.

3.11 PIPE MATERIAL

A. Potable water pipes less than or equal to sixteen-inches (16") in diameter shall be AWWA C151 cement-lined ductile iron pipe or AWWA C900-16 polyvinyl chloride (PVC) pressure pipe.

1. HDPE pipe and fused PVC may be used with City approval for specifically identified purposes, location and uses such as horizontally bored crossings.

B. The Design Engineer shall specify the pipe material and class, as required for specific project conditions. The pipe material and class shall be called out on the Construction Drawings.

C. All ductile iron pipe shall be protected against soil corrosion based on the corrosion level determined from pH and Resistivity levels in accordance with the following table. If the corrosion level is found to be Medium or lower, the pipe shall be wrapped with 8-mils of V-Bio Enhanced Polyethylene Encasement in accordance with AWWA C105. If the Corrosion level is Medium-High or High, then additional Zinc coating of the pipe shall be required.

TABLE 3-3: Corrosive Soil Function of pH and Resistivity

pH	Resistivity (Ohms-cm)	Corrosion
<3.5	Any	High
3.5-4	<4,500	High
	>4,500	Medium-High
4.5-5.5	<4,500	High
	4,500-5,000	Medium-High
	>5,000	Medium
5.5-6.0	<1,000	High
	1,000-5,000	Medium-High
	5,000-10,000	Medium
	>10,000	Medium-Low
6.0-9.0	<1,000	High
	1,000-3,000	Medium-High
	3,000-10,000	Medium
	10,000-20,000	Medium-Low
	>20,000	Low

3.12 VALVES

A. All valves shall be located in dedicated street right-of-way or within a dedicated exclusive easement of appropriate width. City approval is required for all other proposed valve locations.

B. Gate Valves

1. Gate valves are assigned in the potable water distribution system so that no single accident, break, or repair necessitates shutting down a length of pipe greater than 1,000 feet in all directions or no more than one hundred fifty (150) people are out of service at any one time.

2. At street intersections, gate valves shall be located at the extension of property lines, wherever possible.

3. Gate valves shall be located a minimum five (5) feet away from the edge of concrete cross pans or cutters and away from intersection. This requirement has precedence over section 3.12-B. of these Criteria.

4. Fire hydrant and fire sprinkler line gate valves shall be placed at the main. These gate

valves shall be mechanical joint valves and fasten to a mechanical joint anchor tee (swivel tee) on the main.

5. All potable water line valves shall have a concrete collar around the valve box in accordance with *SDC* Standard Drawings.

6. City may require additional valves to allow for maintenance and control and minimizing service outages. Final valve locations shall be solely determined by the City.

7. Valves shall be provided at both ends of water pipelines where the potential of inaccessibility for repairs may exist, this may include; rivers, ponds, ditches, railroads and highways. Where looping is required, valves shall be located at easement lines or ROW to maintain potable service.

C. Combination Air Valves

1. Sixteen-inch (16") diameter mains shall have combination air valves installed at high points along the main and shall be properly sized by the Design Engineer in accordance with the manufacturer's recommendation. The City shall have final determination on valve size, placement, and type of valve to install.

D. Pressure Regulating Valves

1. Pressure regulating valves (PRVs) control pressures between potable water distribution system and shall be placed at pressure zone boundary. The final installation location shall be determined by City.

2. The standard PRV size is eight inches (8") for all 8" mains unless otherwise approved by the City. For all mains larger than 8", duplex PRVs are required and shall be sized according to hydraulic calculations unless otherwise approved by the City.

E. Blowoffs

1. Any required blowoff location shall utilize a city approved fire hydrant or flushing station.

3.13 PIPE ALIGNMENT

A. Potable water mains may have a change in alignment or grade to avoid obstructions, within the limits of the pipe joints. If joint deflections is not feasible or permitted by the City, an appropriate bend fitting shall be used.

B. Allowable Joint Offset for PVC Pipe

TABLE 3-4: Maximum PVC Pipe Joint Deflection or per manufacturers limits whichever is more restrictive

Pipe Diameter (in)	Maximum Joint Deflection (°)
8"	1°

12”	1°
16”	1°

C. PVC pipe can be joined with High Deflection (HD) Couplings which allow five degrees (5°) of pipe joint deflection per coupling. HD couplings can be used in the place of small bends or where it is undesirable or impossible to joint deflect the pipe.

D. Allowable Joint Deflection for DIP Pipe

TABLE 3-5: Maximum DIP Pipe Joint Deflection or per manufacturers limits whichever is more restrictive

Pipe Diameter (in)	Maximum Joint Deflection (°)
6”	4.0°
8”	4.0°
12”	4.0°
16”	2.5°

3.14 THRUST BLOCKING AND PIPE RESTRAINT

A. Concrete thrust blocks or pipe restraints shall be constructed at all mainline bends, tees, dead ends, and valves as shown in the City of Greeley Standard Drawings.

B. Thrust Blocks

1. The thrust block details, as shown in the City of Greeley Standard Drawings, are to be used as minimums only. The Design Engineer shall determine the required size of thrust blocks to use.

2. If for any reason (i.e. temporary dead end line), concrete thrust blocks cannot be used, restrained push-on or mechanical joint restraints shall be required.

C. Pipe Restraint

1. The pipe restraint details, as shown in the City of Greeley Standard Drawings, are to be used as minimums only. The Design Engineer shall determine the required size of thrust blocks to use.

2. For transmission mains, the Design Engineer shall determine the length of required pipe restraint, for the pipe material being used, PVC or DIP, in accordance with AWWA M41 *Ductile-Iron Pipe and Fittings* or AWWA M23 *PVC Pipe – Design and Installation*, latest revision.

D. In some instances (i.e. fire hydrants, large diameter fire lines, water line lowering’s, etc.) thrust blocks may be required in addition to pipe restraint. The design engineer or City shall make such determinations on a case-by-case basis.

3.15 POTABLE WATER MAIN AND SERVICE ENCASEMENTS FOR WET UTILITIES

Wet utilities should be defined as any pipeline that could contaminate the potable water system.

A. No general statement can be made to cover all encasement conditions, therefore only typical encasement situations are addressed in this section. Encasement requirements shall ultimately be determined by the City on a case-by-case basis.

B. Refer to construction specification *Section 02445, Casing Pipe – Borings and Encasements* for encasement pipe material, diameter, and wall thickness (if applicable), casing spacers, and standard detail end seals, and installation requirements. No encasements shall be constructed from poured concrete.

C. The use of "line" or "lines" in this section shall refer to both mains and services.

1. Where sanitary sewer lines cross beneath potable water lines with less than eighteen inches (18") clearance or any sanitary sewer lines cross above potable water lines, or the ten (10) feet horizontal clearance between potable water lines and sanitary sewer lines cannot be maintained, pipe encasement shall be designed and constructed so as to protect the potable water line.

2. Where non-potable Distribution lines cross above or below potable water lines with less than eighteen inches (18") clearance, pipe to be center on potable water Main or Fused and shall be designed and constructed so as to protect the potable water line.

3. Pipe encasement shall be placed on the sanitary sewer line or non-potable irrigation line except in situations where the sanitary sewer or non-potable irrigation line is existing. Where the sanitary sewer or non-potable irrigation line is already constructed, the pipe encasement shall be placed on the potable water line. Priority shall be given to encase service lines before main lines.

4. The encasement pipe shall extend a minimum ten (10) feet on either side of the crossing measured from the outside diameter of the crossed pipe. Longer casing pipes may be required depending on the encasement situation.

5. For any atypical encasement sizing situations, the Design Engineer shall size the encasement pipe such that the inside clearance is at least one inch (1") greater than the maximum outside diameter of the casing spacer runners.

6. Where storm water lines cross above potable water mains, storm water pipe joints shall utilize rubber gaskets and exterior joint wrap a minimum ten (10) feet on either side of the crossed potable water main, measured from the outside diameter of the pipe.

D. Potable water main crossings under any open irrigation ditch shall have a minimum five (5) feet of cover and shall be encased.

E. Bored utility crossings shall have a minimum twenty-four inches (24") of vertical clearance from the outside diameter of the utility casing to the outside diameter of the potable water line if the bored utility crosses above the potable water line and a minimum thirty-six inches (36") of vertical clearance from the outside diameter of the utility casing to the outside diameter of the potable water line if the bored utility crosses below the water line.

F. If there are horizontal or vertical clearance conflicts between the potable water line and gravity utilities, the City may require that the potable water main be lowered, raised, or realigned in order to maintain the required clearances.

3.16 POTABLE WATER MAIN BORINGS & ENCASEMENTS REQUIRED BY OTHER AGENCIES

A. Installation of potable water mains through City of Greeley or another agency's right-of-way, easement, or other, may require a bored casing pipe to facilitate main installation. The type of bored casing material and its properties will be specified by the agency granting permission to cross. Such crossings shall be subject to approval by the City to avoid conflicts in requirements or standards between the City and the agency granting permission to cross.

1. A letter, permit, or approved crossing application from the agency granting permission to cross, must be provided to the City prior to the boring.

2. The City shall not accept any bored crossings imposed with an annual user or crossing fee from the agency granting permission to cross. All bored crossing fees, if applicable, shall be paid by the Developer prior to the boring.

B. The minimum requirements for bored casings within the City shall be in accordance with construction specification *Section 02445, Casing Pipe – Borings and Encasements. & standard drawings*

1. The required bore length of casing pipe shall be determined by the Design Engineer and must be accepted by the City.

2. All bored casing shall have a minimum of twenty-four inches (24") of vertical clearance from the outside diameter of the casing pipe to the outside diameter of the utility line if the bored casing crosses above the utility and a minimum thirty-six inches (36") of vertical clearance from the outside diameter of the casing pipe to the outside diameter of the utility line if the bored casing crosses below the utility, unless more stringent requirements by other utility.

3.17 POTABLE WATER SERVICES AND FIRE SPRINKLER LINES

A. General

1. Potable water service lines shall not be installed in trenches with other wet or dry conduits/utilities. A service line shall be separated from other conduits a minimum ten (10) feet horizontally and eighteen inches (18") vertically. The only exception will be a fire sprinkler line. In this instance, the horizontal separation may be a minimum of five (5) feet, from outside diameter of the pipe and final determination. This shall be evaluated by the City on a case-by-case basis.

2. Potable water services and fire sprinkler lines for a given lot must be tapped on the potable water main within the confines of the extended property lines. Certain lots and cul-de-sacs may have the potable water service line or fire sprinkler line located anywhere along the lot frontage but shall be a minimum three (3) feet and preferred location is five (5) feet inside the property line being served.

3. No potable water service taps shall be made on fire sprinkler lines.

4. All taps shall require a tapping saddle or tapping sleeve and valve as shown in standard detail. No direct taps are allowed.

5. Potable water services and fire sprinkler lines not intended to be utilized shall be abandoned. Refer to appendix section *A3 – Policies Impacting Design and Construction* for abandonment procedures.

B. Water Services

1. Refer to construction specification *Section 02514, Water Service Lines, Meters, and Appurtenances,* for service pipe materials and installation requirement.

2. A separate potable water service line and meter must serve each building with individual owners.

3. No potable water service lines shall cross property lines, including irrigation systems, unless otherwise approved by the City for irrigating multiple outlots. Irrigation systems from a single potable water service shall only be allowed for use on that single property. Refer to appendix section *A2 – Compound Tap Exemption Policy for Irrigation of Multiple Outlots.*

4. No compound potable water taps are allowed. Refer to *City of Greeley Charter and Code, Title 20: Public Services*, Section 20-253.

5. Where one or more master meters are allowed for residential units, meters shall be configured to serve contiguous groups of units on one lot with no more than an estimated twenty-five residents served by a single master meter. The master metered system shall also be designed and constructed such that the property owner does not become a public water provider under state or federal regulations.

6. Pressure boosters are prohibited without adequate backflow protection.

7. Potable water services shall be located a minimum five (5) feet inside the property being served.

8. Under no condition is a potable water service to be located under driveways, trees, or other permanent structures.

9. Potable water service taps shall be separated by at least five (5) feet, measured along the potable water main length, including when taps are on opposite sides of the potable water main. Potable water service taps shall also be a minimum five (5) feet from all joints, fittings, or valves.

10. The corporation stop, curbstop, meter, that portion of the service line between the corporation stop and the meter, and five (5) feet past the meter shall all be the same internal diameter.

11. Potable water service curb stops shall be located ± one (1) foot from the property line or easement boundary and preferred inside the row. Potable water service meter

pits/vaults shall be located as close as possible beyond the curb stop. See City of Greeley Standard Drawings for additional service and meter installation requirements.

12. Potable water service meter pits/vaults shall normally be located after the curbstop in a landscaped area or streetscape. Meter pits/vaults shall not be installed in any street, parking area, driveway, or sidewalk unless otherwise approved by the City. If a meter pit/vault is permitted by the Water & Sewer Department to be located in any traffic area, the pit/vault shall be designed to withstand HS-20 traffic loadings. Curbstops with tracer wire test stations shall be in a valve box.

13. There shall be no major landscaping (trees, boulders, or shrubs with mature growth greater than three (3) feet), buildings, or other permanent structures within ten (10) feet of the meter pit/vault.

14. The maximum allowable number of living units on a single tap may be determined using a fixture analysis per the process outlined in the most recent edition of AWWA Manual of Water Supply Practices M22 – Sizing Water Service Lines and Meters. If no analysis is provided, the maximum values are shown below: Any residential project requesting a domestic tap larger than three inches (3") shall be reviewed on a case-by-case basis.

TABLE 3-6: Living Units Allowed Per Tap Size

Tap Size (inch)	Maximum Allowable Living Units
3/4"	2
1"	4
1 ½"	10
2"	25
3"	45

15. Commercial and industrial developments may provide potable water service stubouts, if the end user is known.

C. Fire Sprinkler Lines

1. Fire sprinkler lines two-inch (2") or smaller shall be type "K" copper. Fire sprinkler lines larger than two-inch (2") shall be restrained DIP. Restrained DIP fire sprinkler lines require concrete thrust blocking at the main and a gate valve at the main. Fire sprinkler lines are not metered.

2. Fire sprinkler lines must be connected to the potable water distribution system. Connections to non-potable irrigation system are prohibited.

3.18 POTABLE WATER MAINS AND SERVICES IN RELATION TO DRY UTILITIES

Dry utilities shall be defined as any utility pipeline that could not contaminate the potable water system.

A. Potable water services and distribution mains shall have a minimum ten (10) feet horizontal and eighteen inches (18") vertical separation from all utilities measured from outside

diameter.

B. Dry utility crossings shall be encased in high density polyethylene pipe (HDPE), Standard Dimension Ratio (SDR) 11 or approved equal from edge to edge of the easement or right-of-way, or ten (10) feet on either side of the potable water main, whichever is greater. Final determination shall be accepted only by the City

C. Right angle utility crossings are only permitted above and below the potable water main with adequate clearance. Non-right-angle crossings shall be approved by the City. Parallel installation of other utilities in exclusive water easements are not permitted.

D. For a potable water line crossing situation not specifically mentioned in this section, the crossing requirements provided in these Criteria shall be applied to that particular situation to the best extent possible.

3.19 FIRE PROTECTION AND HYDRANT SPACING

A. All fire protection, fire flow, and hydrant requirements are subject to approval by the Greeley Fire Department.

B. Hydrant Spacing

1. Residential structures shall be no further than 250 feet, fire access distance[2], from a fire hydrant.

2. In R-L zoned areas, fire hydrant spacing shall be no further than 600 feet measured along the street curb line.

3. In R-M and R-H zoned areas, fire hydrants shall be spaced equal to or less than 500 feet apart, measured along the street curb line. Structures shall be 250 feet or closer, fire access distance, from a fire hydrant.

C. In commercial and industrial areas, structures shall be 250 feet or closer, fire access distance, from a fire hydrant.

D. Where potable water mains are extended along streets where hydrants are not needed for the protection of structures, hydrants shall be provided at spacing not to exceed 1,000 feet.

E. Hydrants shall be located at intersections whenever possible. Hydrants located mid-block shall be aligned with the extension of a property line.

F. Fire hydrants shall be installed in accordance with construction specification *Section 02516, Water Utility Distribution Fire Hydrants* and City of Greeley Standard Drawings.

G. A three (3) foot radius in all directions around the hydrant shall be clear of obstructions.

1. Where hydrants are vulnerable to vehicular damage, crash posts shall be provided outside of the three (3) foot radius clearance in all directions from the hydrant and a

[2] Fire access distance is the distance a fire pumper must travel to lay a standard hose line from a hydrant to the primary access point of a structure. The hose lay distance is not measured over unimproved areas that may be impassable due to weather conditions, obstructions, etc.

minimum of one foot from edge of sidewalk.

2. When hydrants are located less than 4 feet from a vehicular travel path, or not protected by curb and gutter then crash posts shall be provided. Crash posts shall be concrete filled pipes that are four-inches (4") in diameter and a minimum of four (4) feet in height above the finished ground surface with two (2) feet of post below the finished ground surface.

H. All hydrants must be within dedicated exclusive easements or public rights-of-way. Refer to *Section 2* of these Criteria for easement requirements.

3.20 CROSS CONNECTION AND BACKFLOW PREVENTION

A. Potable water service lines on any property or inside any building shall have NO physical connection with any pipes, pumps, hydrants, tanks or non-potable irrigation systems that could draw or discharge any unsafe or contaminated water (including steam condensation or cooling water) into the potable water distribution system.

B. For additional information on cross connection or backflow prevention requirements, refer to appendix section *A1 – Cross Connection and Backflow Prevention Policy*.

SECTION 4

SANITARY SEWER COLLECTION SYSTEM DESIGN CRITERIA

4.01 GENERAL

A. The purpose of this section is to provide information for the design and layout of a sanitary sewer collection system. Sanitary sewer collection system design shall be in accordance with the City of Greeley Sanitary Sewer Master Plan, latest revision, and these Criteria.

B. This section is not intended to be inclusive of all situations and the Design Engineer may be required to use additional engineering judgment to meet the overall design intent for constructability and long-term operations and maintenance. **This Design Criteria typically applies to sanitary sewer mains twelve inches (12") in diameter and smaller.** The City of Greeley Water and Sewer Director reserves the right to make final determinations of the system design based on the best interest of the City's system. Refer to standard detail drawings for additional design information.

4.02 DEFINITIONS

A. Sanitary Sewer Collection Mains

1. A sanitary sewer collection main is a sanitary sewer pipe that gathers wastewater flows directly from individual sanitary sewer services or private sewer mains and transports.

B. Sanitary Sewer Interceptor Lines

1. Sanitary sewer interceptors within the City are fifteen inches (15"), eighteen inches (18"), or twenty one inches (21") in diameter.

C. Sanitary Sewer Trunk Lines

1. A sanitary sewer trunk line is a sanitary sewer pipe that collects sewage flows from the collection mains and interceptors and carries those flows to the wastewater treatment facility.

2. Sanitary sewer trunk lines are larger than twenty-one inches (21") in diameter.

3. All sanitary sewer trunk lines require additional approval through the Colorado Department of Public Health and Environment (CDPHE), and all permitting shall be completed by Developer and Design Engineer and must be approved and signed by City.

D. Sanitary Sewer Services

1. Sanitary sewer services include all piping, fittings, and appurtenances used to convey sanitary sewage from the plumbing system of a structure to a sanitary sewer collection main.

2. Sanitary sewer services are typically four inches (4") or six inches (6") in diameter.

4.03 **DESIGN FLOW**

A. The sanitary sewer collection system shall be designed to carry peak wastewater flows plus infiltration/inflow in accordance with these Criteria.

1. Depending on a development's location, consideration of upstream and offsite flow contributions may be required by the City to ensure proper sizing of the sanitary sewer collection mains within the development. This will be determined by the City on a case by case basis.

2. Depending on the existing capacity of the downstream sanitary sewer collection system, the City may require verification that the downstream sewer system can convey the development's peak flows. If the downstream capacity is inadequate, the Developer may be required to make appropriate downstream sewer system upgrades. This will be determined by the City on a case by case basis.

3. Any infill or redevelopment project that is an intensification of use shall require the Developer to verify that the downstream sewer system can convey the development's peak flows. If the downstream capacity is inadequate, the Developer may be required to make appropriate downstream sewer system upgrades.

B. Design Flow

1. The wastewater flows presented in the following table are minimum criteria and the City reserves the right to modify the Criteria, at any time, for the design of specific projects. Wastewater flows for uses not provided in the table shall be determined during system design.

TABLE 4-1: Sanitary Sewer Design Flow

Residential			
Zoning based on City of Greeley Charter and Code, Chapter 24.401, Zoning District Development Standards			
Use	Units Per Acre	Occupancy	Average Day Wastewater Flows*
R-E	3	3.1 persons	0.13 gpm/unit
R-L	5	3.1 persons	0.13 gpm/unit
R-M	10	2.7 persons	0.11 gpm/unit
R-H	20	1.7 persons	0.07 gpm/unit
Commercial			
Use			Average Day Wastewater Flows*
C-L (not specified)			1,500 gpd/acre (minimum)
C-H (not specified)			3,000 gpd/acre (minimum)
Retail/Offices			200 gpd/1,000 SF
Hotels/Motels			350 gpd/1,000 SF
Restaurants			500 gpd/1,000 SF

Bars and Lounges	300 gpd/1,000 SF
Neighborhood Stores	200 gpd/1,000 SF
Department Stores	200 gpd/1,000 SF
Laundry and Dry Cleaning	1,000 gpd/1,000 SF
Banks	300 gpd/1,000 SF
Nursing Homes	350 gpd/1,000 SF
Warehouses	25 gpd/1,000 SF
Car Washes with Water Reuse	1,500 gpd/1,000 SF
Auto Dealer/Repair/Service	115 gpd/1,000 SF
Grocery Store	430 gpd/1,000 SF
Religious Buildings	300 gpd/1,000 SF
Factories	800 gpd/1,000 SF
Hospitals	380 gpd/1,000 SF
Schools (without showers)	12 gpd/student
Schools (with showers)	36 gpd/student
Industrial	
Use	Average Day Wastewater Flows*
I-L (not specified)	1,500 gpd/acre
I-M (not specified)	1,500 gpd/acre
I-H (not specified)	3,000 gpd/acre
**1cfs = 448.33 gpm* *Average day wastewater flow per capita = 60 gpcd*	

2. All flows used in the design of sanitary sewer collection systems are subject to approval by the City.

C. Peaking Factor

1. A domestic peaking factor shall be obtained from ASCE Peak Flow Curve G[1]:

$$P_f = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where P = Population in thousands (example: P = 2 for population of 2,000)

[1] American Society of Civil Engineers (ASCE). 1982. *Gravity Sanitary Sewer Design and Construction. Manuals and Reports on Engineering Practice – No. 60.* Reston, VA: American Society of Civil Engineers.

$$P_f = \frac{18 + \sqrt{\frac{F}{60000}}}{4 + \sqrt{\frac{F}{60000}}}$$

Where F = Flow in gallons per day (based on 60 gpcd in Table 4-1)

4.04 INFILTRATION AND INFLOW (I/I)

A. Infiltration and inflow (I/I) is extraneous water flow that enters the sanitary sewer collection system.

1. Infiltration is water entering the sanitary sewer collection system from the ground through service connections, defective pipes, pipe joints, and manhole connections.

2. Inflow is unintentional water entering the sanitary sewer collection system from roof drains, underdrains, surface stormwater runoff, and natural drainage. Any direct connections to the sanitary sewer system shall be removed and directed to the appropriate locations.

B. 200 gallons per day per inch-diameter per mile of pipe shall be added to the peak design wastewater flow as the allowance for I/I.

C. 500 gallons per day per inch-diameter per mile of pipe located in groundwater shall be added to the peak design wastewater flow as the allowance for I/I.

D. I/I flows are not subject to a peaking factor.

4.05 HYDRAULIC DESIGN

A. The required pipe size shall be computed by Manning's Equation below:

$$Q = \frac{1.49}{n} A R^{2/3} \sqrt{S}$$

Where:

Q = Flow (cfs)
n = Manning's Coefficient of 0.013
A = Area of Flow (ft^2)
R = Hydraulic Radius (A/P)
Where: P = Wetted Perimeter
S= Slope of pipe (ft/ft)

B. All sanitary sewer collection mains shall be designed to a maximum depth of flow, depending on age.

1. Half full (d/D=0.5) for all mains constructed prior to 2022 due to historical tap locations on the mark.

2. 4/5 full (d/D=0.8) for all new development.

Where:
d = Depth of Flow
D = Diameter of Pipe

C. Minimum design velocity at peak flow shall not be less than two (2) ft/s or greater than seven (7) ft/s. Where 2 ft/s is not feasible, the minimum slope shall be 1% slope for 8" pipe.

1. Sewer shall be designed for velocities less than seven (7) ft/s whenever possible and for subcritical flows whenever possible.

2. When conditions require velocity to be greater than seven (7) feet per second, special provisions shall be made to avoid scour and protect against displacement caused by erosion or impact.

D. When lines are 10" and larger, Developer shall analyze flows for hydraulic jumps and special provisions shall be made to avoid H2S and protect against its effects.

4.06 SANITARY SEWER MAIN SIZE AND SLOPE

A. The following table shows the minimum allowable slopes per sanitary sewer main diameter. These minimum slopes may be used provided that the hydraulic design requirements in 4.05 of these Criteria are met.

TABLE 4-2: Minimum Sanitary Sewer Main Slopes (ASCE)

Pipe Diameter (in)	Minimum Slope (%)
8"	0.40%
10"	0.28%
12"	0.22%
15"	0.15%
18"	0.12%
21"	0.10%

B. The maximum slope for any sanitary sewer collection main shall be 5%

C. The City requires sanitary sewers to maintain a consistent slope throughout the sewer alignment in order to maintain capacity.

D. All proposed sanitary sewers shall maintain the same inner diameter (ID) pipe size to match the existing City collection system; no downsizing shall be allowed.

E. The City may require the Developer to install a sanitary sewer collection main larger than is needed to adequately service the development. Refer to *Section 2* of these Criteria for oversizing reimbursement.

4.07 DEPTH OF BURY

A. Sanitary sewer collection mains shall have four (4) feet minimum depth of cover from the top of pipe to finished ground surface.

B. Where grading, existing field conditions, or service constraints demonstrate that a sanitary sewer main must have less than four (4) feet of cover or when sewer main installation is deeper than twenty (20) feet at the invert, refer to section 4.10.

C. Installation of sanitary sewer mains with depths greater than twenty (20) feet at the invert shall require written approval from Water & Sewer after all reasonable effort is made to keep depths to less than twenty feet.

D. Where the elevation difference between the top of foundation and the top of the sanitary sewer collection main is less than ten (10) feet, the Construction Drawings and the plat shall indicate the lot is served by a "shallow sewer" and appropriate elevation information shall be given.

4.08 LOCATION OF SANITARY SEWER COLLECTION MAINS

A. All sanitary sewer collection mains shall be located in dedicated street right-of-ways. Any other sanitary sewer collection mains shall be in a dedicated easement of appropriate width (refer to section 2.06). City approval is required for all proposed locations.

B. The centerline of sanitary sewer collection mains shall not be placed closer than five (5) feet to the lip of the street gutter without prior acceptance by the City. The sewer collection mains centerline should avoid traffic wheel paths where feasible.

C. Sanitary sewer collection mains shall extend to the upstream extremities of the property or subdivision being served. Main extensions shall be in appropriate locations to provide adequate sanitary sewer system connections for adjacent, future developments.

1. A sanitary sewer collection main serving one (1) lot shall extend all the way across the frontage for that lot.

2. The City may grant exceptions to sanitary sewer collection main extensions if development of an adjacent property is located in a different sewer basin, or if the

property can currently connect to the sanitary sewer system. This will be determined by the City on a case by case basis.

3. Sanitary sewer mains shall be extended offsite when required to tie into the existing collection system.

D. Sanitary sewer collection mains shall be straight between manholes, both in alignment and slope.

E. Stormwater and underdrain piping shall be distinguishable by color from sanitary sewer collection mains.

4.09 SANITARY SEWER COLLECTION SYSTEM PHASED INSTALLATION AND STUBOUTS

A. Sanitary sewer collection system phasing, if proposed by the Developer, shall be clearly identified on the master utility plan. Sewer plan and profile sheets shall clearly show and label the phasing transitions in the sanitary sewer main design.

B. The phased sanitary sewer collection system shall be designed for full build out of the development being served including any additional offsite flows that must be passed through the development. Stub-out shall be designed for future development flows.

C. Phased sanitary sewer main or stub-out construction shall be extended a minimum ten (10) feet beyond phased street paving to avoid asphalt removal during excavation for future connections.

D. A stub-out for future connection shall be provided for an adjoining phase or adjacent future developments.

E. The stub-out design and installation shall maintain both vertical and horizontal alignment in accordance with these Criteria. The stub-out shall be shown on the sanitary sewer plan and profile sheets with the length and end of pipe invert labeled.

F. The end of the stub-out shall be sealed with a removable watertight plug restrained by half (1/2) a cubic yard of concrete behind the plug until the time of future connection.

G. The maximum length of a stub-out shall be forty (40) feet unless otherwise approved by the City. If the maximum stub-out length must be exceeded, the sewer main installation shall end at a terminal manhole or be extended to the next upstream manhole.

H. Sanitary sewer main stub-outs not utilized shall be abandoned. Refer to appendix section *A3 – Policies Impacting Design and Construction* for abandonment procedures.

4.10 PIPE MATERIAL

A. Sanitary sewer collection mains shall be polyvinyl chloride (PVC) SDR 35 pipe suitable for sanitary sewer flows.

B. Alternative pipe materials shall only be used in the following situations:

1. Where sanitary sewer collection mains are installed less than four (4) feet from the finished ground elevation to the top of pipe, approval by Water & Sewer Department is required.

    a. The pipe material shall be PVC SDR 26 with flow fill from bottom of trench to one (1) foot above top of pipe, and the full trench width, and manhole to manhole.

2. Where sanitary sewer collection mains are installed deeper than twenty (20) feet at the invert, polyvinyl chloride (PVC) SDR 26 shall be used.

    a. For alternative pipe material installation situations, external load (earth and live load) analysis is required to verify the minimum alternative pipe material is suitable for the specific project conditions. If the alternative pipe material is unsuitable, the Design Engineer shall specify an acceptable pipe material. External pipe load calculations shall be submitted to the City for review and acceptance.

    b. The length of alternative pipe material to install shall be called out on the Construction Drawings.

C. Changes between pipe materials are not permitted along a continuous sewer main. The alternative pipe material shall be installed from manhole to manhole.

D. To allow new connections to mains that are damaged, the main shall be replaced or rehabilitated per specifications from the upstream to downstream manhole.

4.11 MANHOLE LOCATION AND SIZE

A. General

1. Manholes shall be installed at every change in direction, slope, or connection with other sanitary sewer collections mains.

2. There shall be no more than three (3) lines designed to discharge into any one manhole. This includes both main and service lines.

3. The Design Engineer shall determine if conditions require an interior protection on the manhole from microbial induced corrosion. Acceptable protections for new construction are polymer concrete, concrete with Xypex Bio-San C500 admixture, or approved HDPE manhole liner systems. Acceptable protections for existing manholes are polymer concrete liner systems or coatings. Water & Sewer Department reserves the right to require additional locations where interior coatings may be required. Locations that require interior manhole protections may include, but are not limited to:

    a. Locations where hydraulic jump may occur and the next downstream manhole.

    b. Every drop manhole and the next adjacent downstream manhole.

c. Any manhole where invert slope exceeds 5% or velocities exceed 5 ft/s or where flows change from supercritical to subcritical.

4. Buoyancy calculations shall be provided for manholes and pipes where groundwater may be encountered, has been identified in the geotechnical report, is located in the floodplain or other water sources are present. The manhole shall be sealed from the outside with an approved seal wrap, where groundwater or other water sources are present.

5. Connection and modifications of existing manholes that are constructed of bricks or show signs of damage shall be replaced or rehabilitated and coated per specifications.

B. Manhole Location

1. All manholes shall be located in dedicated street right-of-way or within a dedicated easement of appropriate width (refer to section 2.06). City approval is required for all other proposed manhole locations.

2. The center of manholes shall not be placed closer than eight (8) feet to the lip of the street gutter without prior acceptance by the City.

3. The edge of the manhole cover shall be located a minimum five (5) feet from the edge of cross pans, wherever feasible.

4. Manholes located outside of the street section shall be located in areas not subject to flooding, stormwater conveyance, ponding or detention.

a. If locating manholes in stormwater conveyance areas cannot be avoided, a solid, watertight, bolt down manhole cover with an integral rubber gasket, shall be used.

b. Manholes located within the 100-year flood plain shall have a solid, watertight, rubber gasket, bolt down manhole cover. The manhole cover and grade ring shall be bolted to the manhole cone, and all manhole joints and grade rings shall be sealed from the outside with an approved seal wrap.

c. Manholes located within groundwater or where other water sources are present, shall have all manhole joints and grade rings sealed from the outside with an approved seal wrap.

5. Manholes outside of road rights-of-way shall be provided with direct access by means of an all-weather road. All-weather road requirements are as follows:

a. All-weather roads shall be designed to support City maintenance vehicles up to thirty-five (35) tons with a minimum turning radius of sixty (60) feet.

b. At a minimum, all-weather roads shall be ten (10) feet wide with eight (8) inches of compacted aggregate base course. Subgrade preparation, compaction, and aggregate base course shall be in accordance with *SDC* construction specifications.

c. If the all-weather road is longer than fifty (50) feet and does not have a public road access from both ends, an appropriately sized turn around shall be provided.

d. The Design Engineer shall verify that these minimum requirements for the all-weather road are suitable for the specific project conditions.

e. The all-weather road shall be located in a dedicated sanitary sewer or access easement.

C. Manhole Size and Spacing

1. The following table displays the diameter of standard manholes and the maximum manhole spacing for each sanitary sewer pipe diameter:

TABLE 4-3: Standard Manhole Diameter and Spacing

Sewer Pipe Diameter (in)	Manhole Diameter (ft)	Manhole Spacing (ft)
8”	4 ft	450 ft
10”	4 ft	450 ft
12”	4 ft	550 ft
15”	5 ft	550 ft
18”	5 ft	550 ft
21”	5 ft	550 ft

2. The following table displays the diameter of inside drop manholes. Use standard manhole spacing from Table 4-3 for inside drop manhole spacing. Inside drop manhole shall only be allowed for utility conflicts and pipe sizes up to eight inches (8”). City approval is required for all other proposed inside drops.

TABLE 4-4: Inside Drop Manhole Diameter

Inside Drop Pipe Diameter (in)	Manhole Diameter (ft)
4” or 6”	4 ft
8”	5 ft

4.12 MANHOLE INVERTS

A. The minimum elevation drop across a manhole shall be one-tenth of a foot (0.1 ft) except where cast-in-place manholes are to be installed over existing sanitary sewer mains. In such cases, the existing sanitary sewer pipe grade determines the elevation drop across the manhole, by constructing the cast-in-place manhole over the existing, straight sewer main and removing the upper half of the pipe.

B. Where a smaller sanitary sewer main joins a larger one, the smaller sanitary sewer main crown elevation shall match the crown elevation of the larger sanitary sewer main. This includes sanitary sewer service lines.

C. Where the invert elevation difference between the invert in and invert out is twenty four inches (24”) or more and eight inches (8”) or smaller pipe size, an inside drop apparatus

shall be constructed. Refer to City of Greeley Standard Drawings for drop manhole construction.

D. Sanitary sewer mains and services entering a manhole with less than twenty four inches (24") but greater than six inches (6") of elevation difference between the invert in and invert out shall be avoided. If unavoidable, the invert shall have a sloping bench to prevent solids deposition.

4.13 GROUNDWATER BARRIERS

A. Groundwater barriers shall be installed across the sanitary sewer collection main, ten (10) feet upstream of every manhole, in areas where sanitary sewer collection mains are below groundwater.

B. Refer to the Standard Drawings and construction specification *Section 02315, Excavation and Fill* for additional information and installation requirements for groundwater barriers.

4.14 SANITARY SEWER MAIN AND SERVICE ENCASEMENTS

A. Refer to 3.15 of these Criteria and construction specification Section 02445, Casing Pipe – Borings and Encasements for typical sanitary sewer main and service encasement requirements.

4.15 SANITARY SEWER MAIN BORINGS

A. Refer to 3.16 of these Criteria and construction specification Section 02445, Casing Pipe – Borings and Encasements for sanitary sewer main boring requirements.

4.16 SANITARY SEWER SERVICES

A. General

1. Sanitary sewer service lines shall not be installed in trenches with dry conduits/utilities. A service line shall be separated from other conduits a minimum of five (5) feet horizontally and eighteen inches (18") vertically.

2. Sanitary sewer service lines shall not be installed in trenches with wet conduits/utilities. A service line shall be separated from other conduits a minimum of ten (10) feet horizontally and eighteen inches (18") vertically.

3. Sanitary sewer services for a given lot must be tapped on the sanitary sewer collection main within the confines of the extended property lines. The sanitary sewer service line shall be located a minimum five (5) feet inside the property being served.

4. Sanitary sewer services not utilized shall be abandoned. Refer to appendix section *A3 – Policies Impacting Design and Construction* for abandonment procedures.

B. Sewer Services

1. Sanitary sewer services shall be polyvinyl chloride (PVC) SDR 35 pipe

2. Sanitary sewer services are four inches (4") or six inches (6") in diameter and shall have a minimum slope of 1% (1/8" per foot).

3. The maximum allowable slope for a sanitary sewer service is 8%.

4. If a sanitary sewer service line is required to be greater than six inches (6") in diameter, its design and connection to the existing sanitary sewer system shall be considered as a

collection main. Even though the sanitary sewer service is larger than six inches (6") in diameter, it is still considered private and maintained by the property owner.

5. A separate sanitary sewer service line must serve each structure.

6. No sanitary sewer service lines shall cross property lines.

7. Compound sanitary sewer services shall be avoided where feasible.

8. Sanitary sewer service connections at manholes shall be avoided where feasible.

9. Sanitary sewer services shall be located a minimum ten (10) feet downstream of the potable water service, wherever feasible.

10. Sanitary sewer service connections at manholes shall be avoided where feasible.

11. The sanitary sewer service line shall be electronically locatable and have tracer wire installed per *Section 02534, Sanitary Sewer Service Lines* and Standard Detail Drawings.

12. Tapping new connections to the existing sanitary sewer system shall be completed by City.

13. Sanitary sewer service connections to the sanitary sewer collection main shall be made with a tee or tapping saddle and shall be separated by at least five (5) feet along the

sewer main length, including when connections are on opposite sides of the sanitary sewer collection main.

14. Sanitary sewer service wyes are not allowed on the sanitary sewer collection main except in cul-de-sacs where a manhole or tee connection is not feasible.

15. Sanitary sewer service clean-outs are not permitted in the public right-of-way or sanitary sewer easement.

16. Sanitary sewer service connections to 15", 18" or 21" collection system interceptors or trunk lines are not permitted unless approved by the Water & Sewer Department.

4.17 SANITARY SEWER MAINS AND SERVICES IN RELATION TO OTHER UTILITIES

A. Refer to 3.18 of these Criteria and construction specification Section 02510, Water Utility Distribution Piping for sanitary sewer main and service separation in relation to other utilities requirements.

4.18 SANITARY SEWER LIFT STATIONS AND FORCE MAINS

A. All lift stations with capacities at 2,000 gallons per day (gpd) or greater are subject to Colorado Department of Health and Environment (CDPHE) Regulation 22.

B. Cost Responsibilities

1. Design and Construction

   a. The Developer shall be solely responsible for all costs associated with the design and construction of the lift station and force mains. This includes the cost of any easements, land acquisition, documents associated with permitting approval through CDPHE and North Front Range Water Quality Association (NFRWQPA), and any other cost associated with the project.

2. Reimbursement

   a. Where additional service area outside of the proposed development is anticipated, the City of Greeley will require the lift station and associated improvements to provide additional capacity than what is necessary for the initial development. Refer to Section 2.12 of this criteria for additional clarification.

3. Operations and Maintenance

   a. Public Facilities: Public lift stations are defined as any lift station serving more than one user and accepted by the Public utility. Operations and maintenance activities shall be the responsibility of the City for all public lift stations only upon completion and acceptance of the proposed improvements. The Developer shall provide an operations and maintenance manual and procedures for all equipment and processes associated with the lift station. The Developer shall coordinate with the City during

the planning and design phases on equipment operations and maintenance requirements.

b. Private Facilities: Private lift stations are defined as any lift station serving only one user. Operations and maintenance responsibilities for private lift stations are the sole responsibility of the owner or private entity.

C. Planning and Permitting

1. General

a. Gravity based solutions are preferred to lift stations as it provides the most reliable and lowest cost service for our customers. The use of a lift station and force main shall be evaluated on a case-by-case basis. If there is an appropriate gravity solution, then the developer shall design and construct the proposed improvements meeting the City of Greeley Criteria. Any lift station or force main shall first be approved by the City following proper justification by the Developer. Where a lift station is determined to be required it shall be designed to allow for an eventual connection into a gravity system.

b. The lift station and force main design shall adhere to state and regional approval processes and the Developer shall keep informed and notify the City of major milestones during the design and approval processes. The Developer shall adhere to the submittal requirements previously stated in Section 2 of these Criteria.

2. Procedures

a. The Developer shall employ the services of an engineer licensed in Colorado that has successfully designed and permitted at least two lift stations of similar size as proposed, within the State of Colorado. The Developer and the engineer shall adhere to the following procedures through the planning and design phases:

i. Coordinate a conceptual project meeting with the City to provide justification for the project and initial design considerations including site location, force main alignments, land acquisition requirements, preliminary design criteria, project schedule, and permitting requirements.

ii. Upon initial conceptual acceptance for consideration of the need for a lift station, provide written project justification for the project and design considerations including site location, force main alignments, land acquisition requirements, preliminary design criteria, project schedule, and permitting requirements.

iii. Attend follow up meeting following completion of the review of conceptual documents.

iv. It is the expectation that the developer keep the City informed of the project's progress from design through construction approval. This includes notifying the City of the major project milestones associated NFRWQPA and CDPHE review and approval process and allowing for City review of major reports and documents. Major milestones include but are not limited to:

- Site Application submittal to NFRWQPA

- Signed and approved Site Application submitted to CDPHE
- Basis of Design Report (BDR) submittal to CDPHE
- Design approval from CDPHE
- Funding requests
- Public meetings/outreach

v. Upon the City's review and acceptance of the conceptual design, the applicant may proceed with the Lift Station Site Application process in accordance with CDPHE Regulation 22.
   - The Site Application shall be submitted to NFRWQPA following review and acceptance by the City
   - Following NFRWQPA and local agencies approval of the Site Application, the applicant shall submit the Site Application and required counterparts in accordance with Regulation 22 to CDPHE for review and approval

vi. The Lift Station BDR shall be reviewed by the City prior to submitting the BDR to CDPHE for review and approval. The BDR shall include at least a 60 percent design package and shall only be submitted to CDPHE upon City approval of 60 percent design package.

vii. Prepare and deliver final design plans and technical specifications for the City's review and approval.

viii. Applicant shall coordinate with the City through the construction bidding process as necessary.

ix. Applicant shall coordinate construction inspections with City Inspectors.

x. Applicant shall submit all construction submittals for review including shop drawings and data and operation and maintenance manuals.

xi. Applicant shall coordinate with the City for start-up testing and required training.

xii. Applicant shall submit final record drawings to the City in AutoCAD and pdf format.

3. Colorado Department of Public Health and Environment (CDPHE)

   a. The design and construction of all lift stations and force mains shall adhere to CDPHE's most recent version of Regulation 22 – Site Location and Design Approval for Domestic Wastewater Treatment Works (The City reserves the right to review all procedures and reports required under Regulation 22 and request revision if necessary. Where CDPHE's Regulation 22 and the City's Criteria differ, the more restrictive of the conditions shall apply.

4. North Front Range Water Quality Planning Association (NFRWQPA)

   a. The planning and Site Application process of the proposed lift station and force main shall be in accordance with NFRWQA wastewater utility plan guidance. The applicant will be required to provide updates to the City's Wastewater Utility Plan

(WUP) for the proposed lift station and force main as part of the Site Application process.

b. The process for obtaining lift station approval from the Water Quality Control Division (WQCD) begins with the NFRWQPA (www.nfrwqpa.org). CHPHE *Regulation 22*, latest revision, requires that prior to WQCD final design review and approval, the lift station Site Application must be submitted to the NFRWQPA. Refer to the NFRWQPA website and *Regulation 22* for guidelines and requirements on the lift station site location and design approval process.

5. City of Greeley

a. The Developer shall coordinate with the following City's departments to ensure all procedures and policies are adhered to.

i. Water and Sewer Department

ii. Community Development

ii-a. Engineering Development Review

ii-b. Planning Department

ii-c. Building Inspections

iii. Other Departments as Required

6. Lift Station Design Criteria

a. Applicable Codes, Environmental Compliance, and Health and Safety

i. Applicable Codes: For work done in the City, work shall be performed in accordance with the codes established by the City's building department.

ii. Environmental Compliance: Environmental assessments and/or environmental reviews may be required as a preliminary investigation to determine if a particular parcel of real property is subject to recognized environmental constraints such as, and not limited to the following: floodplain areas, wetlands, endangered species, and hazardous conditions. Should environmental constraints exist as identified above, it is the Developer's responsibility to incorporate mitigation measures to comply with environmental requirements in accordance with applicable and current rules and regulations.

iii. Health and Safety: Public lift stations are required to conform to all City and OSHA health and safety requirements. City operation staff safety shall also be considered during the design and construction of the lift station including, but not limited to:

- Readily accessible equipment placement for maintenance activities
- Classified areas in accordance with the National Fire Protection Association (NFPA) 820 Regulations
- Lifting assistance for heavy equipment

- Nonslip floor finishes
- Handrails
- First-aid and safety equipment
- Fall protection
- Limitation of confined spaces – it is desired by the City to limit confined space entries where possible

b. Determination of Wastewater Flows

i. Existing wastewater flows shall be calculated using the calculation methods stated in Section 4.03, 4.04, and 4.05. Should the project area not fit the previously stated design flow estimation methods, applicable and industry-standard calculation methods shall be utilized. Methods include real-time flow monitoring or calculations based on land-use. Methods and calculations shall be included in relevant planning documents and subject to City's review.

ii. Proposed and future wastewater flow projections shall be estimated for the build-out conditions of the service area. Estimation methods shall be based on projected land-use. The planning period and projected land-use within the service area shall be coordinated with the City during the planning phases.

iii. Organic and other applicable wastewater constituent loadings shall be considered and evaluated based on existing and projected land-use. It is the Developer's responsibility to calculate based on most current available information, flows and constituent loadings for accessing available sewer and wastewater treatment capacities.

c. Impacts on Downstream Lift Stations or Sewer Capacities

i. Ultimate peak hour design flows shall be used to determine the impact to downstream collection system infrastructure including treatment facilities, lift stations, and sewers. Existing infrastructure needs to be able to accommodate peak flows and loadings from new lift stations and force mains. The capacity of existing infrastructure to accommodate flows from new lift stations shall be justified to the City as part of the planning and design documents.

d. Lift Station Capacity

i. Lift station capacity shall be designed to accommodate existing and future projected peak flows for the entire service area.

ii. Hydraulic calculations and system/pump curves require consideration and shall be submitted for review during the planning phases to the City of Greeley and as part of the CDPHE's approval process.

iii. Receiving sewers shall be evaluated to ensure adequate capacity to accommodate the ultimate lift station flow.

e. Emergency Storage

i. The lift station shall be designed for at least 60 minutes of emergency storage at peak hour flow conditions or as required by CDPHE. Emergency storage can utilize volume within the wet well above the high level alarm and upstream collection system piping provided that it is demonstrated that back-up will not occur into any existing or potential future service connections or taps. No future taps shall be constructed within the section of influent sewer or sewers to the lift station designated to provide emergency storage. If a piping connection is required to accommodate emergency storage provisions, the invert of the pipe connecting the wet well to emergency storage shall be above the high level alarm. Additional emergency storage may be required at the discretion of the City based on site location, emergency response time, and potential environmental concerns.

ii. Emergency storage can be accomplished using an additional storage vault structure. The emergency storage structures shall provide adequate access and floor slope for cleaning and shall be designed with pre-cast concrete, cast-in-place concrete, fiberglass reinforced plastic, or other approved equals. If constructed of concrete, adequate protection (i.e. polymer concrete or concrete admixtures) shall be provided to mitigate corrosion caused by hydrogen sulfide. If used, the emergency storage vault shall be designed to provide flow to and from the wet well to the vault and with adequate access for pumping via vacuum truck or other appropriate method.

iii. If emergency storage can be accomplished through gravity flow from the lift station to another existing collection system, the City may consider that as an option to meet emergency storage requirements. It shall be demonstrated that the gravity overflow, existing collection system, and downstream facilities be adequately sized to accept increased flow. Additionally, should the collection system be operated by another entity, a legal agreement stating the entity can and shall receive emergency flows shall be coordinated and presented to the City during the design review process.

7. Force Main Design Criteria

a. Materials and Sizing

i. Force main material shall be AWWA C900-16 with minimum wall thickness of at least DR-25. DR-18 or DR-14 shall be required if pressure or surface loading at any location in the system exceeds the DR-25 pressure rating.

ii. Force mains shall be minimum 4-inch diameter. Force mains shall be sized appropriately for a minimum fluid velocity of 2 feet per second and maximum velocity of 7.5 feet per second. Sizing shall also conform to CDPHE design requirements, whichever is most limiting. Parallel force mains are strongly preferred by the City for maintenance procedures, emergency conditions, and capacity optimization between existing and build-out flows. If parallel force mains are not considered feasible for a specific installation, it shall be demonstrated that the force main diameter is optimal for existing and build-out flow velocities.

iii. If force main diameter is such that the wastewater velocity is less than 2 feet per second at initial operating conditions, the design shall include VFDs on the pumps to allow the motors for the pump or pumps to increase frequency to increase the wastewater velocity in the force main to be a minimum of 3 feet per second for a minimum flushing time of 5 minutes. Reference the Electrical and Controls section of this criteria.

b. Access / Cleaning Stations

i. Force main clean-out access shall be provided every 500-feet in situations where the force main is 950-feet or longer. Clean-outs shall provide adequate access to allow for pipeline condition observations via video camera and maintenance.

c. Protection, Bedding and Compaction

i. Pipe bedding and backfill of force mains shall conform to the specifications in Section 02315 of these standards.

d. Force Main Alignments and Separation

i. The minimum buried depth of the force main shall be 48-inches from top of pipe.

ii. Wastewater force mains shall adhere to CDPHE and City standards for separation between potable water lines and other utilities. Wastewater force mains shall travel below existing potable water lines meeting the minimum requirements as outlined in Section 4.18. Should minimum separation requirements not be possible, refer to encasement requirements in Section 4.15 of the Criteria.

iii. Should the wastewater force main alignment be such that it cannot accommodate these separation requirements vertically or horizontally, provisions shall be provided to safeguard the existing utilities in accordance with the City design criteria and construction standards.

e. Special Permitting Requirements

i. In situations where the force main alignment crosses areas that include wetlands, floodplains, irrigation ditches, railroads, and waterways, the Developer shall be responsible for all permitting during the design phase to ensure that local and state requirements are adhered to. The Developer shall document all required permits with the City prior to proceeding with construction. In all cases, the Developer shall evaluate alternative force main alignments to minimize impact to sensitive areas described herein.

ii. Easements required for the force main alignment shall adhere to Section 2.06 of these criteria. All easements required for the force main shall be approved by the City and granted to the City prior to City of Greeley approval of construction documents.

8. Land Acquisition and Easements

   a. All land area requests for the lift station sites shall be submitted and approved by the City prior to starting the land acquisition process. Lift Stations shall be located on property deeded to the City. The minimum size for the lift station site shall allow for adequate equipment access, maintenance activities, and ancillary equipment (i.e. generator, odor control, emergency storage, etc.). In no cases shall the lift station site be less than 2,500 square feet in size. Applicant shall provide preliminary lift station site drawings showing major lift station components, security, buildings, and access for the City to review and determine required site size.

   b. Force main alignments exiting the lift station site up to the point of gravity connection shall be contained within an sewer easement and shall be dedicated to the City per Section 2.06 of this criteria.

D. Lift Station Site

1. Location and Topography

   a. The lift station and site location shall be designed and constructed to limit disturbance to the surrounding properties both aesthetically and during construction activities. The site shall allow adequate access to the site from existing public right of way. The lift station site shall be designed to provide adequate drainage away from the lift station and building and conform to City standards for drainage and storm water management plans. Developer shall perform a geotechnical evaluation of the site to determine soil conditions and hydrology as well as recommendations for lift station construction. Lift station sites shall be located outside of the FEMA 100-year floodplain with the finished floor elevation of the lift station a minimum of 2-feet above the floodplain. All lift station site locations are subject to review and approval by the City and CDPHE Regulation 22.

2. Lift Station Building / Enclosure

   a. The lift station shall be enclosed in a weatherproof structure. The lift station enclosure and lift station pumping components as a minimum shall be accessible without permitting for confined space access. As a minimum the lift station enclosure shall be ventilated and heated and conform to the City's planning and building department requirements and applicable structural and building codes. The size of the building or enclosure shall allow for adequate clearance to maintain pumping equipment, piping, valves, electrical gear and controls. The minimum spacing between pumps shall be 30 inches, spacing around pumps of 36 inches, and electrical panel clearance shall be no less than 48 inches or as required by the National Electrical Code. Building or enclosure entry ways, hatches and overhead doors shall allow for convenient access and equipment removal for maintenance and replacement. All lift station enclosures or buildings must be approved by the City

and applicable architectural committees that are associated with the subdivision or local association.

3. Aesthetics

    a. The lift station shall be subject to the City's Development Review process and applicable development standards. The lift station architecture and aesthetics shall be designed to match the surrounding structures. Landscaping shall be considered and planned to match the surrounding environment with low maintenance and water use. Appropriate screening and other methods shall be utilized to minimize noise and visual impacts.

4. Access

    a. All wastewater lift stations shall be sited to allow access by all-weather surface roads capable of accommodating maintenance trucks from public right of way to the lift station site. The access shall at a minimum support HS-20 loading with a minimum width of 15 feet. The access points and site shall be designed to allow WB-50 trucks to maneuver within the site and exit the site without backing into public right of way. The site layout shall allow for access to the wet well and vacuum/jetter truck to clean out accumulated material in the wet well. All hard or concrete surfaces shall be designed for the expected vehicle and equipment loads.

5. Security Fencing

    a. The lift station site shall contain perimeter security fencing minimum 6' in height. The fencing is subject to the City of Greeley Municipal Code and shall be reviewed and approved by the City.

    b. The lift station site access gate shall have a minimum size full width opening of 18-feet and of lockable type.

6. Lighting

    a. Lighting shall be provided at the lift station site to allow for necessary activities during night and times of low visibility. The lighting system shall be designed to provide illumination best suited for the station layout which may include suspended, wall, or ceiling mounted fixtures and shall be suitable for routine maintenance activities and inspections. Site lighting equipped with photocells shall not be

allowed. Refer to Chapter 18 of Greeley Municipal Code for more information, as applicable.

7. Potable Water

   a. The site shall have access to potable water. Potable water connection, service size, backflow device and meter shall be coordinated with the City. At a minimum, there shall be a frost proof yard hydrant located in the vicinity of the wet well.

E. Lift Station Components

1. Pumping System

   a. Each Lift Station shall have a minimum of 2 pumps. The pumps shall be designed to accommodate existing flows and future flows from fully developed contributing area. Firm capacity of the pump system shall be designed (or phased) to pump ultimate peak flow at maximum computed total dynamic head. Pump operation shall be automatic but fitted with the capability to run the system in manual control.

   b. Lift Stations shall be designed as a duplex system as a minimum. Duplex system for ultimate flow of the service area, shall be designed so that each pump is sized for peak hourly flow. The applicant shall provide a spare pump of the same capacity. Lift stations serving service areas that are phased over several years shall be designed initially as a duplex system as a minimum with room to add additional pumps for meeting the ultimate flow demands of the service area. Lift stations that are designed with more than two pumps shall be capable of pumping peak hourly flows with the largest pump out of service. The applicant shall provide a spare pump matching the size of the largest pump in service.

   c. In all cases pumping systems shall be designed to accommodate existing and build-out flows with adequate redundancy as defined by CDPHE Regulation 22 and in these criteria. If future build-out conditions require pumps (greater than 2) that are not needed for near term flow conditions, the lift station shall be designed to add additional pumps, piping, valves, electrical and controls without the need for a major system shutdown and / or bypass pumping.

   d. Pumping system shall be designed to allow for adequate access between other pumps, piping, and ancillary equipment for maintenance activities including, but not limited to, routine maintenance and inspection and pump removal.

   e. Required Pumping System Type: Above Ground Mounted Self-priming Suction

      The pumping system is self-priming suction pumps placed on grade with minimal piping to suction from the wet well. The only accepted manufacturer for the pumping system is Gorman Rupp. Pumping systems shall be site-specific designs or pre-packaged systems meeting site requirements. All designs are contingent upon review and approval by the City.

f. Alternate Pumping System

If the Developer, with approval from the City, determines above ground mounted self-priming suction pumps are insufficient for the application, the Developer can seek a variance to utilize either wet well / dry well or submersible pump configurations. The Developer must adequately prove that the alternative pump configuration is the optimal choice for the application and include evaluations between both dry-pit and submersible configurations.

i. Submersible Pumps: Where above ground mounted self-priming suction pumps are insufficient, City of Greeley will only consider submersible pumps where the ultimate build out peak hour flow rate is less than 100 gallons per minute. Where submersible pumps are approved by City of Greeley, the pumps must be removable without entering the wet well by providing rail and crane system. Control Panels and associated equipment shall be located within an enclosure of adequate size. The Developer shall provide two spare pumps to the City of Greeley.

ii. Wet Well/Dry Well: Where above ground skid mounted self-priming suction pumps are insufficient and flow rate is greater than 100 gallons per minute during peak hour flow at full build out, the lift station shall be configured to provide separate wet wells and dry wells. Common walls between wet wells and dry wells shall be water and gas tight. Suitable and safe means of access shall be provided to the dry well for operations staff, maintenance, and removal of all equipment from the dry well. Access shall include separate equipment and access hatches. Access to the dry well shall be provided through stairs. Ladder access is not allowed. Where dry wells are considered, the lift station shall be designed to ensure that surface runoff cannot enter the lift station. Where groundwater may exist above the dry well, adequate measures shall be provided to prevent infiltration of groundwater into the dry well and wet well.

g. Pumping System Components

i. Each pump shall have a dedicated check valve, plug valve, and air-relief valve on the discharge side of the pump. Pressure gauges shall be provided on both the suction and discharge (prior to the check valve) side of the pump. Pressure gauges shall be provided with a pulsation snubber constructed of 316 stainless steel and an isolation valve. It is preferred that these pump system components are supplied by the pump manufacturer if supplied as a skid-type system to ensure compatibility, performance, and single point of supply.

h. Hydraulics

i. Pumps shall be designed to accommodate existing and future flows. Pump design calculations shall be included in the design reports and subject to City review. Hydraulic calculations shall include pipe friction losses using appropriate friction coefficients and minor friction losses. Net positive suction head available ($NPSH_A$) and net positive suction head required ($NPSH_R$) shall be considered to ensure pump cavitation will not occur. Control descriptions for the pumps shall consider water levels required to maintain adequate $NPSH_A$ and $NPSH_R$.

2. Station Piping

    a. Material and sizing

        i. Station piping shall be 316 stainless steel or ductile iron pipe and sized to accommodate the necessary flow ranges. Flanged header pipe shall be ductile iron complying with ANSI/AWWA A21.51/C115 and Class 53 thickness. Flanges shall be ductile iron class 150, or as required by pumping application and pressures, and comply with ANSI B16.1. Generally, the liquid velocity in the station piping shall be no less than 3 feet per second and no greater than 7 feet per second.

        ii. All ductile iron piping shall be glass lined in accordance with ASTM B1000, use pipe suitable for glass lining with minimum Class 53 thickness.

    b. Expansion Joints/Victaulic Coupling

        i. Station piping shall include expansion joints, flanged coupling adaptors and/or grooved couplings to allow for dismantling of station piping for maintenance and parts replacement.

3. Grinders

    a. Grinders may be required, which the City will determine on a case by case basis, depending on expected flows and loading.

        i. Grinders shall be in-line only.

        ii. Accepted manufacturers are Franklin-Miller or approved equal.

        iii. All grinders are contingent upon review and approval by the City.

4. Valves

    a. Plug Valves

        i. Isolation valves shall be eccentric non-lubricated plug valves. Each pump discharge shall have a dedicated isolation valve so that each pump can be isolated from the common discharge header. Plug valves shall be of cast iron body, ASTM A126 Class B. Valve plugs shall be cast iron ASTM A126 Class B covered with a Buna-N Rubber compound. The seats are to be a corrosion resistant alloy either 316 stainless steel or nickel. Valve body shall be semi steel with flanged end connections drilled to 150 pounds, or higher as required by application pressures. Valve shall be operated with a single lever actuator providing lift, turn, and reseat action. The lever shall be equipped with a locking device to hold the plug in the desired position. Valves shall be able to pass a spherical solids not less than 3 inches diameter. Accepted manufacturers include DeZurik, Valvmatic, Milliken.

b. Check Valves (4” or more in diameter)

i. Check valves shall be swing check valves capable of passing a 3-inch spherical solid. Check valves shall meet the latest AWWA C508 standard and be of the resilient hinge check valve type. All internal hardware shall be stainless steel. Valve shall be equipped with flanged ends and be fitted with an external lever and spring. Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. Valve shall be rated at 175 PSI water working pressure, 350 PSI hydrostatic test pressure. For high pumping head applications (150 feet or greater), the Developer shall submit a type of check valve that will minimize hydraulic surges or slam to the system. Each pump discharge shall have a dedicated check valve. Accepted manufacturers include Val-matic, DeZurik, Victaulic, Golden Anderson.

c. Combination Air and Vacuum Valves

i. Sewage rated combination air and vacuum valves shall be placed at the discharge of pumps as close to the check valve as possible and at any local high points in the station piping. Route discharge line to sump. Accepted manufacturers include Val-matic and Golden Anderson.

5. Bypass Pumping Assembly

a. Lift Station Out of Service

i. A bypass pumping configuration shall be designed to bypass the lift station should it ever need to be taken offline. The bypass pumping configuration shall include provisions to bypass the entire lift station as well as lift station components including the wet well and pumping equipment and station piping. Bypass connections shall also be included on the common discharge header to the lift station pumps (station piping) as well as the force main (site piping) along with isolation valves. All bypass connections shall be at a minimum 6” camlock.

b. Approach Manhole

i. An approach manhole shall be constructed upstream of the wet well within the lift station site boundaries. The approach manhole shall serve as a common connection for the gravity sewer or sewers feeding the pump station and shall connect to the wet well by a single gravity pipe.

c. Wet well

i. Lift Station wet wells shall be Polymer Concrete or concrete with Xypex Bio-San C500 admixture to prevent corrosion on the interior surfaces caused by concentrated levels of H2S and other corrosive properties of raw wastewater.

ii. All wet well penetrations shall be link sealed and grouted to prohibit any leakage from the wet well or groundwater infiltration.

d. Coatings and Paintings

i. All exposed carbon steel or ductile iron surfaces, piping and equipment shall have field-applied protective painting or coating except where material (i.e. PVC, stainless steel, hot-dipped galvanized or aluminum) or factory coating warrants exception. All paint and coatings systems shall be approved by the City and shall adhere to City standards for color coding.

6. Electrical and Controls

a. Arc Flash

i. Study

i-a. Provide arc flash study on the electrical equipment per NFPA 70E.

ii. Labeling

ii-a. Provide labeling per NFPA 70E.

b. Electrical Equipment

i. All electrical control panels with controls and wiring shall be built in accordance with NEC, UL, NFPA 70E, NFPA 820 and ETL standards. The electrical components and enclosure shall be labeled as a complete UL listed assembly with manufacturer's UL label applied to the door. Developer shall coordinate with City Building Department on applicable codes.

ii. Developer shall coordinate with the City for electrical utility providing electrical service. Station shall be provided with a separate utility transformer and meter/main with ground fault protection. Primary power to the station shall be 480-volt, 60 Hz, 3-phase service per utility provider standards. Developer is required to pay permitting, design, and costs for primary power to the lift station site. Secondary power service shall be designed by a certified electrical engineer licensed in the State of Colorado. As a minimum, the station shall include service disconnect panel, automatic transfer switch (ATS), motor control center (MCC) or electrical distribution panel. The service disconnect panel shall be mounted on the exterior face of the lift station building common wall to the indoor electrical switch gear.

iii. The ATS shall be provided to switch from normal utility power to standby emergency power upon power outage and switch back to normal power once the power outage is restored. The ATS shall have indicating lights for normal power, emergency power, and a digital panel indicating volts and amps. The ATS shall be mounted inside the lift station building integral to the MCC. The ATS manufacturer shall be compatible and approved by the accepted lift station pump manufacturer, Gorman Rupp. The City's standard for standby emergency power is natural gas-powered engine generators manufactured and provided with the lift station pumps manufacturer, Gorman Rupp. If the lift station pumps are provided by a manufacturer other than Gorman Rupp, the Developer shall

provide the ATS and standby emergency power generator specifications and manufacturer for City review and approval.

iv. Electrical switchgear (480 volt) shall be mounted in a NEMA 1 MCC with removable buckets within a NEMA 3R wrapper. A step-down transformer shall be included to provide power service to a separate light or power panel rated for 120 / 240-volt service. The light or power panel is required to provide service for interior and exterior lighting, receptacles, ventilation and controls. Switchgear shall be manufactured by Cutler-Hammer, Allen Bradley, Square "D", or approved equal by the City.

v. Transient voltage suppression rated at 80 KA minimum shall be provided at the main electrical service panel and shall be installed in accordance with the latest requirements of NEC Article 285.

vi. Wiring to any instrumentation shall be multi-conductor shielded cable suitable for Class 2 low voltage controls. Must use Black and red wiring in cable for all class 2 low voltage controls.

vii. All wiring that that is running from VFD to motor shall be VFD rated cabling if shared with other VFDs.

viii. All wiring from control panels to motors shall be in liquid-tight conduit with copper conductors rated not less than 600 volts AC. All wiring shall follow NEC code and local code.

c. VFDs and Soft Start and Stop

i. All motor sizes greater than 20 HP shall be equipped with a reduced voltage solid state start and stop or also known as soft start and stop. The use of variable frequency drives (VFD) for the lift station pumps shall be evaluated on a case-by-case basis. The Developer will be required to demonstrate the advantages for installing VFDs for the ranges of pumped flows. The soft start / stop device and / or VFD shall be mounted adjacent to the MCC. Accepted manufacturers for the soft start / stop and VFD equipment shall be Allen-Bradley, Eaton or Mitsubishi.

d. Level Controls

i. The primary level control system used for the lift station to turn pumps on and off and sequence lead and lag operations shall consist of the radar level measurement type. The primary level control system shall have a minimum of five differential level set points including low liquid level, start / stop lead pump, start / stop lag pump, start / stop standby pump (if required), and high water level. The level control shall be equipped with a transmitter device and user interface screen for user set points and display of liquid level in the wet well. Contacts shall be provided for selected alarm outputs for integrating into the SCADA and telemetry system. Accepted manufacturers for level control shall be Endress Hauser or a manufacturer approved by the City.

ii. In addition to the primary level control system, the lift station shall be equipped with a secondary level control system for back-up. The secondary level control

shall consist of electro-mechanical float switches for low water cut-off, pump on / off, and high-water alarm. Accepted manufacturers for float switches shall be Siemens Water Technologies Model 9G-EF or approved equal.

iii. The secondary level control system would be based on a PID loop and use wet well levels to modulate the VFD speed.

e. Lift Station Control Systems

i. Controls shall provide automatic reset of alarm conditions for normal power fail, high water level, standby pump run, and a common alarm contact. However, alarm conditions shall activate an alarm light that is mounted at the roof line of the lift station building or enclosure. Any pump alarm conditions shall require manual reset and SCADA reset. All lift station alarm outputs shall be transmitted via telemetry system to on-call City operation staff and master SCADA control center.

ii. The lift station PLC shall be an Allen Bradley CompactLogix 5069-L320ER. Alternative PLC's must be approved by the City.

7. Control Panel

a. Each control panel shall contain adequate surge protective devices.

b. The PLC control panel shall be sized to adequately contain all PLC and communication equipment and rated for NEMA 4X/12 enclosure.

8. Human Machine Interface (HMI)

a. Redlion G15C1100

b. HMI program shall be unlocked and copy of program given to City of Greeley I&C department after commissioning of Control Panel.

9. PLC (Programmable Logic Controller)

a. Allen Bradley Studio 5000 Platform

b. Compactlogix or Controllogix Series

c. IO check to be done after completion of control panel being installed.

d. Each PLC shall have a minimum of a 2-hour uninterrupted power supply (UPS).

e. Program shall be unlocked and copy of program given to City of Greeley I&C department after commissioning of PLC.

10. Instrumentation

a. Vibration Sensor must be provided on each motor.

i. Acceptable Manufacturer

i-a. Allen Bradley

i-b. Banner

b. Radar

i. Must install one radar to read the level of the wetwell and also backup floats

ii. Only acceptable manufacturer is Endress Hauser

c. Backup Floats

i. Must be approved by the City.

d. Discharge Flow Meters

i. Acceptable Flow Meter Manufacturers

i-a. Endress Hauser

i-b. Rosemount

i-c. Must have an approved vendor do a start up on the flow meter.

ii. Communication

ii-a. Ethernet IP

ii-b. Modbus TCP

iii. Flow totals must come from the meter and not be calculated in the PLC.

iv. The flow meter shall be fitted with grounding rings as required with 150 pound flanged connections.

b. Upstream Flow Meters

i. Acceptable Flow Meter Manufacturers

i-a. ISCO or approved equal

i-b. It will need to have a Tienet box in the manhole.

i-c. Must have an approved vendor do a start up on the flow meter.

i-d. Manufacture: Isco Tienet 360 LaserFlow. Signature Laser flow meter transmitter.

ii. Communication

ii-a. Ethernet IP

ii-b. Modbus RTU

11. Programming

a. Alarms

   i. Contact City of Greeley I&C Department for list.

b. Trending

   i. All analog signals

c. PLC (Programmable Logic Controller)

   i. Communication

      i-a. PLC to PLC messaging must be done through Ethernet.

      i-b. PLC to VFD communication must be done through Ethernet.

d. HMI/SCADA

   i. Status Colors

   ii. Motor Status

      ii-a. Green - Running in Auto

      ii-b. Red – Off

      ii-c. Yellow – Running in Hand or Manual

      ii-d. Red flashing - Faulted

e. Back-up Power Supply

   i. Back-up power shall be supplied at the lift station to power the pumps and ancillary equipment in the event of a power outage. The back-up power system shall be natural gas powered. The Gorman Rupp standby engine system is preferred, and the Developer shall determine if that system is suitable for the application. Other back-up power systems will be considered if application is not suitable for the Gorman Rupp system. If not provided by Gorman Rupp, alternate back-up power system will be evaluated and approved by the City on a case-by-case basis. The City's preference for alternate back-up power systems is Cummins for both the generator and ATS.

f. Telemetry and SCADA

   i. The Remote Telemetry Unit (RTU) shall communicate by way of Ethernet or Allen Bradley Ethernet. Use approved City of Greeley radio system. Programming of SCADA system must be done by an approved and qualified contractor.

   ii. Provide 40-foot pole for SCADA radio, which can be integrated into light pole.

   iii. Required Data and Inputs in SCADA

iii-a. Intrusion alarm

iii-b. Wetwell Level - Floats

iii-c. Wetwell Level - Radar

iii-d. Wetwell Low Level activated

iii-e. Wetwell High Level activated

iii-f. VFD Running Amps from VFD or Softstart

iii-g. Flow (gpm)

iii-h. Flow Totalization - must be the totalizer from flow meter

iii-i. Flow total from yesterday

iii-j. Pump motor status

iii-k. Softstart or VFD status “"Faulted”

iii-l. Softstart or VFD status on/off

iii-m. Power Fail

iii-n. Amperage for each pump

iii-o. VFD status on/off

iii-p. VFD speed (Hz)

iii-q. VFD Reference

iii-r. Station common alarm

iii-s. Generator Running

iii-t. Generator Switch in Normal or Emergency

iii-u. Generator common alarm

iii-v. Runtime for each pump

iii-w. Pump starts

iii-x. Control Panel Temperature

iii-y. Pump Selector Switches status

iii-z. H2S Monitoring System in wetwell or discharge manhole

iii-aa. Calculated Inflow (gpm)

iii-bb. Flood Alarm

iii-cc. Phase Monitor power status

iii-dd. Generator battery voltage

iii-ee. Vibration sensors on motors

iii-ff. Building or Vault temperature

g. Alternate Communication

i. Provide an option to install fiber from Lift Station to closest City of Greeley fiber pull box.

ii. Must use a City of Greeley approved vendor.

h. H2S Monitoring Systems in Wet well or discharge manhole

i. The City may require that the Developer design and install H2S monitoring and mitigation in the manhole the force main discharges into. Factors that may require H2S monitoring in the manhole include pump flow, force main length and location of the discharge manhole.

12. Mechanical

a. Ventilation

i. Adequate ventilation shall be designed in buildings and vaults as required and adhere to all applicable State, NFPA, and OSHA requirements. Ventilating system shall consist of electric or natural gas make-up air units sized to provide a minimum of 6 air changes per hour and shall automatically begin operation upon user selected indoor temperature settings for both summer and winter modes. Supplemental cooling and heating will be required if building temperatures exceed 85 degrees Fahrenheit (F) or fall below 55 degrees F. Ventilation shall be accomplished by the introduction of fresh air in the station and be filtered to remove debris and minimize particles. Ventilation fans shall automatically come on upon entry of the lift station enclosure or building or activated by the light switch adjacent to the entry door.

ii. In addition to the make-up air ventilation system, supplemental heat shall be required using electric or natural gas unit heaters to maintain a minimum temperature of 55 degrees F. Unit heaters shall be automatically controlled thermostatically. Heating systems shall be designed based on an outside ambient temperature of negative 20 degrees F.

b. Air Conditioning

i. Air conditioning shall be provided if ventilation system cannot ensure inside air temperate of below 85 degrees F within a reasonable time period of ventilating.

Cooling systems shall be designed based on an outside ambient temperature of 105 degrees F.

c. Drains

iii. Lift station enclosures or buildings shall contain no floor drains that connect to the wet well. The enclosure at the level the pumps are located shall include a trench drain which slopes to a sump pit equipped with a duplex submersible sump pump system controlled with weighted float level switches. The sump pump system shall discharge to the top of the wet well with an air gap. The pump system shall be sized based on expected drain flows such as air release valves, maintenance, etc. Each sump pump discharge shall contain a check valve and isolation valve along with a pump removal system. The sump pump system shall be connected to the back-up or emergency power system.

iv. Pumps shall be equipped with drains that flow via gravity to the wet well for evacuating wastewater during maintenance.

v. The lift station site shall be equipped with a perimeter drain if recommended from the geotechnical study.

13. Odor Control and H2S Generation

a. The lift station shall be evaluated for the odor mitigation system and final determination of implementing odor control measures will be reviewed and determined by the City. Supporting data, calculations, or assumptions for hydrogen sulfide generation based on estimated wastewater characteristics and industry standards shall be included in the evaluation. In the absence of supporting data and / or calculations, the Developer shall utilize the latest edition of "Metcalf and Eddy Wastewater Engineering Treatment and Resource Recovery" for medium strength sulfide concentrations in wastewater. Other factors to consider in the evaluation include but are not limited to:

- Proximity to and use of neighboring properties
- Wastewater composition (BOD5, COD, TSS, Sulfides, TKN, Ammonia-N)
- Wind direction and downwind properties
- Operation and maintenance requirements of odor control system

b. If odor control is determined necessary, the type of system shall be selected based on the site-specific needs of the lift station. All ancillary equipment and necessary provisions shall be incorporated into the design of the lift station to provide a functional system. Odor control systems may include but are not limited to the following mitigation technologies:

- Carbon absorption systems
- Biological scrubber or filter
- Chemical scrubber

c. If odor control is not required, provisions for future addition of odor control facilities (i.e., installation of ventilation ducts and penetration into the wet well for future connections) shall be provided.

14. Force Main Components

a. Connection to Existing Gravity Sewer and Discharge Manhole

i. Force mains shall connect to a gravity wastewater system at a manhole, or a structure designed to receive pumped wastewater. At a minimum the discharge manhole and the next two downstream manholes shall be polymer concrete, concrete with Xypex Bio-San C500 admixture, or approved HDPE manhole liner systems. The force main discharge shall be designed to minimize turbulence and scour within the connecting structure. The City will determine on a case by case whether odor control is required at the receiving structure.

b. Isolation Valves

i. It is desired by the City to design the force main to limit required valves along the force main alignment. High points and low points shall be minimized along the pipe alignment.

ii. If required, isolation valves shall be plug valve type. All direct buried plug valves shall normally remain open (with exception of bypass connection and isolation valves) and be installed with a valve box and lid. Accepted manufacturers include DeZurik, Valvmatic, Milliken

c. Air and Vacuum Relief Valves

i. High points and low points shall be minimized along the pipe alignment.

ii. Air relief valves shall be provided on ultimate and local high points throughout the force main alignments. All air relief valves shall be located in an access manhole or vault appropriately sized for the application and maintenance staff access. Air and vacuum relief valves shall be minimized along the pipe alignment and must be approved by City.

d. Fittings

i. Piping shall be PVC or ductile iron and sized to match the force main size.

i-a. PVC force main material shall be in accordance with AWWA C900-16 with minimum wall thickness of at least DR-25. DR-18 or DR-14 shall be required if pressure or surface loading at any location in the system exceeds the DR-25 pressure rating.

i-b. All ductile iron piping shall be glass lined in accordance with ASTM B1000, use pipe suitable for glass lining with minimum Class 53 thickness.

15. Testing and Start-up

    a. Lift Stations

        i. The Developer shall develop a plan to test and demonstrate successful and flawless performance of all equipment and components of the lift station in manual and automatic mode. The start-up and testing plan shall be submitted to the City for review prior to commencing the start-up. A factory representative for the pumps and controls and City I&C and Operations representatives shall be on site for the start-up operations.

    b. Force Mains

        i. Force mains shall undergo hydrostatic pressure testing for at least two hours at two times the working pressure. Test results shall be documented and demonstrate holding pressure within the criteria and specifications described in the City's Design Criteria and Construction Specifications (see Section 01713 Water Distribution System Testing for requirements).

16. Operation and Maintenance Procedures and Warranties

    a. Operations and Maintenance

        i. The Developer shall supply the Water and Sewer Department with two (2) complete sets of operation and maintenance instructions, shop drawings, and pump curves. An electronic set on a thumb drive shall also be submitted. Developer and/or manufacturer shall provide one half day training on operations of the lift station for City Staff.

        ii. Operation and maintenance instructions shall be specific to the equipment installed. All non-relevant reference material shall be removed or clearly crossed out using heavy red line.

        iii. All emergency power generation equipment shall have operation and maintenance instructions. Must provide training for operations and maintenance staff. Contractors to verify that generator alarms work in SCADA.

    b. Warranties

        i. A two (2) year warranty shall be provided for the lift station system including performance, materials, and installation.

        ii. The date of substantial completion shall be specifically determined, in writing, for the lift station system.

        iii. Any warranties associated with the lift station shall be transferred to the City after final acceptance and construction is complete.

17. Standard Details

    a. Flow Schematic

    b. Below Grade Lift Station

    c. Above Grade Lift Station

    d. Bypass Pumping Detail

SECTION 5

NON-POTABLE IRRIGATION SYSTEM DESIGN CRITERIA

5.01 GENERAL

The City of Greeley (City) uses non-potable (untreated) water to irrigate both public and private property throughout the City. The City has a network of irrigation ditches for supplying source water for irrigation purposes. The typical irrigation system arrangement is a "hub-and-spoke" layout where irrigation water is diverted from an irrigation ditch to an irrigation water storage pond and then pumped to the distribution system to provide sufficient pressure and capacity to serve many customers. Another arrangement specifically for a small irrigation system is a direct connection between the ditch and pump station excluding the storage pond. The goal of the City is to expand the non-potable water system and reduce the use of potable water for irrigation purposes and improve irrigation practices, which is key to the City's long-term water conservation plan.

The purpose of this section is to provide information for the design and configuration of a non-potable irrigation system. Non-potable irrigation system design shall align with the City of Greeley's *Non-Potable Water Master Plan* (Master Plan), latest revision. The City of Greeley Water and Sewer Director reserves the right to make final determinations of the system design based on the best interest of the City's system. Refer to standard detail drawings for additional design information.

This section is not intended to be inclusive of all situations and the Design Engineer may be required to use additional engineering judgment to meet the overall design intent for constructability and long-term operations and maintenance.

The Design Engineer shall meet with Engineering Development Review (EDR) and Water and Sewer (W&S) Departments to discuss how new developments fit into the City's overall Non-Potable Water Master Plan to provide non-potable irrigation service at acceptable pressures in both new and existing areas.

The Master Plan shows proposed service area boundaries and conversion areas. These service area boundaries are subject to change during the planning phase based on property boundaries, non-potable water supplies, planned conversion areas, existing system capacities, and other factors. Final service area boundaries shall be determined by the Water & Sewer Department.

The City has the right to oversize the irrigation system to serve customers outside the development's improvements limits. The City will reimburse the developer for oversizing based on Section 2.12 of these Criteria.

The Design Engineer shall also meet with the ditch company from where the raw water is being diverted. The City will assist in coordinating the meeting and have a City representative present. The purpose of this meeting is to discuss the diversion requirements such as check structures,

head gates, and flow measurement, and determine if there is sufficient capacity within the ditch to serve the new Non-potable Irrigation System.

The non-potable irrigation storage pond and pump station facility shall be located on property deeded to the City. The raw water supply line and its appurtenances between the water source (i.e. ditch) and the storage pond shall be within a utility easement dedicated to the City.

The Design Engineer shall provide supporting calculations, design methodologies, and references documentation used to establish the design parameters. All information shall be included in the Non-Potable Irrigation System Design Report. Refer to Section 2.08 of these Criteria for Non-Potable Irrigation System Design Report requirements and formatting.

The Non-Potable Irrigation System Design Report shall be stamped and certified by a Professional Engineer registered in the state of Colorado. The design report shall verify that the proposed non-potable irrigation system can provide the required irrigation demands for the service area, at an acceptable pressure, and meet the overall non-potable irrigation system design requirements set forth in these Criteria.

The City of Greeley Water and Sewer Director reserves the right to make final determinations of the system design based on the best interest of the City's system.

5.02 DEFINITIONS

A. Non-potable Irrigation System – The non-potable irrigation system consists of (1) ditch headgate and appurtenances to divert flows, (2) raw water supply line and appurtenances between the water source and storage pond, (3) storage pond, (4) pump station facility, and (5) distribution mains and appurtenances.

B. Non-potable Irrigation Main - A pressurized pipeline that conveys non-potable water to individual non-potable irrigation services.

C. Non-potable Irrigation Services – Non-potable irrigation services include all piping, fittings, and appurtenances used to convey non-potable water from the irrigation main to the consumer.

D. Air Gap – A method of backflow prevention defined as the unobstructed, physical distance of two (2) feet minimum of free atmosphere between the discharge point of a potable water supply line and the highest level of the irrigation storage pond or the FEMA 100-year floodplain, whichever is greater.

E. Reduced Pressure Zone (RPZ) Backflow Preventer – A device that can be connected to a potable water system to supply water to a non-potable water system and protect the potable

water system from backflow contamination. The device consists of two check valves with a pressure vacuum breaker in the middle. This devise can be used in lieu of an Air Gap.

F. Shoulder month/season – The periods in early spring and late fall where non-potable customers require some irrigation water, but the agricultural ditches are not operational, occasionally resulting in the non-potable water system being supplied by potable water.

G. Shoulder tap – A connection from the potable water distribution system to the non-potable water system to provide water for irrigation purposes during the early spring and late fall shoulder months.

H. Service Area – The general geographic area that is served by or expected to be served by an individual non-potable irrigation supply system.

I. Conversion Area – A previously developed parcel that is currently irrigated by potable water but may consider switching to non-potable irrigation in the future; the amount of irrigated area for this type of customer is typically known.

5.03 DESIGN FLOW

A. The non-potable irrigation system shall be designed to transport peak season irrigation demands in accordance with these Criteria.

B. All irrigation demands used in the design of non-potable irrigation systems are subject to approval by the City.

C. Pump Station Design Capacity

1. The non-potable irrigation demand criteria presented below are the minimum criteria and the City reserves the right to modify the criteria, at any time, for the design of specific projects. The non-potable irrigation application rates includes provisions for evapotranspiration and operational efficiency losses in the non-potable irrigation system.

2. The City's goal is to minimize the size of the pump station by having a balanced system. A balanced system is where half the irrigable areas within a service area are being irrigated on any given irrigation day. Refer to Section 6 *Landscape Irrigation Criteria* for additional information regarding irrigating operational requirements.

   a. Weekly Irrigation Application Rates:

      i. Bluegrass turf, arborvitae, willows = 1.9 inches/week

      ii. Tall Fescue, columbine, potentilla purple coneflower = 1.6 inches/week

      iii. Buffalograss turf, sedums, succulents, iris, penstemon = 0.9 inches/week

      iv. Native grasses, yarrow, rabbitbrush = 0.2 inches/week

b. Daily Watering Window = 8 hours

c. Irrigation Days/Week = 6 days (Monday through Saturday)

i. Single family residential may irrigate up to three (3) days per week on their assigned days.

ii. All other areas including, but not limited to civic and open spaces, common areas for all customer classes, right-of-ways, municipal buildings, multi-family residential, and non-residential areas may irrigate 6 days per week (Monday through Saturday) with half of the area being irrigated on any given irrigation day.

3. Sizing the design capacity of a pump station shall be based on the following equation:

$$\sum \boldsymbol{Q_{i,ii,iii,iv}} = \frac{\boldsymbol{a}}{\boldsymbol{b}} \boldsymbol{x} \frac{\boldsymbol{c}}{\boldsymbol{d}} \boldsymbol{x} \frac{\boldsymbol{e}}{\boldsymbol{f} \boldsymbol{x} \boldsymbol{g}}$$

Where:

Q = Pump Station Design Capacity (gpm)

a = Irrigation Application Rate (inches/week)

b = Number of Irrigation Days per Week (days/week)

c = Total Irrigable Area (acres)

d = 12 inches/foot (conversion factor)

e = 325,829 gallons/acre-foot (conversion factor)

f = Daily Watering Window (hours/day)

g = 60 minutes/hour (conversion factor)

5.04 HYDRAULIC DESIGN

A. Raw Water Supply Pipe

1. The design flow shall be based on the time it takes to replace two (2) full days' worth of storage over a 24 hour period.

2. Pipe size shall be computed by Manning's Equation up to a maximum 80% full and friction coefficient of 0.015, but shall not be less than 12-inches in diameter.

B. Pump Station Intake Pipe

1. The design flow shall be based on the Pump Station Design Capacity.

2. Pipe diameter shall be based on a maximum velocity of 1.0 feet per second (fps) when the pipe is flowing full, but shall not be less than 24-inches in diameter.

3. The intake pipe shall be equipped with a passive intake screen. Refer to 5.21 of these Criteria for additional information.

C. Distribution System

1. Distribution System Pressure

a. For new developments with no conversion areas within the non-potable pump station's service area, the non-potable irrigation pump station and distribution system within the service area shall be designed for a maximum pressure of 125 psi and a working pressure range of 70 - 100 psi at high points and the furthest service point of application.

b. For new developments that include conversion areas within the service area, the Design Engineer shall consider potable water system pressures based on fire hydrant static pressures provided by the City when sizing the pump station and distribution system. Static pressures that exceed 90 psi shall be brought to the W&S Department's attention.

2. Friction Coefficient

a. Non-potable irrigation lines shall be designed using a Hazen-Williams friction coefficient "C" equal to 120.

3. Velocity

a. All pipes shall be sized for maximum water velocity of no greater than five (5) feet per second (fps) at peak flow.

4. The minimum size of non-potable irrigation mains shall be six-inches (6") in diameter.

5.05 DEPTH OF BURY

A. The minimum depth of cover shall be four (4) feet and the maximum depth of cover shall be six (6) feet for non-potable irrigation mains.

B. When design or constructability constraints are present, deeper or shallower main installation may be permitted only with acceptance from the City. Additional design and installation considerations may be required by the City depending on the situation.

5.06 CONNECTIONS TO THE EXISTING NON-POTABLE IRRIGATION SYSTEM

A. Connections to the existing non-potable irrigation system shall be in accordance with the *Construction Specifications, Section 02510, Water Utility Distribution Piping*.

5.07 LOCATION AND LOOPING OF NON-POTABLE IRRIGATION MAINS

A. All non-potable irrigation mains shall be located in dedicated street right-of-way or within a dedicated easement of appropriate width. City approval is required for all other proposed non-potable irrigation main locations.

B. The centerline of non-potable irrigation mains shall not be placed closer than three (3) feet

to the inner edge of concrete gutter without prior acceptance by the City.

C. A non-potable irrigation main serving one (1) lot shall extend all the way across the frontage for that lot.

D. Non-potable irrigation mains shall extend to the extremities of the property or the subdivision served. Extensions shall be in appropriate locations to provide adequate connections.

E. The City shall determine on a case by case basis if non-potable irrigation system looping is required for a development.

5.08 NON-POTABLE IRRIGATION SYSTEM PHASED INSTALLATION AND STUBOUTS

A. Non-potable irrigation system phased installation and stubouts shall be in accordance with Section 3.10 of these Criteria.

B. Locate temporary blowoff assemblies at the end of each phase or stubout.

5.09 PIPE MATERIAL

A. PVC: AWWA C900-16 DR 18 (235 PSI) polyvinyl chloride (PVC) pressure pipe, purple color for direct buried applications only. Refer to construction specification *Section 02513, for Polyvinyl Chloride Pressure Pipe* for additional information.

B. DIP:

1. ANSI/AWWA C151/A21.51 ductile iron pipe with mechanical joints for direct buried applications only. Refer to Section 3.11 C. of these Criteria for corrosion protection requirements.

2. ANSI/AWWA C115/A21.88 flanged ductile iron pipe with flat faced flanges for exposed applications only.

3. Refer to construction specification *Section 02512, for Ductile Iron Pipe* for pipe additional information.

C. Steel: AWWA C200 steel pipe for both direct bury and exposed applications. Design Engineer shall determine required thickness for each application. The Design Engineer shall submit proposed interior and exterior coatings for City review and approval.

5.10 VALVES

A. All valves shall be located in dedicated street right-of-way or within a dedicated easement of appropriate width. City approval is required for all other proposed valve locations.

B. Gate Valves

1. Gate valves shall be installed in accordance with Section 3.12 of these Criteria and *W&S Standard Drawings*, latest revision.

2. All non-potable water line valves located in paved areas shall have a concrete collar

around the valve box in accordance with *W&S Standard Drawings*, latest revision.

3. Refer to construction specification *Section 02515, Water Utility Distribution Valves* for gate valve requirements.

C. Air/Vacuum Valves

1. Air/Vacuum Valves shall be installed at all high points along the non-potable irrigation main and shall be properly sized by the Design Engineer in accordance with the manufacturer's recommendation. The City shall have final determination on valve size and placement. NOTE: It is the City's preference that the number of high points within the pipeline be minimized.

2. Refer to construction specification *Section 02515, Water Utility Distribution Valves* for Air/Vacuum valve requirements.

3. Reference *W&S Standard Drawings* for installation requirements.

D. Non-potable Blowoffs

1. Non-potable blowoffs shall be installed at the end of all non-potable irrigation mains. The City may also require that non-potable blowoffs be located at low points within the system.

2. Reference *W&S Standard Drawings* for installation requirements.

5.11 PIPE ALIGNMENT

A. The curved pipe alignment design requirements for non-potable irrigation mains shall be in accordance with Section 3.13 of these Criteria.

5.12 THRUST BLOCKING AND PIPE RESTRAINT

A. Thrust blocking and pipe restraint requirements for non-potable irrigation mains shall be in accordance with Section 3.14 of these Criteria.

5.13 NON-POTABLE IRRIGATION MAIN AND SERVICE ENCASEMENTS

A. Refer to Section 3.15 of these Criteria and construction specification Section 02445, Casing Pipe – Borings and Encasements for typical non-potable irrigation main and service encasement requirements.

5.14 NON-POTABLE IRRIGATION MAIN BORINGS

A. Refer to section 3.16 of these Criteria and construction specification Section 02445, Casing Pipe – Borings and Encasements for non-potable irrigation main boring requirements.

5.15 NON-POTABLE IRRIGATION SERVICES

A. General

1. Non-potable irrigation service lines shall not be installed in trenches with other

conduits/utilities.

2. There shall be no physical connections between the non-potable irrigation system and the potable water system unless an approved backflow device is used to prevent non-potable water from entering the potable water system (i.e. RPZ device).

3. Non-potable irrigation services not utilized shall be abandoned. Refer to appendix section *A3 – Policies Impacting Design and Construction* for abandonment procedures.

B. Irrigation Services

1. Non-potable irrigation services 3/4" to 2" in diameter shall be crosslinked PEXa in accordance with AWWA C904 with acceptable manufacturers is Municipex®, Uponor AquaPEX®, or approved equal.

2. The non-potable irrigation service for a given lot must be tapped on the non-potable irrigation main within the confines of the extended property lines unless excepted by the City for the irrigation of multiple outlots under single ownership. Refer to appendix section *A2 – Compound Tap Exemption Policy for Irrigation of Multiple Outlots.* Otherwise, irrigation systems from a single non-potable irrigation service shall only be allowed for use on that single property. Refer to *City of Greeley Charter and Code, Title 14: Public Services*, Section 14.04.200 for compound tap restrictions.

3. Non-potable irrigation services shall not be located under driveways, trees, or other permanent structure.

4. Non-potable irrigation services shall be located a minimum three (3) feet inside the property being served.

5. Non-potable irrigation service taps shall be separated by at least two (2) feet, measured along the non-potable irrigation main length, including when taps are on opposite sides of the non-potable irrigation main. Non-potable irrigation service taps shall also be a minimum two (2) feet from all joints, fittings, or valves.

6. The corporation stop, curbstop, meter, the service line between the corporation stop and the meter, and five (5) feet past the meter shall all have the same equivalent inside pipe diameter.

7. Non-potable irrigation shutoff valves (curb stops and gate valves) shall be placed within one (1) foot of the property line or easement boundary (inside or outside).

8. Non-potable irrigation meter vaults pits/vaults shall normally be located after the curbstop in a landscaped area or streetscape. Meter pits/vaults shall not be installed in any street, parking area, driveway, or sidewalk unless otherwise approved by the City. If a meter pit/vault is permitted by the Water & Sewer Department to be located in any traffic area, the pit/vault shall be designed to withstand HS-20 traffic loadings. Curbstops with tracer wire test stations shall be in a valve box.. See *W&S Standard Drawings* for additional service and meter installation requirements.

9. There shall be no major landscaping (i.e. boulders, and trees, or shrubs with mature growth greater than three (3) feet), and buildings, or other permanent structures within

ten (10) feet of the meter vault.

10. Pressure boosters are allowed if required. Booster pumps must be prefabricated units with variable speed controls. Provide submittal cut sheets for City approval prior to ordering booster pump.

5.16 NON-POTABLE IRRIGATION MAINS AND SERVICES IN RELATION TO OTHER UTILITIES

A. Non-potable irrigation mains and services shall have a minimum eighteen-inch (18") vertical separation and minimum five (5) feet horizontal separation or twice the depth of the invert of the pipe, whichever is greater from all utilities measured from outside diameter.

B. Where non-potable irrigation lines cross above or below potable water lines with less than eighteen-inch (18") clearance, pipe encasement shall be designed and constructed so as to protect the potable water line. Note: It is the City's preference to have non-potable waterlines located below potable water lines.

C. Non-potable irrigation main crossings under any open irrigation ditch shall have a minimum five (5) feet of cover and shall be encased.

D. Dry utility crossings shall be encased in high density polyethylene (HDPE) pipe, Standard Dimension Ratio (SDR) 11 from edge to edge of the easement or right-of-way, or ten (10) feet on either side of the non-potable irrigation main, whichever is greater. Perpendicular utility crossings are permitted above and below the non-potable irrigation main. Parallel installation of other utilities in non-potable irrigation easements is not permitted.

E. Bored utility crossings shall have a minimum twenty-four inches (24") of vertical clearance from the outside diameter of the utility casing to the outside diameter of the non-potable irrigation line if the bored utility crosses above or below the non-potable irrigation line.

F. If there are horizontal or vertical clearance conflicts between the non-potable irrigation line and a utility, the City may require that the non-potable irrigation main be lowered, raised, or realigned in order to maintain the required clearances.

G. For a non-potable irrigation line crossing situation not specifically mentioned in this section, the crossing requirements provided in these Criteria shall be applied to that particular situation to the best extent possible.

5.17 UNDERGROUND MARKING AND IDENTIFICATION

A. Underground un-detectable marking tape shall be installed 18-inches above non-potable irrigation mains.

B. Reference construction specification Section 02315, Excavation and Fill for Marking Tape Requirements.

5.18 NON-POTABLE IRRIGATION WATER STORAGE FACILITIES (PONDS)

A. General

1. All water to be stored in the non-potable irrigation pond and the pond location shall be approved by the Water and Sewer Department prior to proceeding with facility design.

2. Combining non-potable irrigation storage with storm water detention requires approval by both the Water and Sewer Department and Public Works Department Storm Water Division. A written explanation shall be submitted describing the circumstance as to why a combined pond is needed.

3. The Design Engineer shall determine the high and low operating levels, required design storage volume, and the invert elevation of the pump station intake pipe.

4. The Design Engineer shall design a gravity flow raw water supply pipe from the water source (i.e. ditch) to the irrigation storage pond.

5. There shall be no major landscaping (trees, shrubs) with mature height greater than three (3) feet planted within ten (10) feet of the liner anchor trench.

B. Storage Volume Design

1. Non-potable irrigation ponds shall be sized to accommodate a minimum four (4) days of supply based on the Pump Station Design Capacity. The four day supply volume shall not include the dead storage.

2. Dead storage shall be based on the water level that limits the wet well inflow below 75% of the Pump Station Design Capacity. For example, if the Pump Station Design Capacity is 1,000 gpm, the dead storage begins when the inflow is less than 750 gpm.

3. A minimum freeboard of 12-inches shall be provided for storage ponds not combined with storm water and 18-inches for combined storage ponds.

4. Minimum usable storage volume of an irrigation storage pond shall be based on the following equation:

$$V = \frac{Q \; x \; a \; x \; b \; x \; c}{d}$$

Where:

V = Total Useable Storage Volume (acre-feet)

Q = Pump Station Design Capacity (gpm)

a = Daily Watering Window = 8 hours/day

b = 60 minutes/hour (Conversion Factor)

c = Days of Storage (days) = 4 minimum

d = 325,829 gallons/acre-foot (Conversion Factor)

5. The minimum depth of the pond shall be 8-feet from the full pond surface level to the bottom.

6. Pond side slopes shall include a 4:1 safety bench for 12-feet horizontally and 3:1 slope thereafter to achieve maximum depth of pond. If steeper side slopes are required to meet storage volume requirements due to site constraints, then fencing must be installed around the pond for safety purposes. Fencing materials must match architectural components of development or HOA fencing requirements.

7. The non-potable irrigation pond shall be designed with either an overflow spillway if topography allows or an overflow structure hydraulically connected to storm sewer.

    a. Spillway or overflow structure shall be designed to convey a minimum of 150% of the pond fill rate based on 5.04 A. 1. of these Design Criteria.

    b. The Design Engineer shall provide necessary design information and construction details on the Construction Drawing for the irrigation pond overflow/spillway.

8. If the non-potable irrigation pond is intended to also function as a stormwater detention facility, with approval from the City, the Design Engineer shall include the additional detention storage volume over and above that required for irrigation operations. Refer to the *SDDC*, for stormwater detention pond design requirements. In addition, the irrigation source water flow shall be measured and recorded. Refer to 5.22 of these Criteria for additional information.

C. Non-Potable Irrigation Pond Liner

1. All non-potable irrigation ponds shall be designed with an approved liner system. Field conditions, constructability, storage volume fluctuations, costs, warranty, and operation and maintenance shall be considered in the selection and design of the pond liner system.

2. Approved pond liner materials are listed in Section 02666 Pond Liners. A layer of 10 oz/sy. geotextile must be included on top and bottom of pond liner material for protection purposes.

3. The Design Engineer may specify a pond liner alternative depending on the project conditions. The alternative pond liner system is subject to approval by the City.

4. Lining installation in areas where groundwater pressure can occur shall be avoided. The bottom of the liner shall be above the water table to prevent the liner from floating.

5. Additional Pond Liner Information:

    a. Site structures such as piping, concrete, and drains shall be completed prior to lining installation.

    b. The design and construction requirements for special liner installations such as anchor trenches, pipe protrusions through the liner, liner vents, batten attachments to concrete structures, seaming methods/testing, subgrade preparation, and cover treatment over the liner shall be in accordance with the manufacturer's specifications and the design shall ensure that the liner warranty is not invalidated. Coordination with and approval by the liner manufacturer is required. The proposed special liner installation details are subject to approval by the City.

c. Construction details for special liner installation items shall be provided by the Design Engineer to be included on the Construction Drawings.

D. Shoreline Protection Treatment

1. Non-potable irrigation ponds shall be designed with a perimeter shoreline protection treatment to protect against wave action erosion. Due to the numerous shoreline protection treatments available (i.e. riprap, boulders, perimeter concrete walls, geotextile products, riparian plantings) the Design Engineer shall propose a suitable shoreline protection treatment depending on the project conditions. The proposed shoreline protection treatment for erosion protection is subject to approval by the City.

2. The Design Engineer shall make special considerations regarding the selection, design, and installation of shoreline protection treatment to ensure that the liner warranty is not invalidated. Coordination with and approval by the liner manufacturer is required.

3. Areas subject to scouring water velocities, such as at the raw water supply pipe discharge conveyance into the pond or beneath the pond fill line/service, shall be adequately protected against erosion and wash out (i.e. concrete splash pad, grouted riprap, large boulders, or appropriately sized riprap).

4. Appropriate construction details for shoreline protection treatment and erosion protection shall be provided by the Design Engineer to be included on the Construction Drawings.

5.19 AERATION SYSTEMS

A. The Criteria provided here offer generic guidelines for the design of non-potable storage pond aeration systems. Each aeration system is unique and requires special design, therefore, it is the Design Engineer's responsibility to design a fully operational system for the given conditions and provide necessary construction details and specifications to accompany the design.

B. Refer to construction specification *Section 11230, Aeration System* for additional non-potable pond aeration system requirements.

C. Aeration System Design

1. Coordinate the aeration system design and construction with the non-potable irrigation pump station design. House and incorporate aeration system components within the irrigation pump station building.

2. Aeration system design components shall include, but are not be limited to, air compressors, aftercoolers, condensate separators, electrical controls, valves, pipe manifolds, flow meters, gauges, aeration pods/diffusers, housing requirements, installation and operational instructions, and recommended maintenance.

3. The Construction Drawings for the aeration system shall show a typical layout, elevation and plan views, and critical dimension for the aeration system design and construction. The aeration system manufacturer is responsible for the layout and design of the aeration system supplied and any special coordination issues that affect

the critical dimensions, layout or orientation of the aeration system.

4. Aeration system shall be sized to provide four (4) pond volume turnovers per day based on the following equation:

$$X = \frac{V\ x\ b}{c}$$

Where:

X = Number of Fine Bubble Diffusers

V = Pond Volume (millions of gallons)

b = 4 (Turnovers/day)

c = Effective Turnover Rate = d x e / f

Where (numbers below are based a disk aeration module with model ADS LWA-3, other manufactures and models will require calculations changes based on specific equipment):

d = Diffuser Depth (feet)

e = Diffuser Turnover Rate = 3.5 mgd

f = Diffuser Effective Depth = 15 ft

5. Fine Bubble Diffusers shall be spaced to provide even coverage.

5.20 NON-POTABLE IRRIGATION PUMP STATION

A. General

1. All pump station site locations are subject to review and approval by the City.

2. Pump station sites shall be located outside of the FEMA 100-year floodplain.

3. The pump station finished floor elevation shall be a minimum of 2-feet above the storage pond's highest water surface elevation to prevent water overflowing the wet well into the pump station building.

4. The non-potable irrigation pump station location shall allow adequate access to the site from new or existing public right of way. The site shall be designed to provide adequate drainage away from the pump station building, pond, and conform to City standards for drainage and storm water management plans.

5. The building shall be sited to allow access by all-weather surface roads capable of accommodating maintenance trucks from public right of way to the pump station site. The access shall at a minimum support HS-20 loading with a minimum width of 15

feet. The access points and site shall be designed to allow WB-50 trucks to maneuver within the site and exit the site without backing into public right of way. The site layout shall allow for access to the wet well and vacuum/jetter truck to clean out accumulated material in the wet well. All paved surfaces shall be designed for the expected vehicle and equipment loads.

6. Developer shall have a geotechnical evaluation completed of the site to determine soil conditions and hydrology as well as recommendations for storage pond, pump station foundation and wet well construction. Refer to Section 2.09 of these Criteria for Geotechnical Soils Report for additional information.

7. The Criteria provided here offer guidelines for the design of non-potable irrigation pumping systems. Each pumping system is unique and requires special design, therefore, it is the Design Engineer's responsibility to design a fully operational system for the given conditions and provide necessary construction details and specifications to accompany the design.

8. Refer to construction specification *Section 15140, Irrigation Pump Station* for additional non-potable irrigation pump system requirements.

B. Pump System Design

1. The pump system shall be designed with a reinforced concrete one common wet well and multiple vertical turbine pumps to provide irrigation flows at varying demands and constant discharge pressure. Pump redundancy is not required.

2. Each pump shall have a dedicated VFD to control the pump.

3. The bottom of the wet well shall be a minimum 4-feet below the invert of the intake pipe.

4. The wet well shall be designed to prevent vortexes and cavitation which can adversely affect pump performance.

5. Pump efficiency shall be a minimum eighty percent (80%) at the specified operating point.

6. The pump system design shall include a skid assembly to support all pump components during shipping and to serve as the installed mounting base. The base shall be of sufficient size and strength to resist twisting and bending from hydraulic forces and support the full weight of all components (i.e. pumps, motors, filters, piping, valves, etc.).

7. The pump system shall include a pressure maintenance pump for sustaining the pressure in the non-potable irrigation system during non-irrigated times and shall operate no more than every 15-minutes to maximize pump life. If the pressure maintenance pump operates more frequently then allow larger pressure differential (in pump controls) to reduce operating cycles to recover lost water pressure.

8. Pump system design components shall include, but not be limited to, motors, filters, valves, gauges, mounting and support structures, power and electrical equipment,

control systems, operator interface devices, alarms, data acquisition and telemetry, and monitoring devices.

9. Pump discharge piping and filter waste pipe shall be supported 6 to 18-inches off the building floor and exit through the wall before pipe burial.

10. Filter to waste pipe shall discharge into the storage pond a minimum distance of 100-feet from the Pump Station Intake Pipe inlet and liner protection is required.

11. The Construction Drawings for the irrigation pumping system shall show a typical layout, elevation and plan views, and critical dimensions or clearances for the pump system, building, wet well, electrical, etc.

12. The pump system manufacturer is responsible for the layout and design of the pump system supplied and any special coordination issues that affect the critical dimensions, layout or orientation of the pump system.

13. The pump system design is subject to approval by the City.

5.21 PUMP STATION INTAKE PIPE AND INTAKE SCREEN

A. Intake pipe shall be AWWA C900-16 DR32.5 (125 PSI) polyvinyl chloride (PVC) pressure pipe, color purple or green or ASTM F679 PVC gravity sewer pipe.

B. The exposed section of the intake pipe shall have intermediate concrete pipe cradles with a stainless steel strap to secure the pipe to the cradle. The maximum length of unsupported pipe shall be 9-feet.

C. Intake Screen

1. Intake pipe shall be equipped with a square shaped passive intake screen constructed of 16 gauge, flattened 304 stainless steel, with 3/8 x 7/8 inch openings. The frame shall be constructed of stainless steel.

2. The intake screen shall be sized such that the velocity through the screen does not exceed 0.25 feet per second (ft/s).

3. The bottom of the screen shall be a minimum 16-inches above the bottom of the pond. The intake screen shall be supported by and mounted on top of a reinforced concrete block.

D. Intake Pipe Isolation

1. The wet well shall be equipped with a slide gate or the intake pipe equipped with a buried gate valve to shut off flow between the storage pond and wet well. Refer to Construction Specification *Section 15140 for Slide Gates and Gate Valves*.

5.22 RAW WATER SUPPLY SYSTEM

A. Raw water supply pipes shall have a minimum eighteen-inch (18”) vertical separation and minimum five (5) feet horizontal separation or twice the depth of the invert of the pipe, whichever is greater from all utilities measured from outside diameter.

1. Pipe Material: PVC, DIP, or RCP. Refer to City of Greeley *Stormwater Design Standards*, Section 6, subsection 9.3.7 for additional culvert information.

B. The raw water supply line shall be located on the opposite side of the pond as the non-potable pump station intake structure to promote water turnover within the pond and minimize stagnation that leads to water quality degradation.

C. Flow shall be controlled by a hand wheel operated slide gate (headgate) mounted to a reinforced concrete headwall. The headwall shall be equipped with a steel trash rack anchored to the concrete headwall with stainless steel hardware.

1. Head Gate Manufactures/Models: Refer to Construction Specification *Section 11285, Slide Gates*.

2. Refer to City of Greeley *Stormwater Design Standards*, Section 9, subsection 9.3.7 for additional trash rack requirements.

3. The headgate configuration shall be approved by both the City and the associated ditch company.

D. Flow Measurement

1. A parshall flume shall be used to measure flow in close proximately to the headgate. Construction of the parshall flume shall be dictated by the ditch company.

2. The flow approaching the parshall flume shall be subcritical and operate under free-flow conditions.

a. The parshall flume shall be equipped with an 8-inch diameter stilling well to measure the flow depth using either a stage recorder or a non-contact level radar measurement device with the signal transmitted to the City's SCADA system via the Pump Station's Remote Telemetry Unit (RTU). Power shall be brought from the non-potable pump station to power either unit. Refer to Section 5.2 of these Design Criteria for additional SCADA information.

b. Where the Colorado Department of Natural Resources (DNR) requires flow data, a stage discharge recorder shall be mounted on top of the stilling well to compute and log discharge flow and totals.

i. Manufacturer and Model: Sutron Corporation, model SDR-0001-4 or approved equal.

c. For locations where the DNR does not require flow data, a radar level measuring unit may be used in place of the stag recorder.

i. Manufacturer and Model: Endress and Hauser - Micropilot FMR10 or approved equal.

E. Check Structures

1. A check structure may be required where there is not sufficient depth within the irrigation ditch to provide sufficient head to achieve the raw water supply design flow. If the Design Engineer determines that a check structure is needed, a HEC-RAS model shall be created to compute water surface profiles. The check structure shall not prevent deliveries of water to downstream users.

2. The check structure shall be constructed of reinforced concrete with removable boards.

5.23 PUMP BUILDING

A. The pump building shall be a precast concrete building sufficiently sized to house all the equipment including but not limited to pump skid, electric and controls cabinets, telemetry cabinet, and aeration system.

B. There shall be a minimum 4-feet spacing between the building walls and pump skid.

C. There shall be sufficient space between the pump skid filter(s) and building walls to allow removal of the filter screen for servicing and replacement. Space must be also provided to meet all electrical code requirements.

D. The minimum wall height shall be 8-feet 6-inches with equipment doors sufficiently sized to be remove and replace electrical and controls panels.

E. The pump building shall be equipped with two trench type floor drains that run either the width or length of the building and connect directly and perpendicular to the wet well.

F. Refer to construction specification *Section 15140, Irrigation Pumps for additional requirements*.

5.24 SHOULDER MONTH WATER SUPPLY

A. All non-potable irrigation systems require a backup potable water tap (shoulder tap) for providing irrigation water when non-potable water is unavailable ("shoulder months"). There is no Plant Investment Fee (PIF) required for a shoulder tap.

B. Shoulder month water supplies must be approved by the City.

C. Shoulder month water shall be discharged into the non-potable irrigation system's water storage facility (pond). A candy cane configured discharge pipe with a minimum two (2) foot air gap shall be provided between the shoulder tap discharge and the maximum operating or overflow elevation of the pond water surface, whichever is greater.

D. The shoulder tap shall be size based on the maximum water demands during shoulder months or at least four (4) inches in diameter and metered. Only City personnel may operate the shoulder tap.

5.25 SCADA

A. A Remote Telemetry Unit (RTU) shall be provided to communicate with the City's SCADA system. The RTU shall communicate with the City's SCADA via City fiber optic if within 1,500-feet of the pump station. If fiber optic is not available, the RTU shall communicate via XetaWave radios.

B. The RTU shall communicate with the pump system and instrumentation by way of Modbus serial or Ethernet, or Allen Bradley Ethernet or serial. If there is no ability to communicate with the Control Panel, analog and digital inputs may be utilized.

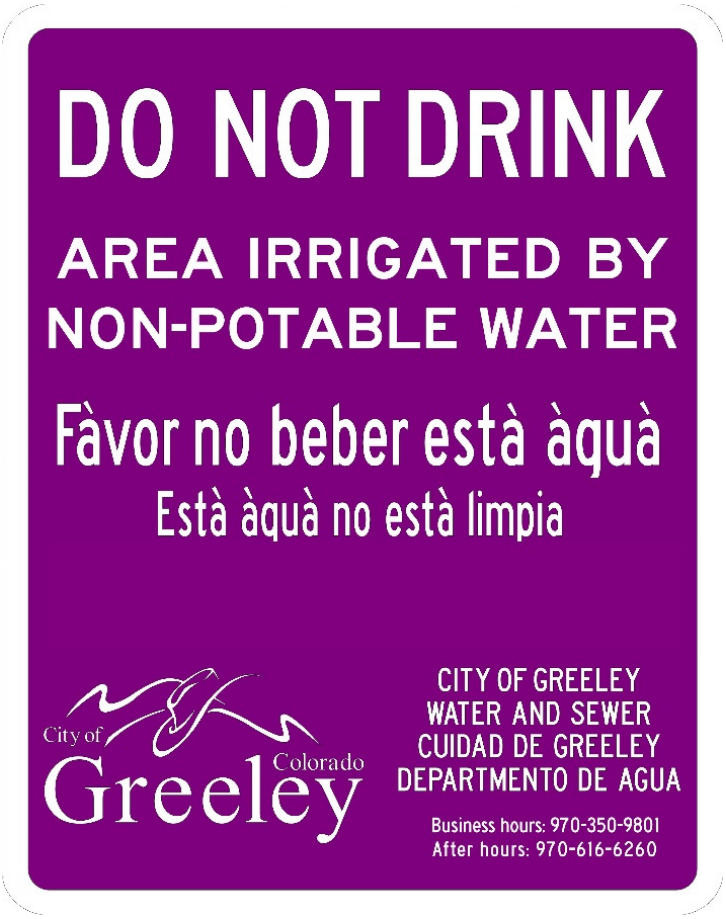
C. Refer to construction specification *Section 15140, Irrigation Pumps for additional requirements*.

5.26 SIGNAGE

A. Signage must be posted at sites where non-potable water is utilized for irrigation. Signs shall be posted near sidewalks and paths that provide access into the non-potable irrigated area(s). Where neighborhoods use non-potable water for irrigating individual homes, all street access points into the neighborhood shall also be posted. Coordinate signage locations with the City of Greeley during design process.

B. An example of an approved sign is provided below (sign design/layout provided by Area Wide Protective).

C. Signs shall be 12-inches wide by 18-inches tall. Holes for fastening the sign to post shall not damage nor cover any text.



5.27 WATER DEDICATION REQUIREMENTS FOR NON-POTABLE IRRIGATION

A. Contact the Water and Sewer Department and refer to *City of Greeley Charter and Code, Title 20: Public Works and Utilities* regarding water dedication requirements.

5.28 WATER SUPPLY WELLS

A. Under certain circumstances the City may, at its election and in its sole discretion, accept use of a well(s) to meet non-potable needs. In that case, ownership of the well(s) would need to be transferred to the City and the well(s) permit changed to non-exempt irrigation well permit. Depending on the development layout and capacity of the well(s), the well could be used directly for irrigation without filling a storage pond first. The Design Engineer would need to evaluate each system individually and obtain City approval. Sufficient information regarding the well(s) such as condition and sustainable yield will be required to assist in the evaluation.

SECTION 6

LANDSCAPE AND IRRIGATION DESIGN CRITERIA

6.01 GENERAL

The City of Greeley Landscape and Irrigation Criteria and Standards, hereafter referred to as the "Criteria", is intended to provide information for the design, review, installation and maintenance of landscape and irrigation systems within the City of Greeley to promote the efficient use of water and the reduction of water waste through best management practices. Both landscape and irrigation systems should be designed for non-potable water type water.

It is the purpose and intent of this Criteria to support the City of Greeley Comprehensive Plan, the Greeley Water Master Plan, and the Landscape Policy Plan for Water Efficiency to:

Promote water conservation

- Reduce or eliminate outdoor water waste
- Reduce peak summer water usage
- Reduce water demand of new construction and development
- Reduce overall per capita demand
- Guide smart development by incorporating land use and water planning principals
- Guide smart development through practices, problem solving, technology and innovation
- Utilize onsite stormwater runoff to supplement landscape irrigation through rain water harvesting

Support attractive and sustainable landscapes

- Use of low-water adaptive plants like native landscapes and xeriscape
- Stormwater and rain garden utilization
- Support an urban canopy by strategically placed trees to reduce heat islands and energy use.

These Criteria shall be regarded as the minimum requirements and performance standards for the design, installation and maintenance of landscape and irrigation systems.

Whenever a provision of these Criteria and any other provision of the City of Greeley Municipal Code or any provisions in any law, ordinance, resolution, rules or regulations of any kind, contains any requirements covering any of the same subject matter, the requirements that are more restrictive or impose higher standards shall govern. In the event that there is a discrepancy in the interpretation of these Criteria, the Water and Sewer Director or designee thereof, shall make the final determination of the intent of these Criteria.

Supplemental information including but not limited to forms, checklists, notes, etc. are available on the City of Greeley's website and shall be referenced or submitted in accordance with the requirements set forth in these Criteria. It is the responsibility of the owner, designer, installer or maintenance contractor to obtain the latest version of any submitted document, as the City will periodically update these items.

- Landscape and Irrigation Criteria Checklists
- Irrigation Performance Audit Guidelines

- Sprinkler Performance Audit Form
- Water Budget Chart and Example
- Pressure calculations worksheet
- WaterWise Best Management Practices
- Example of median and right-of-way designs

6.02 DEFINITIONS

A. APPLICATION RATE: The depth of water applied to a given area and during a specific time, usually expressed in inches per hour or inches per week.

B. CHECK VALVE OR ANTI-DRAIN VALVE*:* A valve located under or incorporated within a sprinkler head or other location within the system to prevent the system from draining on the lowest head(s) when the system is off.

C. CYCLE AND SOAK: Method of irrigation where water is applied in multiple, short cycles. This allows the water to be applied more slowly, allowed to soak into the soil and prevent run-off, promoting deeper roots and healthier plants.

D. DISTRIBUTION UNIFORMITY: The measure of the uniformity of the irrigation water over a defined area.

E. DROUGHT: Periods or seasons with below average precipitation.

F. EMITTERS: A component of an irrigation system that disperses water to the landscape (i.e. sprinklers, bubblers, micro-sprays, etc.

G. ESTABLISHED LANDSCAPE*:* The point at which plants in the landscape have developed roots into the soil beyond the root ball, which promotes long-term health and growth.

H. ESTABLISHMENT PERIOD: The first year after installing the plant in the landscape or the first two years if irrigation will be terminated after establishment. Typically, most plants are established after one or two years of growth. Native habitat mitigation areas and trees may need three to five years for establishment.

I. HARDSCAPES: A non-living landscape feature that is made of any durable material (pervious and non-pervious) such as building, pavement, walkways and parking areas-including those of crushed stone, patios, and decks.

J. HYDROZONE: An area within a landscape where the plant materials require a similar amount of water. For the purpose of this document, hydrozones are divided into four (4) categories:

- *Very-Low hydrozone:* Plant materials that require less than one gallon per square foot of area per growing season of supplemental water once established. The plant materials within this zone are typically drought-tolerant natives. This hydrozone is designated by the letter “V” on landscape plans.

- *Low Hydrozone:* Plant materials that require between one (1) and nine (9) gallons per square foot of area per growing season of supplemental water. This hydrozone shall be designated by the letter "L".
- *Moderate Hydrozone*: Plant materials that require between ten (10) and 14 gallons per square foot of area per growing season of supplemental water. This hydrozone shall be designated by the letter "M".
- *High Hydrozone*: Plant materials that require more than 14 gallons per square foot of area per growing season of supplemental water. The plant material within this zone are intended for high-pedestrian traffic areas such as sport fields or community gathering spaces. This hydrozone shall be designated by the letter "H".

K. IRRIGATION EFFICIENCY: The measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. Greater irrigation efficiency can be expected from well designed and maintained systems.

L. LOW FLOW IRRIGATION OR DRIP IRRIGATION: The application of irrigation water at low pressure through a system of tubing or lateral lines and emitters such as point source emitters, dripper lines, micro-sprays and bubblers. Low flow irrigation systems apply small volumes of water slowly at or near the root zone of plants.

M. MAINTENANCE OR MAINTENANCE OF LANDSCAPING: Shall mean but not be limited to regular watering, mowing, pruning, fertilizing, clearing of debris and weeds, the removal and replacement of dead plants and the repair and replacement of an irrigation system. Any activity undertaken to prevent the deterioration, impairment, or need for repair of an area, structure, rights-of-way, or land use.

N. MASTER SHUT-OFF VALVE*:* An automatic valve installed at the irrigation supply point which controls water flow into the irrigation system. When this valve is closed water will not be supplied to the irrigation system.

O. MULCH: Organic material such as leaves, bark, straw, wood chips or inorganic mineral materials such as rocks, gravel, decomposed granite or pebbles smaller than a half-inch in diameter left loose and applied to the soil surface for the beneficial purposes of reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion.

P. NON-ESSENTIAL AREAS: A high hydrozone with traditional turf that receives little, if any, use (i.e. the only person who walk on those areas is the person maintaining the turf).

Q. PREFERRED TURF: Very-low to low hydrozones grasses such as Buffalo Grass (Buchloe dactyloides), Blue Grama (Bouteloua gracilis) or other native seeds.

R. RIGHT-OF-WAY LANDSCAPING Shall mean landscaping located within the public or private right-of-way adjacent to a privately owned lot, outlot, or tract, including parkways.

S. SEASONAL WATERING SCHEDULE: The programmed schedule set in the Smart Irrigation Controller. The schedule is based on the summation of the water that has been

lost to evaporation and that has been used by the plant materials. The amount of water required to meet the needs of the plant materials change with the weather (seasons).

T. SMART IRRIGATION CONTROLLER: An automatic timing device with nonvolatile memory used to remotely control valves that operate an irrigation system that is contractor-grade quality. Smart irrigation controllers are able to self-adjust and reschedule irrigation events based on integrated instrumentation that measures evapotranspiration (weather-based) or soil moisture or flow or a combination. The Smart Irrigation Controller must be selected from the WaterSense labeled irrigation controller list. Retail grade controllers are not acceptable.

U. SOIL AMENDMENT: An organic and inorganic material that is added to native soil to improve texture, moisture holding capacity, nutrient capacity, and water and air infiltration.

V. SUSTAINABLE LANDSCAPES: Landscapes that feature climate-appropriate landscape design and efficient technologies and are maintained through efficient irrigation practices to support community water objectives.

W. TRADITIONAL TURF: High hydrozones grasses defined as Bluegrass (Poa pratensis), genus Poa and turf type tall fescue (Festuca arundinacea) and cultivars thereof having dense tufts blades and creeping rhizomes.

X. WATER BUDGET: The water that is applied annually from an irrigation system to an established landscape area. It is based upon the area's reference evapotranspiration and is adjusted for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape.

Y. XERIC LANDSCAPING OR XERISCAPE OR WATERWISE: Shall mean the use hydrozones that are very-low to low-water use in place of plants that typically require more water to survive and include, but are not limited to, plants having a low or very low water requirement.

Z. ZONE: Typically, an area served by a single irrigation control valve, sometimes referred to as a "station". Zones are comprised of plant materials and soil types with similar water requirements.

6.03 APPLICABILITY

A. These Criteria shall apply to all landscape and irrigation system design, and installation and maintenance performed as a requirement of Chapter 8 – Landscape Standards of the Greeley Development Code and any other code, policy or criteria adopted by the City of Greeley. Areas that fall under these Criteria include but are not limited to:

- Civic and Open spaces
- Common areas for all customer classes (outlots, pocket parks, usable detention, private/on-lot required/usable areas)
- Right-of-ways
- Municipal buildings
- Multi-family residential

- Non-residential (institutional, commercial, and industrial)

B. Applicability for these Criteria shall follow major development as defined in Chapter 8, Section 24-801 b. – Landscape Standards of the Greeley Development Code.

C. These Criteria shall govern over privately enforced guidelines or requirements related to landscaping and irrigation (i.e. business association, homeowners association design guidelines, regulations and requirements, etc.).

D. Exemptions or where these criteria do not apply to:
- Single-family and up to 4 units per lot
- Ecological restoration projects not requiring a permanent irrigation system.
- Exemptions listed in Chapter 8, Section 24-801 b.3.- Landscape standards

6.04 ENFORCEMENT

A. The City of Greeley shall be provided the opportunity to review all landscape and irrigation plans, site and soil amendments, design and installation for compliance with these Criteria. The Criteria are enforced by the City or authorized representative.

B. All landscape improvements, indigenous plant material, and irrigation system components shall meet performance standards and supporting criteria. The City shall review all submittals for general compliance with these Criteria. An approval by the City does not relieve the owner, designer, installer or maintenance contractor from the responsibility of ensuring the design, plans, specifications, construction, maintenance, and record drawings are in compliance with these Criteria.

C. In the event of Level 3 or 4 drought declared by the Water and Sewer Board, extreme water use plantings temporary irrigation may occur at the discretion of the Water and Sewer Director or designee thereof. For drought declarations visit City of Greeley's website.

6.05 HANDLING OF TOPSOIL

A. Stripping and stockpiling of native topsoil onsite shall be required during construction. This topsoil shall be incorporated as the final layer of soil for landscaping unless soil contamination has been determined. Stockpiling shall be handled by the Stormwater Management Plan and applicable Best Management Practices- see Stormwater Section 12-Construction Water Quality. Soil contamination determinations shall be at the discretion of the Public Works Director or his or her designee.

B. The onsite replacement of topsoil and the addition of soil amendments are critical to successful establishment and ongoing health of plant material and efficient use of water through the life of the project.

6.06 SOIL AMENDMENTS

A. Soil amendments (organic or inorganic) shall adhere to the Greeley Municipal Code, Section 24-804(e)(3) – Landscape Standards Installation and Maintenance for all properties.

B. A minimum of four (4) cubic yards of compost per 1,000 square feet of area shall be used.

C. Per Greeley Municipal Code Chapter 8, Section 24-801(b) and 24-804(e)(3) – Landscape Standards, soil amendment verification documentation and receipts shall be submitted to the Water and Sewer Department, Water Conservation Program prior to installation of plant material, and shall include review of adherence to all criteria and performance standards. Written documentation reflecting approved volume, method of tilling and type of soil amendment is required.

6.07 MULCH

A. Mulch (organic or inorganic) shall be used in areas used to cover bare ground, reduce evaporation, suppress weeds, moderate soil temperatures and prevent soil erosion to promote landscape establishment within landscape beds. Seeding for large areas for grasses and naturalized landscape areas do not require mulch.

1. Organic Mulch
   a. Organic mulch material includes leaves, bark, wood chips and straw. No construction debris such as pallets shall be used.
   b. Shall be applied at one (1) cubic yard per eighty (80) square feet at a depth of four (4) inches, and as appropriate to each species.
   c. Shall be applied to soil surface, not against the plant stem, or high against the base of tree trunks to minimize disease.

2. Inorganic Mulch
   a. Inorganic mulch includes rock, gravel and pebbles (pea gravel) smaller than a half-inch in diameter for water conservation and weed suppression. Any materials greater than a half-inch is not considered mulch.
   b. Rock mulch shall have a minimum depth of three inches (3”).

6.08 WEED BARRIER

A. Black plastic (polyethylene), woven weed barrier fabrics (polypropylene) and plastic weed barriers are not allowed with any plant material unless they are used for playgrounds, large-scale vegetable/edible plant production, or areas that are designated as rock greater than half-inch in diameter (dry creek beds without vegetation).

6.09 SUSTAINABLE LANDSCAPE DESIGN

A. Hydrozones

1. For the purposes of this document, hydrozones are broken into the following four categories:

Table 6-1: Hydrozone Category

Hydrozone Category	Water Needs	Landscape Examples
High	>14 gallons/S.F./season	Bluegrass turf, arborvitae, willows
Moderate	10-14 gallons/S.F./season	Tall Fescue, columbine, potentilla purple coneflower
Low	1-9 gallons/S.F./season	Buffalograss turf, sedums, succulents, iris, penstemon
Very-Low	<1 gallons/S.F./season once established	Native grasses, yarrow, rabbitbrush

B. Landscape water budget and plant material

1. Greeley Municipal Code, Chapter 8 – Landscape Standards shall be adhered to.

2. An annual water budget chart shall be submitted for the landscape and irrigation plans. A water budget chart will show the total annual water used, which shall not exceed an average of 15 gallons/square foot for the landscape for all hydrozones per tap.

3. Plants are to be hydrozoned with plants of similar hydrozone (i.e. low with low). Plants of very low hydrozones are not to be planted in moderate to high hydrozones.

4. High hydrozones shall be limited to appropriate high-use areas with high visibility and functional needs. No more than 25% of the design irrigated area shall be high hydrozones. Where commercial and industrial uses include residential or recreational components, such as, but not limited to, assisted living, schools and daycares, picnic grounds, pocket park, outlots, the Water and Sewer Director or his or her designee may approve a greater percentage of high hydrozones. The applicant must demonstrate that the additional high hydrozones (traditional turf grass) areas are being used in high-traffic areas, such as, but not limited to, athletic fields, children's play areas, parks and courtyards.

5. Preferred turf grass species are not limited in the design.

6. Specifications are found under Stormwater Design Standards, Section 14- Vegetation and Irrigation shall be followed for stormwater detention and retention ponds.

7. Plant material shall be selected from a list of native and other plants determined to be appropriate for and well adapted to the soil and local environmental conditions and solar exposure requirements. The material plant lists can be found under the Water and Sewer Department, Water Conservation's Plant Database and City of Greeley's Forestry Department Front Range Tree Recommendation List. Upon request to the Water and Sewer Director or his or her designee, additional plants may be added to the list that are appropriate for these criteria.

8. Plant materials should provide an enriched quality of life by providing multi-season interest, color, texture and diversity in plant material using the WaterWise Best Management Practices found under Water and Sewer Department, Water Conservation website www.greeleygov.com/wc

9. Plant material that is banned for use by the City of Greeley, Weld County and/or the State of Colorado shall not be used. This applies to all builders, installers, and owners. See the Colorado Department of Agriculture website for detailed list of restrictions.

10. The following landscape practices are highly recommended:
    a. Methods outlined in the WaterWise Landscaping Best Practices created by the Water Conservation program.
    b. Protection and preservation of native species and natural vegetation.
    c. Plant selection based on disease and pest resistance.
    d. Implementing stormwater best management practices into the landscape and grading areas to minimize runoff and to increase on-site retention and infiltration.
    e. Rain gardens, water quality ponds, bioswales and other landscape feature and practices that increase rainwater capture and create opportunities for infiltration while adhering to Colorado Statute 37-92-602(8) the water right of less than 72 hours of water retention and Storm Drainage Design Criteria and Construction Specification manual.

6.10 LANDSCAPE PLANS

Landscape Plan requirements shall be used to aid the applicant, designer, installer and maintenance contractor in the analysis, design, installation, and maintenance of landscapes. These requirements presented herein are the minimum necessary for landscape plan submittals and shall be considered in conjunction with the requirements set forth by the City's Community Development Department and Greeley Municipal Code, Chapter 8 – Landscape Standards.

A general landscape plan shall be included with the Site Development Plan submittal and a more detailed landscape and irrigation plan shall be submitted with the Construction Document submittal. All forms, checklists and plant list can be found online at the City's website (www.greeleygov.com/wc)

All landscape plans shall adhere to Water and Sewer Department's the Design Criteria and Construction Specification-Potable Water Distribution, Sanitary Sewer Collection, and Non-Potable Irrigation System.

A. The landscape plans analyses shall include:

1. A site analysis of all existing features that may influence landscape design such as prevailing winds, exposures, topography, hardscapes, and existing features like utilities, fences, structures etc. Site analyses shall adhere to local zoning and codes related to utility easements, site distance requirements, and buffer zones.

2. Designed to incorporate water efficient techniques described as follows:

    a. Group landscape material accordingly based upon hydrozones.

b. Selected plants shall be well-adapted to the Greeley climate and site conditions. Plants shall be grouped according to water and light requirements.

c. Irrigation equipment shall be appropriate to the hydrozone. Water deeply and infrequently to develop greater drought tolerance.

3. Use site analysis to identify the landscape function and activities. This includes the overall theme of the site and neighborhood, onsite traffic patterns and activity and service area needs.

4. Biodiversity in plant material such as trees and shrubs. Monoculture landscapes are not allowed to avoid drastic negative environmental and economic impacts from tree and shrub pests and diseases.

5. A water budget chart that shows the total annual water use, which shall not exceed an average of fifteen (15) gallons/square foot/year for each water tap and percentage of each landscape hydrozone type.

6. Accurate and clear identification of all applicable hydrozones as categorized in Section 6.09 A. and marked as defined in Section 6.02.

7. Final landscape design plans shall be stamped by a Colorado registered landscape architect.

6.11 IRRIGATION SYSTEM REQUIREMENTS

Per section Chapter 8, Section 24-804(h)-of the Greeley Municipal Code, an irrigation system design shall be submitted in conjunction with a landscape plan. The irrigation system design shall incorporate the required items set forth below:

A. Irrigation Methods and Layout

1. Provisions shall be made for permanent, automatic irrigation of all plant material, with the following exceptions:

   a. Hydrozones very-low water use plantings that do not require any supplemental irrigation beyond establishment.

   b. Trees and other plants placed within the landscape area along residential local street parkways for single-family detached dwellings.

2. The irrigation method shall be selected to correlate the hydrozones shown on the landscape plan. The following criteria shall be followed during the design of the irrigation system:

   a. Drip irrigation or bubblers shall be used for sparsely-planted trees and shrubs which are greater than three (3) feet.

   b. Rotors and spray heads with multi-jet rotary nozzles shall be used for turf grass. Spray heads are not allowed unless retrofitted with rotary nozzles.

c. Only subsurface drip irrigation shall be used to irrigate strips less than 11 feet wide within street right-of-ways. Above ground irrigation is strictly prohibited.

d. Inline emitter driplines are encouraged especially for higher density of planting.

e. Each hydrozone shall irrigate a landscape with similar site, soil conditions and plant material with similar water needs. To the extent reasonably feasible, areas with significantly different solar exposures shall be zoned separately.

f. Traditional turf and non-turf areas shall be irrigated on separate hydrozones.

g. On steep grades, an irrigation method with a lower application rate shall be used in order to minimize runoff and, to the extent feasible, these areas shall be zoned separately and zoned in lines parallel to the slope rather than in blocks. On steep grades, traditional and preferred turf shall not be allowed on slopes greater than 25 percent where the toe is adjacent or within ten (10) feet to an impermeable hardscape.

h. Drip, micro-sprays, retrofitted spray heads with rotary nozzles and rotors shall not be combined on the same zone.

B. Equipment

1. Valves
   a. A backflow prevention assembly shall be installed in accordance with Greeley Municipal Code, Chapter 14.08.070-Cross-connection control. All backflow assemblies shall be equipped with adequately sized winterization ports downstream of the backflow assembly and must be the same material type

   b. In order to reduce water leaks from the irrigation system, a master shut-off valve shall be installed downstream of the backflow device to shut off water to the system automatically when not operating. Flow sensors, integrated with the Smart Irrigation Controller are required for single or combined point of connection flows of 200 gpm or greater.

2. Submeters for irrigation systems are encouraged to enable the owner and landscape maintenance contractor to monitor water use. The installation and maintenance of the submeter shall be borne by the owner of the property and not by the City. All such submeters shall be installed in accordance with the specifications established by the City.

3. Irrigation controllers shall be “smart” controllers, using climate-based or soil moisture-based technology selected from the WaterSense labeled irrigation controllers list issued by the United States Environmetnal Protectection Agency form time-to-time and available at the City of Greeley’s Water and Sewer Department. Controllers shall be installed and programmed according to the manufacturer’s specifications.

a. Post at each smart irrigation controller a data input chart including the precipitation rate from the audit, water budget, and zone descriptions.

b. Within six (6) weeks of the installation of new landscaping, the irrigation system Smart Controller(s) shall be reset to the normal seasonal watering schedule.

c. Irrigation days of the week shall follow Greeley Municipal Code, 14.08.160- Water conservation and use restrictions; drought response.

d. An evapotranspiration (ET) senor or weather monitor installed according to manufacture's specifications in a location to receive accurate weather conditions.

4. Sprinklers and nozzles shall meet the following requirements:

a. The type of sprinkler and associated nozzles shall be selected to correlate with the size and geometry of the zone being irrigated.

b. Sprinklers shall be spaced no closer than seventy-five (75) percent of the maximum radius of throw for the given sprinkler and nozzle. Maximum spacing shall be head-to-head coverage.

c. Coverage arcs and radius of throw for turf areas shall be selected and adjusted to water only turf areas and minimize overspray onto vegetated areas, hard surfaces, buildings, fences, or other non-landscaped surfaces.

d. Sprinklers, bubblers or emitters on each zone shall be of the same manufacturer. Multiple manufactures can be used throughout the system as long as each zone has the same manufacture.

e. Sprayheads in turf areas shall have a minimum six (6) inch pop-up riser height. A four (4) inch pop-up riser height is permitted when the irrigation head is in line with a curb along a parking space.

f. Spray nozzles are not allowed.

g. Nozzles for rotors shall be selected to achieve an approximate uniform precipitation rate throughout the zone.

h. All sprayheads and rotors shall be equipped with check valves and pressure regulating stems in accordance with Colorado's House Bill 19-1231.

i. Pressure-compensating emitters shall be used for drip irrigation. For sloped areas, check valve(s) shall be installed or the drip line shall be parallel to the slope.

j. Remote control valves shall have flow control.

k. Properties with single or combined point of connection flows of 200 gpm or greater, shall have a control system capable of providing real-time flow monitoring

and the ability to shut down and/or isolate the problem area(s) with an isolation valve in the event of a high flow condition.

l. Emitters shall be set back from foundations a minimum of five (5) feet or as recommended by the project soils engineer's investigation and analysis.

m. Sprayheads in turf areas shall be matched precipitation nozzles. Variable Arc Nozzles (VANS) are not acceptable for 90, 180, and 360 degree applications. High-Efficiency Variable Arch Nozzles (HE-VANS) are allowed in odd shaped areas (non-linear or triangular head spacing) where 90, 180 and 360 degrees nozzles are not applicable.

5. Sleeving shall meet the following requirements:

a. Separate sleeves shall be installed beneath paved areas to route each run of irrigation pipe or wiring bundle. The diameter of sleeve shall be twice that of the pipe or wiring bundle.

b. The sleeve material beneath sidewalks, drives and streets shall be PVC Class 200 pipe with solvent welded joints.

c. For all sleeving located under concrete, the pavement or other hard surfacing shall be notched on both sides to mark the sleeve location and tracer wires shall be installed.

d. Contain no joins when less than twenty (20) feet.

C. Water Pressure

1. The irrigation system designer shall verify the existing available water pressure.

2. The irrigation system shall be designed such that the point-of-connection design pressure, minus the possible system pressure losses, is greater than or equal to the design sprinkler operating pressure.

3. All rotary sprinklers and multi-stream rotary nozzles pop-up spray sprinkler bodies shall operate at the manufacturer's specific optimum performance pressure range.
4. All pop-up spray sprinkler bodies equipped with a sprayheads shall operate at no less than twenty (20) psi and no more than thirty (30) psi.

5. If the operating pressure exceeds the manufacturer's specified maximum operating pressure for any sprinkler body, pressure shall be regulated at the zone valve or sprinkler heads.

6. Pressure boosters are allowed if required. Booster pumps must be prefabricated units with variable speed controls.

6.12 IRRIGATION DESIGN PLAN

The purpose of a preliminary irrigation design plans is to provide a general design and annual water allotment for landscapes. The final irrigation design plans build upon the preliminary design with additional details. In accordance with Greeley Municipal Code, Chapter 8, Section 24-804(h) – Landscape Standards, the irrigation plan shall be designed in conjunction with a landscape plan in a manner to maximize irrigation efficiencies:

A. Preliminary Irrigation Design Plans shall include:

1. Accurately and clearly identify all applicable hydrozones with square footage using the defined four categories in Section 6.10 and using letter marking found in Section 6.2 of these Criteria.

2. Include irrigation methods according to the hydrozones. Spray heads on a zone shall have matched precipitation nozzles.

3. A water budget chart that shows the total annual water use, which shall not exceed fifteen (15) gallons per square foot over the site.

B. Final Irrigation Design Plans shall include:

1. Same information required for the Preliminary Irrigation Design Plan submittal and;

2. A Smart Irrigation Controller data input chart. Irrigation schedules for landscape establishment period and established planting shall include irrigation frequency, cycles per day, and minutes per cycle, and a note stating that the schedule is a guide only and actual field conditions may require more or less watering time as plants mature. Seasonal adjustment shall be included in the data input chart.

3. A pressure calculation worksheet that shall demonstrate the point-of-connection design pressure, minus the possible system pressure losses, is greater than or equal to the design sprinkler operating pressures.

4. The following General Notes:

   a. Contractor installing the system including name, address, and phone number

   b. Any irrigation certifications

   c. All field adjustments or redesign to show “as-built” drawings after installation is complete

1. The owner of the property shall be provided:

   a. “As-built” irrigation drawings

   b. Water budget chart

   c. Smart Irrigation Controller data input chart

   d. Two (2) operating keys for each type of manually operated valves

e. Two (2) of each servicing wrench or tool needed for complete access, adjustment and repair of sprinklers.

6.13 IRRIGATION SYSTEM INSTALLATION

Irrigation system installation shall be consistent with approved plans and meet the City's Criteria prior to issuance of Certification of Occupancy or other City approvals. Release of bonding or surety (if applicable) shall be withheld until approval is given.

Materials, installation and execution for parks shall follow City of Greeley Design Criteria and Construction Specifications, Section 02810 Irrigation Specifications.

Otherwise the following shall occur for irrigation system installation:

A. Quality Assurance:

1. Irrigation system installation shall be consistent with approved system design and applicable water type (potable versus non-potable systems). It is recommend for the irrigation system to be designed and construction for non-potable water systems.

2. Work and materials shall be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.

3. When contract documents call for material or construction of better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.

4. A Field Supervisor shall review and sign-off on the installation. Field Supervisors shall have at least five years (5-years) experience in two wire installation.

B. Installation

1. Contact the City of Greeley Water and Sewer Department at conserve@greeleygov.com when irrigation construction begins.

2. Installation shall be consistent with approved system design.

3. New and existing tree and shrub locations as shown on the landscape plans take precedence over irrigation equipment locations. Conflicts between irrigation system, planting material and architectural features shall be avoided.

4. Assembling pipe and fittings shall be in a manner recommended by the manufacturer and in accordance with accepted industry practices.

5. A minimum of two (2) appropriately sized control wires and one (1) common wire from controller located to each dead-end of mainline for use as spares in case of control wire failure. Cap end of wires with water-proof wire connector. Wire terminations must be located in a valve box. In addition, coil three (3) feet of wire in the valve box.

6. Sprinkler assemblies shall be installed as per the specifications and at the locations of the irrigation plans. All sprinkler assemblies shall be installed for best performance. The City reserves the right to conduct follow-up audits as deemed necessary at the expense of the customer to ensure irrigation system efficiencies.

C. Testing

1. All irrigation zones shall be free of leaks, defects or deficiencies in the irrigation system. It is unlawful for any owner or user of water to fail to comply to the prevision of Greeley Municipal Code, Section 10.08.100 and to waste water through neglect or by reason of faulty or imperfect plumbing or fixtures per Greeley Municipal Code, Section 14.08.090.

6.14 IRRIGATION PERFORMANCE AUDIT

Per Greeley Municipal Code, Section 24-801(b)(5) and 24-804(h)(5) a letter of substantial completion of the landscape plan and an irrigation performance audit must be completed prior to issuance of Certification of Occupancy or other City approvals. Release of bonding or surety (if applicable) shall be withheld until approval is given. Details of the Irrigation System Installation, Performance Audit and Landscape and Irrigation System Maintenance

A. Exemptions

1. Systems with only subsurface irrigation are exempt from the audit.
2. Landscape plans and plant installation without turf areas.

B. Certification

3. The contractor in charge of the irrigation system installation must contract to have an irrigation performance audit completed by either a:

   a. Certified Landscape Irrigation Auditor (CLIA) and/or the Irrigation Association (a non-profit industry organization dedicated to promoting efficient irrigation)

   b. Qualified Water Efficient Landscaper (QWEL) who is certified by EPA WaterSense

4. A sprinkler audit must be performed either by the City of Greeley's Water Conservation Program personnel, a CLIA or QWEL independent of the installation contractor.

5. The cost of hiring the CLIA/QWEL contractor shall be the responsibility of the contractor in charge of the installation.

C. Performance Audit Guidelines

1. The minimum acceptable distribution uniformities shall be sixty (60) percent for sprayhead zones and seventy (70) percent for rotor zones.

2. Results below minimum acceptable distribution uniformity will require adjustments and/or repairs made to the irrigation system. These corrections will be noted on the irrigation as-builts and the test area re-audited until acceptable results are produced.

3. A signed copy of the Irrigation Performance Audit shall be submitted to and approved by the Water and Sewer Department, Water Conservation Program Manager before issuance of a Certificate of Occupancy or other City approvals.

6.15 LANDSCAPE MAINTENANCE

Per section 24-804(e) installation and maintenance of the landscape areas of the Greeley municipal code, the developer, owners' association, property managers, property owner and/or tenant, as required by Chapter 8, shall be responsible for maintaining in a healthy condition all on-lot and right-of-way landscaping, buffering, perimeter treatment and screening improvements. The landscape and irrigation maintenance shall incorporate the required items set forth below:

A. The Owners' Association, property managers, property owner and/or tenant shall be jointly and severally responsible for the regular maintenance of all landscaping elements and irrigation system in good condition. All landscaping shall be maintained free from disease, pests, weeds and litter.

B. Regular maintenance shall be consistent with the needs of the plant material and shall include pruning, mowing, fertilization, mulching and weeding, and plant materials replacement.

C. Preferred turf shall follow the City of Greeley's Natural Areas & Trails Department No-Mow policy. The policy requires the following targeted mowing:

1. 6' maximum width, 6-12" high on each side of a concrete or soft-surface trail up to 3 times per growing season, May 15th through September 15th.

2. 15' maximum width, 6-8" high, along the property line, if feasible and accessible, where a designated natural area abuts residential/commercial property up to 3 times per growing season, May 15th through September 15th.

D. Best management practices to fix erosion shall be used to maintain landscapes and irrigation systems.

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6.16 IRRIGATION SYSTEM MAINTENANCE

A. Regular maintenance of the irrigation system includes backflow prevention assembly testing, leak repair, replacement of damaged system components, head adjustments, filter and strainer cleaning/replacement and application rate adjustments.

B. A completed, passing backflow prevention assembly test, consistent with the parameters outlined in the City's Cross-Connection Control Standards Section 14.08.070 is required for irrigation system start-up. Proper assembly operations shall also be verified through passing backflow prevention assembly test when the assembly is taken out of service for maintenance or repair.

C. All irrigation system elements shall be repaired and replaced periodically to maintain an efficient and well operating system.

D. Irrigation controllers shall be seasonal adjusted, no programed to irrigate between the times of 10:00 a.m. to 6:00 p.m. and use a cycle and soak irrigation method.

E. Irrigation days of the week shall follow Greeley Municipal Code, 14.08.160-Water conservation and use restrictions; drought response

F. Subject to Chapter 14.08-Water Rates and Regulation, failure to maintain any plumbing or fixtures of any premises are so defective as to waste any water is unlawful and shall be subject to penalties and/or water shutoff.