WWE
Wright Water Engineers, Inc.
2490 W. 26th Ave., Ste. 100A
Denver, CO 80211
(303) 480-1700 TEL
(303) 480-1020 FAX
www.wrightwater.com
e-mail: dludwig@wrightwater.com

April 23, 2024

Development Services Department
City of Aurora
15151 E. Alameda Parkway, Suite 5200
Aurora, CO 80012

Re: Aurora Parklands – Coal Creek Stream Improvements Site Plan Cover Letter

To Whom It May Concern,

Wright Water Engineers, Inc. (WWE) has prepared this letter on behalf of NL Village I Land Co., LLC to introduce and summarize the proposed improvements to Coal Creek as part of the Aurora Parklands development in Aurora, Colorado (Project). The Project reach of Coal Creek generally extends from East Jewell Avenue to East Mississippi Avenue near Harvest Road. The preliminary Project improvements were developed in close collaboration with the Aurora Parklands design team as well as multiple staff members from the City of Aurora (City) and Mile High Flood District (MHFD). The improvements proposed within the Preliminary Drainage Report and Plan are consistent with the Master Drainage Report for the Parklands Development.

The objective of the Coal Creek stream improvements through Aurora Parklands is to maintain the naturally functioning stream corridor while providing mitigation structures that limit the impact from potential future adverse responses to hydromodification and other catchment- and reach-scale disturbances. The Project is intended to be publicly maintained and eligible for the MHFD Maintenance Eligibility Program. Major design elements of the Project include:

- Minimizing flood risk and preserving floodplain function by locating development outside of the hazard areas, such as the 100-Year floodplain, as identified in previous studies.
- Installation of targeted buried riffle structures to protect against long-term degradation.
- Installation of at-grade riffle structures to reconnect the overbank areas where the creek has become moderately entrenched.
- Protecting the high-value riparian corridor along the Project Reach.
- Recommended development setbacks and considerations atop the steep slope located at the outside of the bendway.

We appreciate your consideration and look forward to continuing to work with the City on this exciting Project.

Sincerely,

WRIGHT WATER ENGINEERS, INC.

By _____
Drake Ludwig, P.E.
Water Resources Engineer

MEMORANDUM

To: Dave Carro
Oakwood Homes, LLC
Via Email: <DCarro@OakwoodHomesCO.com>

From: Wright Water Engineers, Inc.
Andrew Earles, Ph.D., P.E., CPESC
Drake Ludwig, P.E.

Date: September 16, 2021

Re: DRAFT Coal Creek Conceptual Design Memorandum

This memorandum documents the discussions and recommendations provided by the Mile High Flood District and the City of Aurora during a site visit to Coal Creek between East Jewell Avenue and East Mississippi Avenue near Harvest Road in Aurora, Colorado (Project Reach).

Meeting: Coal Creek Site Visit

Date/Time: September 9, 2021
9:30 AM – 11:30 AM

Location: On-Site, at Coal Creek

Attendees: Morgan Lynch, Mile High Flood District
Mark Schutte, Mile High Flood District
Craig Perl, City of Aurora
George Slovensky, City of Aurora
Brian Green, City of Aurora
Katie Jagt, Watershed Science and Design
Bruce Rau, Oakwood Homes
Dave Carro, Oakwood Homes
Randy Bauer, Oakwood Homes
Layla Rosales, Terracina Design
Anthony Files, Terracina Design
Rob Hansen, Core
Mike Guiffre, Core
Caitlin Soley, Core
Troy Thompson, Ecological Resource Consultants
Andrew Earles, Wright Water Engineers
Drake Ludwig, Wright Water Engineers

SITE VISIT MEETING MINUTES

The following list provides a summary of the discussions during the September 9th visit to Coal Creek.

- Introductions
- Overview and Background:
    - Oakwood provided background on Project schedule.
    - Discussion of the Conceptual Design Memorandum distributed by WWE to the group of attendees on September 7, 2021:
        - Overview of the stream assessment and findings:
            - Previous studies (MDP and FHZ),
            - Coal Creek was found to be relatively stable,
            - Identified areas of concern included floodplain constrictions, the erosional feature identified in the FHZ, and localized instabilities.
        - Discussed conceptual plan to keep Coal Creek in its existing alignment, provide buried riffles and toe protection where needed, and restore unstable reaches.
    - Discussed intent of site visit to present findings to MHFD and Aurora and get their feedback on the conceptual design approach.
    - Discussed project phasing, intent is to start from the northwest corner near Harvest Rd and Jewell Ave. Detention ponds will be brought online from downstream to upstream along Coal Creek as the project progresses. Currently three (3) ponds are planned along the south and west sides of Coal Creek. The first phase will include roughly 500 lots and one detention pond.
    - Morgan had noted that the erosional feature identified in the FHZ was of particular concern.
- The group walked along Coal Creek to observe the erosional feature:
    - The land plan for the area above the erosional feature was discussed. MHFD expressed concerns with development above the erosional feature and desire to address this risk concurrently with the stream improvements.
    - Core and Oakwood noted that the planned development above the feature is offset from the top of slope.
    - The mechanism of erosion was discussed, and it was agreed that the slope was eroding from above and that there was not evidence of erosion at the toe of slope, due to Coal Creek. Drainage from the development above the feature will therefore need to be carefully managed to prevent the saturation of soils. Potential management solutions discussed were: xeriscaping, capturing infiltration, and routing drainage away from the feature.
    - MHFD requested that these considerations be memorialized in the MDP.
    - Potential options for providing additional stability to the toe were discussed, including willow plantings and rock toe protection / bendway weirs.
    - The variability in reach hydraulics were discussed. Grading in the floodplain is recommended to keep the stream power relatively consistent through Coal Creek. One of the detention ponds on the site is located near a contraction in the corridor, so

the detention pond design will need to be coordinated with floodplain corridor improvements in this area.
    - Considering the future conditions and sediment transport regime of the creek will be important. Keep stream power consistent will avoid excessive aggradation upstream of constrictions that create zones of lower velocity upstream.
- General discussion regarding various project elements was had:
    - MHFD recommended obtaining several geotechnical borings to understand groundwater levels and soils on site.
    - The proposed buried riffle structures will still require heavy equipment, special consideration should be given to the sandy soil.
    - Vegetation can play a key role in stabilization along the corridor, and a planting plan designed in conjunction with hydraulic and geomorphic analysis can help manage erosional forces along the corridor.
    - MHFD does not have specific concerns regarding the outfall of the western pond (Pond J1 in the previous master plan) as long as the pond is outside of the active stream corridor and the outfall is stabilized.
    - Core and the City discussed pond sizing adjustments based upon timing of peak flows within Coal Creek and from the development on-site.
    - MHFD mentioned possible site access and approval to complete boring in trees to complete historic flood data research. Rob at CORE ask for a request that he could pass along to the development team and property owner for approval.

RECOMMENDATIONS FOR COAL CREEK IMPROVEMENTS

The following is a list of recommendations for the Coal Creek improvements based on comments made by the MHFD and the City of Aurora during the site visit. *MHFD and City of Aurora to edit or comment on this list to clarify or add to recommendations.*

- Maintaining the existing alignment of Coal Creek and preserving its floodplain is acceptable with the following considerations:
    - Future development above the identified erosional feature will:
        - Be offset from the existing top of slope based on recommendations of a geotechnical engineer,
        - Manage drainage from the site to avoid surface discharge to the erosional feature and minimize infiltration in the area above the slope. Managing stormwater to drain around and discharge downstream of the erosional feature is recommended to reduce the risk of erosion and slope failure. Additional water management measures such as Xeriscaping may also be needed to reduce potential for infiltrating water to cause piping or build-up of hydrostatic pressure in ground beneath the slope.
    - Stabilization at the toe of the erosional feature will promote stability. Excavation is not recommended along the toe of the existing slope. A planting plan is recommended promote stability in this area. At-grade rock structures such as a riprap toe revetment or deflector structures (bendway weirs) should also be considered.

    - Alleviate the identified areas of constriction by grading the floodplain to create greater continuity in stream power through the corridor. Floodplain grading will be required in the vicinity of Pond J2, necessitating reconfiguration of the pond.
- The installation of buried riffle structures will help prevent potential future downcutting of Coal Creek through the project area as flows increase with upstream urbanization in the watershed.
- Localized stream improvements will help restore localized areas of instability. It is understood that this geomorphically dynamic reach of Coal Creek and some areas of erosion and deposition are to be expected due to natural processes. The goal of localized improvements would be to address any areas of excessive erosion or aggradation.
- Developing a planting management plan and fencing off the creek to grazing (or removal of livestock) will promote stream stability.
- Geotechnical borings should be collected in a number of locations to understand groundwater and soil conditions.

Aurora Parklands
Coal Creek Stream Improvements

Meeting: Coordination Meeting with City of Aurora and MHFD
Date/Time: March 20, 2023
3:00 pm
Location: Remote – Microsoft Teams

Attendees

- Craig Perl, City of Aurora
- Brian Green, City of Aurora
- George Slovensky, City of Aurora
- Colin Haggerty, Mile High Flood District
- Derek Clark, Mile High Flood District
- Mark Nickless, OMSC, LLC
- Marie Russo, ERO Resources
- Liam Shannon, Kimley-Horn
- Drake Ludwig, Wright Water Engineers

Agenda

1. Introductions
2. Project Background
    a. Ownership: MHFD inquired about potential future development within the floodplain between Creek and future Mississippi which is not held by the ownership group. Master Plan documents show this as open space.
    b. Previous Work: MHFD had read through previous report developed by WWE and did not provide any comments.
        i. Concept Design
            1. The City and MHFD appreciated the low-impact approach to the project and did not have objections to the concepts shown to-date.
            2. Colin will be looking for more information related to the restoration approach in some of the more heavily grazed areas.
            3. A discussion of Adaptive Management Plans was had between the City and MHFD, though it was not necessarily recommended for this site.
            4. The development plans upstream of the erosional feature were discussed. Consistent with the discussions had during the September 16, 2021 site visit, development should be offset from the top of bank and drainage should not be routed into Coal Creek via the bank.
        ii. Permitting

3. Next Steps
    a. Refine conceptual design and work towards final design
        i. Refine and provide additional information regarding the overbank grading and the restoration of heavily grazed areas.
        ii. Submit Coal Creek Project as its own ISP. MHFD happy to review information ahead of formal submittal if the project team desires.
    b. Permitting
        i. No-Rise v. CLOMR/LOMR
            1. Craig Perl okay with No-Rise if it can be shown that improvements would not cause more than 0.00 feet of rise through the reach.
        ii. 404 Permitting
            1. NWP27 seemed reasonable. Colin recommended that Marie reach out to Mary Powell at MHFD to make sure there aren't any red flags with this approach.
4. Schedule
    a. Village I
    b. Coal Creek Stream Improvements

Aurora Parklands
Coal Creek Stream Improvements

Meeting: Coordination Meeting with City of Aurora and MHFD
Date/Time: February 22, 2024
11:00 am
Location: Remote – Microsoft Teams

Attendees

- George Slovensky, City of Aurora
- Craig Perl, City of Aurora
- Brian Green, City of Aurora
- Colin Haggerty, Mile High Flood District
- Derek Clark, Mile High Flood District
- Marie Russo, ERO Resources
- Liam Shannon, Kimley-Horn
- Ziggy Files, Terracina Design
- Tony Peall, AzTec
- Troy Thompson, ERC
- Drake Ludwig, Wright Water Engineers
- Madison Gutekunst, Wright Water Engineers

Agenda

1. Introductions
2. Purpose of meeting:
    a. Review the latest design
    b. Get feedback from the City and MHFD and/or concurrence on the approach to move the design forward
    c. Understand the submittal process through the City
3. Previous discussions
    a. 'Lighter touch approach'
    b. Some overbank grading
    c. Restoration of the upstream reach
4. Updated Analysis
    a. Integrated site survey
    b. Identified target areas for overbank reconnection
        i. Evaluated targeted overbank grading areas
        ii. Minimal hydraulic and geomorphic benefit
        iii. MHFD and the City were generally in agreement that localized impacts of grading did not justify the work
    c. Evaluated scour and slope stability of bendway - no additional protection currently proposed
        i. Site evidence suggests erosion from hillslope rather than Coal Creek

ii. Development on the top of the erosional feature will be setback and all drainage routed north, away from the bank
iii. MHFD and the City were okay without a rock revetment at the toe of slope, understanding that development on the hillslope will be set back and all drainage generated from future development be routed to the north, away from the hillslope
iv. Potential downstream hydraulic controls were discussed. A buried riffle is proposed at the location of the roadway crossing (well downstream of the bend)

d. Targeted Structures
   i. Buried Riffles: 2.5' drop spaced at ~0.2% equilibrium slope
   ii. WWE to verify slope and more clearly label existing structure
   iii. At-Grade Riffle Structures: Variable drop, 2.5% longitudinal slope, target for overbank reconnection
   iv. The City would like to see the hydraulics updated with the at-grade riffle structures
   v. MHFD concurred with the buried sills and recommended that the elevations be considered during the final design to ensure that they direct flow back towards the creek

e. Site Planning
   i. Development stays out of:
      1. Effective 100-year floodplain
      2. Future 100-year floodplain
      3. Active Stream Corridor
   ii. MHFD suggested adding the buffer on top of the erosional feature to this area

5. Submittal Process
   a. Submit document as PDR with typical site plan
   b. City would prefer that the existing utilities be potholed and elevations be shown on the plan
   c. The City anticipates that the floodplain corridor be dedicated to the City as a tract
6. Effective Floodplain Models
   a. MHFD will send the effective model for the assessment of floodplain impacts
7. Misc. Discussion
   a. The timing of the project was briefly discussed. MHFD has concerns with Pond C coming online prior to the construction of the stream improvements. The timing of Pond C is currently driven by the development south of Jewell.
8. Next Steps
   a. WWE to update grading with at-grade structures and model proposed conditions
      i. George recommends another meeting after the proposed model conditions are developed to make sure all parties are okay with the modeled hydraulics and design approach. A variance for the hydraulic parameters (shear, velocity, etc.) will likely be required
   b. Design team to prepare documents for formal PDR submittal

Aurora Parklands
Coal Creek Stream Improvements

Meeting: Coordination Meeting with City of Aurora and MHFD
Date/Time: March 18, 2024
1:00 pm
Location: Remote – Microsoft Teams

Attendees

- George Slovensky, City of Aurora
- Craig Perl, City of Aurora
- Brian Green, City of Aurora
- Colin Haggerty, Mile High Flood District
- Derek Clark, Mile High Flood District
- Mark Nickless, OSMC, LLC
- Marie Russo, ERO Resources
- Liam Shannon, Kimley-Horn
- Ziggy Files, Terracina Design
- Troy Thompson, ERC
- Drake Ludwig, Wright Water Engineers
- Madison Gutekunst, Wright Water Engineers

Agenda

1. Purpose of meeting:
    a. Review the updated hydraulic model results with the inclusion of the at-grade riffle structures
    b. Confirm the design approach with the City although some of the hydraulic parameters are higher than the design values in the USDCM
2. Updated Analysis
    a. WWE shared updated model results with the inclusion of the proposed grading of the at-grade riffle structures
    b. In the bankfull and 100-Year events, the impact to the hydraulics were minor and highly localized to the immediate vicinity of the structures
    c. WWE highlighted that the at-grade riffle structures are intended to reconnect the overbanks during low flow events (lower than bankfull) to improve overbank vegetation and stability
        i. The City mentioned that they would be interested in seeing the performance of the structures under the anticipated low flow rates and asked that this be included in the PDR.
    d. The high-flow hydraulics of the Project reach are largely unchanged with the proposed structures
        i. The City noted that the hydraulics still exceed the USDCM criteria (as they do in the existing condition) and recommended another meeting with

Vern Adam. There was some discussion as to whether another meeting was required.

ii. MHFD mentioned that they are less concerned about the hydraulics during a large flow than the impact of more frequent, sediment-hungry baseflows resultant of future upstream development. WWE noted that it is the intent of the buried and at-grade riffle structures to help limit the potential for long-term incision while being minimally invasive.

3. Next Steps
    a. City to follow-up with Vern to understand if a meeting is need prior to submitting the PDR.
    b. WWE to update the hydraulic modeling with low-flow hydrology for inclusion in the PDR submittal