ANDERSON ENGINEERING
EMPLOYEE OWNED

HIGHLAND MEADOWS 5TH & 6TH PLATS

STORMWATER MANAGEMENT FACILITY - BMP OPERATION & MAINTENANCE (O&M) PLAN

Project Location:
NE Corner of Longview Blvd. and SW 12th Street
Lee's Summit, MO 64082

Prepared for:
Highland Meadows Homes Association
Young Management Group, Inc.
10660 Barkley, Suite 200
Overland Park, KS 66212
Contact: John Young
Phone: (913) 890-2300

Prepared by:
ANDERSON ENGINEERING
EMPLOYEE OWNED
941 W. 141st Terrace
Kansas City, MO 64145

July 21, 2022
Rev. 1 – September 14, 2022

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STORMWATER MANAGEMENT FACILITIES DESCRIPTION

General Site Description

Highland Meadows is a residential subdivision located south of the intersection of SW Longview Road and Longview Boulevard in Lee's Summit, Missouri. The 5th and 6th Plats contain a combined 77 residential lots and are the final two phases of construction for the development. Both phases were constructed concurrently and consist of approximately 26.29 total acres. As part of the stormwater requirements of the City of Lee's Summit, Missouri, Best Management Practices (BMPs) have been implemented within the Highland Meadows development. The primary BMP being utilized for the 5th and 6th Plats of the Highland Meadows residential subdivision is an Extended Dry Detention Basin (EDDB), to reduce peak stormwater discharge rates, reduce downstream flooding, and improve stormwater quality. The EDDB is located on the northeast corner of SW 12th St. and Longview Blvd., also designated as Tract G of the 5th plat. The EDDB contains an outlet control structure at the south end that limits the outflow of stormwater and provides water quality for the development. Stormwater flowing into the outlet control structure flows south into the City's public storm sewer system under SW 12th Street, and discharges at the south end of the development. Drainage Area Maps, Basin As-Built Drawings, and Outlet Control Structure Details can all be referenced in Appendix A.

Stormwater Management Facilities BMP Components

An increase in stormwater runoff is anticipated within the Highland Meadows development due to the increase in impervious area. To mitigate the increase in runoff, an Extended Dry Detention Basin (EDDB) has been implemented as the primary BMP for reducing peak stormwater discharge rates and improving stormwater quality. This is accomplished by a custom outlet control structure that was designed to release stormwater at specific rates, which are less than the rates flowing into the basin. This causes the basin to fill up and detain the excess stormwater volume for an extended period of time, which subsequently allows sediment and debris time to settle out of suspension, as well as reduce any flooding impacts downstream of the development. Also incorporated into the design of the basin, due to its flat sloping bottom, is a Low Flow Concrete Channel that runs up the middle of the basin. This channel helps the basin completely drain after a rain event, since water flows better on a continuous hard surface. Construction details for the Outlet Control Structure and Low Flow Concrete Channel can be referenced in Appendix A on the Outlet Control Structure Details sheet. A final component of the basin that is also very important for proper functionality of the basin is rip-rap stabilization around the inlet pipes and outlet control structure. This rip-rap helps prevent erosion that could otherwise cause slope stability issues or failure of the storm sewer networks. Included in Appendix A are Riprap details that were utilized in the construction plans.

SITE CONTACTS & CHANGE OF OWNERSHIP PLAN REQUIREMENTS

With the permanent development of Highland Meadows, the Extended Dry Detention Basin (EDDB) will be owned and maintained by the Highland Meadows Homes Association (HOA), which is managed by Young Management Group, Inc. located at 10660 Barkley, Suite 200, Overland Park, KS 66212. The management company contact is John Young and can be reached at (913) 890-2300. If circumstances arise and there is a change in ownership or management of the HOA, the new owner shall take responsibility for the EDDB and give immediate notice to the city of the change in ownership. Additionally, any changes made to this O&M Manual will need to be resubmitted to the city of Lee's Summit for review and approval prior to acceptance.

INSPECTIONS

Right of Entry for Inspections

As a stormwater treatment facility on private property that is connected to a public storm sewer system, the Highland Meadows HOA shall grant to the City of Lee's Summit, in a manner and form acceptable to the City Engineer, the right to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. This includes the right to enter a property when it has a reasonable basis to believe that a violation of city ordinances is occurring or has occurred, and to enter when necessary for abatement of a public nuisance or correction of a violation. All correspondence with the City and/or violation instances shall be documented and stored with all other basin-related records for future reference.

Inspector Qualifications and Inspection Frequency

The type and extent of inspections shall fall under three categories. Category one shall include designated residents living within the Highland Meadows 5th and 6th plat area and/or adjacent to the EDDB. Category one inspections shall generally consist of visual inspection occurring on a weekly to monthly basis, mainly to ensure that the basin is functioning properly and no major issues are occurring. Any concerning issues identified by the residents shall be reported to the HOA immediately, followed by a category two inspection conducted by the HOA or authorized representative.

The second category of inspections shall consist of the HOA management organization and/or an authorized representative of the HOA that has extensive background in dry detention basins, BMPs, and the City of Lee's Summit stormwater management facility requirements. These inspections should occur on an annual basis and include the inspection logs located in Appendix C of this report, as well as an annual certification statement. The certification statement shall confirm that the basin is, to the best of the inspector's assessment, fully functioning as intended, and/or recommendations for any necessary maintenance. All inspection records shall be kept in a secure location by the HOA for future reference, and be readily available to supply to the City upon request.

The third and most intensive category of inspections shall require hiring a licensed civil engineer or landscape architect to perform a full in-depth assessment of the EDDB, to ensure proper functionality and make any major maintenance recommendations. These inspections shall include the inspection logs located in Appendix C of this report and any other documentation and/or photographs from the professional responsible for the conducting the inspection. The inspection shall also include a certification statement. The certification statement shall confirm that the basin is, to the best of the inspector's assessment, fully functioning as intended, and/or recommendations for any necessary maintenance. All inspection records shall be kept in a secure location by the HOA for future reference, and be readily available to supply to the City upon request.

Ultimately, it is the duty and responsibility of the Highland Meadows HOA to ensure that all inspections are performed at the specified frequency. Failure to perform routine inspections, or neglecting to address problems promptly once discovered, will lead to larger problems forming in the future. Appropriate inspection frequencies must be enforced. Contained below is general information on responsibilities of the inspector:

- The inspector shall be familiar with all construction drawings, plans, and other background information associated with the basin.

- The inspector shall have a thorough background in and understanding of detention system operation and maintenance, field experience, water quality and environmental measures, and pertinent training that will assist during the inspection.
- The inspector shall perform a thorough, detailed, and extensive field inspection of the basin and appurtenant stormwater facilities.
- The inspector shall carefully document field conditions, through inspection forms, reports, photography, and other measures, and provide those reports to the basin owner.
- Upon satisfactory completion of all the recommended or required items, the inspector shall update all files and databases.
- The inspector shall immediately notify the Highland Meadows HOA and City of Lee's Summit representative in the event that a structural deficiency has been identified, such that imminent threat to property or public safety is perceived.
- The inspector will inform the basin owner and municipal representative of any and all potential situations that may result in any water quality problem, either confined to the basin or discharged downstream.
- The inspector will work cooperatively with the City of Lee's Summit, Missouri Department of Natural Resources (MDNR), Environmental Protection Agency (EPA), and other departments to initiate and follow through with necessary repairs or improvements, and/or the assessment and enforcement process.

General Extended Dry Detention Basin Inspection Items

The inspection logs included in Appendix C contain a comprehensive list of important inspection items and shall be used to conduct all annual inspections. This is to ensure all inspections are thorough and consistent, should the need to compare previous inspection reports arise. Below is a general list of items that are standard in an inspection for Extended Dry Detention Basins:

- Inspect for bare soils or disturbed vegetation on the upstream and downstream sides of the embankment.
- Inspect for soil subsidence or settlement of the embankment.
- Check for any damage to the embankment and bare areas where there is no vegetation.
- Inspect for trees and woody growth on or near the embankment.
- Inspect the perimeter side-slopes for bare vegetation and erosion.
- Inspect the bottom of the basin for sediment accumulations, areas devoid of vegetation, or evidence of standing water.
- Inspect the pipes and channels discharging to the basin for erosion and scouring.
- Inspect the upstream end of the outfall and spillway structure(s) for debris accumulation.
- Inspect the downstream end of the outfall spillway structure(s) for erosion and scouring.
- Inspect entire basin for large areas of dead vegetation or other evidence of chemical contamination.
- Observe for any signs of vandalism or trespassing that could affect the basin operation and site stability.

Annual Certifications

The inspection log included in Appendix C shall serve as the annual certification, which shall document if the stormwater treatment facility passes inspection and include any items that require corrective action.

The report shall document each item including, but not limited to, the need for removal of silt, litter and other debris, grass cutting, removal of undesirable vegetation, replacement of landscape and vegetation and replacement and/or repair of structure items including underdrains, overflow structures, and storm drainage pipes. Any maintenance needs found shall be addressed in a timely manner, as determined by the City Engineer, and the inspection and maintenance requirements may be increased as deemed necessary to ensure proper functioning of the stormwater treatment facility.

MAINTENANCE

Maintenance Responsibility

The Highland Meadows HOA is responsible for maintaining the EDDB in good working condition, which includes but is not limited to: promptly cleaning, repairing, and/or restoring all surface grades, orifice plates, berms, vegetation, and other erosion & sediment control devices. Such repairs or restoration and maintenance shall be in accordance with relevant agreements, plans, and reports accepted by the City Engineer and any amendments thereto.

- **Owner's Responsibility**
  - It is the owner's ultimate responsibility to perform routine and non-routine maintenance to ensure a properly functioning and safe detention system.
  - The owner is responsible for all documentations associated with inspection, maintenance, and improvements.
  - In the event of maintenance or repair work performed by the municipality due to inadequate operation or an emergency, it is the owner's responsibility to repay the municipality for all work rendered and all fines assessed, as governed by federal state, and local regulations.
  - The basin owner is ultimately responsible for the performance of the basin, both for water quantity and water quality.
  - Owners should make available any and all inspection forms and documentation of maintenance activities to the appropriate municipal representative. Owners should also forward inspection forms to their municipal stormwater representative upon completion.
- **Inspector's Responsibility**
  - The inspector's responsibilities are as previously listed under the "Inspector Qualifications" section of this report.
- **Municipality Coordination**
  - The City of Lee's Summit may aid on inspection and maintenance, including procedures, forms, activities, and other measures that may benefit the sustainability of the basin operation.
  - The City of Lee's Summit may issue penalties, fines, or other means to safeguard the environment and public from inattention from basin owners. Penalties, fines, and other means are subject to applicable federal, state, and local regulations.
  - The City of Lee's Summit may elect to, but is not required to, implement corrective action if danger is perceived to life, property, or the environment. Subject to local regulation, the repairs and corrective action will be at the basin owner's expense.

Maintenance Prevention

The most effective measure to reduce maintenance and associated costs is a preventative approach to limiting pollutants, sediments, and other trash or debris from entering the EDDB in the first place. The HOA shall be responsible for educating the residents living within the Highland Meadows subdivision, and how a community effort is required to effectively reduce pollution, sediment, trash, and debris capable of collecting in the EDDB. The City of Lee's Summit has many resources available at the following website: https://cityofls.net/stormwater. The following list also summarizes some general information that is important for the general public to be made aware of.

- Educate residents to be aware of how their actions impact water quality, and how they can help reduce maintenance costs and protect their local streams.
- Keep properties, streets, curbs and gutters, free of trash, leaves, debris, and lawn clippings.
- Ensure the proper disposal of hazardous wastes and chemicals like motor oil and pool water.
- Plan lawn care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces and put the sweepings in a compost pile or back on the lawn.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.
- Do not store materials outdoors (including landscaping materials) unless they are properly protected from rain and from stormwater runoff.
- Arrange for sediment and vegetative waste to be picked up and disposed of at an approved site.
- Allow sediment settling in the EDDB and remove in accordance with the requirements listed in the BMP Waste Disposal section of this document.

Routine Maintenance Activities

Primary maintenance in EDDBs is related to maintaining dry conditions, repairing erosion, and managing vegetation. EDDB structures handle sporadic, intense runoff events, and are vulnerable to erosion on the side slopes and the flow line of the basin. Preserving design elevations through routine maintenance of outlets, inlets, low-flow channels, riprap stabilization, and vegetative cover in the areas contributing drainage is critical to avoiding costly sediment dredging. Table 8.12 located in Appendix B of this report summarizes typical maintenance activities and frequency. This table was developed by the Kansas City Chapter of the American Public Works Association, in conjunction with the Mid-America Regional Council, and can be found on page 8-111 in the MARC BMP Manual (2012), which is an approved resource by the City of Lee's Summit. The following is a list of additional features that should be taken into consideration during an inspection and maintenance recommendation as necessary:

- **Vegetation**
  - Cut grass every 1-2 weeks during the growing season months of April-September.
  - Vegetation should be managed based on the construction plans and with native vegetation where feasible. Periodic mowing should take place on embankments and surrounding areas.
  - Trees should not be allowed on the basin embankment. Removal of large trees from an embankment requires the supervision of a professional engineer.

- **Blockages at Outlets/Spillway Structures**
  - Clean trash and woody debris regularly from outlet structures.
  - If regular clogging takes place, a routine inspection and maintenance plan should be implemented.
  - Contact a professional for the removal of large debris and heavy limbs.
  - After debris cleaning, inspect the structure and surrounding areas for damage; repair to stabilize disturbed areas as needed.
  - DO NOT attempt to clear debris from spillways during high flows.
- **Animal Burrowing and Nuisance Wildlife**
  - The burrows need to be filled with properly compacted material placed under the supervision of a professional engineer.
  - Deterrents, such as wire mesh and matting placed above and below the shoreline may be selected to prevent animal burrowing activity.
  - Immediately contact the City of Lee's Summit Public Works Department if large voids are discovered that could compromise the stability of the basin and basin embankment.
  - If animal burrowing problems continue to occur, local and state animal control authorities should be contacted to remove the animals from the basin area.
- **Vandalism and Public Access**
  - Use signage to inform and warn.
  - Distribute pamphlets and fliers to inform surrounding residents about restricted access areas.
- **Trash and Debris**
  - Follow all construction plans and long-term operation and maintenance agreements when performing maintenance and making repairs to basin system.
  - Post "No Dumping" signs in areas near the basin, and especially where previous dumping violations have taken place.
  - Do not allow surrounding property owners to dump woody debris, yard waste, and other material in or near the basin.
  - Post "No Littering: signs and encourage surrounding property owners to pick up trash to minimize accumulations in basins
  - Inform surrounding property owners about water quality issues such as fertilizer and pesticide use via mailers, fliers, posters, discussions at homeowner association meetings, etc.
  - Coordinate with City of Lee's Summit Stormwater Coordinator on additional ways to inform property owners as to how they can help water improve water quality.
  - Encourage surrounding property owners to notify the City of Lee's Summit or the Highland Meadows HOA of the detention basin when dumping is observed, or when a problem is perceived with the basin's operation.

Non-Routine Maintenance Activities

Contained below is general information on non-routine maintenance activities.

- **Sediment Removal (As Needed)**
  - A professional surveyor may be necessary to collect elevations and determine the volume of sediment buildup. Special measures will be necessary to collect bottom elevations in wet detention ponds.

  - Every drainage detention system has its own sediment capacity, so it is essential that periodic inspections take place to determine when accumulations should be removed.
  - Permits may be needed to remove sediment accumulations from wet detention systems.
- **Side Slope Repair (As Needed)**
  - The side slopes shall conform as closely as possible to the approved as-built plan located in Appendix A, and shall not exceed 3:1 (H:V). Slopes showing excessive erosion may require erosion control, additional riprap stabilization and/or other safety measures to prevent further degradation.
- **Erosion Repair (As Needed)**
  - Bare areas should be reseeded and stabilized immediately.
  - Locations where large amounts of flow enter or leave the basin, such as pipe discharges and spillways, are more susceptible to erosion. These areas will likely require riprap, turf-reinforced matting, or other armoring practices.
  - For wet detention basins suffering from shoreline erosions, erosion control material should be selected by a professional engineer and installed promptly.
  - Always perform follow-up inspections after the first storm event following completion of erosion repair to ensure eroded areas have been stabilized sufficiently.

The frequency of all non-routine maintenance activities is to be determined and overseen by the Highland Meadows HOA.

Maintenance Materials

Contained below is general information on materials used in the initial design and construction of the EDDB at Highland Meadows. Coordination with the City of Lee's Summit shall be the first step if infrastructure failure is identified during a routine inspection.

- Reinforced Concrete Pipe, Class III, ASTM C-76 (Coordinate with City for repairs)
- HDPE, AASHTO Designation M252 and M294 (Coordinate with City for repairs)
- MoDOT Type IV RipRap (Coordinate with City for repairs)

Maintenance Certifications by the HOA

The property owners of all stormwater treatment facilities, except for distributed facilities serving individual residential lots, must submit a maintenance certification report to the City Engineer on or before the first day of each year. The maintenance certification report shall be completed and sealed by a registered professional engineer, landscape architect in the State of Missouri or Certified Stormwater manager, unless the city engineer approves other qualified professionals to perform these duties. Such maintenance certification report shall document each item including, but not limited to, the need for removal of silt, litter and other debris, grass cutting, removal of undesirable vegetation, and replacement of landscape vegetation or other specific items noted in the maintenance agreement. Any maintenance needs found must be documented and addressed in a timely manner, as determined by the city engineer, and the inspection and maintenance frequency required may be increased as deemed necessary to ensure proper functioning of the stormwater treatment facility.

Maintenance Certifications by the City of Lee's Summit

The City Engineer may establish an inspection program, including but not limited to routine inspections, random inspections, inspections based upon complaints or other notice of possible violations, inspection

of drainage basins or areas identified as higher than typical sources of sediment or other contaminants or pollutants, inspections of businesses or industries of a type associated with higher than usual discharges of contaminants or pollutants or with discharges of a type which are more likely than the typical discharge to cause violations of state or federal water or sediment quality standards or the NPDES stormwater permit, and joint inspections with other agencies inspecting under environmental or safety laws. Inspections may include, but are not limited to, reviewing maintenance and repair records, sampling discharges, surface water, groundwater, and material or water in drainage control facilities, and evaluating the condition of drainage control facilities and other stormwater treatment practices.

General Safety Procedures

It is preferable to perform inspections in teams, for both the purposes of safety as well as thoroughness. Teams should operate as one and routinely call out problems and discuss observations. Team members should also cover the same ground and follow the "check and recheck" approach to these inspections. Whenever possible, it is ideal to notify surrounding property owners prior to performing inspections. For safety purposes, teams should notify a third-party contact of their location and periodically check in. Appropriate personal protective equipment (PPE) should be worn during these inspections. Inspectors should be familiar with hazards associated with the site (i.e., steep terrain, flowing water, confined spaces, snakes, etc.). To effectively collect and document useful information during the inspection, crews should also use field equipment. Field equipment may include:

- Measuring instruments including, box tape, 300-foot open reel tape, rigid measuring stick such as a survey rod or folding carpenter's tape, etc.
- Digital camera with flash, cell phone, two-way radios, metal detector
- Flashlight, high-visibility vest, gloves, walking stick, field boots, etc.

BMP WASTE DISPOSAL

Some sediment may contain contaminants of which the Missouri Department of Natural Resources (MDNR) requires special disposal procedures. If there is any uncertainty about what the sediment contains or it is known to contain contaminants, then MDNR should be consulted and their disposal recommendations followed. Sampling and testing shall be performed on sediments accumulated in areas where pollutants (other than "clean" soil) are suspected to accumulate and be conveyed via stormwater runoff.

Some sediment collected may be innocuous (free of pollutants other than "clean" soil) and can be used as fill material, cover, or land spreading. It is important that this material not be placed in a way that will promote or allow resuspension in stormwater runoff. The sediment shall not be placed within the high-water level area of the EDDB, other BMP, creek, waterway, buffer, runoff conveyance device, or other infrastructure. Some demolition or sanitary landfill operators will allow the sediment to be disposed at their facility for use as cover. This generally requires that the sediment be tested to ensure that it is innocuous.

- Remove sediment when accumulation reaches 6 inches, or if resuspension is observed or probable.
- Remove all sediment accumulation within 18 inches of an orifice plate

IMPORTANT CONTACTS

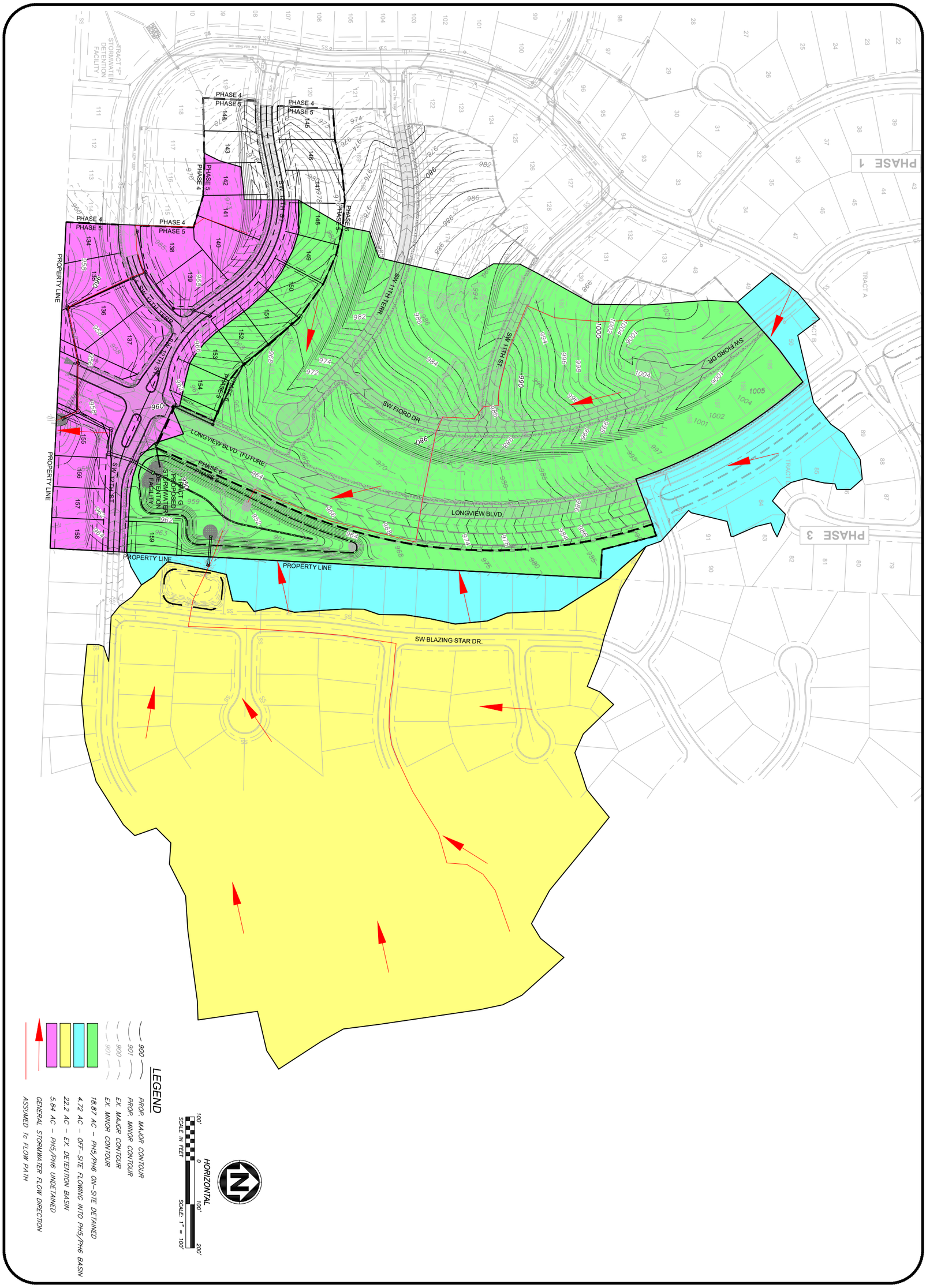
City of Lee's Summit
220 SE Green St.
Lee's Summit, MO 64063
(816) 969-1000

Lee's Summit Police Department
10 NE Tudor Rd
Lee's Summit, MO 64086
(816)969-7390
FOR EMERGENCIES: DIAL 911

Lee's Summit Fire Department
FIRE STATION 3: 2023 NW Shamrock Avenue, Lee's Summit, MO 64081
FIRE STATION 7: 2150 SW Scherer Road, Lee's Summit, MO 64082
(816) 969-1300
FOR EMERGENCIES: DIAL 911

Lee's Summit Animal Control
1991 SE Hamblen Rd, Lee's Summit, MO 64082
(816) 969-1640
FOR EMERGENCIES: DIAL 911

APPENDIX A – DRAINAGE MAPS & AS-BUILT DRAWINGS



SHEET NUMBER 1
1 OF 1

SUMMIT HOMES KC
HIGHLAND MEADOWS - 5TH & 6TH PLAT

STORMWATER EXHIBIT

S10, T47N, R32W
LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DRAWING INFO.	
DRAWN BY:	GC
CHECK BY:	ZM
LICENSE NO.	PE-2012003232
DATE:	12/11/2020
ISSUED FOR:	DRAINAGE STUDY
JOB NUMBER:	20KC10057
MO COA NO.	000062

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811 E. THIRD STREET • JOPLIN, MISSOURI 64801 • PHONE (417) 782-7399
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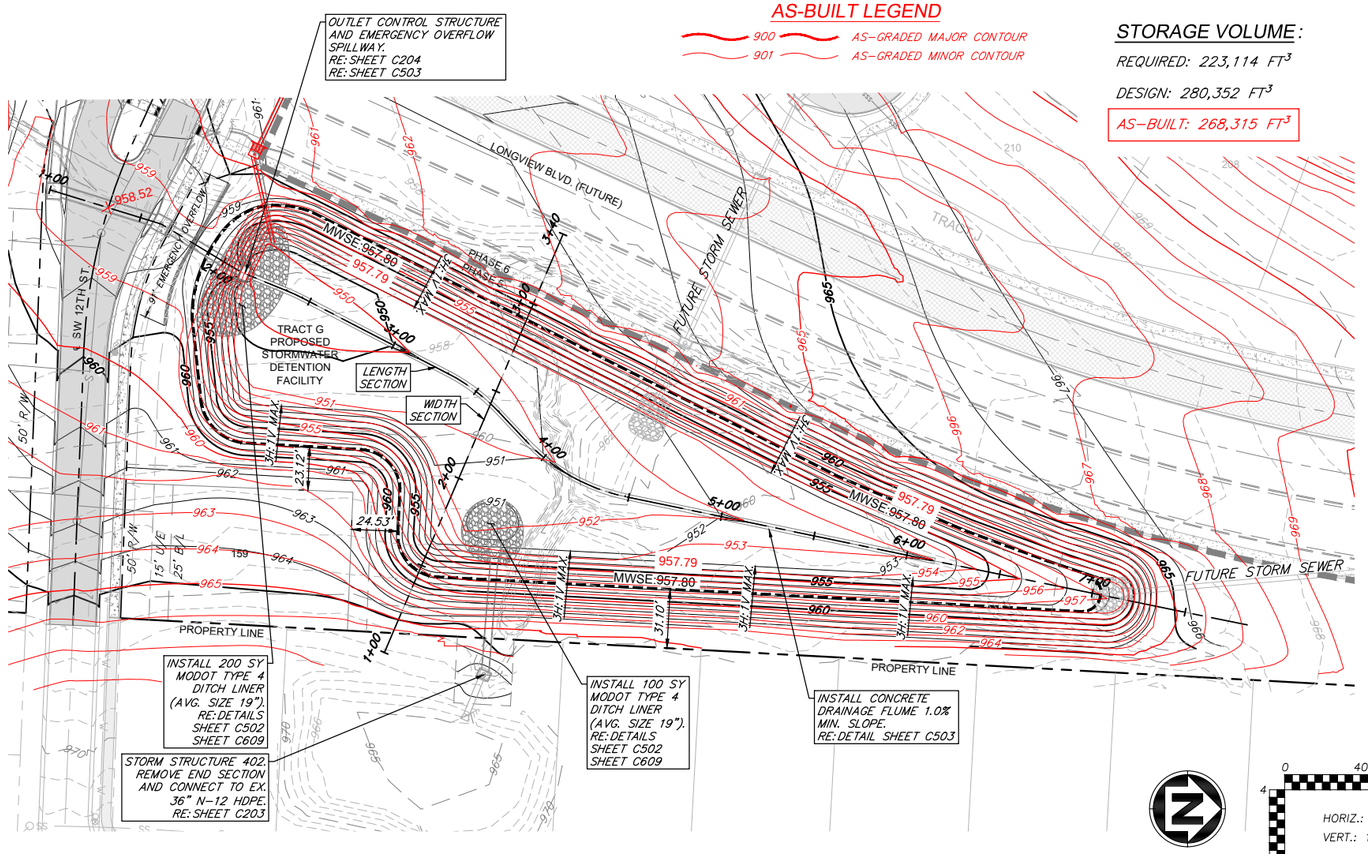


STORAGE VOLUME:

REQUIRED: 223,114 FT³

DESIGN: 280,352 FT³

AS-BUILT: 268,315 FT³

WATER SURFACE ELEVATIONS:

W_QV	~~952.06~~	952.75
2-YR	~~953.49~~	953.59
10-YR	~~955.57~~	955.61
100-YR	~~957.80~~	957.79

OUTLET DISCHARGE RATES:

W_QV	~~0.08~~ CFS	0.08
2-YR	~~23.41~~ CFS	23.43
10-YR	~~94.04~~ CFS	94.14
100-YR	~~194.07~~ CFS	194.05

LEGEND

- 900 — PROPOSED MAJOR CONTOUR
- 901 — PROPOSED MINOR CONTOUR
- 900 — EXISTING MAJOR CONTOUR
- 901 — EXISTING MINOR CONTOUR
- TYPICAL 28' ROADWAY PAVEMENT SECTION
- 5' CONCRETE SIDEWALK
- RIPRAP STABILIZATION
- RIGHT-OF-WAY
- ROAD CENTERLINE

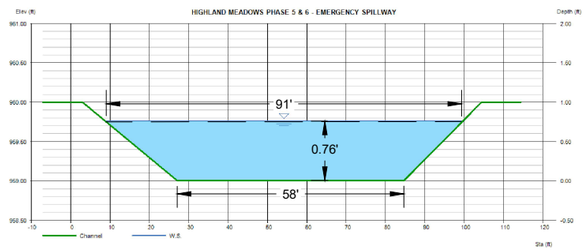
MAXIMUM WATER SURFACE ELEVATION - MWSE

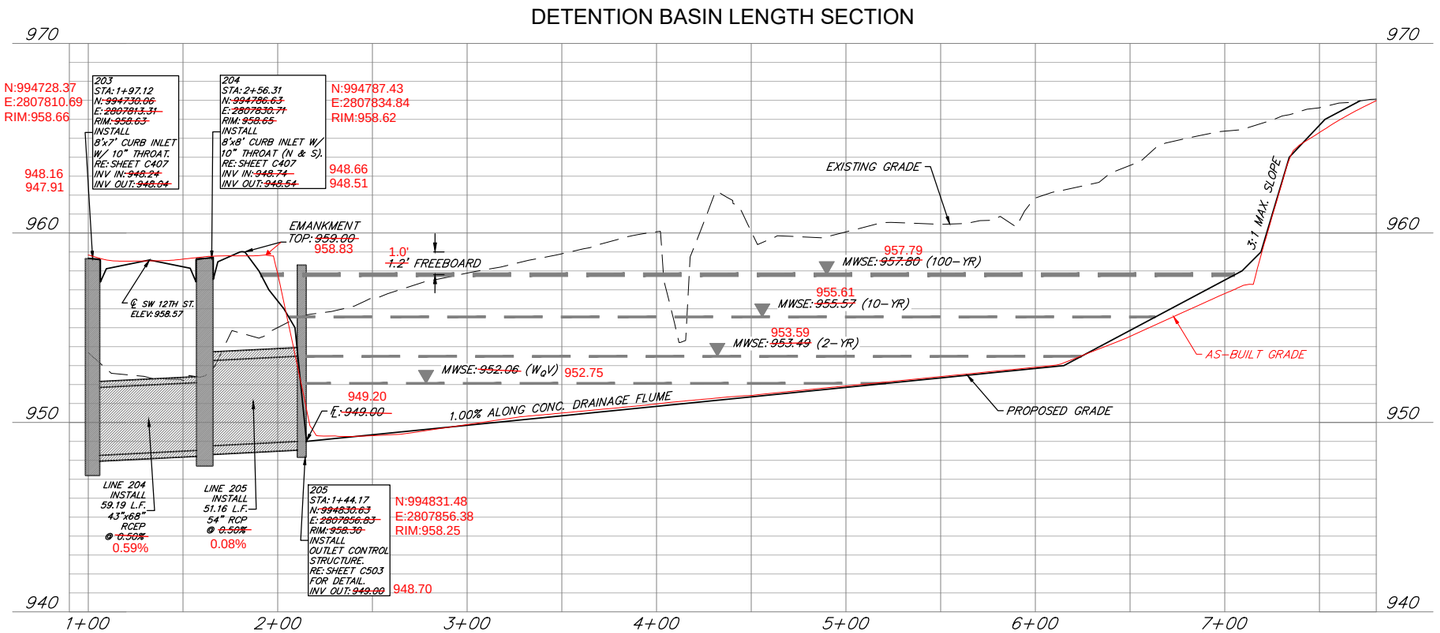
DETENTION BASIN GENERAL NOTES:

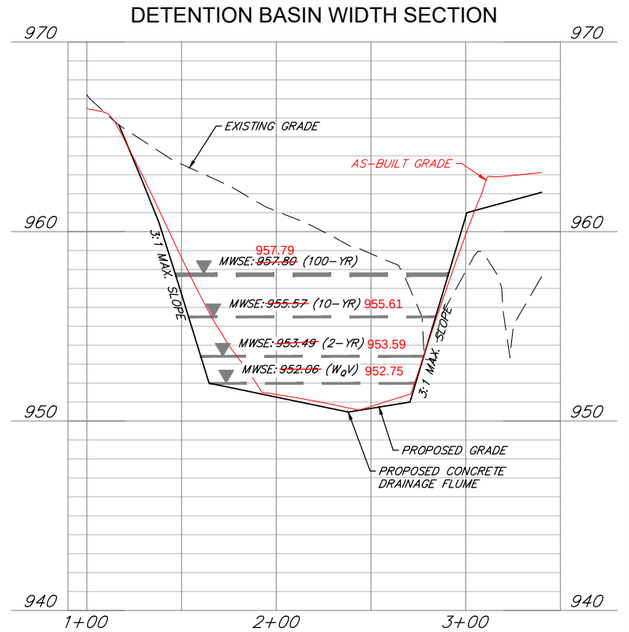
1. CONTRACTOR TO CONSTRUCT STORMWATER MANAGEMENT FACILITIES, SPECIFICALLY THOSE FEATURES RELATED TO DETENTION, PRIOR TO ANY LAND DISTURBANCE OF THE SITE AND PRIOR TO THE CONSTRUCTION OF ANY OTHER SITE DEVELOPMENT WORK AS NOT TO EFFECT DOWNSTREAM NEIGHBORS WITH UNDETAINED STORMWATER DISCHARGE.
2. AN AS-GRADED AND AS-BUILT DRAWING SHALL BE SUBMITTED TO AND REVIEWED BY THE CITY FOR THE DETENTION BASIN. THIS SHALL BE REQUIRED PRIOR TO ISSUANCE OF A CERTIFICATE OF SUBSTANTIAL COMPLETION. ALL PRECAUTIONS SHOULD BE TAKEN TO ENSURE DETENTION POND AND OUTLET STRUCTURE ARE CONSTRUCTED ACCORDING TO THE APPROVED PLANS; VOLUMES AND ELEVATIONS ARE CRITICAL FOR AS-BUILT APPROVAL. THE CITY SHALL BE PROVIDED WITH AN AS-BUILT SURVEY OF THE DETENTION BASIN, OUTLET STRUCTURE INCLUDING ALL WEIR ELEVATIONS AND STORM SYSTEM INCLUDING ALL THE INVERTS, STAMPED BY A MISSOURI LICENSED ENGINEER.
3. ALL SIDEWALK ADJACENT TO TRACTS SHALL BE CONSTRUCTED WITH PUBLIC IMPROVEMENTS, ALONG WITH ALL ADA ACCESSIBLE SIDEWALK RAMPS.
4. DETENTION BASIN SHALL FUNCTION AS A SEDIMENT BASIN UNTIL ALL DISTURBED AREAS ARE ADEQUATELY STABILIZED AND DISPLACED SEDIMENTS ARE NO LONGER BEING COLLECTED IN THE BASIN. REFER TO EROSION CONTROL PLANS AND DETAILS WITHIN THIS PLAN SET, AS WELL AS, SWPPP DOCUMENTS AND MDNR LAND DISTURBANCE PERMIT FOR STATE REQUIREMENTS.

EMERGENCY SPILLWAY CALCULATIONS:

DEPTH	0.76 FT
Q_{SPILL}	203.4 CFS
Q_{100}	194.2 CFS
AREA	56.4 SQ.FT.
V	3.61 FT/S
W_P	90.9 FT
Y_C	0.67
TOP W	91 FT
BOT. W	58 FT







AS-BUILT

The information provided on this drawing conforms to construction records; it is not intended for construction, implementation or recording purposes, and it is solely based on information obtained by my firm. 1"=100.00' [1:1200] at 24"x36" and 1"=50.00' [1:600] at 12"x18". Users of this information are responsible to verify that design data has been replicated with "as-built" information. All other data is as designed and has not been field verified.

Certified by: GRC
Firm: Anderson Engineering Inc.
Date: 06/07/2022
Title: Project Engineer

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941 W. 141ST TER • KANSAS CITY, MISSOURI 64145 • PHONE (816) 777-0400
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REVISIONS			DRAWING INFO.	
NO.	DESCRIPTION	BY	DATE	DRAWN BY: GC
1.	REVISED PER CITY COMMENTS	GC	1/15/21	CHECK BY: ZM
2.	REVISED PER CITY COMMENTS	GC	2/26/21	LICENSE NO. PE-2012009232
2.	REVISED PER CITY COMMENTS	GC	3/10/21	DATE: 12/2/2020
				ISSUED FOR: FOR REVIEW
6.	AS-BUILT DRAWINGS	GC	4/27/22	JOB NUMBER: 20KC10057
7.	AS-BUILT DRAWINGS	GC	6/7/22	MO COA NO. 000062

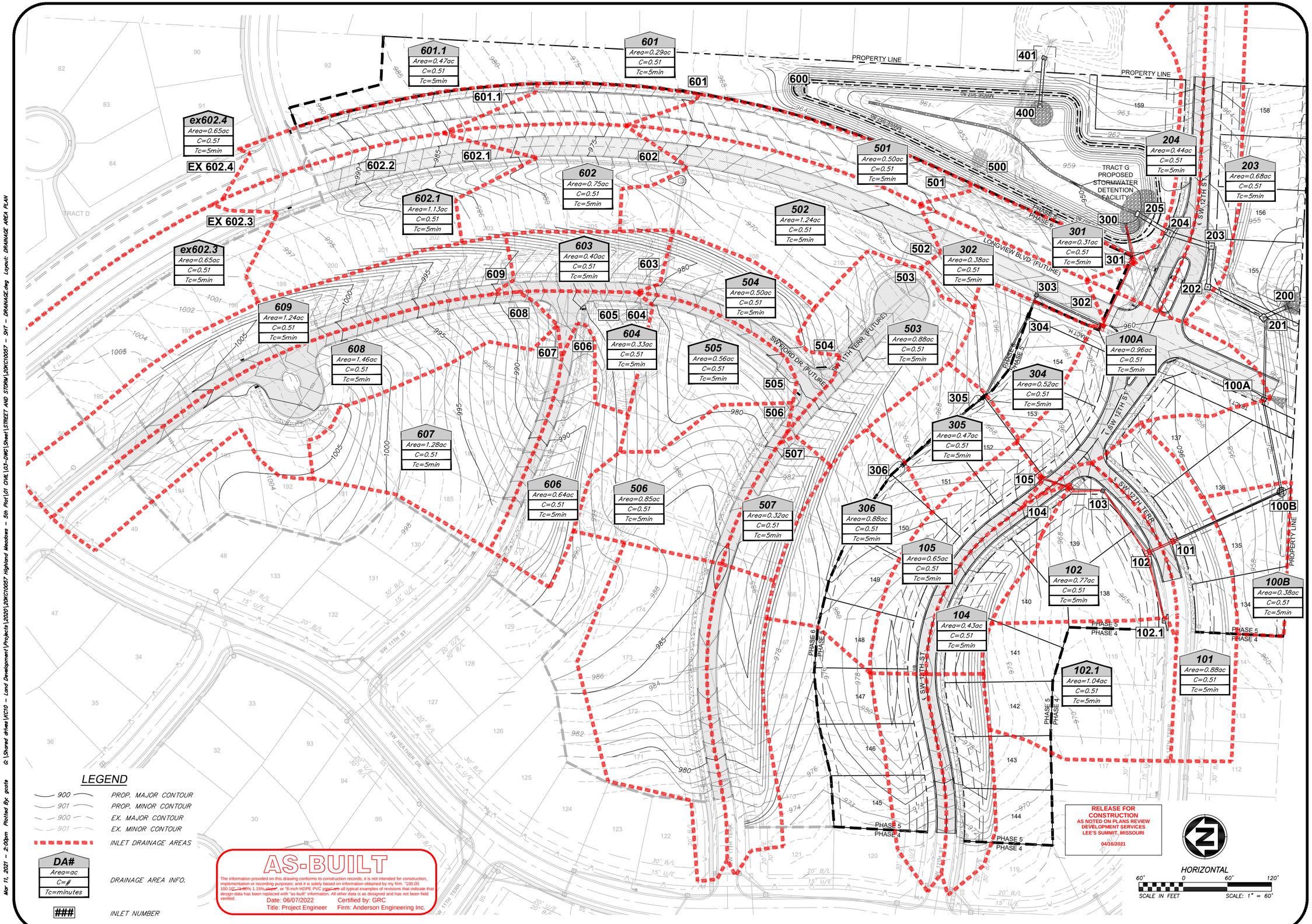
SUMMIT HOMES KC
HIGHLAND MEADOWS - 5TH PLAT

DETENTION BASIN PLAN & PROFILE

S10, T47N, R32W
LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

SHEET NUMBER
C205
13 OF 41

Apr 26, 2022 - 3:44pm Plotted By: gcote G:\Shared drives\KC10 - Land Development\Projects\2020\20KC10057 Highland Meadows - 5th Plat\01 CIVIL\03-DWG\Sheet\STREET AND STORM\Asbuilt\20KC10057 - SHT - DETENTION BASIN PLAN & PROFILE Layout: DETENTION BASIN PLAN & PROFILE



LEGEND

- 900 — PROP. MAJOR CONTOUR
- 901 — PROP. MINOR CONTOUR
- 900 — EX. MAJOR CONTOUR
- 901 — EX. MINOR CONTOUR
- INLET DRAINAGE AREAS
- DA# / Area=ac / C=# / Tc=minutes — DRAINAGE AREA INFO.
- ### — INLET NUMBER

AS-BUILT

The information provided on this drawing conforms to construction records; it is not intended for construction, implementation or recording purposes; and it is solely based on information obtained by my firm. "100.00 100.10 ~~1.10%~~ 1.15% lower", or "8-inch HDPE PVC ~~pipe~~ ", all typical examples of revisions that indicate that design data has been replaced with "as-built" information. All other data is as designed and has not been field verified.

Date: 06/07/2022 Certified by: GRC
Title: Project Engineer Firm: Anderson Engineering Inc.

ANDERSON ENGINEERING
EMPLOYEE OWNED
ENGINEERS • SURVEYORS • LABORATORIES • DRILLING
941 W. 141ST TER • KANSAS CITY, MISSOURI 64145 • PHONE (816) 777-0400
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DRAWING INFO.

REVISIONS NO.	DESCRIPTION	BY	DATE
1.	REVISED PER CITY COMMENTS	GC	1/15/21
2.	REVISED PER CITY COMMENTS	GC	2/26/21
6.	AS-BUILT DRAWINGS	GC	4/27/22
7.	AS-BUILT DRAWINGS	GC	6/7/22

DRAWING INFO.	
DRAWN BY:	GC
CHECK BY:	ZM
LICENSE NO.	PE-2012009232
DATE:	12/2/2020
ISSUED FOR:	FOR REVIEW
JOB NUMBER:	20KC10057
MO COA NO.	000062

SUMMIT HOMES KC
HIGHLAND MEADOWS - 5TH PLAT

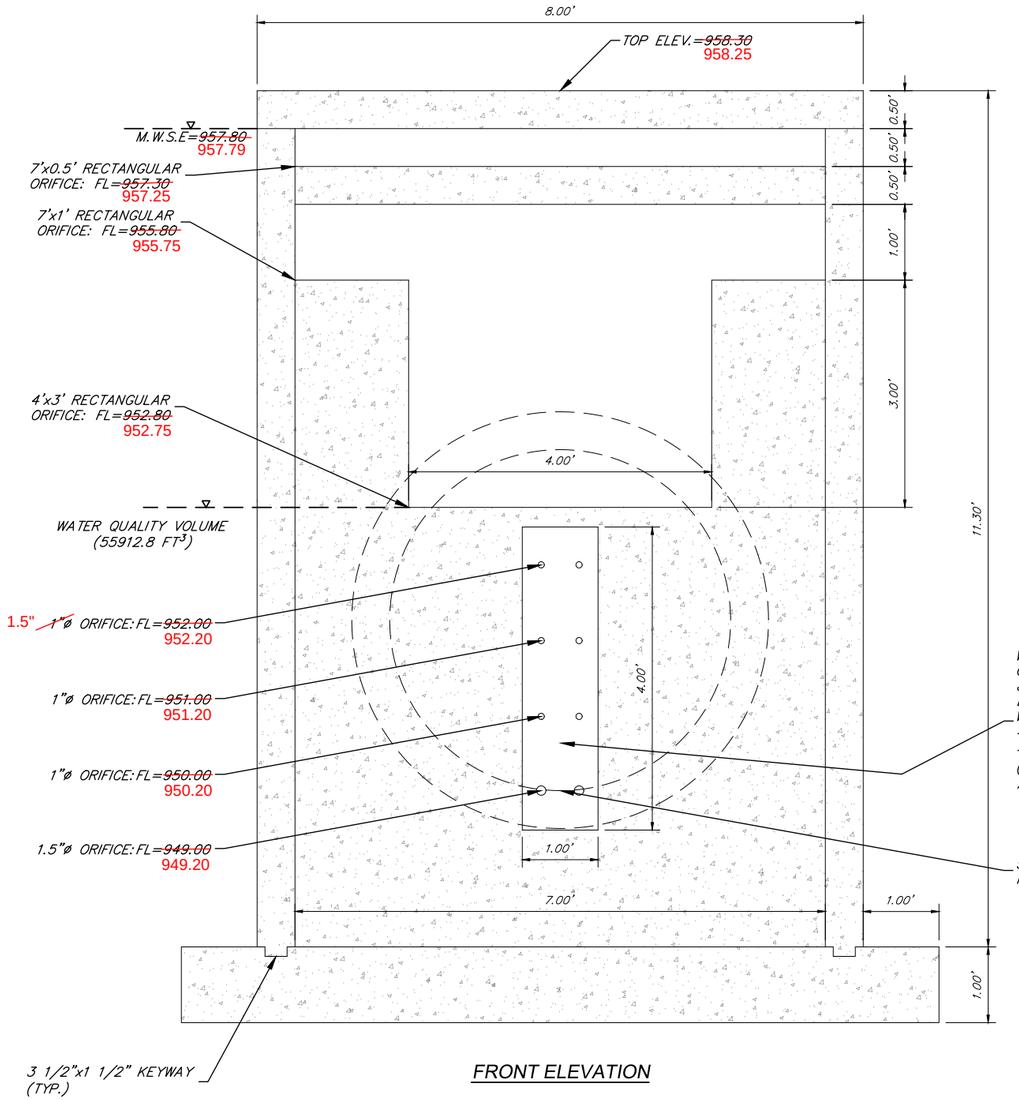
DRAINAGE AREA PLAN

S10, T47N, R32W
LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

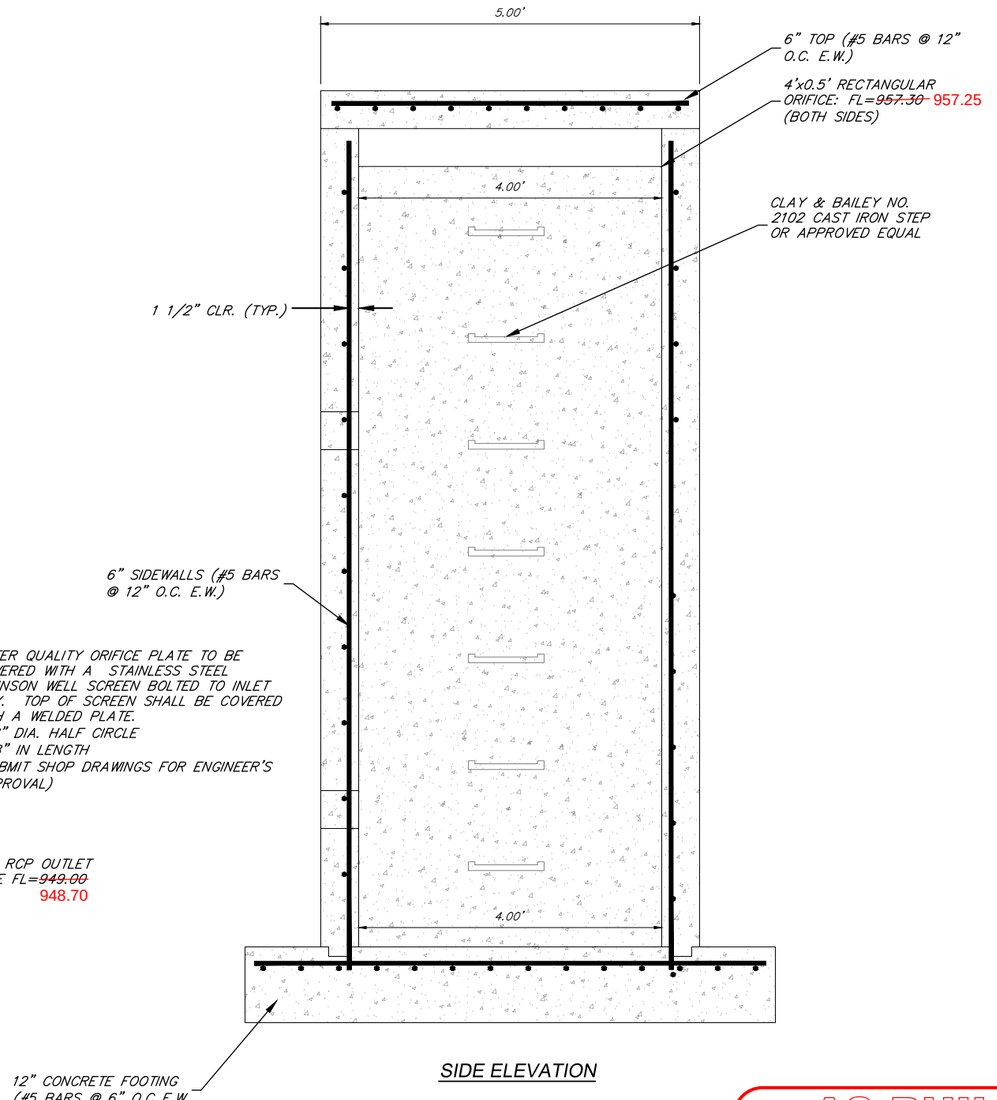
STATE OF MISSOURI
ZACH A. MYERS
NUMBER PE-2012009232
3/10/22
PROFESSIONAL ENGINEER

SHEET NUMBER
C201
9 OF 40

Mar 11, 2021 - 2:08pm Plotted By: gcote G:\Shared drives\KC10 - Land Development\Projects\2020\20KC10057 - Highland Meadows - 5th Plat\01 CIVIL\03-DWG\Sheet\STREET AND STORM\20KC10057 - SHT - DRAINAGE.dwg Layout: DRAINAGE AREA PLAN



FRONT ELEVATION



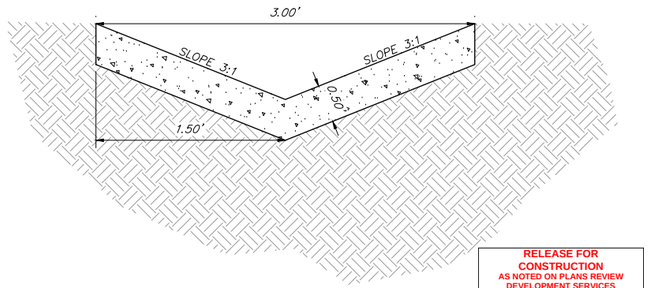
SIDE ELEVATION

DETENTION OUTLET CONTROL STRUCTURE

SCALE: 1"=1'

NOTES

1. ALL CONCRETE SHALL BE KCMMB 4K.
2. ALL REINFORCING STEEL SHALL BE 60 KSI.
3. THE FIRST DIMENSION LISTED IN THE CONSTRUCTION NOTES IS THE "L" DIMENSION. THE SECOND DIMENSION IS THE "W" DIMENSION.
4. FLOOR OF INLET SHALL BE SHAPED WITH NON-REINFORCED CONCRETE INVERT TO PROVIDE SMOOTH FLOW.
5. EXPANSION JOINTS SHALL BE EITHER HOT OR COLD POURED JOINT SEALING COMPOUND, OR PREMOLDED EXPANSION JOINT FILLER.
6. BEVEL ALL EXPOSED EDGES WITH TRIANGULAR MOLDING.
7. ALL DIMENSIONS RELATIVE TO REINFORCING STEEL ARE TO CENTERLINE OF BARS. 2" CLEARANCE SHALL BE PROVIDED THROUGHOUT UNLESS NOTED OTHERWISE. TOLERANCE OF ±1/8" SHALL BE PERMITTED.
8. ALL LAP SPLICES NOT SHOWN SHALL BE A MINIMUM OF 40 BAR DIAMETERS IN LENGTH.
9. ALL DOWELS SHALL BE ACCURATELY PLACED AND SECURELY TIED IN PLACE PRIOR TO PLACEMENT OF BOTTOM SLAB CONCRETE. STICKING OF DOWELS INTO FRESH OR PARTIALLY HARDENED CONCRETE WILL NOT BE ACCEPTABLE.
10. ALL REINFORCING STEEL SHALL BE SUPPORTED ON FABRICATED STEEL BAR SUPPORTS @ 3'-0" MAXIMUM SPACING.
11. DO NOT SCALE THESE DRAWINGS FOR DIMENSIONS OR CLEARANCES. ANY QUESTIONS REGARDING DIMENSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION.
12. THE BOTTOM SLAB SHALL BE AT LEAST 24 HOURS OLD BEFORE PLACING SIDEWALL CONCRETE. ALL SIDEWALL FORMS SHALL REMAIN IN PLACE A MINIMUM OF 24 HOURS AFTER SIDEWALLS ARE POURED BEFORE REMOVAL, AND AFTER REMOVAL SHALL BE IMMEDIATELY TREATED WITH MEMBRANE CURING COMPOUND.
13. RCP CONNECTIONS TO PRECAST STRUCTURES SHALL HAVE A MINIMUM OF 6" OF CONCRETE AROUND THE ENTIRE PIPE WITHIN 2' OF THE STRUCTURE.



CONCRETE FLUME DETAIL
NOT TO SCALE

AS-BUILT

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Date: 06/07/2022 Certified by: GRC
Title: Project Engineer Firm: Anderson Engineering Inc.

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
04/16/2021

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REVISIONS			DRAWING INFO.	
NO.	DESCRIPTION	BY DATE	DRAWN BY:	GC
1.	REVISED PER CITY COMMENTS	GC 1/15/21	CHECK BY:	ZM
2.	REVISED PER CITY COMMENTS	GC 2/26/21	LICENSE NO.	PE-2012009232
			DATE:	12/2/2020
			ISSUED FOR:	FOR REVIEW
6.	AS-BUILT DRAWINGS	GC 4/27/22	JOB NUMBER:	20KC10057
7.	AS-BUILT DRAWINGS	GC 6/7/22	MO COA NO.	000662

SUMMIT HOMES KC
HIGHLAND MEADOWS - 5TH PLAT

STORM SEWER DETAILS (3)

S10, T47N, R32W
LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

STATE OF MISSOURI
ZACH A. MYERS
NUMBER PE-2012009232
3/10/22
PROFESSIONAL ENGINEER

SHEET NUMBER
C503
28 OF 40

Mar 11, 2021 - 2:07pm Plotted By: grote G:\Shared drives\KC10 - Land Development\Projects\2020\20KC10057 Highland Meadows - 5th Plat\01 CIVIL\03-DWG\Sheet\STREET AND STORM\20KC10057 - SHTS - DETAILS.dwg Layout: STORM SEWER DETAILS (3)

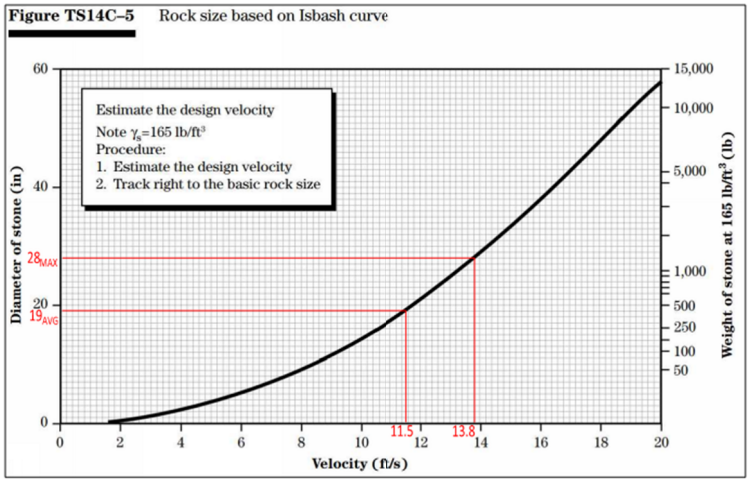


Figure TS14C–5 Rock size based on Isbash curve

MAXIMUM 10–YR OUTLET VELOCITY PER DRAINAGE CALCULATIONS (SHEET C202) ≈ 9.71 FT/S.

PER TABLE ABOVE, 9.71 FT/S x 1.2 SAFETY FACTOR = 11.5 FT/S ≈ 19" AVERAGE STONE SIZE.

19" STONE ≈ MoDOT TYPE 4 DITCH LINER SPECIFICATION

"TYPE 4 ROCK DITCH LINER SHALL CONSIST OF MATERIAL WITH A PREDOMINAT ROCK SIZE OF 19 INCHES, A MAXIMUM ROCK SIZE OF 28 INCHES AND A GRADATION SUCH THAT NO MORE THAN 15% WILL BE LESS THAN 6 INCHES" PER SECTION 609.60.2.4 OF THE 2018 MISSOURI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.

RIP–RAP NOTES:

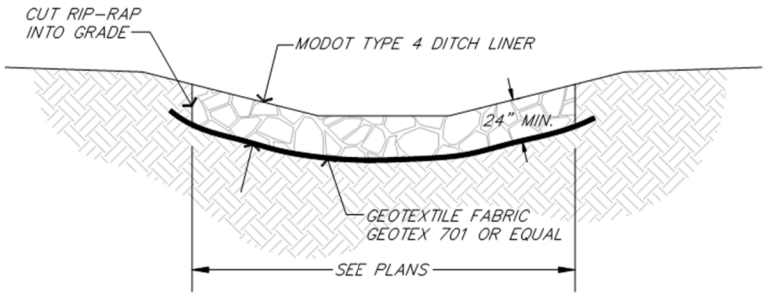
1. ROCK TO BE USED FOR RIP–RAP SHALL CONSIST OF INDIVIDUAL ROCK FRAGMENTS THAT ARE DENSE, SOUND, AND RESISTANT TO ABRASION. THE ROCK SHALL BE FREE OF CRACKS, SEAMS, AND OTHER DEFECTS THAT WOULD TEND TO INCREASE THE DESTRUCTION OF THE INDIVIDUAL ROCK FRAGMENTS DUE TO WATER AND FRONT ACTION. REFER APWA SECTION 2600.

2. RIP–RAP SHALL HAVE A MINIMUM THICKNESS OF 24" AT ALL LOCATIONS SHOWN ON THE PLANS. RIP–RAP SHALL BE PLACED ON GEOTEXTILE FABRIC AS SHOWN IN THE DETAIL.

3. 24" THICK RIP–RAP SHALL BE WELL–GRADED (D_{50} = 19") AND CONFORM TO THE TABLE BELOW:

PERCENT LIGHTER	WEIGHT, LBS.
100	700
85–95	525
30–50	175
0–15	30

4. A SAMPLE OF ALL ROCK TO BE PLACED SHALL BE SET ASIDE AT A QUARRY CHOSEN BY THE CONTRACTOR AND VISUALLY INSPECTED BY THE CONTRACTOR FOR QUALITY TO ENSURE ROCK MEETS ALL REQUIREMENTS PRIOR TO DELIVERY.



RIPRAP DETAILS

NOT TO SCALE

APPENDIX B – TYPICAL MAINTENANCE ACTIVITIES

TABLE 8.12 Extended Dry Detention Basin Typical Maintenance Activities		
Activity		Frequency
Establishment *(1-3yrs)*		
	Watering plants *(seeded areas up to 8 weeks, plugs in drought)*	1" per week as needed
	Weed control *(flail mow, string-trim, selective/preemerg herbicides)*	Monthly
	Remove litter and debris *(trash, leaves, sand, mower discharge)*	Monthly
	Monitor & repair erosion *(stabilize soil, replace plants, secure edging)*	Monthly
	Check for standing water *(longer than design, any puddles, saturated soil)*	Monthly
	Add mulch *(moisture & weed control with plugs/containers, 3" or less)*	Annually
	Inspect drainage area *(parking lot sweeping, open dumpsters, etc)*	Annually
	Replace dead plants *(use design species/size: overseed, install deep cell plugs)*	Annually, as needed
Maintenance *(3+yrs, establishment activities may carry over, as needed)*		
	Vegetation cleanup *(spot treat, prescribed burn, prune)*	Annually, spring or fall
	Evaluate plant composition *(woody invasion, grass/flower ratio, "right plant right place")*	Annually
	Sediment removal, erosion control *(pretreatment structures: forebay, check dams)*	Annually
	Address animal damage *(beaver dams, muskrat burrows, deer rubs)*	Annually
	Verify structural component function *(v-notch weir, check dams, outlet protection)*	Annually
Extended Dry Detention Basin		
	String trim vegetation to minimize disturbance	Annually
	Inspect for erosion in flow lines and slopes	Annually

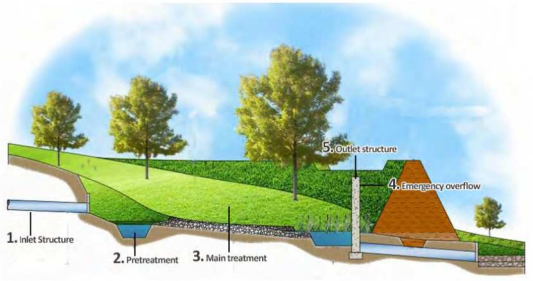
Typical maintenance activities are outlined to provide a basis for scheduling and planning work but should not be considered wholly comprehensive or definitive. Activities and frequencies will vary depending on site conditions and expectations related to adjacent land use. Some activities shown may continue through the establishment and maintenance phases. It's important to use adaptive management based on the goals of the practice and to integrate evaluation and assessment into a long-term maintenance plan.

APPENDIX C – INSPECTION LOGS

Extended Dry Detention Basin Inspection Form

All items listed must be inspected unless Not Applicable (NA). Answering "Yes" indicates a need for maintenance. Please include an approximate repair date for items that require maintenance.

The maintenance and inspection frequency shall be done in accordance with this BMP Operation & Maintenance Plan.



BMP Name(s)				Today's Date:
	Note: The extended dry detention basin name will be shown on the BMP location map included with the Stormwater BMP Record Drawing for this property. A typical name would be "Extended Dry Detention Basin 1" or "Extended Dry Detention Basin A". If this inspection form is being submitted for multiple BMPs of the same type, please list all applicable names.			Date of Last Inspection:
Property Info	Street Address:	City:	State:	Zip:
Who is Inspecting the Extended Dry Detention Basin?	Name (Owner, Tenant, Property Manager or Landscape Company):			Contact Name (If Different):
	Street Address (If conducted by a company, use company address):	City:	State:	Zip:
	Phone #:	Email:	*Check one:* ☐ PE ☐ PLA ☐ No License #:	
Who Owns the Extended Dry Detention Basin?	Name (Person(s) or Company):	Contact Name (If Different):		
	Street Address:	City:	State:	Zip:
	Phone #:	Email:		

Extended Dry Detention Basin Inspection Form

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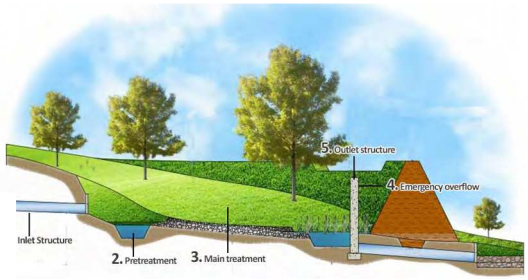

Inspection Question	Answer Y	Answer N	Answer NA	Describe Problem(s) and Solution(s)
***Main Treatment** (Component 3)*				**Success Factors: Vegetation, Protection, Two-Day Drain Time, and Cleanliness**
1. Is it difficult to access the basin for inspection and maintenance?				
Guidance: Any obstacles blocking access and/or maintenance to the basin should be removed. If access is blocked by a permanent fixture (i.e. fence), contact the City of Lee's Summit. **Schedule:** Annually				
2. Is the top of the earthen berm unlevel or uneven? Are there cracks or animal burrows in the berm?				
Guidance: Potholes, depressions, animal burrows and significant cracks on the top or sides of the berm can be a sign that the berm has structural or seepage problems, these worsen over time. Keep a log of these issues during each inspection by noting the location of each issue on the inspection figure and recording and recording the length, width, and depth of the problem on the inspection form. For animal burrows, call animal control for removal and fill the holes with clay. Contact the City of Lee's Summit if these problems appear to be getting worse. **Schedule:** Annually				
3. Is vegetation on the berm dying, diseased, or unhealthy on the front, back, or top of the berm?				
Guidance: The berm should have a healthy, thick stand of non-woody vegetation on all sides of the berm. Patches of bare soil should not be present. Ground cover vegetation should be composed of native plants that that maintain the structural integrity of the berm, discourage animal burrowing, allow for adequate inspection of the berm, and require only intermittent mowing to maintain its health. If vegetation appears unhealthy or thin, determine the cause of the issue take corrective action. More frequent watering, or fertilizer, plant species replacement, or additional seed or sod may be needed to establish fuller, healthier coverage. **Schedule**: Annually				
4. Are trees present on the berm of the basin?				
Guidance: Woody vegetation should be removed right away as they can reduce the structural integrity of the berm. Trees and woody vegetation can also interfere with the ability to fully inspect the berm surfaces. Remove woody vegetation and stumps from the berm, backfill the stump areas with clay soil, and cover with suitable native vegetation. **Schedule:** Annually				

Extended Dry Detention Basin Inspection Form

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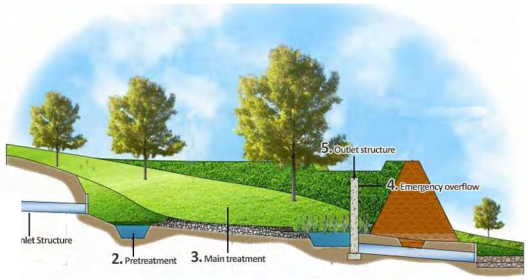

Inspection Question	Answer			Describe Problem(s) and Solution(s)
	Y	N	NA	
5. Is the basin holding water during dry weather?				
Guidance: The extended dry detention basin should follow what would be expected under the seasonal or current climatic conditions (slower to drain during wet weather and very dry during a drought). Ninety percent of the water should drain out of the extended dry detention basin 40 hours after rain events. If the water level rises and doesn't lower in this time period, the outlet structure may be blocked. If there is no water after a large rainfall, the water could be leaking through the berm. Contact an experienced professional if the water level is frequently too low or too high. **Schedule:** Annually				
6. Are there visible areas of bare soil in the basin, water flow paths, or on the basin slopes?				
Guidance: Bare or eroding areas should be vegetated or lined with rock or other material. Visible deposits of soil should be removed, as these deposits can decrease the amount of water storage provided by the extended dry detention basin. **Schedule:** Annually				
7. Are cattails or other invasive plants growing in the basin?				
Guidance: Cattails and other invasive plants have the potential to completely take over the basin area. The basin area should be checked for sediment buildup and may need to be cleaned out. Invasive plants shall be removed. Also evaluate any issues of standing water in the basin 40 hours after a rain event and correct as discussed in #5. **Schedule:** Annually				
8. Are check dams, weirs, and other components of the basin in good repair?				
Guidance: Structural components should be checked for proper operation and repaired as needed. **Schedule:** Annually				
9. Notice another problem? Describe in comments.	**Your Comments:**			

Extended Dry Detention Basin Inspection Form

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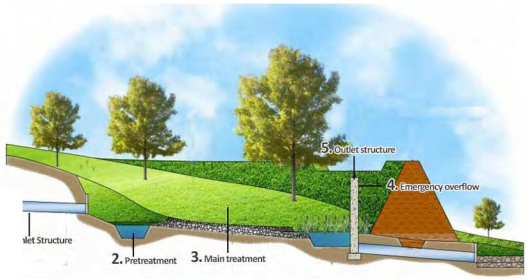

Inspection Question	Answer Y	Answer N	Answer NA	Describe Problem(s) and Solution(s)
Inlet, Pretreatment, & Outlet Structures ***(Components 1, 2, & 5)***				**Success Factors: Vegetation, Protection, Two-Day Drain Time, and Cleanliness**
10. Do the inlets where stormwater enters the basin have unhealthy vegetation, sparse rock, broken concrete, or other damaged materials?				
Guidance: Inlet structures should have dense, healthy vegetation or a rock, concrete, asphalt, or paver lining to prevent erosion. Bare soil or signs of erosion should NOT be present. Repair eroded areas and cover bare soil immediately with the appropriate vegetation or material cover. **Schedule:** Annually				
11. Are trash, sediment, debris, grass clippings, or other materials that can obstruct stormwater flow present in the inlet, forebay, or outlet structures or in their vicinity?				
Guidance: A sediment forebay shall be incorporated into the basin design to trap sediment and trash at all basin inlets, where the sediment and trash can be more easily removed than from the permanent pool. Remove unwanted materials and correct any other problems that block the water flow in or out of the basin. **Schedule:** Annually				
12. Is there bare soil or evidence of erosion or scour at the outlet structure? Is the outlet structure in good repair?				
Guidance: Outlet structures should not have any signs of erosion and should be covered with enough vegetation or material to slow the water and prevent erosion. Typically, this is a rock lining, but can be concrete, asphalt, pavers or even dense vegetation. If signs of erosion are visible at the outlet, install a rock lining that extends at least 10' beyond the area of erosion. Contact a qualified professional if you have questions on the size and type of rock. **Schedule:** Annually				
13. Notice another problem? Describe in comments.	**Your Comments:**			

Extended Dry Detention Basin Inspection Form

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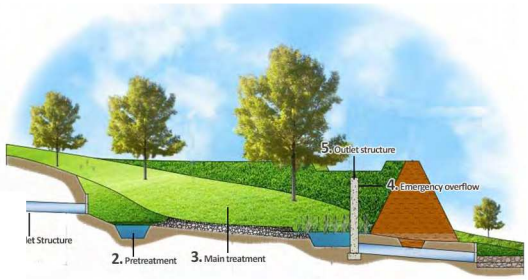

Inspection Question	Answer Y	Answer N	Answer NA	Describe Problem(s) and Solution(s)
Property Draining to Extended Dry Detention Basin				**Success Factors: Vegetation, Protection, Two-Day Drain Time, and Cleanliness**
14. Are litter, trash, debris, sediment, grass clippings, or other materials present in the area?				
Guidance: Trash and other materials can wash into the basin during a storm and can block the inlet, forebay, and outlet structures and fill up the basin storage area. Remove undesirable materials and keep the property clean. **Schedule:** Annually				
15. Are there stockpiles of soil, chemicals, equipment, or other materials that could be a source of pollutants washing into the basin during a storm?				
Guidance: Stockpiled materials can contain pollutants that are harmful to plants or that can otherwise be hazardous. Remove or cover undesirable materials, fully preventing their exposure to rainfall or stormwater runoff. **Schedule:** Annually				
16. Are there areas of erosion or exposed soil or bare earth that could be a source of sediment washing into the basin during a storm?				
Guidance: Too much sediment washing into an extended dry detention basin can reduce the basin storage. Repair and revegetate all areas of erosion or exposed soil. If vegetation is not intended for those areas, cover them with mulch, wood chips, pavement, or another hard surface to prevent sediment erosion. **Schedule:** Annually				
17. Do activities occur nearby that may cause unusual or substantial amounts of pollutants to be discharged to the extended dry detention basin?				
Guidance: Activities include car or equipment washing, pet walking, construction vehicle traffic, etc. Prevent these activities from occurring or take steps to prevent the pollutants from reaching the basin, such as washing cars in areas that drain to the wastewater system, conducting street or parking lot sweeping, installation of pet waste pickup stations, etc. **Schedule:** Annually				
18. Notice another problem? Describe in comments.	**Your Comments:**			

Extended Dry Detention Basin Inspection Form

Use this page for any notes, comments, or questions generated by your inspection. If you are using this page to continue your notes from a previous section, please include the section name and section number. You may also use this page to address issues not covered on the inspection form.

Extended Dry Detention Basin Inspection Form

Provide a photograph(s) of your BMP to document the compliance inspection.

Photograph Description:	**Photograph Description:**
Date Photograph Taken:	**Date Photograph Taken:**