

April 17, 2020

El Paso County Development Services Department  
Attn: Jeff Rice / Steve Kuehster, PCD-Engineering  
2880 International Circle  
Colorado Springs, CO 80910

**SUBJECT: Comment Response Letter (SF-19-014)  
Bent Grass Residential Filing No. 2 Sixth Submittal**

Dear Mr. Rice / Mr. Kuehster,

The comments below include unresolved previous comments and new comments resulting from the re-submittal in **blue bold**. Please see the following responses in **bold and italics** for the 3<sup>rd</sup> review of Bent Grass Residential Filing No. 2.

General

1. **Resolved.**
2. **Resolved.**
3. **Resolved.**
4. **Resolved.**
5. **Resolved.**
6. **Resolved.**
7. **The soils and geology study states that underdrains are not anticipated to be provided due to the need for a pump station. If this is the case, a plan needs to be provided for approval showing allowable locations of sump pump discharges (not toward the public right-of-way) or restricting home designs to those that would not require sump pumps. Unresolved; plan not provided. See also e-mail from Elizabeth Nijkamp dated 4/7/20. **Response: See Note 41 on Plat restricting basements from lots with high ground water.****

Final Plat

1. If there will be underdrains add a plat note stating the entity responsible for maintenance. Unresolved (not found). See General Comment #7 above. Provide plat notes as appropriate. **See General comment #7, above. Response: Note 41 added to plat to restrict basements from lots with high ground water.**
2. **Resolved.**
3. **Resolved.**

4. **Resolved.**
5. **Resolved.**
  
6. **Resolved.**

Transportation / Traffic Impact Study

1. See TIS redlines. Partially resolved; see updated TIS redlines. A response to redlines was not found. Partially resolved; see updated TIS redlines. **Partially resolved; submit completed TIS.**  
**Response: LSC RESPONSE: The updated TIS has been completed and included with this submittal. Note: The March 4, 2020 TIS Addendum Memo has been attached to the TIS for reference.**
  
2. **Resolved.**
  
3. Note: regarding the “Cost Reimbursement” and “Cost Recovery” letters dated October 31, 2019, reference LDC 8.7.2 (D) – Process for Request and Approval of Fair Share Reimbursement. The request will be processed when all required items have been submitted, which is to be no earlier than the date of final plat approval and no later than one year after the date of completion of the improvement(s). Please add the following information to the cost recovery request:
  - a. Add the file number (SF-19-14) to the sheet.
  - b. List the lengths, dimensions and descriptions of the infrastructure anticipated to be constructed and requested for cost recovery.
  - c. Address the Bent Grass metro district involvement, including LDC Section 8.7.2.B.4 (does this district qualify as the requestor?).
  
4. **Resolved.**
  
5. The protected/permissive phasing for eastbound left turns from Woodmen Road to Golden Sage is included in the short-term modeling. If this change is needed in the short term, plans are required and coordination with EPC DPW and possibly the City of Colorado Springs will be necessary for implementation of the added signals and timing.
  
6. The pro-rata shares for improvement items G-J in Table 6 need to have costs assigned if the fair shares of those costs are to be escrowed at or prior to plat recording, with the escrow amounts identified in the escrow agreement. If the district will be providing the fair share at platting the district needs to be a party to the SIA, or responsibility for these improvements included in a revised development agreement. **Provide estimated costs when available. Conditions of approval will be provided.**  
**Response: LSC RESPONSE: Estimated costs will be provided when available.**

MDDP

1. **Resolved.**
2. Address any differences in the proposed design from the DBPS, including the DBPS regional pond that is identified on this site but proposed not to be constructed. Changes may require a DBPS addendum and drainage board approval. **Partially resolved;**
  - a. **Resolved.**

- b. County maintenance and drainage fee reimbursement for constructed improvements will be dependent on Drainage Board approval of a DBPS addendum. It is recommended that an information package be assembled for initial Drainage Board consideration.
3. **Resolved.**
4. See MDDP redlines. Partially resolved; see updated redlines. Partially resolved; see updated redlines. **Partially resolved; see updated redlines.**  
**Response: See attached comments on provided redlines.**
5. Provide HEC-HMS modeling for the Pond WU inflows and outflows with the proposed development and outlet structure revisions. Partially resolved; provide the electronic model and additional input information per redlines. **Provide electronic model.**  
**Response: Model was emailed to Jeff Rice.**
6. Split flow design of the Pond WU inlet features needs to be discussed further. **County staff is awaiting input from USACE regarding the wetlands. If revisions to simplify the design and save construction costs and maintenance are possible they will be discussed. This will not require revisions to the MDDP.**  
**Response: Noted.**

Final Drainage Report / Drainage Plans

1. See FDR redlines. Partially resolved; see updated redlines. **Partially resolved; see updated redlines.**  
**Response: See attached comments on provided redlines.**
2. Regarding the adjacent Falcon West Tributary channel:
  - a. Address how re-routing of flows to one(?) specific outfall on the west tributary channel will affect the channel flow, velocities and localized outfall conditions.
  - b. Address channel velocities and any stabilization necessary above that called for in the DBPS. Unresolved. **See comment #4 below; address in the FDR narrative as appropriate.**  
**Response: Additional narrative was added to report in regards to high velocities and FR #'s. Check structures were also added at transition locations, as noted by County staff.**
  - c. Details, including preliminary design, sizing, and modeling (to verify depths and velocities) are required, including the offsite area (MDDP area). The entire reach through and adjacent to this development needs to be addressed. Final drainage reports need to provide a comprehensive plan for improvements.
3. Regarding the channel:
  - a. Provide a complete channel plan and profile. Unresolved. **Partially resolved; add the plan and profile to the CDs or GEC plan with revisions per the comments below included.**  
**Response: Sheets have been added to GEC plan set.**
  - b. **Resolved.**

- c. If the channel is proposed to be County-maintained rather than metro district-maintained, improvements according to the DBPS need to be provided; address completely in the FDR. Additional improvements to those proposed in the DBPS may be needed to qualify for reimbursement and maintenance eligibility. If the developer desires reimbursement for the construction costs and for the County to maintain the improvements, the process in the DCM needs to be followed (reference DCM Sections 1.7 and 3.3). Revise MDDP and FDR text and plat notes accordingly. Conditions of approval will apply regarding final channel design and construction.
  - d. Resolved.
  - e. Complete channel stabilization improvements need to be provided adjacent to/around the proposed outfalls to protect the outfall and to protect the area impacted by the outfalls. (to be verified with next review). **See CD redlines regarding angles of confluence and softening grading at the south outfalls.**  
**Response: Updated per discussions with County staff.**
  - f. Specifically address geotechnical hazards and any wetlands mitigation in the FDR see redlines. Verify wetlands report conclusions per Environmental comments.
  - g. An O&M manual for onsite and downstream channel maintenance will need to be provided; the template for this document will be provided to you when available.
4. Regarding ditch protection calculations, long-term stability of native vegetation needs to be shown. Long runs of channel (over 200 feet) needing permanent long-term protection need a long-term design, such as ditch checks, drop structures or riprap. Address as appropriate. See redlines regarding modeled channel velocities and Froude numbers. Conditions of approval will be provided regarding developer/district maintenance responsibility. **See updated redlines on the comparison table and floodplain/channel plan in the FDR. Two or three areas of disturbance combined with supercritical channel attributes need to be addressed per redlines.**  
**Response: Check structures have been added.**
5. **Resolved.**
6. Provide a PDB/BMP Maintenance Agreement and Easement for district maintenance of PBMPs. The latest template for the agreement can be e-mailed upon request. See CAO comments.
7. **Resolved.**
8. Regarding the BMP O&M/I&M Plan, ensure that all stormwater control measures/BMPs are addressed and maintenance procedures provided corresponding to the final design. (not reviewed on this submittal). **Again not reviewed due to time constraints.**  
**Response: Noted. Manual has been re-included with the submittal.**
9. Note: Any proposed urban lot areas draining directly offsite require an easement or other documentation from the adjoining owner(s) that the proposed developed condition is acceptable.

10. Address drainage through temporary cul-de-sacs. **Unresolved.**

**Response: Cul-de-sacs have been changed to asphalt and will sheet flow to drainage swales. For temporary condition, sheetflow allowed across cul-de-sac per discussions with County staff and as noted in report.**

Construction Plans / Geotechnical Issues / Grading and Erosion Control Plan / SWMP

1. Provide Construction plans for the offsite "Pond WU" proposed construction. Partially resolved; see updated redlines. Note: a complete review was not performed due to time constraints. Note: a complete review will still need to be performed pending revisions. It is recommended that a thorough quality control check be done on the CDs due to limited Staff review time. **Partially resolved; see updated/remaining FDR redlines regarding a few locations of concern regarding channel stability.**  
**Response: Provided 3 Riprap check dams (1.5' tall) in locations of concern regarding channel stability.**
2. Clearly show and label all required drainage easements and offsite easements. Provide permission/easement documentation or reception numbers. Unresolved (discussed 3/13 **and 4/7**).  
**Response: No offsite easements are needed. Onsite easements are recorded as part of plat.**
3. Revise pipe size/slope or provide a deviation request with adequate justification and specifications for watertight pressure pipe (ECM 3.3.1.D - exceeding short runs with a pressure head) where applicable. (Verify)
4. Resolved.
5. **Resolved.**
6. Resolved.
7. If there will be USPS mail kiosk/cluster(s) in this subdivision provide location(s) and details. Resolved – response is that there will be no USPS kiosk/cluster facilities in this subdivision.
8. Resolved.
9. As noted at the beginning of these comments, updated checklists are required to be provided by the design engineer. Provide with the next submittal. Instructions are provided below the list of attachments. Checklists can be found at:  
[https://planningdevelopment.elpasoco.com/wp-content/uploads/Engineering/EngineeringDocuments/Copy-of-GEC-SWMP\\_Checklists.xlsx](https://planningdevelopment.elpasoco.com/wp-content/uploads/Engineering/EngineeringDocuments/Copy-of-GEC-SWMP_Checklists.xlsx). (To be reviewed with next submittal). Partially resolved; see redlined checklists, SWMP and GEC Plan. **Provide signed checklist.**  
**Response: The signed GEC checklist is provided.**
10. Resolved.

11. See CD/GEC Plan redlines for additional comments and clarification of these comments. Partially resolved; see updated CD redlines. GEC Plan and SWMP comments will be provided with the next submittal. Partially resolved; see redlines. **Partially resolved; see updated/remaining redlines.**  
**Response: Addressed remaining redlines.**
12. Provide a complete channel plan and profile. Show interim and ultimate flowline grades. (See FDR comments.) **Partially resolved; see FDR and CD redlines.**  
**Response: Addressed FDR and CD redlines.**

Forms / SIA / Surety Estimate Form

1. Provide the updated FAE form. Note: FAE quantities and costs will be reviewed in detail with the next submittal. Partially resolved; see updated CD redlines. The Pond WU improvements need to be discussed. Partially resolved; see updated FAE redlines. The Pond WU improvements still need to be discussed. **Partially resolved; see updated/remaining FAE redlines. Temporary mulch or ECB is required with temporary seeding. Channel improvements remain to be discussed.**  
**Response: Noted. Revised quantities for the temporary seeding w/ ECB. Also added channel improvement quantities.**
2. See attached Engineering Final Submittal Checklist for reference.
3. The SIA needs to include a statement about the Meridian/Bent Grass traffic signal and escrow for other offsite improvements as applicable (per TIS). If the intersection improvements at Golden Sage and Woodmen Frontage Road are necessary this needs to be addressed as well. Coordination with the County Attorney's Office will be necessary; see TIS comments above. **(Coordination is ongoing.)**  
**Response: Noted.**
4. Note: The SIA paragraph regarding drainage fees also needs to be revised; draft revisions will be provided by staff when available.
5. Note: A license agreement will be required for landscaping in the Bent Grass Meadows Drive ROW.
  - a. **A redline was previously provided on the landscaping plan to address pedestrian sight distance on the north side of Bent Grass Meadows at the ramp where pedestrians cross toward Lemon Grass Road. It appears that the landscape plan has been revised, but a sight distance line was not found on the plan; please show the line on the landscape plan.**  
**Response: Sight distance line has been added to landscape plan.**

Attachments/Electronic Files

1. Comment Responses – TIS
2. Comment Responses – MDDP
3. Comment Responses – FDR
4. Comment Responses – CD
5. Comment Responses – GEC
6. Comment Responses – Plat
7. Comment Responses – FAE



# MASTER DEVELOPMENT DRAINAGE PLAN

## BENT GRASS RESIDENTIAL SUBDIVISION

El Paso County, Colorado

PREPARED FOR:  
**Challenger Homes**  
8605 Explorer Dr., Suite 250  
Colorado Springs, CO 80920

PREPARED BY:  
**Galloway & Company, Inc.**  
1755 Telstar Drive, Suite 107  
Colorado Springs, CO 80920

DATE:  
**May 2019**  
Revised November 2019  
Revised January 2020  
Revised March 2020

### Engineering Review

04/06/2020 5:27:37 PM

*dsdrice*

JeffRice@elpasoco.com

(719) 520-7877

**EPC Planning & Community  
Development Department**

Galloway responses  
as displayed



**ENGINEER'S STATEMENT**

*The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the Drainage Criteria Manual for the City of Colorado Springs and El Paso County. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.*



\_\_\_\_\_  
Charlene Durham, PE 36727  
For and on behalf of Galloway & Company, Inc.

**DEVELOPER'S CERTIFICATION**

*I, The developer, have read and will comply with all of the requirements specified in this drainage report and plan.*

Sign

Signature Added

By: \_\_\_\_\_

\_\_\_\_\_ Date

Address: Challenger Homes  
8605 Explorer Dr., Suite 250  
Colorado Springs, CO 80920

**DEVELOPER'S CERTIFICATION**

*Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.*

\_\_\_\_\_  
Jennifer Irvine, P.E.  
County Engineer/ECM Administrator

\_\_\_\_\_ Date

Conditions:

This needs to be clarified.

Additional information/write up added to define "natural" areas and areas of improvements

further checked to see if any improvements/changes were being proposed at that cross section. If the location did not have any changes proposed to the channel and it was being left in its "natural" state, then no issues would be assumed for the channel, as (based on site observation conducted with El Paso County Staff, Challenger Homes and Galloway) it is stable under existing conditions, even with the higher Froude #'s and velocities. If changes are being proposed to the channel at these areas with high Froude #'s and velocities, protection measures will be implemented to ensure stabilization of the channel.

The UD-Detention spreadsheet was utilized for sizing the water quality orifices on the proposed water quality portion of the regional detention pond as well as the on-site water quality ponds.

HEC-HMS was utilized to analyze the hydrology of the overall basin and verify that no changes in release rates have occurred to the regional detention pond with the addition of water quality.

## V. Existing Drainage Conditions

The site is contained fully within one major drainage basin; the West Falcon Tributary. The site does border the Middle Falcon Tributary along the eastern edge of the property. The site generally drains from north to south with an average slope of 2% outside of the channel and an average slope of 1% inside the channel. The rational method was used to analyze the individual basins within the site because their size permits it. Excerpts from the DBPS are included in the appendix.

In addition to the DBPS The Ranch MDDP to the north and west of the site revisited the existing conditions as well as existing conditions from the site directly to the north of them. Several detention ponds were created within the Paint Brush Hills Subdivision and revise the offsite flow entering the site within the major drainageway. This is taken into account with The Ranch MDDP. While The Ranch is still in design stage they are proposing detention ponds within their site to release at historic rates. This will revise the flow rates in their designed section of the channel to below the rates that are identified within the DBPS.

Per the DBPS the site lies within basins, WT200, WT210, and WT220. These basins connect to channel reaches RWT202, RWT204, and RWT210. Both the RWT204 and RWT210 sections of channel currently exist and appear as a drainageway when visiting the site. Reach RWT202 appears to be a shallow overland flow through the project site. It is nearly unrecognizable through the site from a visual standpoint.

The existing channels were visually inspected via a site walk and all appear in really good condition. There are no signs of scour within the bottoms of the channel. There are small areas that are incised or sloughing at the top of bank, along the length of the channel, through the proposed site. These areas are less than 12" in height.

There is a small depression at the north end of the site, that appears to be the remnants of an old stock pond. It provides no detention or water quality for the upstream area. It will be removed with the development of this site. A wetlands assessment of this area was performed by American Geoservices dated January 29, 2020. This investigation concluded that "potentially jurisdictional wetlands were not observed within the ponded area."

There is an existing sediment pond located to the east of the site, on what is known as the "School Site." This sediment pond was designed with the FDR Addendum for Bent Grass Residential Filing 1 and works for existing conditions. A permanent pond will need to be provided upon development of this site.

be collected in a culvert under Bent Grass Meadows Parkway at DP 10. It will then be conveyed in a swale east to the RWT210 channel.

**Basin C-1** (19.95 AC, Q5 = 23.2 cfs, Q100 = 58.0 cfs) is located on the west side of the site. It encompasses single family residential lots along with several of the local roads and sits north and west of Bent Grass Meadows Drive. Runoff from the basin is anticipated to be conveyed through the basin generally from northwest to southeast to a water quality pond located at DP 10. Runoff from the basin is anticipated to be partially collected in inlets near Bent Grass Meadows Parkway. All runoff will be captured either within the basin or within Bent Grass Meadows Parkway and will be directed east towards the RWT210 Channel.

**Basin OS-3** (10.61 AC, Q5 = 5.3 cfs, Q100 = 24.3 cfs) is associated with The Meadows Filing No. 1 lots 5, 6, and 7. Runoff from this basin sheet flows east to the western property line of the site to DP 11. It is anticipated that with the construction of the lots along the western property line swales will be constructed to divert flows from Basin OS-3 to the south around the proposed development where it will be collected in a culvert under Bent Grass Meadows Drive to the water quality pond at DP 10. It will then be conveyed in a swale east to the RWT210 channel.

**Basin OS-4** (2.64 AC, Q5 = 0.9 cfs, Q100 = 6.0 cfs) is associated with an undeveloped/unplatted portion of property, currently owned by Falcon Storage Partners. Runoff from the basin is anticipated to be collected in Bent Grass Meadows Drive at DP 12. Flow will continue south along

Information added to finish sentence.

**Basin C-2** (1.88 AC, Q5 = 4.1 cfs, Q100 = 9.0 cfs) is located in the southwest corner of the site. It encompasses Bent Grass Meadows Drive. Runoff from the basin drains towards south towards the site's southern property line and the existing Bent Grass Meadows Drive at DP 13. Runoff is anticipated to be collected in on-grade inlets and release into a water quality pond, along the south property line. Pond outflow will be directed east to the RWT210 channel.

**Basin D-1** (21.44 AC, Q5 = 33.8 cfs, Q100 = 74.3 cfs) is located on the southern middle portion of the site. It encompasses future residential development, along with several of the local roads and sits south of Bent Grass Meadows Drive. Runoff from the basin is anticipated to be conveyed through the basin generally from northwest to southeast to DP 14. Runoff from the basin is anticipated to be collected and directed into the RWT210 Channel. With this filing, no development occurs within this basin, therefore no water quality will be needed. Upon development, this site will need to provide it's own water quality.

**Basin E-1** (0.26 AC, Q5 = 1.0 cfs, Q100 = 1.8 cfs) is located in the southwest corner of the site. It encompasses Bent Grass Meadows Drive. Runoff from the basin drains to the south towards existing Bent Grass Meadows Drive at DP 15. Runoff is anticipated to be released into the existing roadway where it will be collected in the existing storm system south of the property. There are a set of on-grade inlets (20' on the east side, 15' on the west side), which will intercept this flow. Existing inlets will release flows to the east into an existing drainage swale. This existing swale releases into an existing temporary detention pond, which is to remain in place until improvements to the West Trib Channel and Woodmen Road culverts are completed. Based on the Latigo Business Park drainage report by Kiowa Engineering, inlets were designed for flows of 9.9 and 21.2 cfs from this basin. The development of the Bent Grass site has reduced the flows entering the Latigo Business Park site, ensuring the existing storm system will continue to function adequately.

Note added at bottom of table referencing additional write up in reagrds to High Fr #'s

Concerns in these areas as related to channel disturbance. See last pages of FDR (Sheets DR2.2 and 3).

Comparison of Hydraulic Information from HEC-RAS 100-Year Models (Existing vs. Proposed)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El		W.S. Elev		Vel Chnl		Froude # Chl	
				Existing (ft)	Proposed (ft)	Existing (ft)	Proposed (ft)	Existing (ft/s)	Proposed (ft/s)	Existing	Proposed
NCONFL-BGM	5100	100-YR	1450	6961.61	6961.68	6965.81	6965.31	7.26	8.78	0.77	1
NCONFL-BGM	5000	100-YR	1450	6959.87	6959.57	6964.45	6963.33	8.67	8.98	0.89	0.99
NCONFL-BGM	4900	100-YR	1450	6956.13	6956.08	6960.76	6960.79	9	8.63	0.99	1
NCONFL-BGM	4850	100-YR	1450	6954.51	6954.44	6959.69	6959.58	9.51	9.09	0.92	0.96
NCONFL-BGM	4750	100-YR	1450	6952.35	6952.25	6957.64	6957.61	8.54	8.52	0.89	0.87
NCONFL-BGM	4650	100-YR	1450	6950.66	6950.54	6955.77	6955.7	9.42	9.4	0.9	0.89
NCONFL-BGM	4600	100-YR	1450	6949.29	6949.23	6954.25	6954.15	9.39	9.36	0.94	0.94
NCONFL-BGM	4550	100-YR	1450	6947.92	6947.92	6953.98	6954.09	5.86	6.5	0.55	0.58
NCONFL-BGM	4500	100-YR	1450	6947.76	6947.9	6952.64	6952.81	9.25	9.54	1	0.99
NCONFL-BGM	4400	100-YR	1450	6945.04	6945	6950.89	6949.06	9.93	9.35	1	0.95
NCONFL-BGM	4300	100-YR	1450	6943.59	6944.71	6948.68	6948.34	9.64	7.63	1.01	0.78
NCONFL-BGM	4280	100-YR	1450		6944.64		6947.8		9.01		1
NCONFL-BGM	4250	100-YR	1450	6942.87	6940.08	6948.01	6943.2	9.46	9.25	1	0.98
NCONFL-BGM	4240	100-YR	1450		6937.01		6943.72		3.03		0.23
NCONFL-BGM	4200	100-YR	1450		6936.87		6943.62		3.55		0.26
NCONFL-BGM	4175	100-YR	1450		6936.83		6943.42		4.85		0.34
NCONFL-BGM	4150	100-YR	1450	6941.91	6936.78	6946.13	6943.35	9	5.17	1.01	0.36
NCONFL-BGM	4073		Culvert								
NCONFL-BGM	4040	100-YR	1450		6936.4		6940.05		9.57		0.89
NCONFL-BGM	4030	100-YR	1450		6936.38		6940.36		6.94		0.66
NCONFL-BGM	4000	100-YR	1450	6938.32	6936.28	6942.69	6939.58	8.59	8.58	1	0.93
NCONFL-BGM	3900	100-YR	1450	6937.27	6936.02	6940.25	6939.36	5.38	5.72	0.67	0.65
NCONFL-BGM	3850	100-YR	1450	6935.39	6935.31	6939.44	6938.84	7.21	6.58	0.92	0.77
NCONFL-BGM	3800	100-YR	1450	6934.46	6934.35	6938.47	6937.95	8.67	7.95	1.09	1.01
NCONFL-BGM	3694	100-YR	1482	6931.87	6931.81	6935.66	6935.53	6.36	6.76	0.8	0.87
NCONFL-BGM	3600	100-YR	1482	6930.63	6930.58	6934.23	6934.13	8.24	7.59	1.07	1.01
NCONFL-BGM	3500	100-YR	1482	6928.81	6928.8	6933.1	6933.06	5.43	5.39	0.58	0.57



Project: Aug15\_Working\_Falcon\_DBPS\_S  
Simulation Run: FU 100-yr Reservoir: Regional Pond WU South

Start of Run: 01Jan2011, 00:00 Basin Model: Falcon\_DBPS\_Future  
End of Run: 02Jan2011, 00:00 Meteorologic Model: 100-yr  
Compute Time: 25Mar2020, 11:48:34 Control Specifications: 24-hr Storm

Volume Units: AC-FT

#### Computed Results

Peak Inflow :	1126.7 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 07:30
Peak Outflow :	1116.5 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 07:34
Total Inflow :	267.5 (AC-FT)	Peak Storage :	19.5 (AC-FT)
Total Outflow :	257.3 (AC-FT)	Peak Elevation :	6824.1 (FT)

Updated



# FINAL DRAINAGE REPORT

**BENT GRASS RESIDENTIAL SUBDIVISION**  
**FILING NO. 2**  
**(SF-19-014)**

El Paso County, Colorado

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PREPARED FOR:  
**Challenger Homes**  
**8605 Explorer Dr., Suite 250**  
**Colorado Springs, CO 80920**

PREPARED BY:  
**Galloway & Company, Inc.**  
**1155 Kelly Johnson Blvd., Suite 305**  
**Colorado Springs, CO 80920**

DATE:  
**July 2019**  
**Revised October 2019**  
**Revised January 2020**  
**Revised March 2020**

**Engineering Review**

*04/07/2020 6:07:13 PM*

*dsdrice*

JeffRice@elpasoco.com

(719) 520-7877

**EPC Planning & Community  
Development Department**

Galloway responses  
as displayed



**ENGINEER'S STATEMENT**

*The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.*

\_\_\_\_\_  
Charlene Durham, PE 36727  
For and on behalf of Galloway & Company, Inc.



**DEVELOPER'S CERTIFICATION**

*I, The developer, have read and will comply with all of the requirements specified in this drainage report and plan.*

By: \_\_\_\_\_  
**Sign**

**Signature Added**

\_\_\_\_\_  
Date

Address: Challenger Homes  
8605 Explorer Dr., Suite 250  
Colorado Springs, CO 80920

**DEVELOPER'S CERTIFICATION**

*Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.*

\_\_\_\_\_  
Jennifer Irvine, P.E.  
County Engineer/ECM Administrator

\_\_\_\_\_  
Date

Conditions:

temporary, riprap lined, Proposed Swale - B. Flows will continue West and then South to **DP-14** where it will enter the north water quality detention pond.

**Basin B-4** (1.19 AC, Q5 = 0.4 cfs, Q100 = 2.5 cfs): a basin that is in the North-central area of the site. Runoff from this basin sheet flows until it is intercepted by temporary Proposed Swale - B just West of Silky Thread Road. Once intercepted, flows will be routed West and then South to **DP-14** into the north water quality detention pond.

**Basin B-1** (4.46 AC, Q5 = 5.6 cfs, Q100 = 14.0 cfs): a basin that is in the northeast area of the site. It encompasses single-family residential Type A lots along Thedford Court and Willmore Drive. Runoff will flow from each lot onto the street where proposed mountable curb and gutter will convey flows South and then West to **DP-11**. Flow from DP-11 combines with DP-12. **DP-13** is the combined flow from DP-11 and 12 and will sheet flow across the temporary gravel turnaround area and release into temporary swale B, which releases into WQCV North Detention Pond at **DP-14**.

Per meeting with EPC, sheetflow over turnarounds is acceptable and material changed to asphalt

**Basin B-2** (1.17 AC, Q5 = 2.0 cfs, Q100 = 4.3 cfs): a basin that is in the north area of the site. It encompasses the fronts of single-family residential Type B lots along Willmore Drive. Runoff from each lot onto the street where proposed mountable curb and gutter will convey flows West to **DP-12**. Flow from DP-11 combines with DP-12. **DP-13** is the combined flow from DP-11 and 12 and will sheet flow across the temporary gravel turnaround area and release into temporary swale B, which releases into WQCV North Detention Pond at **DP-14**.

**Basin B-5** (1.56 AC, Q5 = 0.5 cfs, Q100 = 3.7 cfs): a basin that is in the northeast area of the site. It is undeveloped and covered in native grasses, weeds, rock, and shrubs. Runoff from this basin sheet flows from North to South along grades around 2 percent. Runoff will be intercepted by temporary Proposed Swale B that will convey flows to **DP-14** into the north water quality detention pond.

**Basin B-6** (0.62 AC, Q5 = 0.2 cfs, Q100 = 1.5 cfs): a basin that is in the northeast area of the site adjacent to RWT204. It encompasses the proposed north water quality detention pond. Runoff will sheet flow directly into the pond. The pond will outfall to RWT204.

**Basin C-5** (7.86 AC, Q5 = 10.9 cfs, Q100 = 24.9 cfs): a basin that is in the southeast area of the site. It encompasses single-family residential lots, Type A lots along Feather Reed Drive and Avena Road. Runoff will flow from each lot onto the street where proposed mountable curb and gutter will convey flows West and then South to a proposed on-grade 15' CDOT Type R inlet, **DP-16**. Captured flow will convey stormwater via a proposed 24" RCP storm sewer to DP-17. By-pass flow will continue down Feather Reed Drive to DP-18 where 5 yr. and 100 yr. flows will be completely captured by a 20' CDOT Type R sump inlet.

**Basin C-6** (5.54 AC, Q5 = 7.0 cfs, Q100 = 16.9 cfs): a basin that is in the southeast area of the site. It encompasses single-family residential lots, Type A lots along the North portion of Feather Reed Drive and Type A lots along the South portion of Feather Reed Drive. Runoff will flow from each lot onto Feather Reed Drive where proposed mountable curb and gutter will convey flows West and then South to a proposed on-grade 10' CDOT Type R inlet, **DP-17**. Captured flow will convey stormwater via a proposed 30" RCP storm sewer to DP-19A. By-pass flow will continue down Feather Reed Drive to DP-19 where 5 yr. and 100 yr. flows will be completely captured by a 20' CDOT Type R sump inlet.

**Basin C-3** (2.38 AC, Q5 = 3.3 cfs, Q100 = 7.8 cfs): a basin that is in the southeast area of the site. It encompasses single-family residential lots, Type A lots along Berwyn Drive. Runoff will flow from each lot

The conclusion of The Ranch MDDP is that major channel improvements are necessary through the Meadows subdivision. They state that multiple meetings have taken place with El Paso County regarding this issue and funding for the improvements is being discussed.

## X. Proposed Regional Pond Improvements

Utilizing the areas and percent impervious values from the future models in the DBPS it was determined that pond WU has a tributary area of 3.58 square miles and a 7.33% impervious. Utilizing the WQCV equations contained with the Criteria it has been determined that a volume of 9.764 ac-ft is required for the entire tributary area. This volume exceeds the volume for the 5-year event per the DBPS.

The stage storage data for the pond was taken from the DBPS and it was found that the required volume exceeds the front edge of the existing outlet structure on the pond. It is proposed to raise the front edge of the existing outlet to provide the required water quality capture volume. The existing orifices on the face of the outlet structure will be covered to prevent release through them and a new rectangular hole will be cut through the existing wall. An orifice plate with square orifices will be installed to release the WQCV. A well screen will be installed on the face of the outlet structure. A small micro pool will be proposed directly in front of the orifice plate in an effort to reduce clogging of the well screen. A portion of the top of the outlet opening will be covered, to ensure flows exiting the pond meet the DBPS flows. The HEC-HMS model prepared for the Falcon DBPS has been modified to account for the changes to Pond WU, removal of Pond SR-3, addition of developed basin along Old Meridian Road and m made upstream in the Ranch MDDP. This model and results are provided in the appendi

Statement removed as revised HMS shows "top" does not need to be covered

In reviewing the pond and in discussions with El Paso County, the inlet to Pond WU has is in need of repair. As part of the proposed improvements to the pond, the washed-out embankment will be repaired. In discussions with the County it is understood that there are multiple areas of wetlands in the area. While the majority of the West Tributary should be directed through Pond WU there are two 18" pipes to the east of the embankment that allow flows to pass from the West Tributary into the existing wetlands to maintain them. The embankment is designed such that flows will back up prior to entering Pond WU and will pass through the existing pipes to the east.

Site investigations have identified that a large reason the embankment failed was improper erosion protection. It is apparent that, as the embankment was overtopped it began scouring under the riprap placed on the downhill side of the embankment. Given enough time or a large enough storm it was able to dislodge a section of the protection and the embankment washed out.

It is proposed to fill the washed-out area of the embankment back to match the existing weir elevation of 6832.5. An 18" pipe will be installed through the embankment. The purpose of this pipe is to drain the area just upstream of the embankment since the dual pipes to the east are higher than that point. The new pipe will release "bottom" flows with the "pre-bay" area, so it does not retain water. The existing dual pipes will continue to provide flows from smaller storm events, above trickle flows, to the existing wetlands. Riprap will be re-established on the downstream side of the embankment. In addition, it is proposed to riprap the top of the embankment to protect it from scour. A cutoff wall will also be installed through the full length of the embankment from the top of the embankment to just below the toe of slope on the downstream side. The cutoff wall should be installed on the downstream side of the top of the embankment.

## STAGE - STORAGE - DISCHARGE TABLE (POND WU - OUTLET REVISIONS)

per UDFCD UD-Detention Spreadsheet

Stage	Area	Volume	2*Vol	Orifice Plate	Overflow #1 Weir	Overflow #1 Orifice	Overflow #1 Mixed	Overflow #1 Control	Spill Way	Total Outflow
[ft]	[ft^2]	[ft^3]	[ft^3]	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]
0.00	15	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.90	21261	20212	40424	1.23	0.00	0.00	0.00	0.00	0.00	1.23
2.70	61537	53331	106662	2.01	0.00	0.00	0.00	0.00	0.00	2.01
3.70	111883	140041	280081	3.03	0.00	0.00	0.00	0.00	0.00	3.03
4.70	149826	270895	541790	4.18	0.00	0.00	0.00	0.00	0.00	4.18
5.70	184669	438143	876285	5.45	7.81	387.49	334.25	7.81	0.00	13.25
6.70	197045	629000	1257999	6.38	387.20	1423.73	986.79	387.20	0.00	393.58
7.70	203805	829425	1658849	7.16	1034.90	1975.83	1423.47	1034.90	0.00	1042.06
8.70	209996	1036325	2072650	7.85	1864.79	2404.32	1918.75	1864.79	0.00	1872.64
9.70	216045	1249346	2498691	8.48	2843.11	2767.24	2496.89	2496.89	0.00	2505.37
10.70	222053	1468395	2936789	9.07	3950.02	3087.80	3161.25	3087.80	0.00	3096.87
11.70	228051	1693447	3386893	9.61	5172.01	3378.07	3910.41	3378.07	0.00	3387.69
12.70	234619	1924782	3849563	10.13	6499.10	3645.30	4741.64	3645.30	0.00	3655.44

Needs pipes?

Spreadsheets for culverts added - Spreadsheet updated per culvert flows and "controlling" outflows































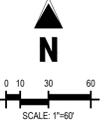
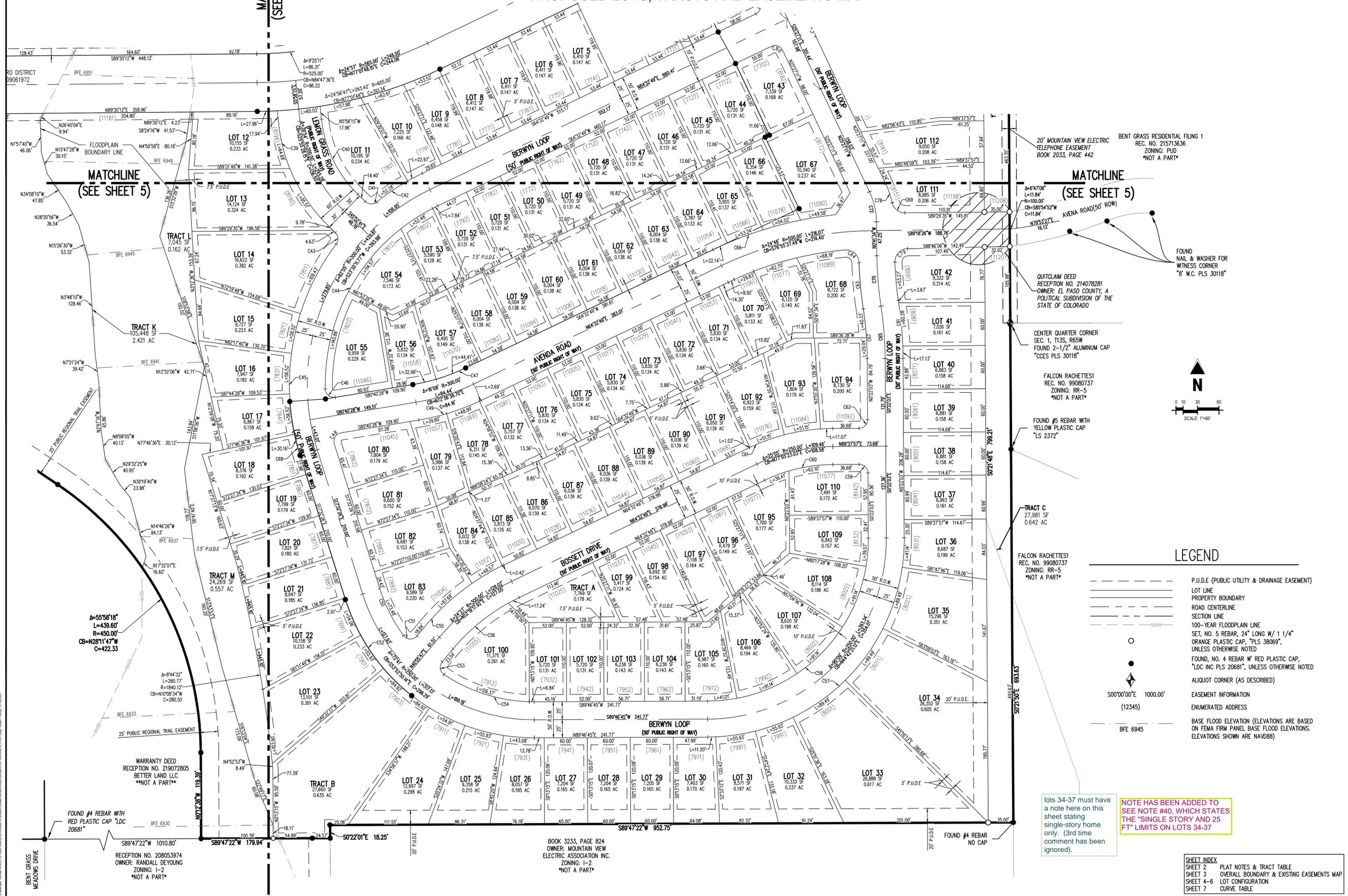
# BENT GRASS RESIDENTIAL FILING NO. 2

LOCATED IN THE NORTHWEST QUARTER AND SOUTHWEST QUARTER OF SECTION 1 T13S R65W OF THE 6TH PRINCIPAL MERIDIAN COUNTY OF EL PASO, STATE OF COLORADO

## PROPOSED LOTS, TRACTS AND EASEMENTS MAP



**FINAL PLAT**  
**BENT GRASS RESIDENTIAL FILING NO. 2**  
 LOCATED IN THE NORTHWEST QUARTER AND SOUTHWEST QUARTER OF SECTION 1 T13S R65W OF THE 6TH PRINCIPAL MERIDIAN COUNTY OF EL PASO, STATE OF COLORADO



**LEGEND**

- P.U.D.E (PUBLIC UTILITY & DRAINAGE EASEMENT)
- LOT LINE
- PROPERTY BOUNDARY
- ROAD CENTERLINE
- SECTION LINE
- 100-YEAR FLOODPLAIN LINE
- SET, NO. 5 REBAR, 24" LONG W/ 1 1/4" ORANGE PLASTIC CAP, "PLS 38069", UNLESS OTHERWISE NOTED
- FOUND, NO. 4 REBAR W/ RED PLASTIC CAP, "LDC INC PLS 20681", UNLESS OTHERWISE NOTED
- ALIQUOT CORNER (AS DESCRIBED)
- EASEMENT INFORMATION
- ENUMERATED ADDRESS
- BASE FLOOD ELEVATION (ELEVATIONS ARE BASED ON FEMA FIRM PANEL BASE FLOOD ELEVATIONS. ELEVATIONS SHOWN ARE NAVD88)

lots 34-37 must have a note here on this sheet stating single-story home only. (3rd time comment has been ignored).

**NOTE HAS BEEN ADDED TO SEE NOTE #40, WHICH STATES THE "SINGLE STORY AND 25 FT" LIMITS ON LOTS 34-37**

**SHEET INDEX**

SHEET 2	PLAT NOTES & TRACT TABLE
SHEET 3	OVERALL BOUNDARY & EXISTING EASEMENTS MAP
SHEET 4-6	LOT CONFIGURATION
SHEET 7	CURVE TABLE

Project No:	CLH014.20
Drawn By:	
Checked By:	BJD
Date:	5/14/2019

2019 Financial Assurance Estimate Form - Pond WU  
(with pre-plat construction)

EPC Planning & Community  
Development Department

Updated: 7/16/2019

PROJECT INFORMATION			
Bent Grass Residential Filing No. 2	3/29/2020		SF-19-014
Project Name	Date		PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction)	
						% Complete	Remaining
<b>SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)</b>							
* Earthwork							
less than 1,000; \$5,300 min		CY	\$ 8.00	=	\$ -		\$ -
1,000-5,000; \$8,000 min		CY	\$ 6.00	=	\$ -		\$ -
5,001-20,000; \$30,000 min		CY	\$ 5.00	=	\$ -		\$ -
20,001-50,000; \$100,000 min		CY	\$ 3.50	=	\$ -		\$ -
50,001-200,000; \$175,000 min		CY	\$ 2.50	=	\$ -		\$ -
greater than 200,000; \$500,000 min		CY	\$ 2.00	=	\$ -		\$ -
* Permanent Seeding (inc. noxious weed mgmnt.)		AC	\$ 800.00	=	\$ -		\$ -
* Mulching		AC	\$ 750.00	=	\$ -		\$ -
* Permanent Erosion Control Blanket		SY	\$ 6.00	=	\$ -		\$ -
* Permanent Pond/BMP Construction	2,400	CY	\$ 20.00	=	\$ 48,000.00		\$ 48,000.00
* Permanent Pond/BMP (Spillway)		EA	\$ 5,000.00	=	\$ -		\$ -
* Permanent Pond/BMP (Outlet Structure)	1	EA	\$ 80,000.00	=	\$ 80,000.00		\$ 80,000.00
Safety Fence		LF	\$ 3.00	=	\$ -		\$ -
Temporary Erosion Control Blanket		SY	\$ 3.00	=	\$ -		\$ -
Vehicle Tracking Control		EA	\$ 2,370.00	=	\$ -		\$ -
Silt Fence		LF	\$ 2.50	=	\$ -		\$ -
Temporary Seeding		AC	\$ 628.00	=	\$ -		\$ -
Temporary Mulch		AC	\$ 750.00	=	\$ -		\$ -
Erosion Bales		EA	\$ 25.00	=	\$ -		\$ -
Erosion Logs/Straw Waddle		LF	\$ 5.00	=	\$ -		\$ -
Rock Check Dams		EA	\$ 500.00	=	\$ -		\$ -
Inlet Protection		EA	\$ 167.00	=	\$ -		\$ -
Sediment Basin		EA	\$ 1,762.00	=	\$ -		\$ -
Concrete Washout Basin		EA	\$ 900.00	=	\$ -		\$ -
Road Straw Bale Check Dams		EA	\$ 100.00	=	\$ -		\$ -
<i>[insert items not listed but part of construction plans]</i>				=	\$ -		\$ -
<b>MAINTENANCE (35% of Construction BMPs)</b>							
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)							
<b>Section 1 Subtotal</b>					<b>=</b>	<b>\$ 128,000.00</b>	<b>\$ 128,000.00</b>
<b>SECTION 2 - PUBLIC IMPROVEMENTS *</b>							
<b>ROADWAY IMPROVEMENTS</b>							
Construction Traffic Control		LS		=	\$ -		\$ -
Aggregate Base Course (135 lbs/cf)		Tons	\$ 28.00	=	\$ -		\$ -
Aggregate Base Course (135 lbs/cf)		CY	\$ 50.00	=	\$ -		\$ -
Asphalt Pavement (3" thick)		SY	\$ 14.00	=	\$ -		\$ -
Asphalt Pavement (4" thick)		SY	\$ 19.00	=	\$ -		\$ -
Asphalt Pavement (6" thick)		SY	\$ 29.00	=	\$ -		\$ -
Asphalt Pavement (147 lbs/cf) _" thick		Tons	\$ 88.00	=	\$ -		\$ -
Raised Median, Paved		SF	\$ 8.00	=	\$ -		\$ -
Regulatory Sign/Advisory Sign		EA	\$ 300.00	=	\$ -		\$ -
Guide/Street Name Sign		EA		=	\$ -		\$ -
Epoxy Pavement Marking		SF	\$ 13.00	=	\$ -		\$ -
Thermoplastic Pavement Marking		SF	\$ 23.00	=	\$ -		\$ -
Barricade - Type 3		EA	\$ 200.00	=	\$ -		\$ -
Delineator - Type I		EA	\$ 24.00	=	\$ -		\$ -
Curb and Gutter, Type A (6" Vertical)		LF	\$ 30.00	=	\$ -		\$ -
Curb and Gutter, Type B (Median)		LF	\$ 30.00	=	\$ -		\$ -
Curb and Gutter, Type C (Ramp)		LF	\$ 30.00	=	\$ -		\$ -
4" Sidewalk (common areas only)		SY	\$ 48.00	=	\$ -		\$ -
5" Sidewalk		SY	\$ 60.00	=	\$ -		\$ -
6" Sidewalk		SY	\$ 72.00	=	\$ -		\$ -
8" Sidewalk		SY	\$ 96.00	=	\$ -		\$ -
Pedestrian Ramp		EA	\$ 1,150.00	=	\$ -		\$ -
Cross Pan, local (8" thick, 6' wide to include return)		LF	\$ 61.00	=	\$ -		\$ -
Cross Pan, collector (9" thick, 8' wide to include return)		LF	\$ 92.00	=	\$ -		\$ -
Curb Chase		EA	\$ 1,480.00	=	\$ -		\$ -
Guardrail Type 3 (W-Beam)		LF	\$ 49.00	=	\$ -		\$ -
Guardrail Type 7 (Concrete)		LF	\$ 72.00	=	\$ -		\$ -
Guardrail End Anchorage		EA	\$ 2,098.00	=	\$ -		\$ -
Guardrail Impact Attenuator		EA	\$ 3,767.00	=	\$ -		\$ -
Sound Barrier Fence (CMU block, 6' high)		LF	\$ 78.00	=	\$ -		\$ -
Sound Barrier Fence (panels, 6' high)		LF	\$ 80.00	=	\$ -		\$ -
Electrical Conduit, Size =		LF	\$ 16.00	=	\$ -		\$ -
Traffic Signal, complete intersection		EA	\$ 425,000	=	\$ -		\$ -

2019 Financial Assurance Estimate Form  
(with pre-plat construction)

PROJECT INFORMATION		
Bent Grass Residential Filing No. 2	3/29/2020	SF-19-014
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction)		
						% Complete	Remaining	
<b>SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)</b>								
* Earthwork								
less than 1,000; \$5,300 min		CY	\$ 8.00	=	\$ -		\$ -	
1,000-5,000; \$8,000 min	4,202	CY	\$ 6.00	=	\$ 25,212.00		\$ 25,212.00	
5,001-20,000; \$30,000 min		CY	\$ 5.00	=	\$ -		\$ -	
20,001-50,000; \$100,000 min		CY	\$ 3.50	=	\$ -		\$ -	
50,001-200,000; \$175,000 min		CY	\$ 2.50	=	\$ -		\$ -	
greater than 200,000; \$500,000 min		CY	\$ 2.00	=	\$ -		\$ -	
* Permanent Seeding (inc. noxious weed mgmnt.)		AC	\$ 800.00	=	\$ -		\$ -	
* Mulching		AC	\$ 750.00	=	\$ -		\$ -	
* Permanent Erosion Control Blanket	2,800	SY	\$ 6.00	=	\$ 16,800.00		\$ 16,800.00	
* Permanent Pond/BMP Construction	6,100	CY	\$ 20.00	=	\$ 122,000.00		\$ 122,000.00	
* Permanent Pond/BMP (Spillway)	2	EA	\$ 5,000.00	=	\$ 10,000.00		\$ 10,000.00	
* Permanent Pond/BMP (Outlet Structure)	2	EA	\$ 55,000.00	=	\$ 110,000.00		\$ 110,000.00	
Safety Fence	80	LF	\$ 3.00	=	\$ 240.00		\$ 240.00	
Temporary Erosion Control Blanket	62,815	SY	\$ 3.00	=	\$ 188,445.00		\$ 188,445.00	
Vehicle Tracking Control	2	EA	\$ 2,370.00	=	\$ 4,740.00		\$ 4,740.00	
Silt Fence	16,368	LF	\$ 2.50	=	\$ 40,920.00		\$ 40,920.00	
Temporary Erosion Control Blanket	42	AC	\$ 628.00	=	\$ 26,376.00		\$ 26,376.00	
Temporary Erosion Control Blanket		AC	\$ 750.00	=	\$ -		\$ -	
Erosion Control Blanket		EA	\$ 25.00	=	\$ -		\$ -	
Erosion Control Blanket		LF	\$ 5.00	=	\$ -		\$ -	
Rock Check Dam		EA	\$ 500.00	=	\$ -		\$ -	
Inlet Protection	11	EA	\$ 167.00	=	\$ 1,837.00		\$ 1,837.00	
Sediment Basin	2	EA	\$ 1,762.00	=	\$ 3,524.00		\$ 3,524.00	
Concrete Washout Basin	2	EA	\$ 900.00	=	\$ 1,800.00		\$ 1,800.00	
Road Straw Bale Check Dams	111	EA	\$ 100.00	=	\$ 11,100.00		\$ 11,100.00	
<i>[insert items not listed but part of construction plans]</i>								
<b>MAINTENANCE (35% of Construction BMPs)</b>					=	\$ 97,559.70		\$ 97,559.70
<b>Section 1 Subtotal</b>					=	<b>\$ 660,553.70</b>		<b>\$ 660,553.70</b>

\* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)

**SECTION 2 - PUBLIC IMPROVEMENTS \***

ROADWAY IMPROVEMENTS							
Construction Traffic Control	1	LS	\$ 5,000.00	=	\$ 5,000.00		\$ 5,000.00
Aggregate Base Course (135 lbs/cf)	20,700	Tons	\$ 28.00	=	\$ 579,600.00		\$ 579,600.00
Aggregate Base Course (135 lbs/cf)	14,500	CY	\$ 50.00	=	\$ 725,000.00		\$ 725,000.00
Asphalt Pavement (3" thick)		SY	\$ 14.00	=	\$ -		\$ -
Asphalt Pavement (4" thick)		SY	\$ 19.00	=	\$ -		\$ -
Asphalt Pavement (6" thick)		SY	\$ 29.00	=	\$ -		\$ -
Asphalt Pavement (147 lbs/cf) <u>4" thick</u>	9,540	Tons	\$ 88.00	=	\$ 839,490.96		\$ 839,490.96
Raised Median, Paved		SF	\$ 8.00	=	\$ -		\$ -
Regulatory Sign/Advisory Sign	15	EA	\$ 300.00	=	\$ 4,500.00		\$ 4,500.00
Guide/Street Name Sign	15	EA	\$ 300.00	=	\$ 4,500.00		\$ 4,500.00
Epoxy Pavement Marking	1,050	SF	\$ 13.00	=	\$ 13,650.00		\$ 13,650.00
Thermoplastic Pavement Marking		SF	\$ 23.00	=	\$ -		\$ -
Barricade - Type 3		EA	\$ 200.00	=	\$ -		\$ -
Delineator - Type I		EA	\$ 24.00	=	\$ -		\$ -
Curb and Gutter, Type A (6" Vertical)	7,597	LF	\$ 30.00	=	\$ 227,910.00		\$ 227,910.00
Curb and Gutter, Type B (Median)		LF	\$ 30.00	=	\$ -		\$ -
Curb and Gutter, Type C (Bump)	14,000	LF	\$ 30.00	=	\$ 420,000.00		\$ 420,000.00
4" Sidewalk		SY	\$ 48.00	=	\$ -		\$ -
5" Sidewalk		SY	\$ 60.00	=	\$ -		\$ -
6" Sidewalk	9,938	SY	\$ 72.00	=	\$ 715,536.00		\$ 715,536.00
8" Sidewalk		SY	\$ 96.00	=	\$ -		\$ -
Pedestrian Ramp <u>Add for T intersections</u>	37	EA	\$ 1,150.00	=	\$ 42,550.00		\$ 42,550.00
Cross Pan, local (8" thick, 6' wide to include return)	780	LF	\$ 61.00	=	\$ 47,580.00		\$ 47,580.00
Cross Pan, collector (9" thick, 8' wide to include return)		LF	\$ 92.00	=	\$ -		\$ -
Curb Chase		EA	\$ 1,480.00	=	\$ -		\$ -
Guardrail Type 3 (W-Beam)		LF	\$ 49.00	=	\$ -		\$ -
Guardrail Type 7 (Concrete)		LF	\$ 72.00	=	\$ -		\$ -
Guardrail End Anchorage		EA	\$ 2,098.00	=	\$ -		\$ -
Guardrail Impact Attenuator		EA	\$ 3,767.00	=	\$ -		\$ -
Sound Barrier Fence (CMU block, 6' high)		LF	\$ 78.00	=	\$ -		\$ -
Sound Barrier Fence (panels, 6' high)		LF	\$ 80.00	=	\$ -		\$ -
Electrical Conduit, Size =		LF	\$ 16.00	=	\$ -		\$ -
Traffic Signal, complete intersection		EA	\$ 425,000	=	\$ -		\$ -

PROJECT INFORMATION									
Bent Grass Residential Filing No. 2			3/29/2020			SF-19-014			
Project Name			Date			PCD File No.			
Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction)			
						% Complete	Remaining		
[insert items not listed but part of construction plans]				=	\$ -		\$ -		
[insert items not listed but part of construction plans]				=	\$ -		\$ -		
<b>STORM DRAIN IMPROVEMENTS</b>									
Concrete Box Culvert (M Standard), Size ( 16 x 6 )	266	LF	\$ 2,000.00	=	\$ 532,000.00		\$ 532,000.00		
18" Reinforced Concrete Pipe	100	LF	\$ 65.00	=	\$ 6,500.00		\$ 6,500.00		
24" Reinforced Concrete Pipe	135	LF	\$ 78.00	=	\$ 10,530.00		\$ 10,530.00		
30" Reinforced Concrete Pipe	110	LF	\$ 97.00	=	\$ 10,670.00		\$ 10,670.00		
36" Reinforced Concrete Pipe	250	LF	\$ 120.00	=	\$ 30,000.00		\$ 30,000.00		
42" Reinforced Concrete Pipe	50	LF	\$ 160.00	=	\$ 8,000.00		\$ 8,000.00		
48" Reinforced Concrete Pipe		LF	\$ 195.00	=	\$ -		\$ -		
54" Reinforced Concrete Pipe		LF	\$ 245.00	=	\$ -		\$ -		
60" Reinforced Concrete Pipe		LF	\$ 288.00	=	\$ -		\$ -		
66" Reinforced Concrete Pipe		LF	\$ 332.00	=	\$ -		\$ -		
72" Reinforced Concrete Pipe		LF	\$ 380.00	=	\$ -		\$ -		
18" Corrugated Steel Pipe		LF	\$ 84.00	=	\$ -		\$ -		
24" Corrugated Steel Pipe		LF	\$ 96.00	=	\$ -		\$ -		
30" Corrugated Steel Pipe		LF	\$ 122.00	=	\$ -		\$ -		
36" Corrugated Steel Pipe		LF	\$ 147.00	=	\$ -		\$ -		
42" Corrugated Steel Pipe		LF	\$ 168.00	=	\$ -		\$ -		
48" Corrugated Steel Pipe		LF	\$ 178.00	=	\$ -		\$ -		
54" Corrugated Steel Pipe		LF	\$ 260.00	=	\$ -		\$ -		
60" Corrugated Steel Pipe		LF	\$ 280.00	=	\$ -		\$ -		
66" Corrugated Steel Pipe		LF	\$ 340.00	=	\$ -		\$ -		
72" Corrugated Steel Pipe		LF	\$ 400.00	=	\$ -		\$ -		
78" Corrugated Steel Pipe		LF	\$ 460.00	=	\$ -		\$ -		
84" Corrugated Steel Pipe		LF	\$ 550.00	=	\$ -		\$ -		
Flared End Section (FES) RCP Size = 18 (unit cost = 6x pipe unit cost)	2	EA	\$ 390.00	=	\$ 780.00		\$ 780.00		
Flared End Section (FES) RCP Size = 24 (unit cost = 6x pipe unit cost)	1	EA	\$ 468.00	=	\$ 468.00		\$ 468.00		
Flared End Section (FES) RCP Size = 36 (unit cost = 6x pipe unit cost)	1	EA	\$ 720.00	=	\$ 720.00		\$ 720.00		
End Treatment- Headwall		EA		=	\$ -		\$ -		
End Treatment- Wingwall		EA		=	\$ -		\$ -		
End Treatment - Cutoff Wall		EA		=	\$ -		\$ -		
Curb Inlet (Type R) L=5', Depth < 5'		EA	\$ 5,542.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	\$ 7,188.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=5', 10' ≤ Depth < 15'		EA	\$ 8,345.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=10', Depth < 5'		EA	\$ 7,627.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=10', 5' ≤ Depth < 10'	4	EA	\$ 7,861.00	=	\$ 31,444.00		\$ 31,444.00		
Curb Inlet (Type R) L=10', 10' ≤ Depth < 15'		EA	\$ 9,841.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=15', Depth < 5'		EA	\$ 9,918.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=15', 5' ≤ Depth < 10'	3	EA	\$ 10,633.00	=	\$ 31,899.00		\$ 31,899.00		
Curb Inlet (Type R) L=15', 10' ≤ Depth < 15'		EA	\$ 11,627.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=20', Depth < 5'		EA	\$ 10,570.00	=	\$ -		\$ -		
Curb Inlet (Type R) L=20', 5' ≤ Depth < 10'	3	EA	\$ 11,667.00	=	\$ 35,001.00		\$ 35,001.00		
Grated Inlet (Type C), Depth < 5'		EA	\$ 4,640.00	=	\$ -		\$ -		
Grated Inlet (Type D), Depth < 5'	1	EA	\$ 5,731.00	=	\$ 5,731.00		\$ 5,731.00		
Storm Sewer Manhole, Box Base		EA	\$ 11,627.00	=	\$ -		\$ -		
Storm Sewer Manhole, Slab Base		EA	\$ 6,395.00	=	\$ -		\$ -		
Geotextile (Erosion Control)		SY	\$ 6.00	=	\$ -		\$ -		
Rip Rap, d50 size from 6" to 24"	110	Tons	\$ 80.00	=	\$ 8,800.00		\$ 8,800.00		
Rip Rap, Grouted		Tons	\$ 95.00	=	\$ -		\$ -		
Drainage Channel Construction, Size ( 26 x 5 )	1,300	LF	\$ 200.00	=	\$ 260,000.00		\$ 260,000.00		
Drainage Channel Lining, Concrete		CY	\$ 570.00	=	\$ -		\$ -		
Drainage Channel Lining, Rip Rap		CY	\$ 112.00	=	\$ -		\$ -		
Drainage Channel Lining, Grass		AC	\$ 1,469.00	=	\$ -		\$ -		
Drainage Channel Lining, Other Stabilization				=	\$ -		\$ -		
[insert items not listed but part of construction plans]				=	\$ -		\$ -		
[insert items not listed but part of construction plans]				=	\$ -		\$ -		
<b>Section 2 Subtotal</b>					<b>=</b>	<b>\$ 4,597,859.96</b>		<b>\$ 4,597,859.96</b>	

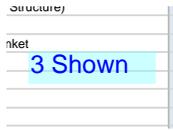
\* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)

Add to Soil/rip rap quantity above, the amount added from the 11/9/19 to the current amount shown on the plan that addressed PCD engineering comments. Additionally add a Quantity "channel lining rip-rap" to address the 4/2020 comments on the drainage report for the main North-south channel improvements.

Revised the soil/riprap quantity to reflect the added riprap as shown on the GEC plans. Also added quantities for the riprap shown in the channel improvements

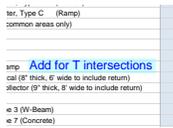
# FAE V\_4 Redlines.pdf Markup Summary

dskdkehster (5)



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Add to Soil/rip rap quantity above, the amount added from the 11/9/19 to the current amount shown on the plan that addressed PCD engineering comments. Additionally add a Quantity "channel lining rip-rap" to address the 4/2020 comments on the drainage report for the main North-south channel improvements.



**Subject:** EPC ENG Review  
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