

**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN**

**GREELEY NO. 3 DITCH
FINAL SUMMARY HYDRAULICS REPORT**

Prepared for:

*City of Greeley
Public Works Department
1001 Ninth Avenue
Greeley, CO 80631*

Prepared by:

*Anderson Consulting Engineers, Inc.
772 Whalers Way, Suite 200
Fort Collins, CO 80525
(ACE Project No. COCOG05)*

March 8, 2006



ANDERSON CONSULTING ENGINEERS, INC.

Civil • Water Resources • Environmental



ANDERSON CONSULTING ENGINEERS, INC.

Civil • Water Resources • Environmental

March 8, 2006

Mr. Bert Leautaud
City of Greeley
Public Works Department
1001 Ninth Avenue
Greeley, CO 80631

RE: City of Greeley Comprehensive Drainage Plan – Greeley No. 3 Ditch
(ACE Project No. COCOG05)


Dear Bert:

Anderson Consulting Engineers, Inc. (ACE) is pleased to inform you that we have completed the analyses and documentation associated with the hydraulic evaluation of the Greeley No. 3 Ditch. In addition, we have completed all revisions to the report pursuant to City review comments and our final in-house review. Please find enclosed two copies of the Final Summary Hydraulics Report along with all accompanying backup documentation.

It has been our pleasure working with you toward the completion of this study. If you have any questions or comments concerning the Report, please do not hesitate to contact us.

Sincerely,
ANDERSON CONSULTING ENGINEERS, INC.


Gregory J. Koch, P.E.
Vice President


Brian L. Van Zanten, P.E.
Project Engineer II

GJK/BLV/vla

Enclosures

**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN**

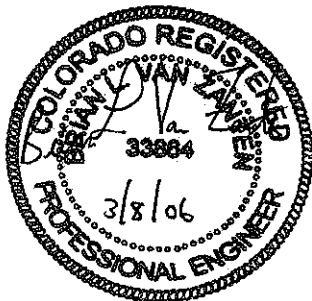
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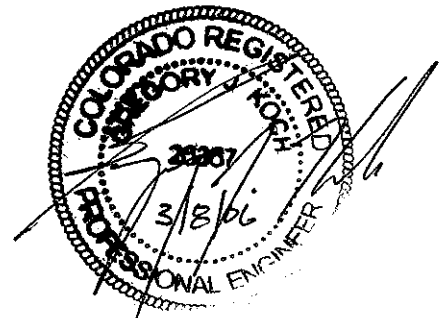


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I. INTRODUCTION

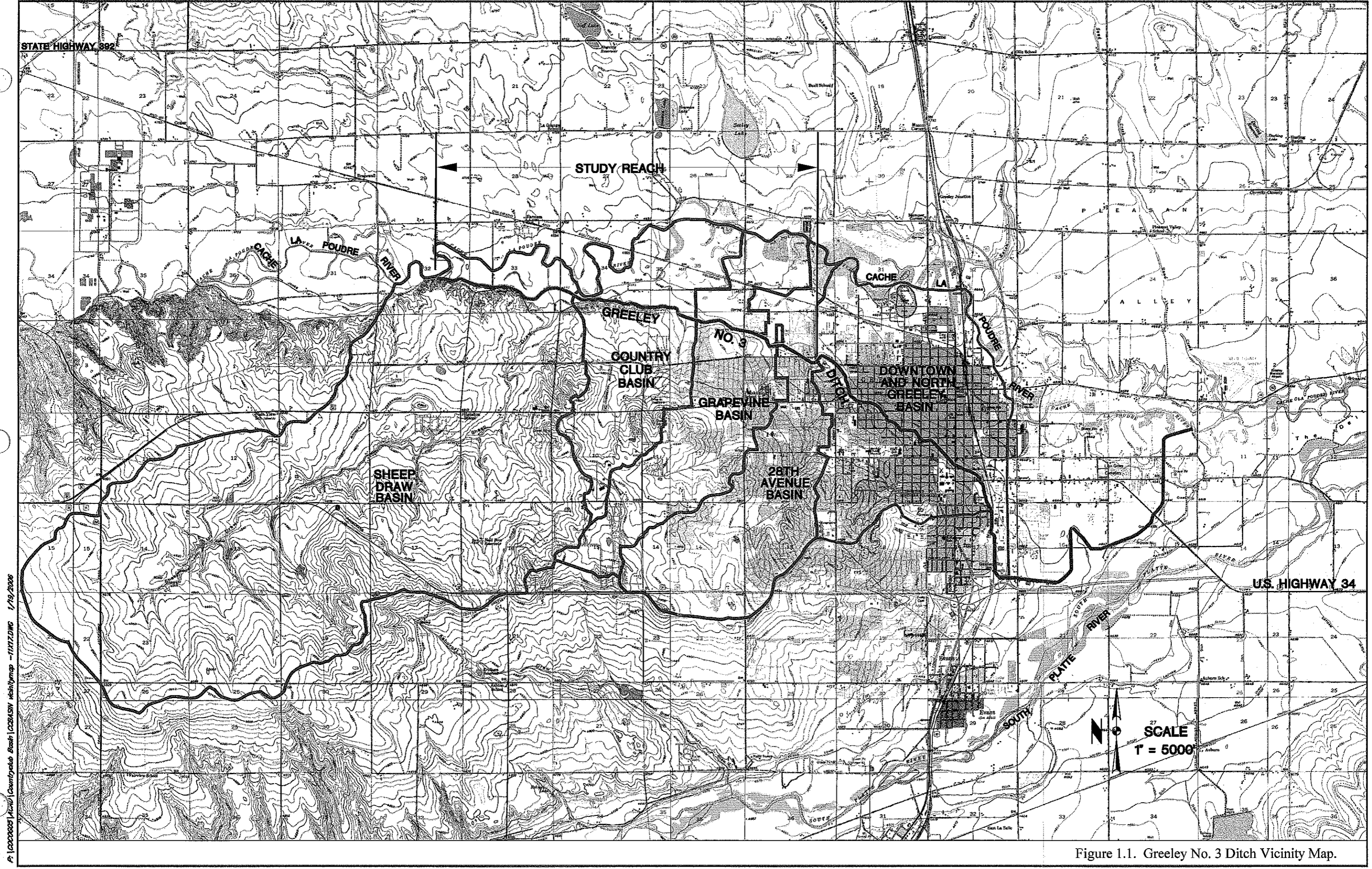
1.1 Background

The Greeley No. 3 Ditch is an irrigation facility that transports both irrigation flows and stormwater flows through the City of Greeley. A manually controlled headgate directs flow into the ditch at the Cache la Poudre River (approximately 0.6 miles west of the intersection of 71st Avenue and F Street) and also has its terminus at the Cache la Poudre River (immediately north of 16th Street and west of Fern Avenue, just outside of the Greeley city limits), a length of approximately 12 miles. The ditch generally flows in a southeasterly direction, traversing five of the City's major drainage basins. A vicinity map depicting the alignment of the Greeley No. 3 Ditch is provided in Figure 1.1.

This study is restricted to the reach west of 23rd Avenue, specifically beginning at the headgate to the Cache la Poudre River as the upstream limit and the Clarkson Spill Structure serving as the downstream limit. This reach of the ditch spans four out of the five City's major drainage basins, including the Sheep Draw Basin, the Country Club Basin, the Grapevine Basin, and the 28th Avenue Basin. The reach of the ditch east of the Clarkson Spill Structure to immediately upstream of the U.S. Highway 85 Bypass was studied in detail as part of the Downtown and North Greeley Basin (Anderson Consulting Engineers, Inc., January 2005); detailed analyses related to that reach are found in that report.

The ditch has several turnouts for diverting irrigation flows, as well as four controlled spill structures for the release of excess stormwater flows located within the Country Club Basin, Grapevine Basin, and 28th Avenue Basin. At several locations, the capacity of the ditch is compromised due to constrictions at bridge or culvert crossings, flow measurement structures, or pipeline crossings. Such encroachments increase the potential for ditch spills. The ditch had not been formerly identified as a north-south drainage boundary in previous Comp Planning efforts. Based on recent analyses, however, the ditch does effectively function as a drainage boundary in the Country Club and Grapevine Basins where the ditch intercepts and conveys either all runoff or a significant portion of the runoff from storm events as large as that associated with the 100-year return period. However, while the ditch serves as a significant drainage boundary through the Country Club and Grapevine Basins, it does not effectively function as a drainage boundary in the Sheep Draw and 28th Avenue Basins. Uncontrolled left bank overtopping generally occurs within the Sheep Draw and 28th Avenue Basins for flows as small as those associated with a 5-year return period.

Within the current study reach, the ditch maintains the following three important functions: (1) conveying irrigation flows to various locations within and in the vicinity of the



P:\000000\Map\Countryclub Basin\000000\mxd -1/19/2006

Figure 1.1. Greeley No. 3 Ditch Vicinity Map.

City of Greeley; (2) intercepting storm runoff from areas south of the ditch; and (3) depending upon location and magnitude of the inflows, safely evacuating those flows through the four controlled spill structures, located west of 23rd Avenue. Historically, larger inflows (e.g., flows associated with a 50-year return period and higher) had a tendency to greatly exceed the capacity of the ditch. As a result, uncontrolled, localized bank overtopping occurred at many locations; particularly both east and west of 59th Avenue in the Sheep Draw Basin, west of 35th Avenue in the Grapevine Basin, and both north and south of 4th Street in the 28th Avenue Basin. Beyond these five general areas, uncontrolled bank overtopping within the four subject drainage basins was relatively limited and isolated.

The City has recently implemented numerous regional drainage improvements and imposed local drainage requirements to reduce stormwater flows entering the ditch by means of the following: (1) local detention has been provided by all recent development within the City to minimize releases into the ditch; and (2) regional detention has also been provided upstream of the ditch, which has served to either minimize flows entering the ditch, or bypass the ditch altogether by conveying releases over or under the ditch. In addition, the recent construction of four controlled spill structures aid in the ditch operation by directing stormwater flows that still enter the ditch to dedicated drainage facilities where they can be safely transported away from the ditch. These spill structures have helped to maintain the Greeley No. 3 Ditch as a viable mechanism for the controlled transport of stormwater runoff.

1.2 Previous Studies

The Greeley No. 3 Ditch was studied in detail as part of the efforts associated with the "Comprehensive Drainage Plan Update, City of Greeley, Greeley No. 3 Ditch, Volumes 1 and 2 - Project Notebook," Lidstone and Anderson, Inc., March 1996. Specifically for that study, a comprehensive inventory and survey of ditch cross sections and crossing structures was conducted to document the condition of the existing facilities and identify locations of potential spills. This work was followed by a detailed hydraulic evaluation of the ditch using HEC-2. Structures and reaches of the ditch, which specifically limit the capacity to convey stormwater runoff, were identified. Improvements to divert and/or convey stormwater captured by the ditch were developed and evaluated within the context of the five drainage basins studied as part of the 1997 Comprehensive Drainage Plan. Many of the improvements identified as part of that study have since been implemented, improving the overall effectiveness of the ditch in controlling and conveying stormwater flows.

As mentioned in Section 1.1, the reach of the Greeley No. 3 Ditch from the Clarkson Spill Structure west of 23rd Avenue to just upstream of the U.S. Highway 85 Bypass was studied

in detail as part of analyses related to the Downtown and North Greeley Basin (Anderson Consulting Engineers, Inc., January 2005). That study converted the existing HEC-2 model of the ditch to HEC-RAS, and utilized its unsteady flow capabilities in order to determine outflow spill hydrographs from the ditch. The model was updated as part of the 2005 study to reflect six controlled spill structures as well as associated ditch bank improvements constructed by the City of Greeley since 1997. In addition to these structures and improvements, and to assist in the determination of additional spill locations, lateral weirs were placed between cross sections along the entire left bank of the model. Inflow hydrographs from the hydrologic model that represents the upper portion of the Downtown Basin were input into the hydraulic model, with the hydraulic model being executed under an unsteady flow mode for each return period. Outflow hydrographs at various locations were obtained and consolidated from the hydraulic model and placed back into the hydrologic model that represents the lower portion of the Downtown Basin, as inflow hydrographs. These inflow hydrographs were then utilized to more accurately determine potential flooding locations, and in turn propose drainage improvements for these areas.

1.3 Scope of Work

The Greeley No. 3 Ditch has the potential to significantly alter surface drainage patterns within the limits of the five major drainage basins that contribute stormwater flows to the ditch in the City of Greeley. A detailed evaluation of the ditch that was limited to the Downtown and North Greeley Basin ("City of Greeley, Comprehensive Drainage Plan, Downtown and North Greeley Basin – Final Report, Anderson Consulting Engineers, Inc., January 2005") has already been completed. Comprehensive analyses were not performed on the ditch as part of analysis for the Sheep Draw Basin ("City of Greeley, Comprehensive Drainage Plan, Sheep Draw Basin – Final Report, Anderson Consulting Engineers, Inc., March 2006"). This was due to the limited capacity of the ditch through the basin, the magnitude of potential stormwater inflows entering the ditch at the confluence with Sheep Draw, and the relative hydraulic inefficiency of the existing diversion structure. The ditch is capable of significant, uncontrolled left bank overtopping within the basin limits, and was not foreseen as transferring large amounts of stormwater to the remaining three drainage basins.

The determination of accurate ditch spills (both in location and magnitude) was seen by the City of Greeley as an important part of the overall hydrologic modeling process for the Country Club Basin, Grapevine Basin, and 28th Avenue Basin because of the ability of the ditch to alter drainage patterns and how those flow path alterations can affect drainage improvements

in close proximity to the ditch. The scope of this study identifies the steps utilized in determining those spills, with the specific tasks outlined below.

1. Hydrologic Modeling. Existing, Future, and Proposed Condition hydrology was determined for all five drainage basins for the 2-, 5-, 10-, 50-, and 100-year return periods. For the Existing and Proposed Conditions, uniform lateral inflow hydrographs and point inflow hydrographs, for all storm events and scenarios analyzed for this study, were defined as boundary conditions for the ditch based on the results of the hydrologic modeling of the upper portions of the five drainage basins. The unsteady flow hydraulic analyses (described below) were conducted and the resulting spill hydrographs were defined and incorporated into the hydrologic models for the lower portions of the Country Club, Grapevine, and 28th Avenue Basins as inflow hydrographs at the appropriate locations along the downslope side of the ditch.
2. Hydraulic Modeling. Unsteady inflow hydrographs from the hydrologic models for each return period were entered into the hydraulic model for the Greeley No. 3 Ditch at various locations. The HEC-RAS model was executed using the unsteady flow routine in order to determine the magnitude and location of ditch spills specific to the Country Club, Grapevine, and 28th Avenue Basins. At the request of the City, however, only the Existing and Proposed Condition scenarios were modeled using HEC-RAS. Unsteady flow analyses were not conducted for the Future Condition as that is a scenario that simply represents an intermediate step between the Existing and Proposed Conditions.
3. Integration of Ditch Spills. Pursuant to the results of the HEC-RAS unsteady flow analyses of the Greeley No. 3 Ditch, unsteady outflow/spill hydrographs were determined for the Existing and Proposed Condition for the Country Club, Grapevine, and 28th Avenue Basins for all five return periods. The hydrographs were entered into each corresponding hydrologic model at the appropriate location. It is noted that for the Future Condition hydrology models, the Existing Condition outflow hydrographs from the ditch to the lower portion of the basins were utilized. It is recognized that assuming Existing Condition inflow hydrographs are applicable in the Future Condition models may result in slightly under-estimated (for both the Country Club and 28th Avenue Basins) or overestimated (Grapevine Basin) peak discharges north of the ditch. This was deemed as an acceptable compromise by City staff in order to simplify the analyses for the Future Condition.

II. HYDROLOGIC ANALYSES: MODELING APPROACH AND INFLOW HYDROGRAPHS

2.1 Existing Condition

The Existing Condition scenario was defined as existing development with existing facilities for the five major drainage basins. Existing development was defined on a basin-by-basin basis, depending upon when the development had been approved for construction by the City of Greeley. Storm hydrographs for each return period were determined using the Colorado Urban Hydrograph Procedure (CUHP). After a conversion program converted the CUHP hydrographs into EPA SWMM hydrographs, the flows were entered into each model and in turn routed within each basin using EPA-SWMM. The resulting hydrographs specifically contributing runoff to the ditch were then extracted from the SWMM models and tabulated for use within the Greeley No. 3 Ditch HEC-RAS model.

2.2 Future Condition

The Future Condition scenario was defined by modifying the Existing Condition model to incorporate all potential future development based on current zoning and land use. The model also assumed that all existing major drainage facilities (generally located along major drainageways within each basin) would be retained from the Existing Condition. At the request of the City, Future Condition hydrographs were not utilized for any hydraulic analyses on the ditch. This determination was based on the fact that since nearly 90 percent of the four basins contributing flow to the ditch (excluding Sheep Draw) had already been developed prior to Future Condition modeling efforts, inflow hydrographs to the ditch were similar for the two conditions. It is noted that assuming Existing Condition inflow hydrographs north of the ditch are applicable to the Future Condition may result in either a slight under-estimation or over-estimation (depending on the drainage basin of interest) of peak discharges.

2.3 Proposed Condition

The Proposed Condition scenario incorporated all Future Condition modeling efforts and included proposed improvements generally along the major drainageways within each basin. In short, the objective of the Proposed Condition modeling efforts was to mitigate potential flooding problems and more importantly from a ditch perspective, reduce flows contributing to

the ditch. Similar to the Existing Condition, resulting hydrographs specifically contributing runoff to the ditch were then extracted from the SWMM models and tabulated for use within the Greeley No. 3 Ditch HEC-RAS model.

III. HYDRAULIC ANALYSES

3.1 Hydraulic Model Modifications

The hydraulic (HEC-2) model for the Greeley No. 3 Ditch that was prepared as part of the 1997 Comp Plan was converted to HEC-RAS as part of the 2005 Comp Plan. The reach beginning near the downstream end of the original model (immediately upstream of the U.S. Highway 85 Bypass) and continuing upstream nearly to the Clarkson Spill Structure (west of 23rd Avenue) was recently converted to HEC-RAS Version 3.1.2 for the Downtown and North Greeley Basin analyses (Anderson Consulting Engineers, Inc., January 2005). The remainder of the ditch (from the Clarkson Spill Structure up to the headgate at the Cache la Poudre River) was converted to HEC-RAS Version 3.1.2 and 3.1.3 for analyses relating to the Country Club Basin, Grapevine Basin, and 28th Avenue Basin; these two reaches were then connected, producing a single hydraulic model for the entire ditch. For purposes of analyses related to all three basins, it was assumed that only normal irrigation flows (70 cfs) would enter the Greeley No. 3 Ditch from the Poudre River.

Modeling parameters for bridges and culverts were modified to accommodate improved modeling techniques available in HEC-RAS; however, these modifications were based on geometric information gathered as part of the 1997 Comp Plan efforts. The ditch was not re-surveyed as part of the current study; consequently, inherent in this analysis is the assumption that the previously defined cross sectional data for the ditch provides a reasonably accurate hydraulic representation of existing conditions. The exception to the use of previously defined geometric ditch data is the incorporation of the left (downslope) ditch bank spill structures constructed since they were recommended as part of the 1997 Comp Plan. Ditch bank data were modified in the hydraulic model based on design drawings of the two new spill structures west of 23rd Avenue. In addition to the new spill structures, ditch bank data were modified to reflect recent improvements to the two existing spill structures west of 23rd Avenue. The four spill structures were designed and/or modified to improve the efficiency of stormwater removal.

Beginning at the upstream end of the ditch, the first spill structure to be improved was the F Street Spill Structure, located in the northwest corner of the Country Club Basin approximately 0.3 miles east of the intersection of F Street and 59th Avenue. Improvements were first outlined for this structure as part of the 1997 Comp Plan efforts, which called for extending the side channel weir upstream along the left bank to divert a maximum discharge of 160 cfs north to the Cache la Poudre River through the existing wasteway structure, limiting the stormwater captured by the ditch to less than 100 cfs downstream of the diversion structure. In conversations with City staff and as part of the updated design, the structure is intended to maintain approximately 110 cfs in the ditch by means of controlled spills over the extended side channel weir and

through a single steel crest gate controlled by an automated assembly. As previously planned, the structure was extended upstream along the left bank of the No. 3 Ditch with a concrete side channel weir, and tied into the existing wasteway structure. The improved diversion structure is depicted in Figure 3.1.

Further downstream along the ditch, the second spill structure to be constructed as part of the 1997 Comp Plan recommendations was the Eagleview Side Channel Weir, built in conjunction with the improvements made as part of the South Eagleview Detention Pond. The pond is located near the northeast corner of the Country Club Basin, north of the intersection of B Street and 43rd Avenue Court, south of the Greeley No. 3 Ditch. The 1997 plan called for a flume to be constructed over the ditch, routing flows from the Larson Ditch into a regional detention pond to be built immediately north of the ditch. A side channel weir was also included, intending to spill all flows in excess of 100 cfs into the pond from the ditch. The revised plan depicts the Larson Ditch directing flows into the pond south of the ditch, with pond outflows flumed over the ditch via a spillway and combined with flows from the side channel weir into a drainage channel. A 12'Wx3'H RCB (reduced to 9 feet in width due to an orifice plate) was installed along the ditch centerline immediately downstream of the side channel weir in order to accommodate the pond outflow flume and to force excess stormwater flows over the weir. The drainage channel directs flows to the north into a second regional pond between F Street and the Colorado and Southern Railroad. The Greeley No. 3 Ditch, concrete side channel weir, and pond outflow spillway are portrayed in Figure 3.2.

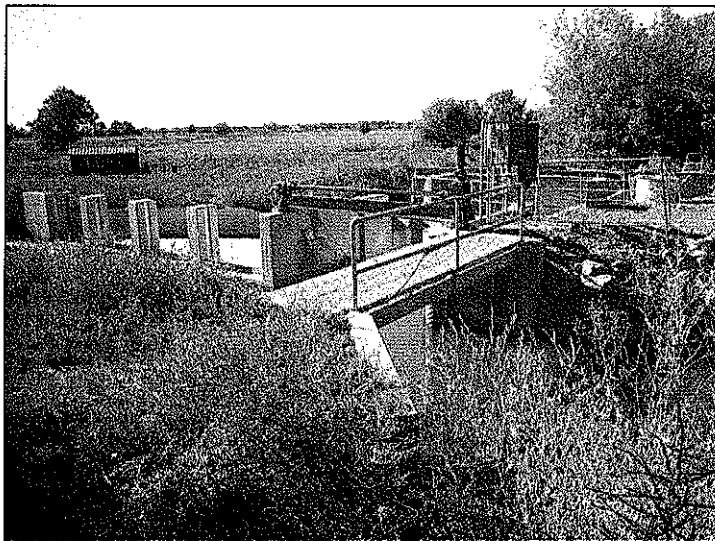


Figure 3.1 F Street Spill Structure.

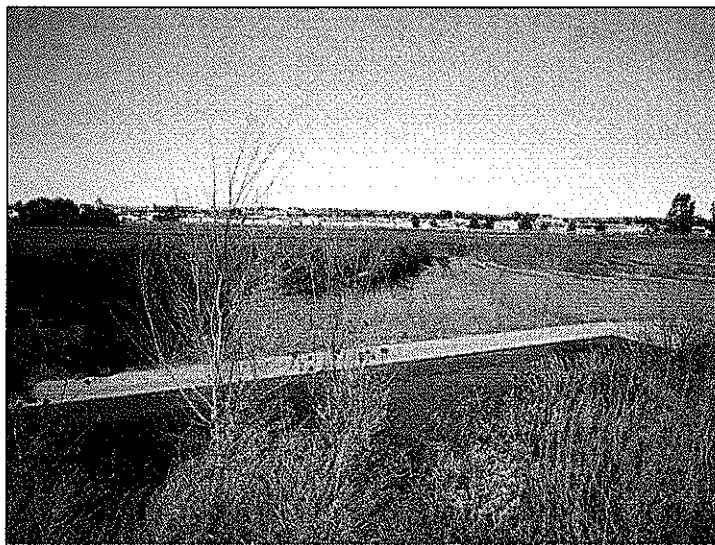


Figure 3.2 Eagleview Side Channel Weir and Pond Outflow Spillway.

The third spill structure recommended as a result of the 1997 Comp Plan was the Northview Side Channel Weir; this structure was built in conjunction with the improvements made as part of the Northview Regional Detention Pond. The pond is located near the northwestern corner of the 28th Avenue Basin, northeast of the intersection of 30th Avenue and 4th Street, north of the Greeley No. 3 Ditch. Improvements outlined for this structure as part of the 1997 Comp Plan included a flume over the ditch, routing flows from the Grapevine Basin secondary drainageway into a regional detention pond to be built immediately north of the ditch. A concrete side channel weir was also designed to spill all flows in excess of 100 cfs into the pond. As part of the design, pond outflows were intended to flow back to the west to the 35th Avenue Outfall Channel. The revised plan portrays the



Figure 3.3 Northview Side Channel Weir, In-line Ditch Control Structure, and Ditch Underchute.

pond to the north of the ditch as planned, with secondary drainageway flows routed beneath the ditch via an underchute. Underchute flows are combined with flows from the side channel weir. An in-line ditch control structure, also constructed in the Greeley No. 3 Ditch as part of the improvements, was installed immediately downstream of the side channel weir. Located directly downstream of the side channel weir, this structure is intended to force higher flows to spill over the side channel weir by means of stop logs placed within the top half of the ditch control structure section. Once flows have been directed into the pond, pond outflows are routed to the northeast toward the Greeley No. 3 Ditch Wasteway. The Northview improvements are shown in Figure 3.3.

The fourth and final spill structure to be improved was the Clarkson Spill Structure, located at the basin boundary between the 28th Avenue Basin and the Downtown and North Greeley Basin. The structure is located immediately south of the intersection of 4th Street and 25th Avenue. Proposed improvements as part of the 1997 Comp Plan called for automation of the structure so as to divert stormwater flows in excess of 80 cfs into the Greeley No. 3 Ditch Wasteway. The revised design included reconstruction of the structure to include a single overshot gate for the diversion of stormwater flows to the north into the Greeley No. 3 Ditch Wasteway. The design also included an automation assembly to maintain approximately 110 cfs in the ditch, according to conversations with City staff. The rehabilitated structure is represented

in Figure 3.4. Design/rehabilitation plans for each of the four spill structures are provided in Appendix A.

The Downtown and North Greeley Basin also included the addition of several spill structures and bank improvements designed and constructed as part of the 1997 Comp Plan. A more detailed discussion of those structures may be found in the Downtown and North Greeley Basin report (Anderson Consulting Engineers, Inc., January 2005).

Lateral weirs were defined along the entire length of the left (downslope) bank through all five basins. These weirs included the controlled spill structures. Where bank improvements have not been implemented, lateral weirs were defined based on top of left bank elevations provided in the original HEC-2 model.

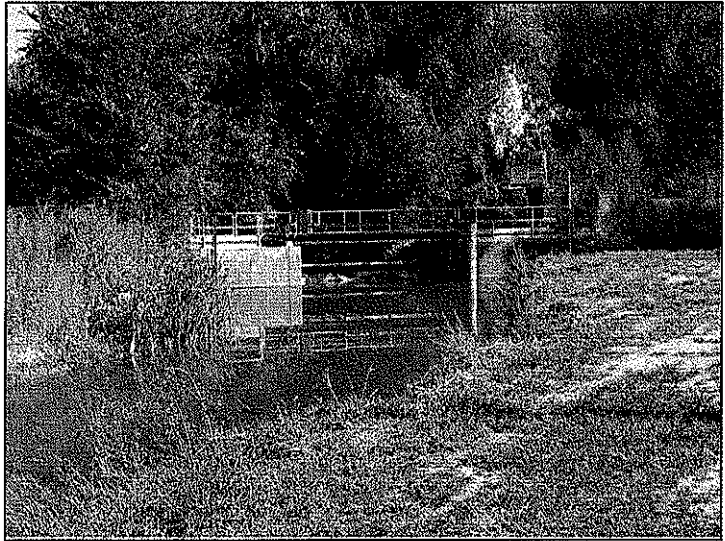


Figure 3.4 Clarkson Spill Structure.

3.2 Unsteady Flow Modeling

Seventeen uniform lateral inflow hydrographs and twelve lateral inflow hydrographs, for all storm events and scenarios analyzed for this study, were defined as boundary conditions for the ditch. These inflows were defined based on the results of the hydrologic modeling of the upper portions of the five major basins. Three additional boundary conditions were included, and they are listed as follows:

- 1) A steady inflow hydrograph of 70 cfs was entered at the upstream end of the model to simulate normal irrigation flows;
- 2) An in-line ditch control structure (installed as part of the Northview Regional Detention Pond improvements, and depicted in Figure 3.3) was placed immediately downstream of the Northview Side Channel Weir to simulate a maximum gate height opening of 2.67 feet; and
- 3) A normal depth slope of 0.02 ft/ft was assumed at the downstream end of the model.

It should also be noted that at the F Street Spill Structure and the Clarkson Spill Structure, discharge rating curves were established at each location. This was done to effectively maintain 110 cfs in the ditch downstream of each structure. Site-specific analyses were conducted at each location; the results of these analyses indicated that each structure has the capability to limit downstream flows along the ditch to 110 cfs if operated properly. HEC-RAS does not have the capability to model an automated gate designed to maintain specific water surface elevations within the ditch; therefore, discharge rating curves were developed and entered into the model. The unsteady flow analyses were conducted for both the Existing and Proposed Condition. Resulting spill hydrographs were defined and incorporated into the hydrologic models for the lower portion of the basin as inflow hydrographs at the appropriate locations along the downslope side of the ditch.

3.2.1 Hydraulic Modeling Results from the Existing Condition Unsteady Flow Model

The Existing Condition analyses for the four major drainage basins indicate that within the Country Club and Grapevine Basins, the ditch is generally effective in controlling bank overtopping and only spilling at the controlled spill structures for storms up to and including a 100-year event. The one exception is uncontrolled, left bank overtopping immediately west of 35th Avenue in the Grapevine Basin during the 100-year event. Uncontrolled bank overtopping is a significantly larger concern within the limits of the 28th Avenue Basin for storms at a 5-year event and higher. Figures 3.5 through 3.8 depict the limits of the Greeley No. 3 Ditch (on aerial photographs taken in 2003) through the Sheep Draw, Country Club, Grapevine, and 28th Avenue Basins. Included in these figures are cross section locations, inflow hydrograph types and approximate spill limits, and tabular information depicting the following: (a) inflow hydrograph and spill identification numbers; (b) inflow and spill hydrograph types (Uniform Lateral or Lateral Inflow Hydrographs, and Uniform Lateral or Lateral Spill Hydrographs, respectively), (c) SWMM inflow and spill/outflow node numbers as they relate to the hydrologic models, if applicable; and (d) peak spill discharges for the five return periods. It is noted that tabular summaries of inflow and outflow/spill hydrographs through the Downtown and North Greeley Basin have already been provided for the ditch in Section 3.4 of the Project Notebook associated with that basin.

Analyzing the ditch on a basin by basin basis, uncontrolled, left bank overtopping of the ditch is prevalent through the Sheep Draw Basin for all return periods from approximately F Street (west of the intersection of the ditch and Sheep Draw) to the eastern limit of the basin (east of 59th Avenue). Ditch spills in this area are seen as having minimal consequence due to lack of development between the ditch and the Poudre River and the presence of the Poudre River

INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	667	11	18	18	18	18
2	LJH	266	13	32	46	121	162
3	ULIH	172	213	677	1192	3148	4586
4	ULIH	270	2	14	33	115	143
5	ULIH	274	0	12	22	65	80

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULSH	N/A	144	477	808	2122	3107
2	ULSH	N/A	3	151	342	995	1456



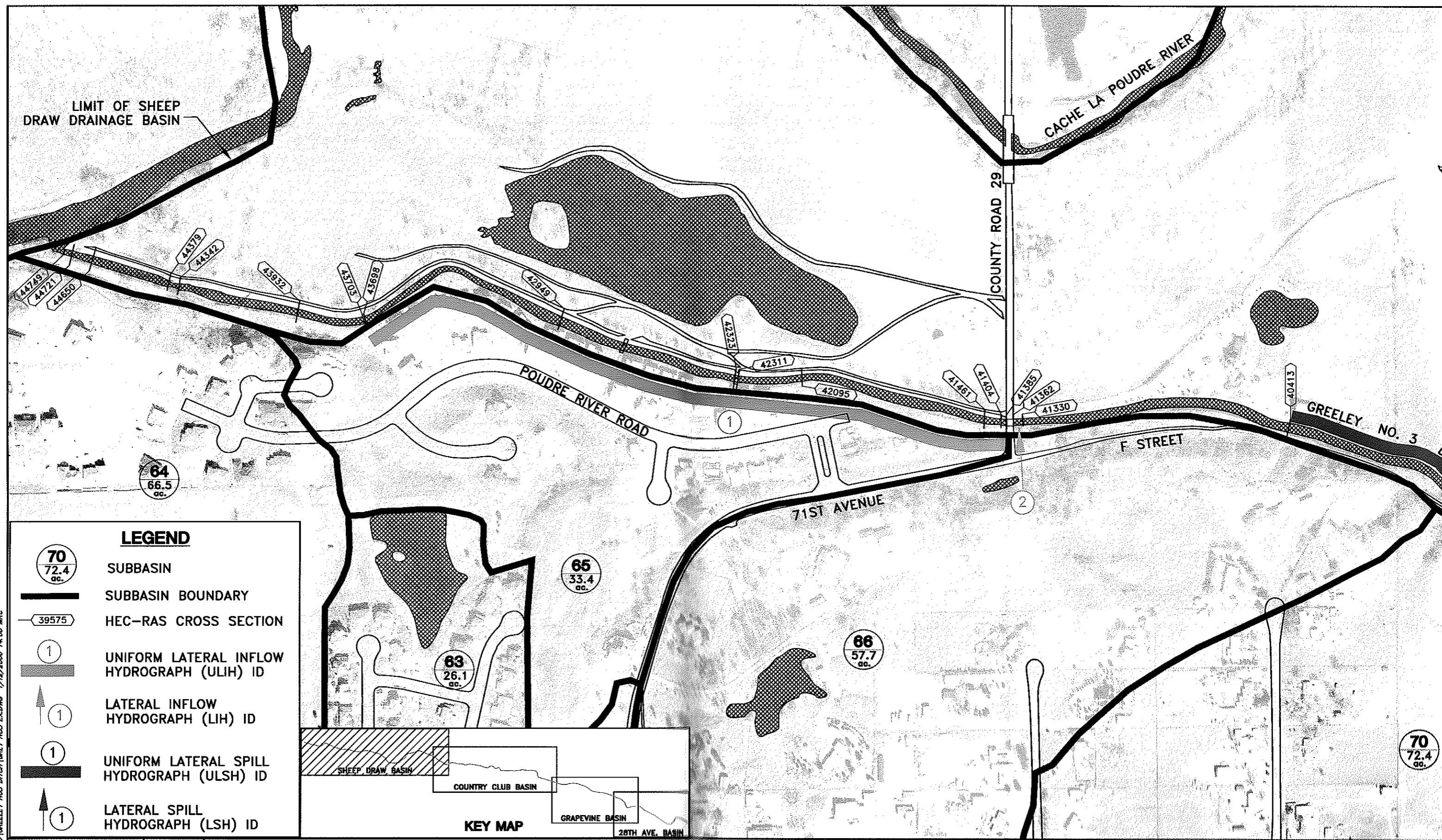
**SHEEP DRAW BASIN-EXISTING CONDITON
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY
FLOW ANALYSIS), AND CROSS SECTION IDENTIFICATION MAP**





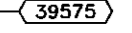




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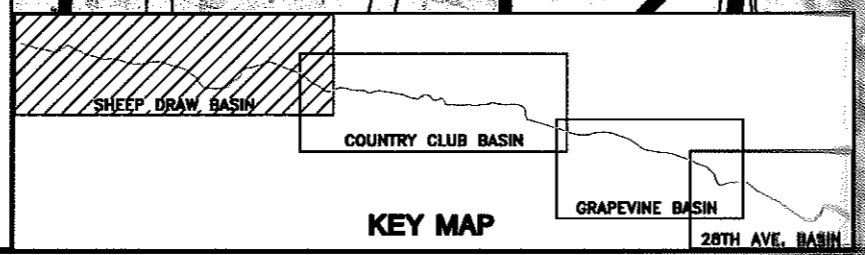
Project No.	COC0006
Date:	1/12/2006
Design:	DLV
Drawn:	MRC
Revisions:	
ADDED: ONLY NO. 3 EXDWO	

**FIGURE
3.5**

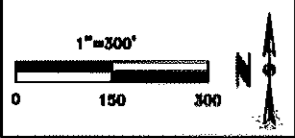


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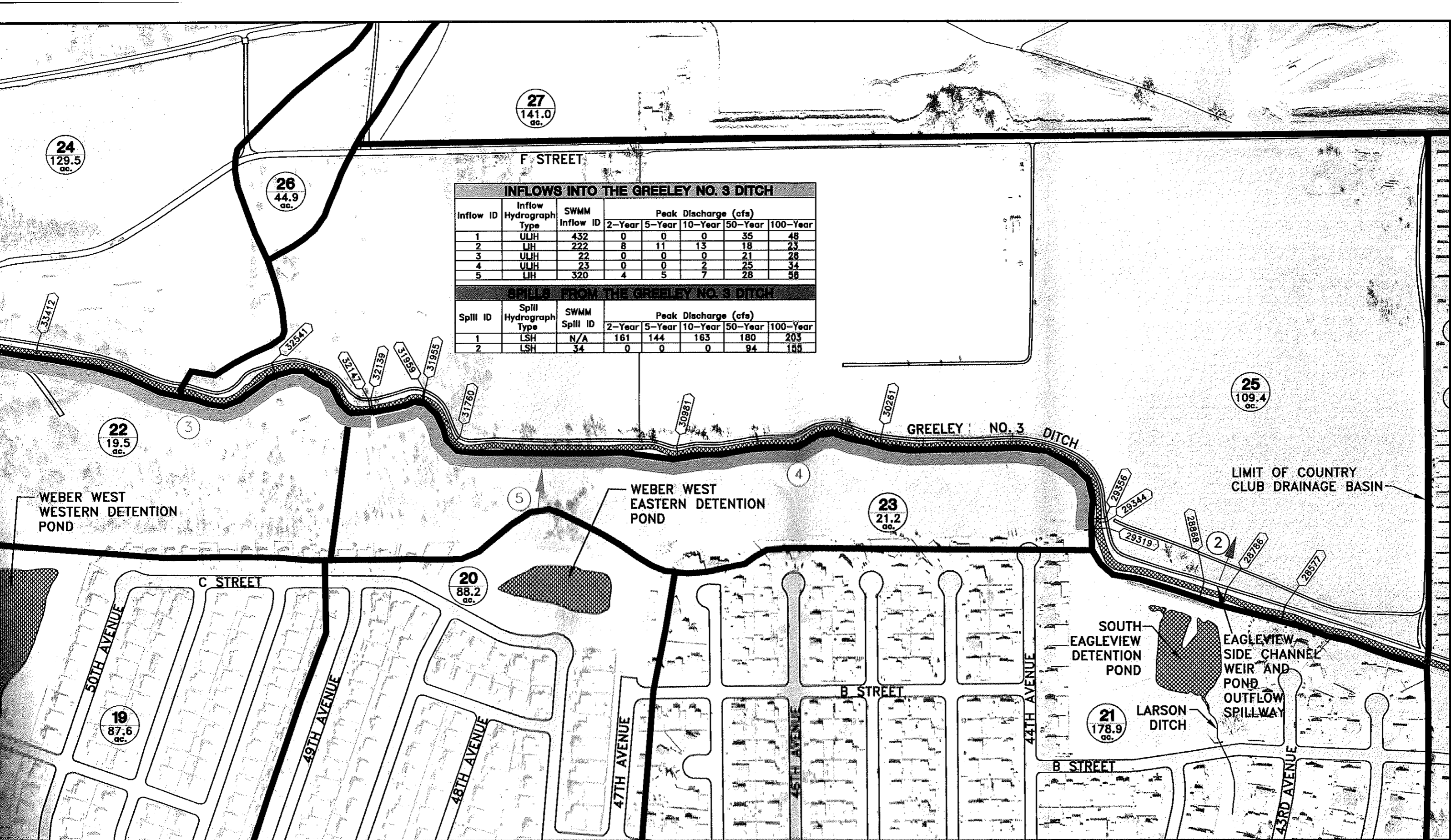
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-  SUBBASIN BOUNDARY
-  HEC-RAS CROSS SECTION
-  UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
-  LATERAL INFLOW HYDROGRAPH (LIH) ID
-  UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
-  LATERAL SPILL HYDROGRAPH (LSH) ID



P:\000000\ACAD\GREELEY NO.3 DITCH\ONLY NO.3 EXL.DWG 1/12/2008 14:00 MRC



**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**



INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	432	0	0	0	35	48
2	LH	222	8	11	13	18	23
3	ULIH	22	0	0	0	21	28
4	ULIH	23	0	0	2	25	34
5	LH	320	4	5	7	28	38

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	LSH	N/A	161	144	163	180	203
2	LSH	34	0	0	0	94	155

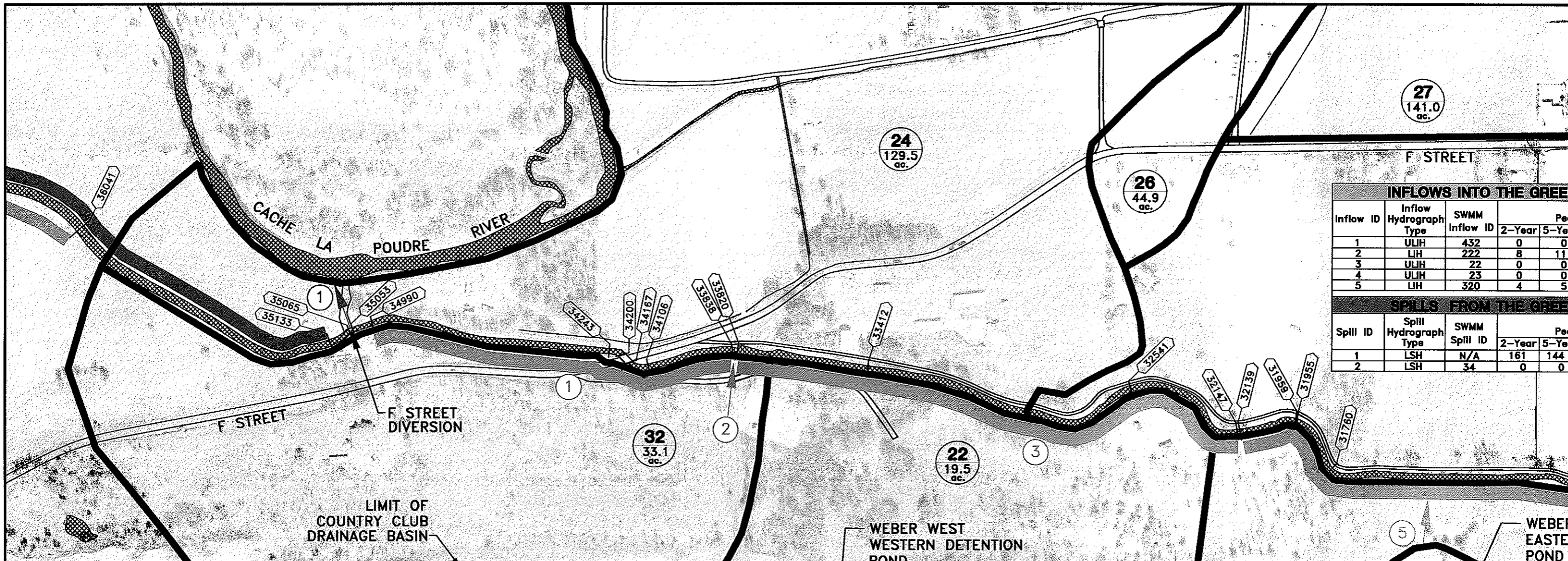
**COUNTRY CLUB BASIN-EXISTING CONDITION
 INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY FLOW ANALYSES),
 AND CROSS SECTION IDENTIFICATION MAP**



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**FIGURE
3.6**

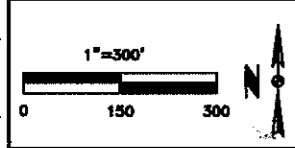
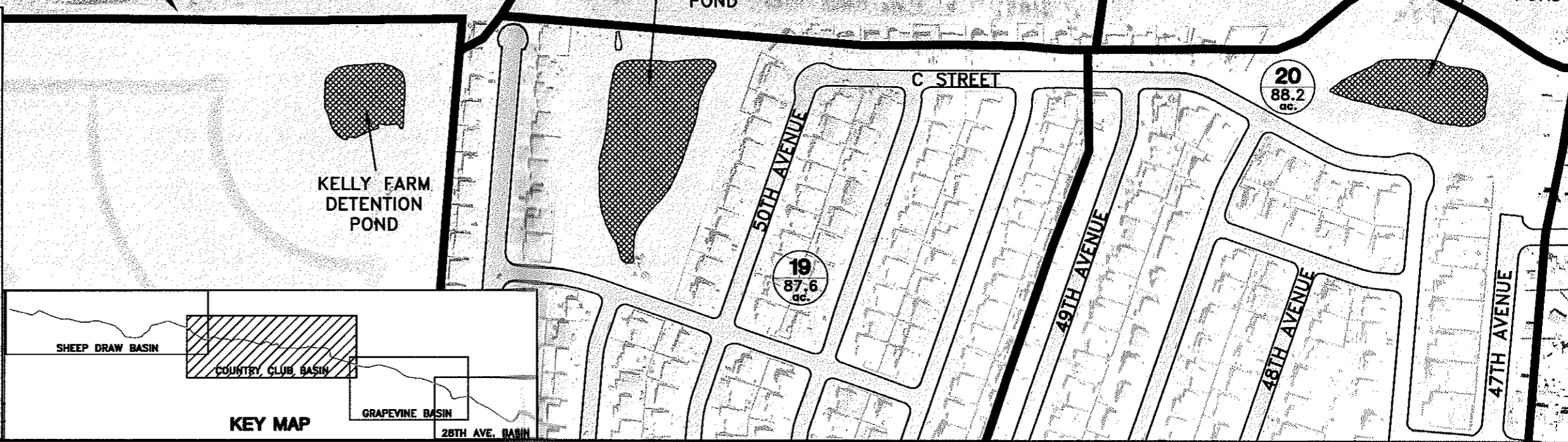


INFLOWS INTO THE GREEN				
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	2-Year	5-Year
1	ULIH	432	0	0
2	LIH	222	8	11
3	ULIH	22	0	0
4	ULIH	23	0	0
5	LIH	320	4	5

SPILLS FROM THE GREEN				
Spill ID	Spill Hydrograph Type	SWMM Spill ID	2-Year	5-Year
1	LSH	N/A	161	144
2	LSH	34	0	0

LEGEND

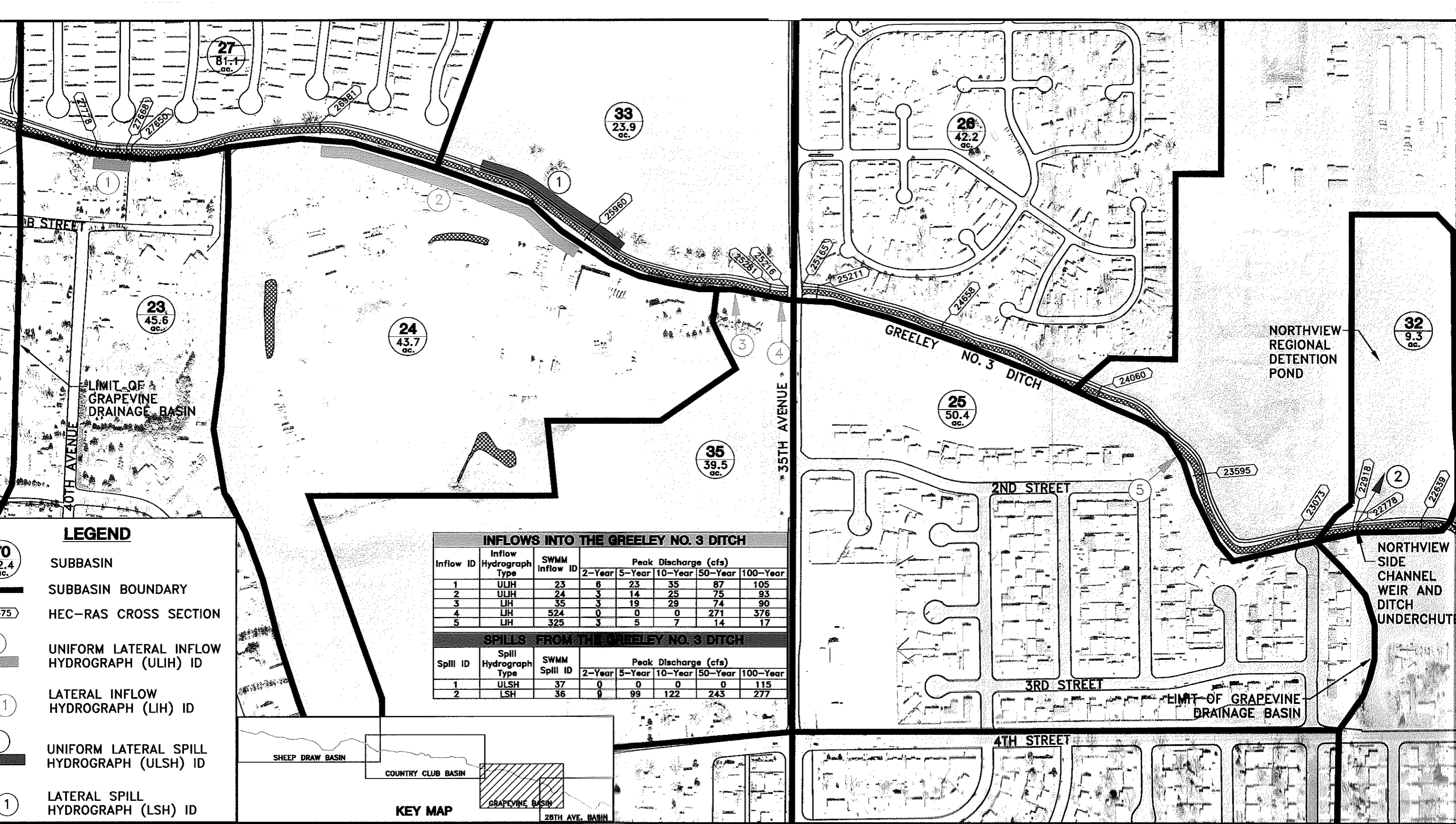
- SUBBASIN
- SUBBASIN BOUNDARY
- HEC-RAS CROSS SECTION
- UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
- LATERAL INFLOW HYDROGRAPH (LIH) ID
- UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
- LATERAL SPILL HYDROGRAPH (LSH) ID



**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**

**COUNTRY CLUB BASIN
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION
AND CROSS SECTION**

P:\C000005\ACAD\GREELEY No.3 DITCH\GRLY No3 EX.DWG 1/12/2006 14:00 MRC

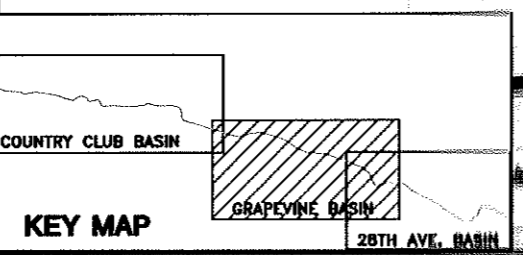


LEGEND

- 2.4 ac. SUBBASIN
- SUBBASIN BOUNDARY
- HEC-RAS CROSS SECTION
- UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
- LATERAL INFLOW HYDROGRAPH (LIH) ID
- UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
- LATERAL SPILL HYDROGRAPH (LSH) ID

INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	23	6	23	35	87	105
2	ULIH	24	3	14	25	75	93
3	LIH	35	3	19	29	74	90
4	LH	524	0	0	0	271	376
5	LH	325	3	5	7	14	17

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULSH	37	0	0	0	0	115
2	LSH	36	0	99	122	243	277



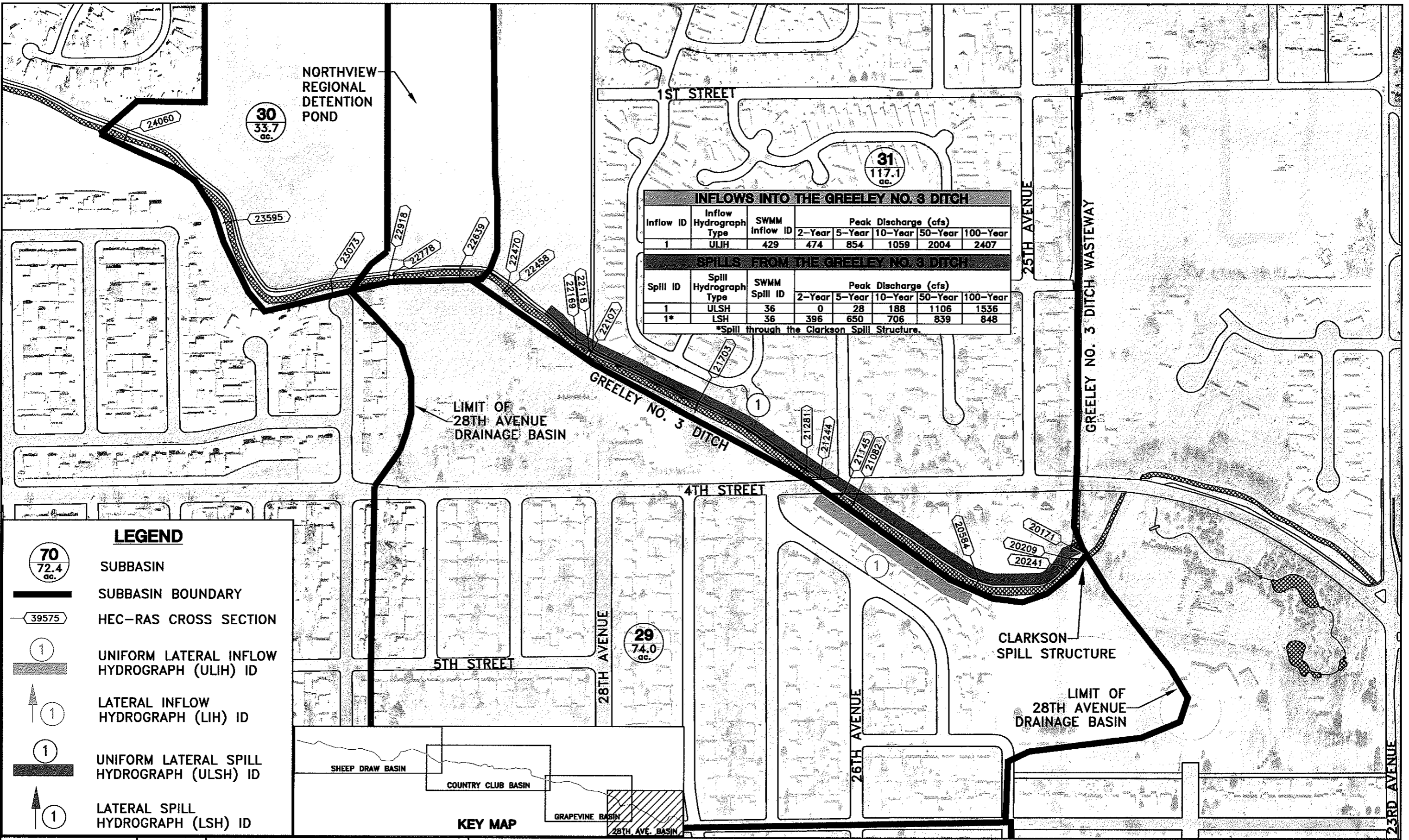
**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**

**GRAPEVINE BASIN-EXISTING CONDITON
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY
FLOW ANALYSES), AND CROSS SECTION IDENTIFICATION MAP**

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**FIGURE
37**

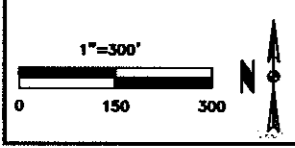
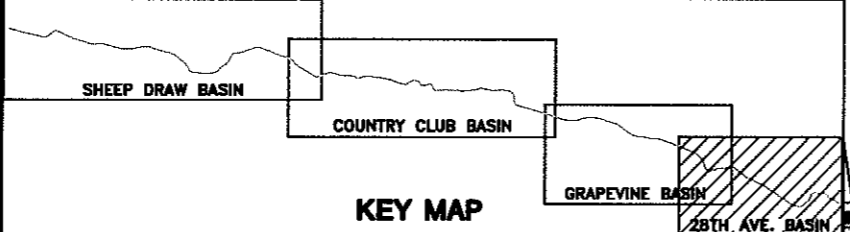


INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	429	474	854	1059	2004	2407

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULSH	36	0	28	188	1106	1536
1*	LSH	36	396	650	706	839	848

*Spill through the Clarkson Spill Structure.

- LEGEND**
- SUBBASIN
 - SUBBASIN BOUNDARY
 - HEC-RAS CROSS SECTION
 - UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
 - LATERAL INFLOW HYDROGRAPH (LIH) ID
 - UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
 - LATERAL SPILL HYDROGRAPH (LSH) ID



**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**

**28TH AVENUE BASIN-EXISTING CONDITON
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY
FLOW ANALYSES), AND CROSS SECTION IDENTIFICATION MAP**



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Reviewed:	
NOTED ONLY M3 EXLOW	

**FIGURE
3.8**

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floodplain, which encompasses this area. Ditch spills are confined to the two spill structures (F Street and Eagleview) within the Country Club Basin; according to the unsteady flow analyses, the Eagleview Side Channel Weir does not operate until the 50-year event. Ditch spills within the Grapevine Basin include uncontrolled left bank overtopping immediately west of 35th Avenue (approximately 115 cfs) from inflows due to the 100-year event, and controlled spills through the Northview Side Channel Weir for all return periods. Uncontrolled left bank overtopping appears to be prevalent through the 28th Avenue Basin from approximately 28th Avenue east to the Greeley No. 3 Ditch Wasteway (immediately east of 25th Avenue) from flows due to a 5-year storm and higher. Ditch spills in this area are significantly more critical due to extensive development both south and north of the ditch. The Clarkson Spill Structure diverts a majority of the flow from the Greeley No. 3 Ditch, especially during higher return periods (e.g., 50-year return period and greater). The results of the hydraulic unsteady flow modeling for the Existing Condition for all four basins and all five return periods are provided electronically on the CD included in Appendix B of this report.

3.2.2 Hydraulic Modeling Results from the Proposed Condition Unsteady Flow Model

The construction of proposed improvements in the upper portions of the five major drainage basins generally decreases the flows contributing to the ditch, which in turn improves the overall effectiveness of the ditch in controlling bank overtopping. Figures 3.9 through 3.12 depict the Proposed Condition scenario for the four major basins.

Proposed Condition spills generally remain the same as Existing Condition spills for a 10-year return period and larger within the limits of the Sheep Draw Basin. Ditch spills associated with the 2-year and 5-year return periods are higher due to elevated inflows into the ditch along the Sheep Draw drainageway. In the Country Club Basin, ditch spills will be slightly higher at the F Street Spill Structure (mainly due to generally higher inflows along Sheep Draw), but decrease at the Eagleview Side Channel Weir. The uncontrolled spill for the 100-year event upstream of 35th Avenue within the Grapevine Basin limits will be eliminated, with the spill at the Northview Side Channel Weir also significantly reduced. It should be noted that the future elimination of the uncontrolled spill and the reduction of the controlled spills at Eagleview and Northview can be attributed to the proposed removal of inflows into the ditch from Grapevine Subbasins 24 and 35 as well as flow along 35th Avenue (total of over 500 cfs), due to the Best-Way Park Regional Detention Pond. Uncontrolled left bank overtopping will persist within the 28th Avenue Basin, as Proposed Condition inflows will generally not be significantly reduced compared to the Existing Condition. The results from the hydraulic unsteady flow modeling for the Proposed Condition for all four basins and all five return periods are provided electronically in Appendix B.

INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	667	11	18	18	18	18
2	LH	*	14	30	40	141	198
3	ULIH	172	437	836	1129	3224	4523
4	ULIH	470	8	16	22	82	109
5	ULIH	474	5	9	12	41	60

*Inflow is a combination of SWMM element No.'s 362, 367, and 466.

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULSH	N/A	324	582	777	2166	3061
2	ULSH	N/A	67	220	329	1032	1450



**SHEEP DRAW BASIN-PROPOSED CONDITION
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HRO HAS UNSTEADY
FLOW ANALYSES), AND CROSS SECTION IDENTIFICATION MAP**



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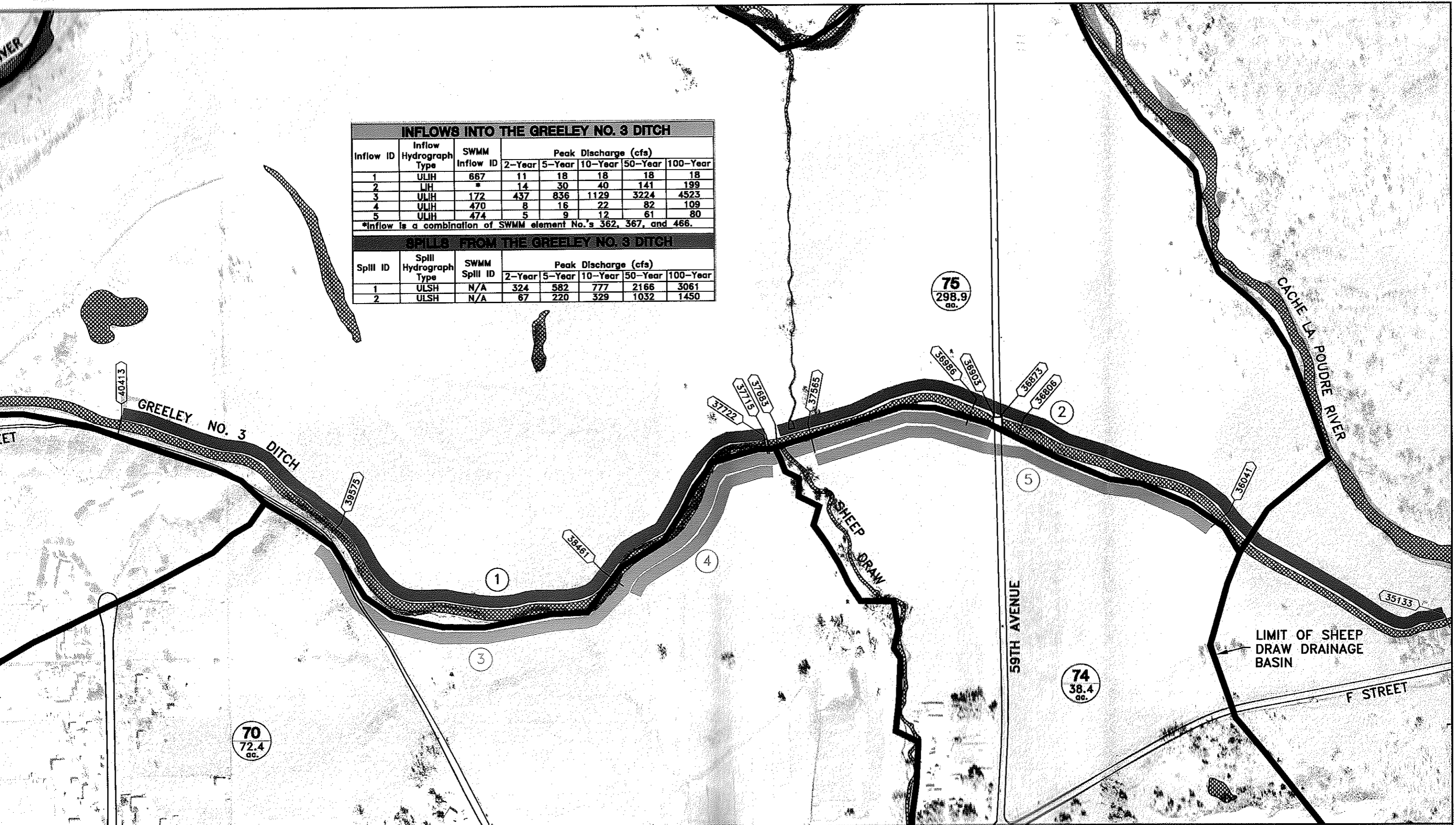
Project No.	COC0605
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Design:	BLV
Drawn:	MRC
Revisions:	
ADDFILE:	GREY No3 PROP.DWG

**FIGURE
3.9**

INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	667	11	18	18	18	18
2	LIH	*	14	30	40	141	199
3	ULIH	172	437	836	1129	3224	4523
4	ULIH	470	8	16	22	82	109
5	ULIH	474	5	9	12	61	80

*Inflow is a combination of SWMM element No.'s 362, 367, and 466.

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULSH	N/A	324	582	777	2166	3061
2	ULSH	N/A	67	220	329	1032	1450



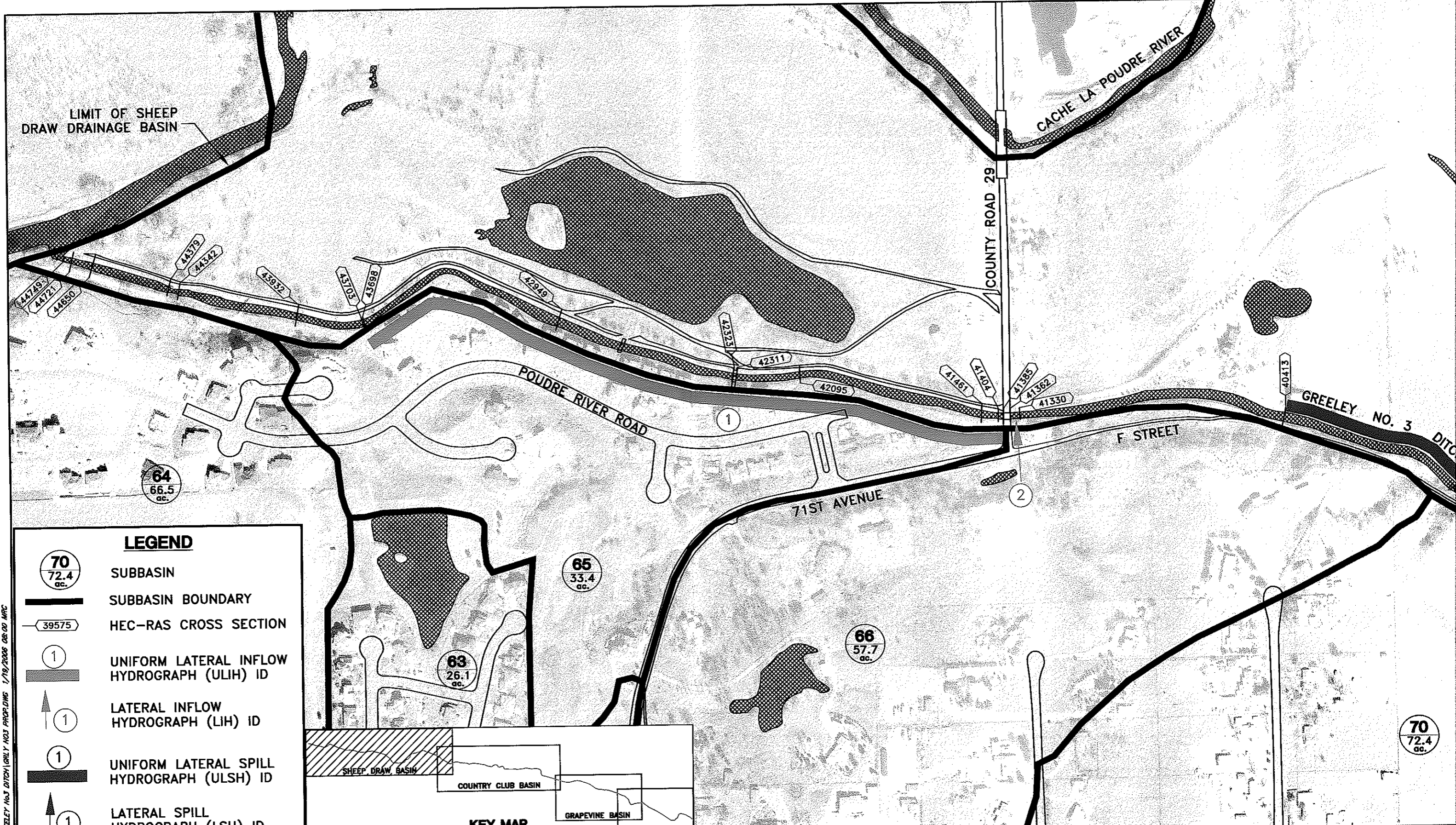
**SHEEP DRAW BASIN-PROPOSED CONDITION
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY
FLOW ANALYSES), AND CROSS SECTION IDENTIFICATION MAP**










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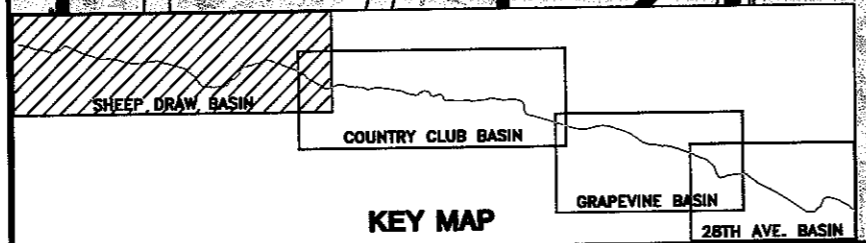
Project No.	COC0005
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Design:	BLV
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Revised:	
ACDFILE ONLY No.3 PROP.DWG	

**FIGURE
3.9**

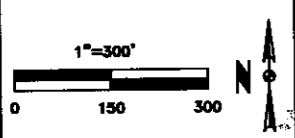


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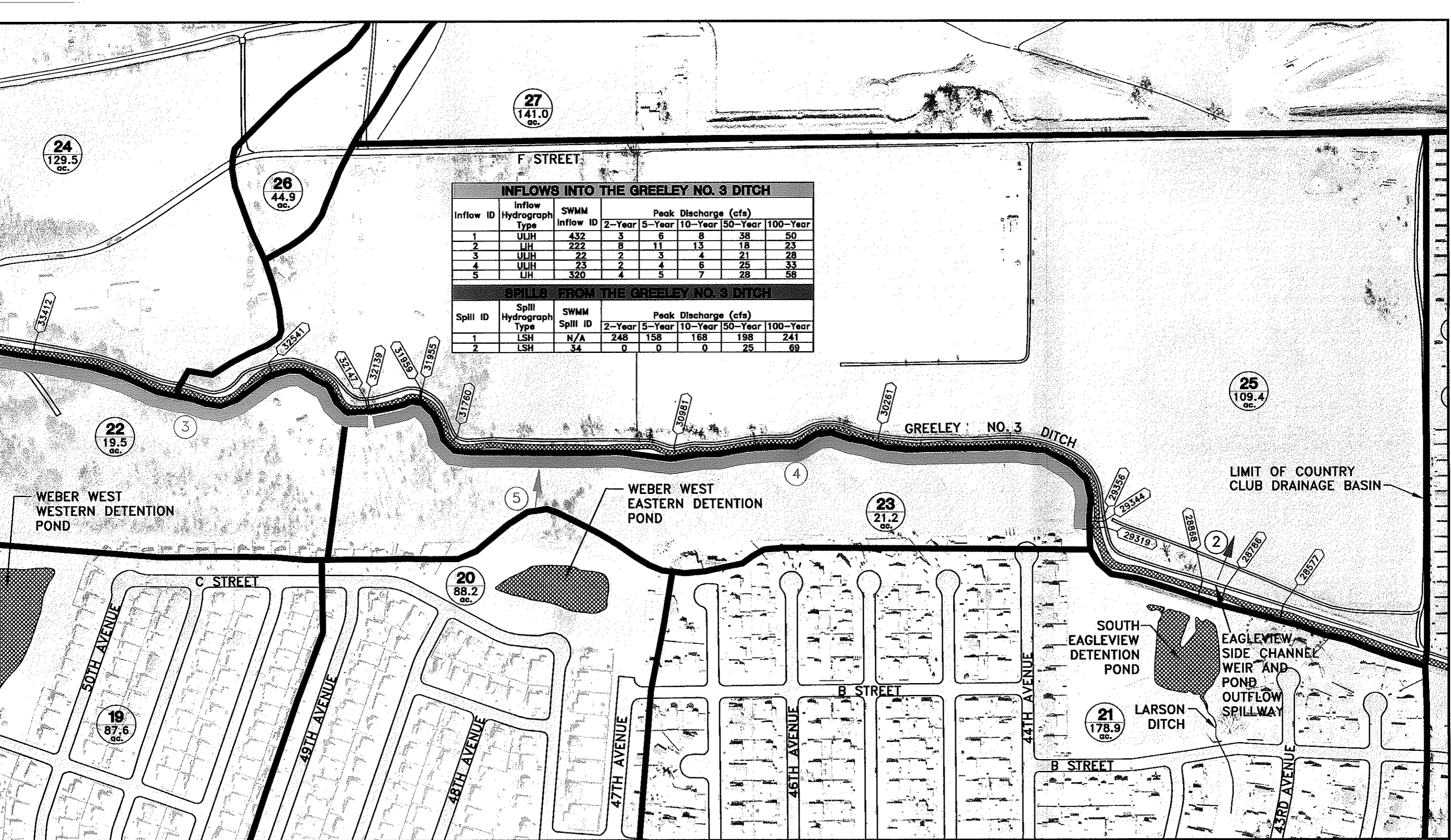
-  SUBBASIN
-  SUBBASIN BOUNDARY
-  HEC-RAS CROSS SECTION
-  UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
-  LATERAL INFLOW HYDROGRAPH (LIH) ID
-  UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
-  LATERAL SPILL HYDROGRAPH (LSH) ID



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**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**



INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULH	432	3	6	8	38	50
2	LH	222	8	11	13	18	23
3	ULH	22	2	3	4	21	28
4	ULH	23	2	4	6	25	33
5	LH	320	4	5	7	28	58

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	LSH	N/A	248	158	168	198	241
2	LSH	34	0	0	0	25	69

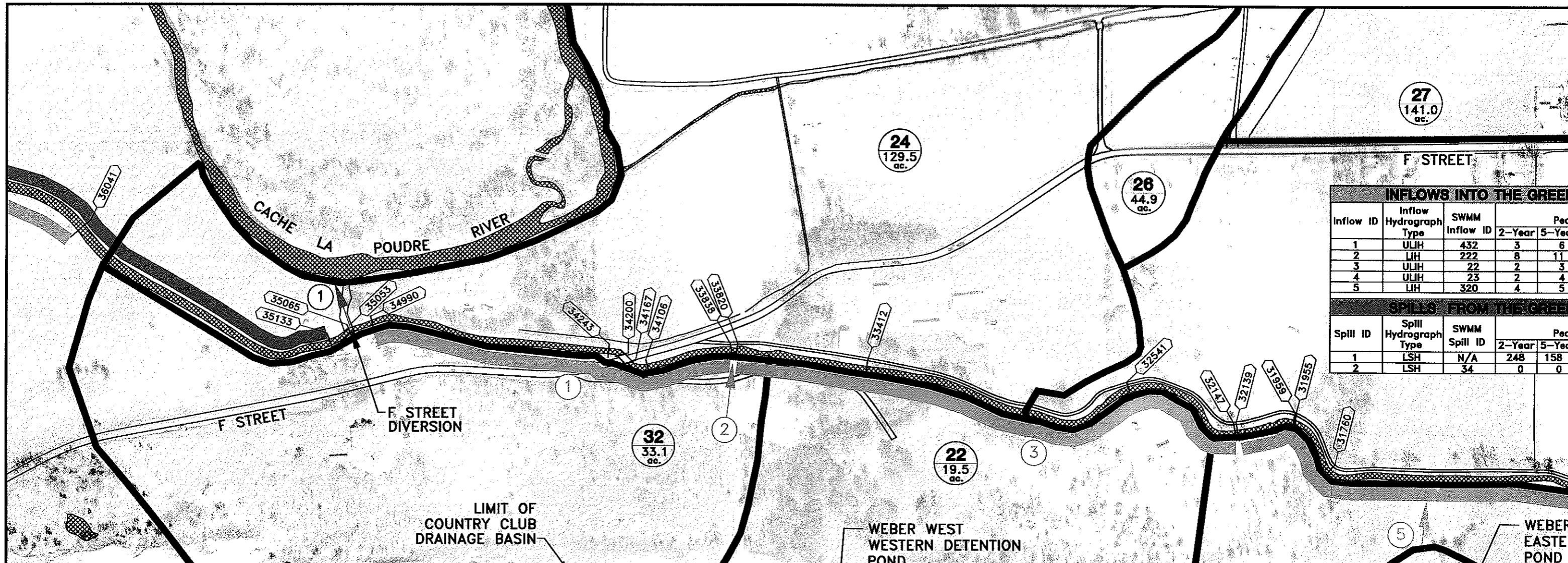
**COUNTRY CLUB BASIN-PROPOSED CONDITION
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 AND CROSS SECTION IDENTIFICATION MAP**



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Revisions:	
ACQFILE:	GRLEY No3 PROP.DWG

**FIGURE
 3.10**

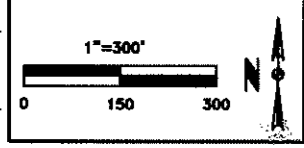
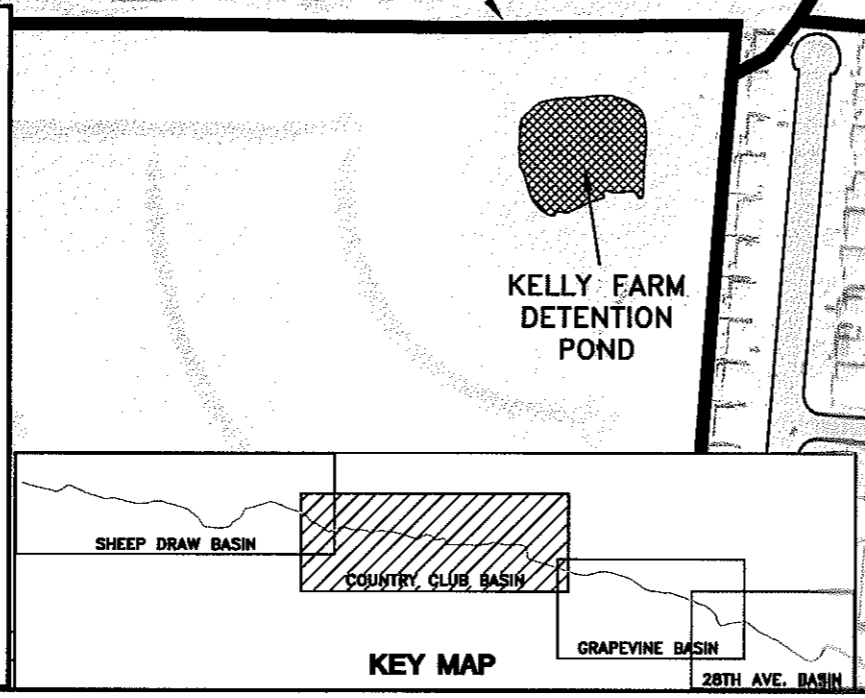


INFLOWS INTO THE GREEN				
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	2-Year	5-Year
1	ULIH	432	3	6
2	LIH	222	8	11
3	ULIH	22	2	3
4	ULIH	23	2	4
5	LIH	320	4	5

SPILLS FROM THE GREEN				
Spill ID	Spill Hydrograph Type	SWMM Spill ID	2-Year	5-Year
1	LSH	N/A	248	158
2	LSH	34	0	0

LEGEND

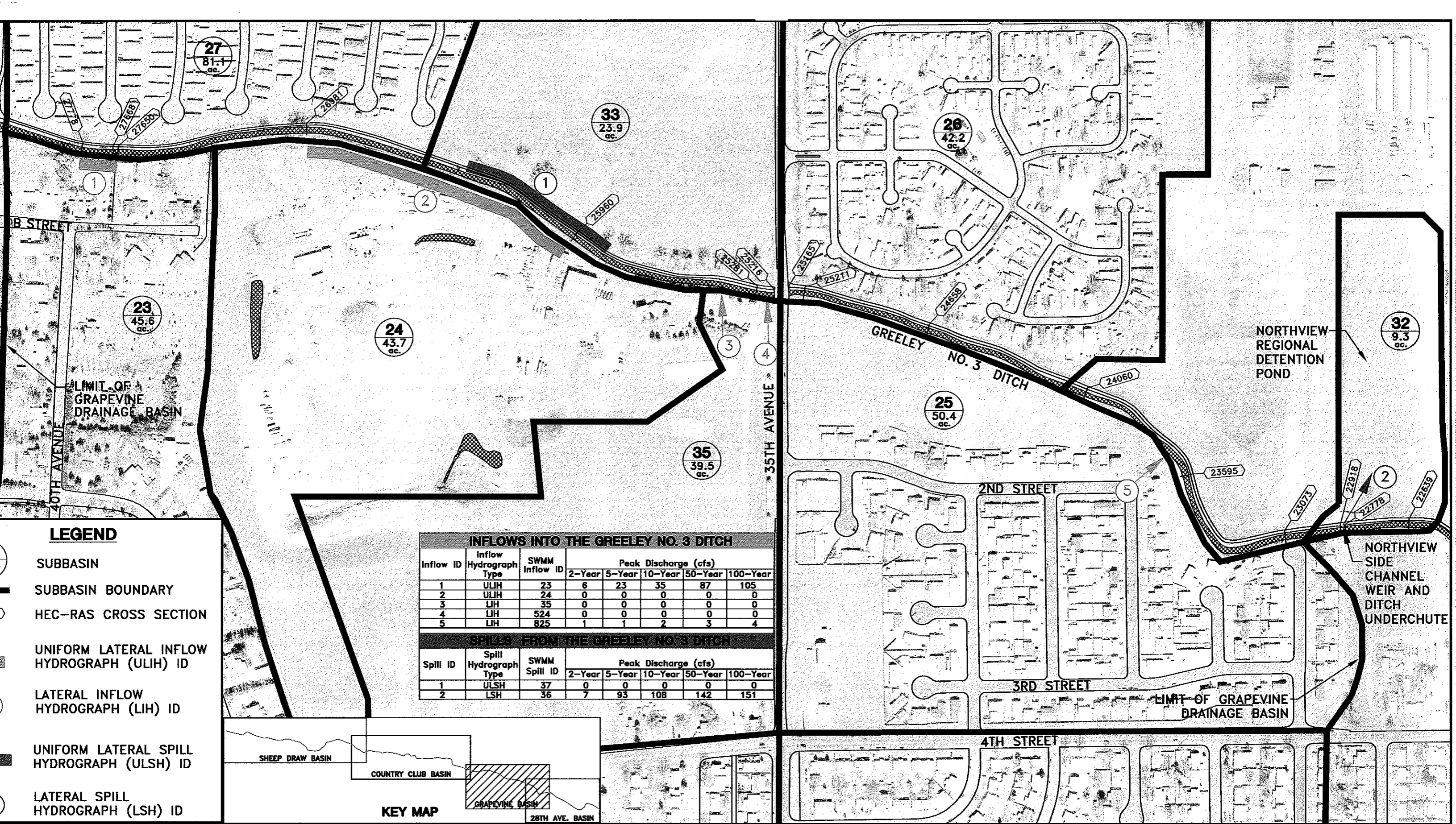
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- SUBBASIN BOUNDARY
- HEC-RAS CROSS SECTION
- UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
- LATERAL INFLOW HYDROGRAPH (LIH) ID
- UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
- LATERAL SPILL HYDROGRAPH (LSH) ID



**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**

**COUNTRY CLUB BASIN
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION
AND CROSS SECTION**

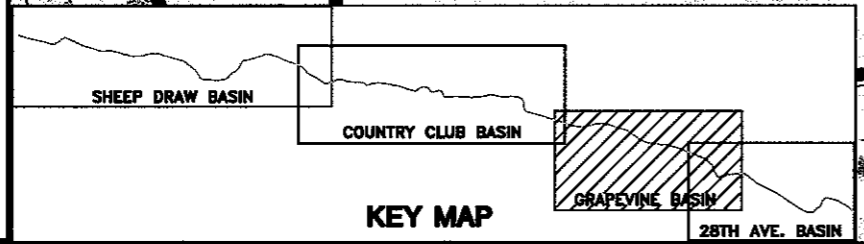
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- LEGEND**
- SUBBASIN
 - SUBBASIN BOUNDARY
 - HEC-RAS CROSS SECTION
 - UNIFORM LATERAL INFLOW HYDROGRAPH (ULIH) ID
 - LATERAL INFLOW HYDROGRAPH (LIH) ID
 - UNIFORM LATERAL SPILL HYDROGRAPH (ULSH) ID
 - LATERAL SPILL HYDROGRAPH (LSH) ID

INFLOWS INTO THE GREELEY NO. 3 DITCH							
Inflow ID	Inflow Hydrograph Type	SWMM Inflow ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULIH	23	6	23	35	87	105
2	ULIH	24	0	0	0	0	0
3	LIH	35	0	0	0	0	0
4	LIH	524	0	0	0	0	0
5	LIH	825	1	1	2	3	4

SPILLS FROM THE GREELEY NO. 3 DITCH							
Spill ID	Spill Hydrograph Type	SWMM Spill ID	Peak Discharge (cfs)				
			2-Year	5-Year	10-Year	50-Year	100-Year
1	ULSH	37	0	0	0	0	0
2	LSH	36	7	93	108	142	151



**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**

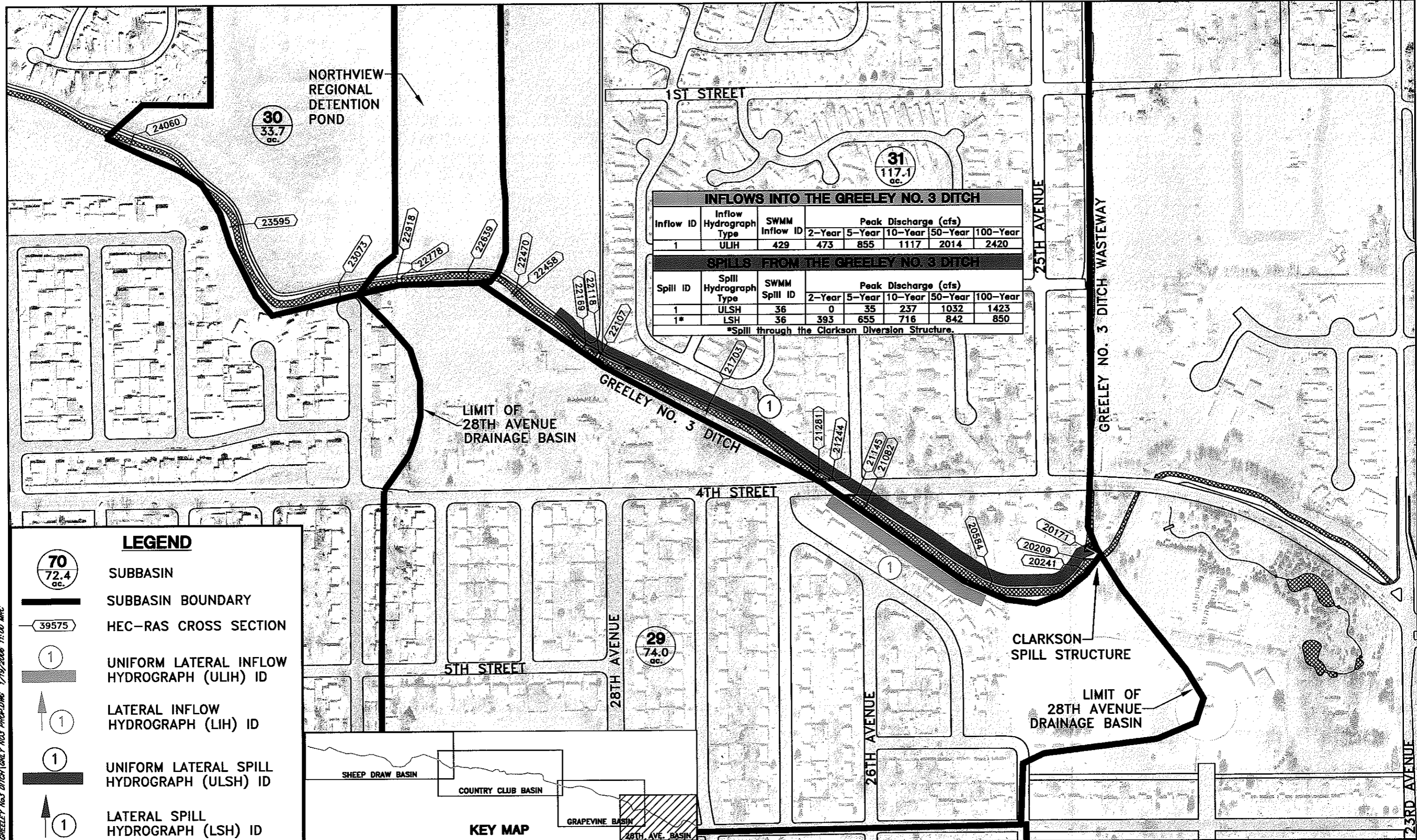
**GRAPEVINE BASIN-PROPOSED CONDITON
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY
FLOW ANALYSES), AND CROSS SECTION IDENTIFICATION MAP**



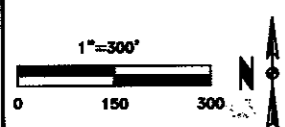
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ACRFILE:	GREY No3 PROP.DWG

**FIGURE
3.11**



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**CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN
GREELEY NO. 3 DITCH**

**28TH AVENUE BASIN-PROPOSED CONDITON
INFLOW HYDROGRAPH, LATERAL SPILL LOCATION (HEC-RAS UNSTEADY
FLOW ANALYSES), AND CROSS SECTION IDENTIFICATION MAP**



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Drawn:	MFC
Revisions:	
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**FIGURE
3.12**

3.3 Summary

The Greeley No. 3 Ditch generally acts as an effective drainage boundary for all return periods under the Existing Condition through the limits of the Country Club and Grapevine Basins, with the exception of an uncontrolled spill for the 100-year event west of 35th Avenue in the Grapevine Basin. The ditch will become an even more effective drainage boundary during the Proposed Condition within the limits of these same two basins, with the elimination of the spill west of 35th Avenue during the 100-year event, along with the reduction of controlled spills at the Eagleview and Northview spill structures. Uncontrolled, left bank overtopping occurs during the Existing Condition generally for most return periods within the limits of the Sheep Draw and 28th Avenue Basins. This will continue to persist under the Proposed Condition in both basins, specifically in the 28th Avenue Basin due to the lack of space in that basin and along the ditch to implement drainage and flood control improvements.

APPENDIX A

*DESIGN/REHABILITATION PLANS
FOR SPILL STRUCTURES*

APPENDIX A.1

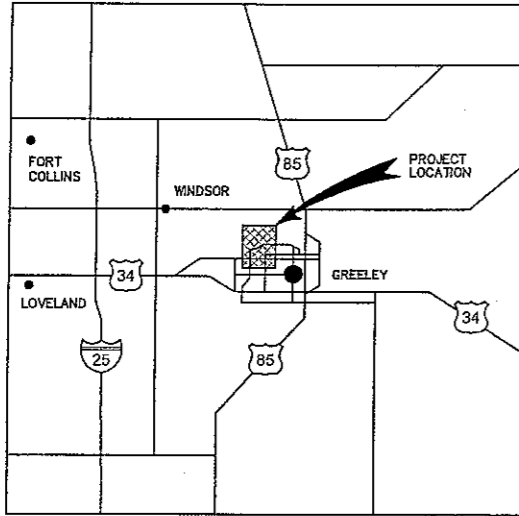
F STREET SPILL STRUCTURE



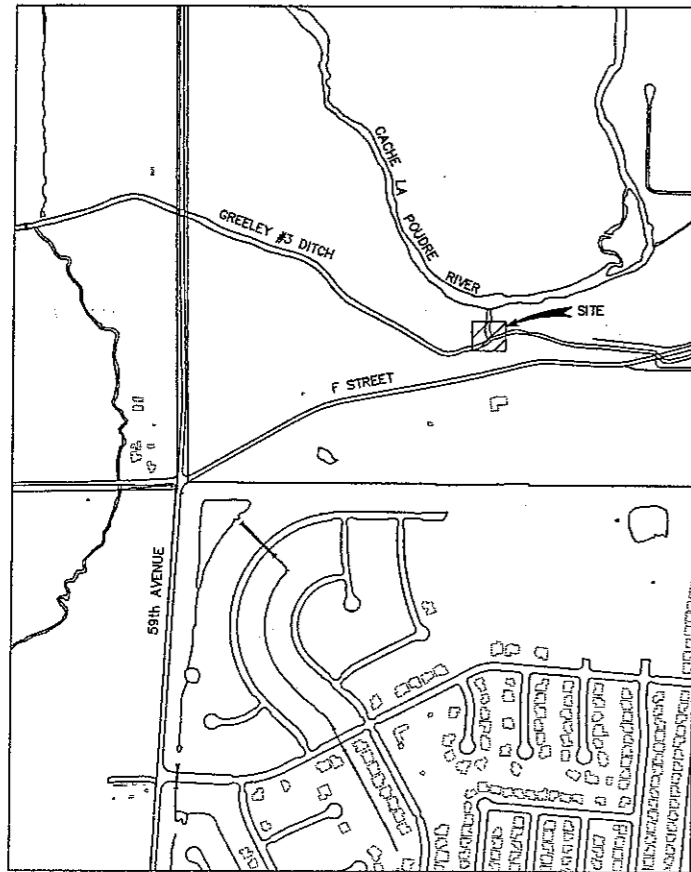
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FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES.

FINAL PLANS
FOR
GREELEY NO. 3 "F" STREET DIVERSION
GREELEY, COLORADO

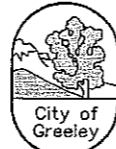
27 SEPTEMBER 2002



VICINITY MAP
N.T.S.



PROJECT LOCATION MAP
N.T.S.



PREPARED FOR:
THE CITY OF GREELEY
1001 9th AVENUE
GREELEY, COLORADO 80631
(970) 336-4121
CONTACT: BERT LEAUTAUD, P.E.



PREPARED BY:
Drexel, Barrell & Co.
Engineers - Surveyors
4840 PEARL EAST CIRCLE, SUITE 114
BOULDER, COLORADO 80301
(303) 442-4338
CONTACT:
CLIFF BROCKMAN, P.E.

ESTIMATED QUANTITIES

ITEM	UNIT	QTY
DEMO EXISTING STRUCTURE	LS	1
STRUCTURAL FILL	TON	226
STRUCTURAL CONCRETE	CY	70
RIP-RAP (TYPE 'M')	CY	40
TYPE II-BEDDING	CY	15
CATWALKS	LF	28
STOPLOG ASSEMBLY	LF	28
FURNISH & INSTALL OVERSHOT GATE	LS	1
ELECTRICAL POWER w/METER	LS	1
BACKFILL AND COMPACTION (NON-STRUCTURAL)	TON	101
AQUATAPOXY COATING	SF	260

SHEET INDEX

SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET
2	SITE PLAN/DEMOLITION PLAN
3	PROPOSED DIVERSION PLAN AND SECTIONS
4	PROPOSED DIVERSION SECTIONS & STRUCTURAL DETAILS
5	PROPOSED DIVERSION SECTIONS & STRUCTURAL DETAILS

ALL WORK SHALL BE CONSTRUCTED TO THE CITY OF GREELEY STANDARD SPECIFICATIONS.

APPROVED _____
CITY OF GREELEY DIRECTOR OF PUBLIC WORKS DATE _____

APPROVED _____
CITY OF GREELEY DIRECTOR OF WATER & SEWER DATE _____

APPROVE: _____
THE GREELEY IRRIGATION COMPANY
REVIEW & APPROVE FOR CONSTRUCTION DATE _____

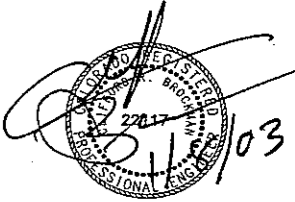
BENCHMARK

LOCATED IN A RANGE BOX AT THE INTERSECTION OF "F" STREET, AND
59th AVENUE. THIS MONUMENT IS THE NORTHEAST SECTION CORNER
TSNR66WS04.

STRUCTURAL NOTES

- GENERAL REQUIREMENTS:
 - ALL CONSTRUCTION SHALL COMPLY WITH THE 1997 UNIFORM BUILDING CODE, OR LATER EDITION ADOPTED BY THE GOVERNMENTAL JURISDICTION, AND ALL OTHER PERTINENT GOVERNMENTAL CODES, ORDINANCES AND REGULATIONS.
- FOUNDATIONS:
 - DESIGN IS BASED ON A MAT SLAB FOUNDATION, PLACED ON 2 FEET OF COMPACTED STRUCTURAL FILL. MAXIMUM BEARING PRESSURE USED IN DESIGN = 1000 psf.
- CONCRETE:
 - ALL CONCRETE SHALL COMPLY WITH THE LATEST EDITIONS OF THE ACI SPECIFICATIONS FOR STRUCTURAL CONCRETE, ACI 301, AND ACI BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318.
 - CONCRETE MIX DESIGN, AIR ENTRAINMENT, PLACEMENT, TRANSPORT, ETC. SHALL BE PER ACI SPEC. MIX DESIGN IS SUBJECT TO THE ENGINEER'S APPROVAL.
 - ALL CONCRETE SHALL BE MADE USING TYPE I/II CEMENT, WITH STONE AGGREGATE, AND SHALL DEVELOPE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 psi.
 - MIX DESIGN SHALL HAVE THE FOLLOWING PROPERTIES:

MAXIMUM WATER/CEMENT RATIO:	0.51
SLUMP AT WALLS	4" TO 6"
SLUMP AT SLABS	3" TO 5"
AIR ENTRAINMENT	5% TO 7%
 - WATER ADDED TO CONCRETE AT THE SITE SHALL NOT EXCEED THE AMOUNT PERMITTED BY THE BATCH TICKET. CONCRETE AT PLACEMENT TIME WHICH DOES NOT MEET THE SPECIFIED SLUMP OR AIR CONTENT SHALL BE REFUSED BY THE CONTRACTOR.
 - ALL REINFORCING STEEL SHALL BE ASTM A615-GRADE 60, (INCLUDING #4 AND #5 BARS).
 - REINFORCING STEEL SHALL BE FABRICATED AND PLACED IN ACCORDANCE WITH THE ACI MANUAL OF STANDARD PRACTICE.
 - CONCRETE PROTECTION FOR REINFORCEMENT:
 - CONCRETE PLACED AGAINST EARTH: 3"
 - CONCRETE PLACED IN FORMS AND EXPOSED TO EARTH, WEATHER OR WATER (PRINCIPAL REINFORCEMENT): 2"
 - TIES AND STIRRUPS: 1 1/2"
 - NO SPLICES OR WELDING OF REINFORCEMENT SHALL BE MADE EXCEPT AS DETAILED OR AUTHORIZED BY THE ENGINEER. LAP SPLICES, WHERE PERMITTED, SHALL BE 24" MINIMUM UNLESS OTHERWISE NOTED.
 - DETAIL BARS IN ACCORDANCE WITH THE LATEST EDITIONS OF THE ACI DETAILING MANUAL AND ACI BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE. PROVIDE ALL ACCESSORIES NECESSARY TO SUPPORT REINFORCING AT THE POSITIONS SHOWN ON THE PLANS OR AS NOTED ABOVE.
 - SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL, IN REPRODUCIBLE FORM, OF ALL REINFORCING STEEL PRIOR TO FABRICATION.
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 - PROVIDE CORNER BARS AT ALL WALL INTERSECTIONS. SIZE AND SPACING OF BARS SHALL MATCH HORIZONTAL WALL REINFORCING. DO NOT PLACE CORNER BARS FROM "INSIDE FACE TO INSIDE FACE". PROVIDE THREE CORNER BARS TYPICAL FOR DOUBLE MAT WALLS AT 90 DEGREE CORNERS.
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- STEEL:
 - ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36, UNLESS OTHERWISE NOTED. STEEL PIPE SHALL CONFORM TO ASTM A53, GRADE B.
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NOT VALID WITHOUT ORIGINAL
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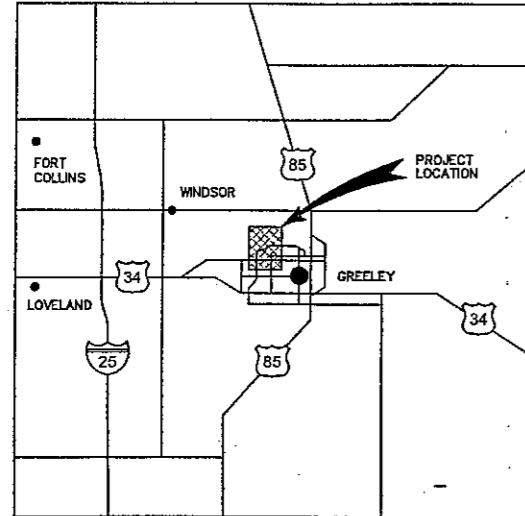
REVISION DESCRIPTIONS	DATE
CREST GATE AND STOP LOG ASSY.	07 JAN 2003



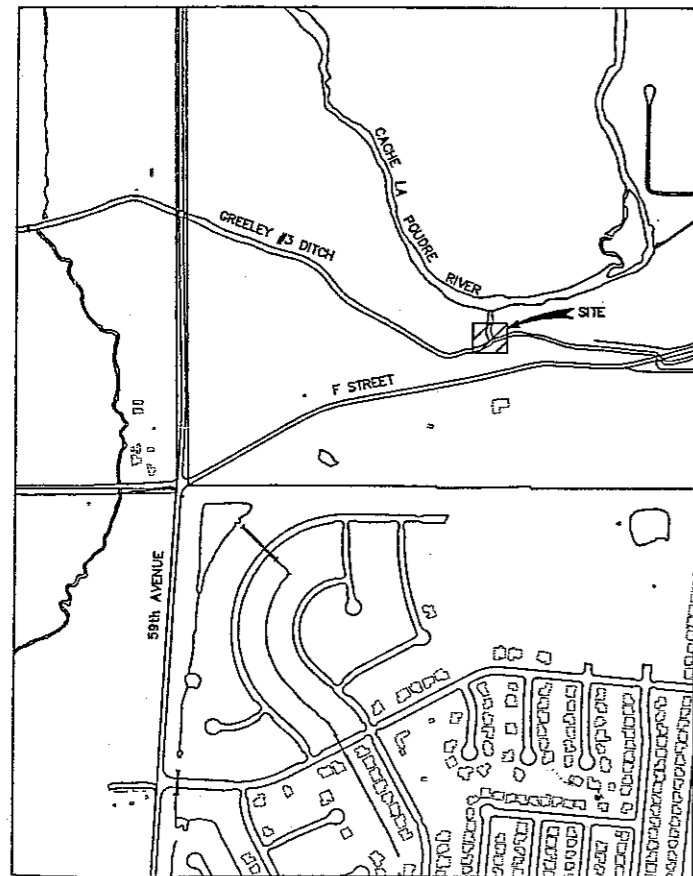
CALL UTILITY NOTIFICATION
CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR EXCAVATE
FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES.

FINAL PLANS FOR GREELEY NO. 3 "F" STREET DIVERSION GREELEY, COLORADO

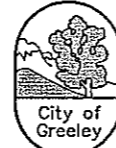
27 SEPTEMBER 2002



VICINITY MAP
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ELECTRICAL POWER/NEMA TYPE 4 ENCLOSURE (24"x30"x10") w/METER	LS	1
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APPROVED *William S. Taylor* 9/30/02
CITY OF GREELEY DIRECTOR OF PUBLIC WORKS DATE

APPROVED *[Signature]* 10/25/02
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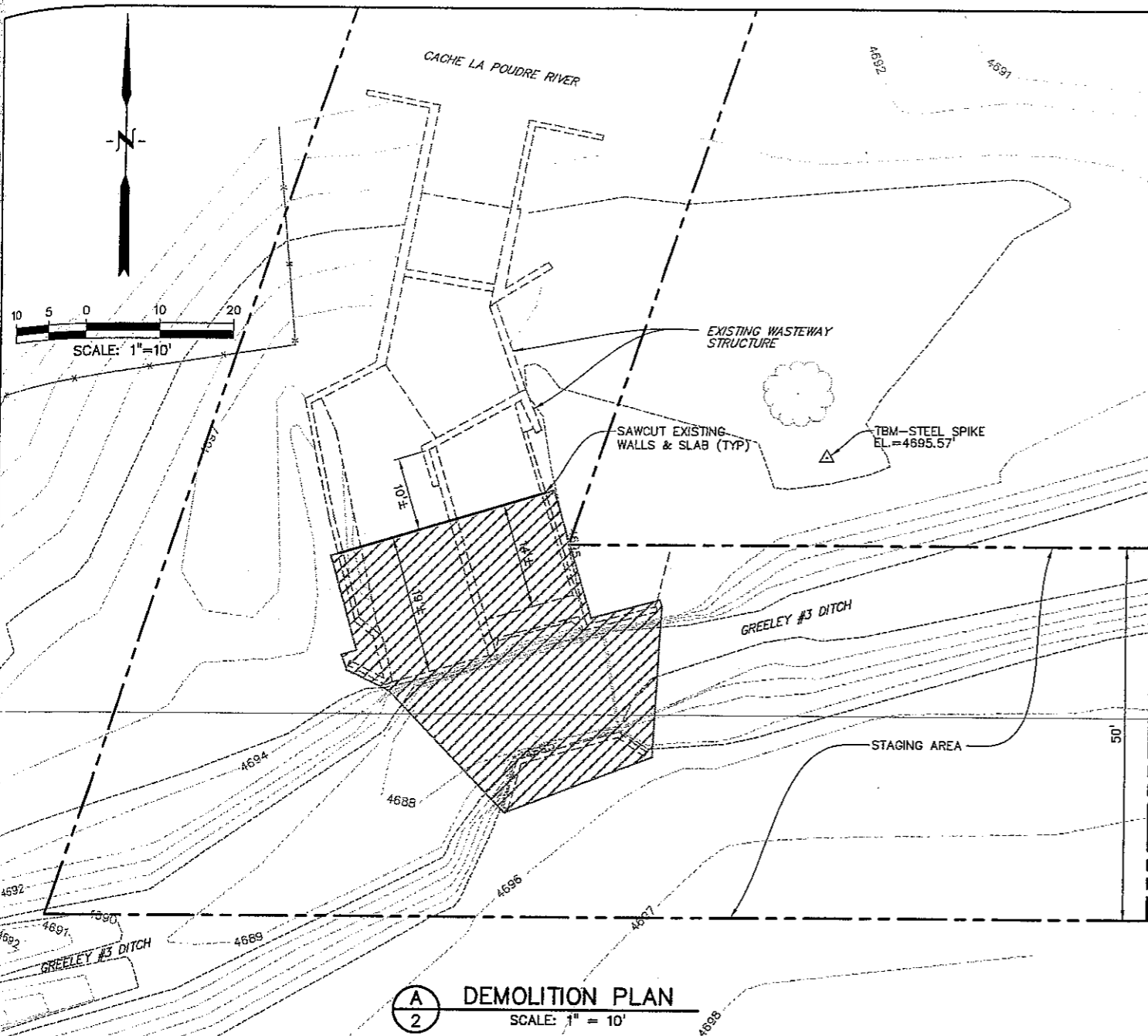
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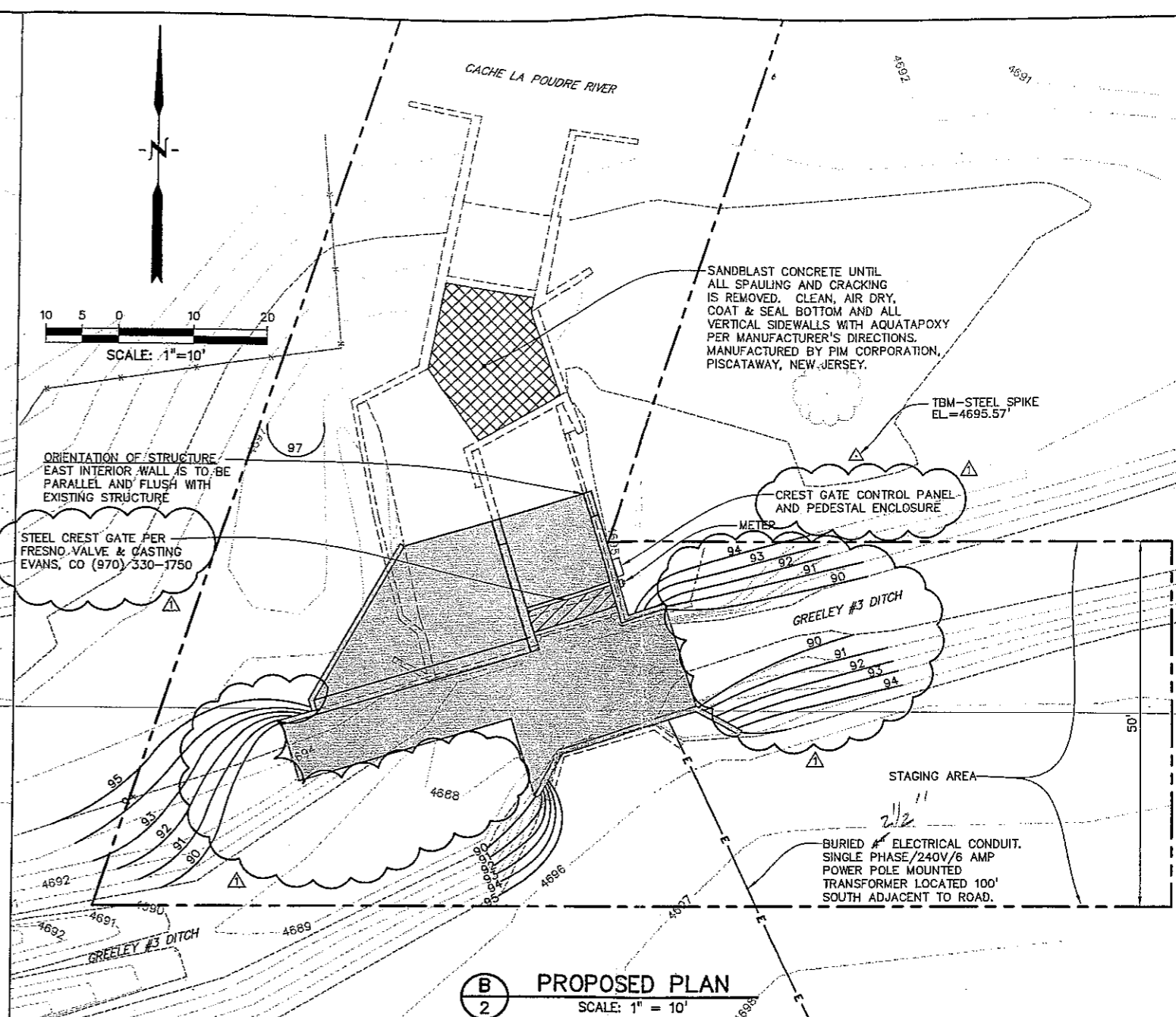


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REVISION DESCRIPTIONS	DATE



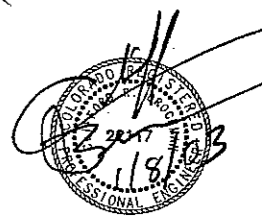
A
2
DEMOLITION PLAN
SCALE: 1" = 10'



B
2
PROPOSED PLAN
SCALE: 1" = 10'

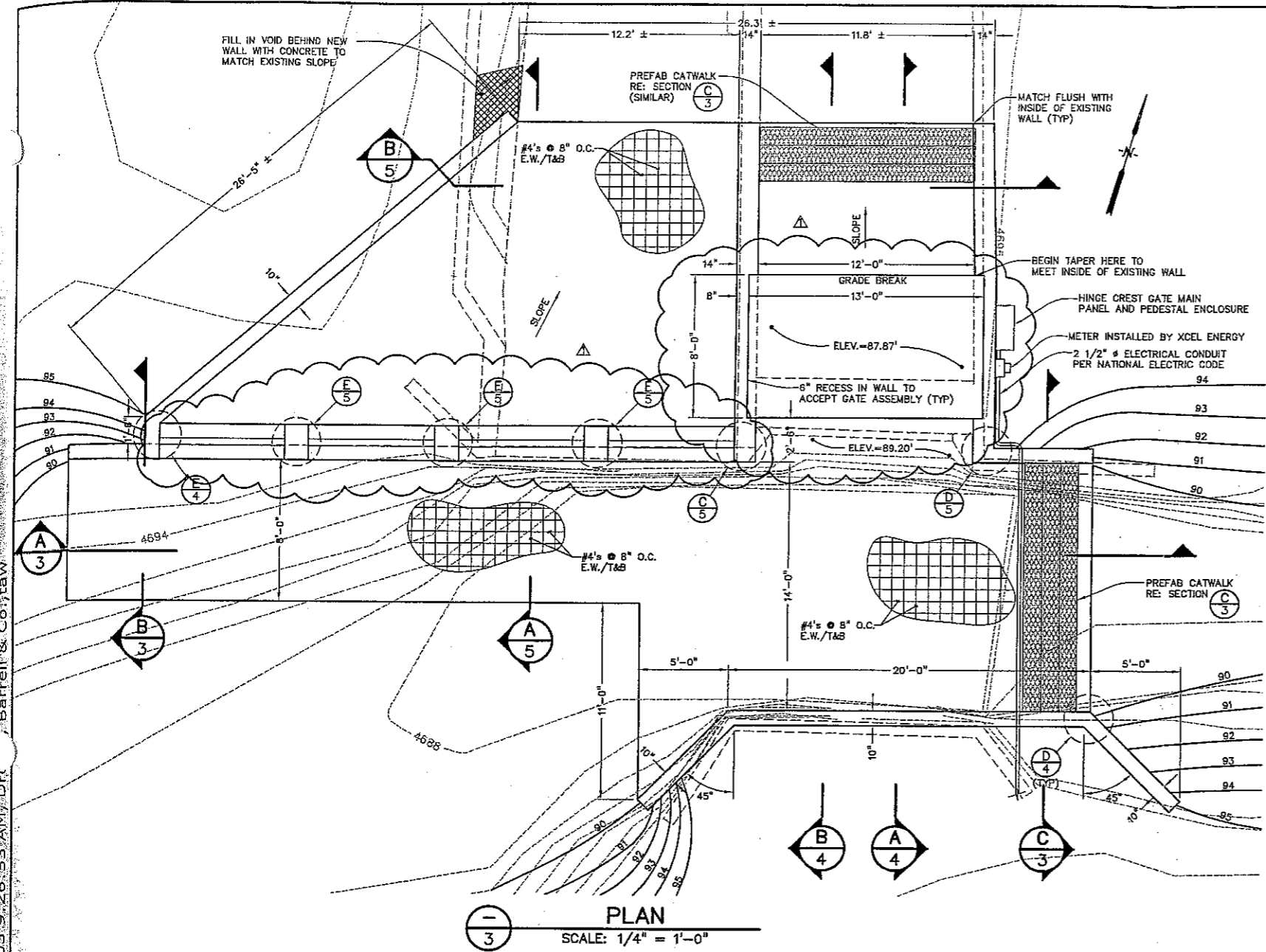
LEGEND

- AREA TO BE REMOVED
- EXISTING CONTOUR 4700
- PROPOSED CONTOUR 95
- AREA TO BE COATED WITH AQUATAPOXY

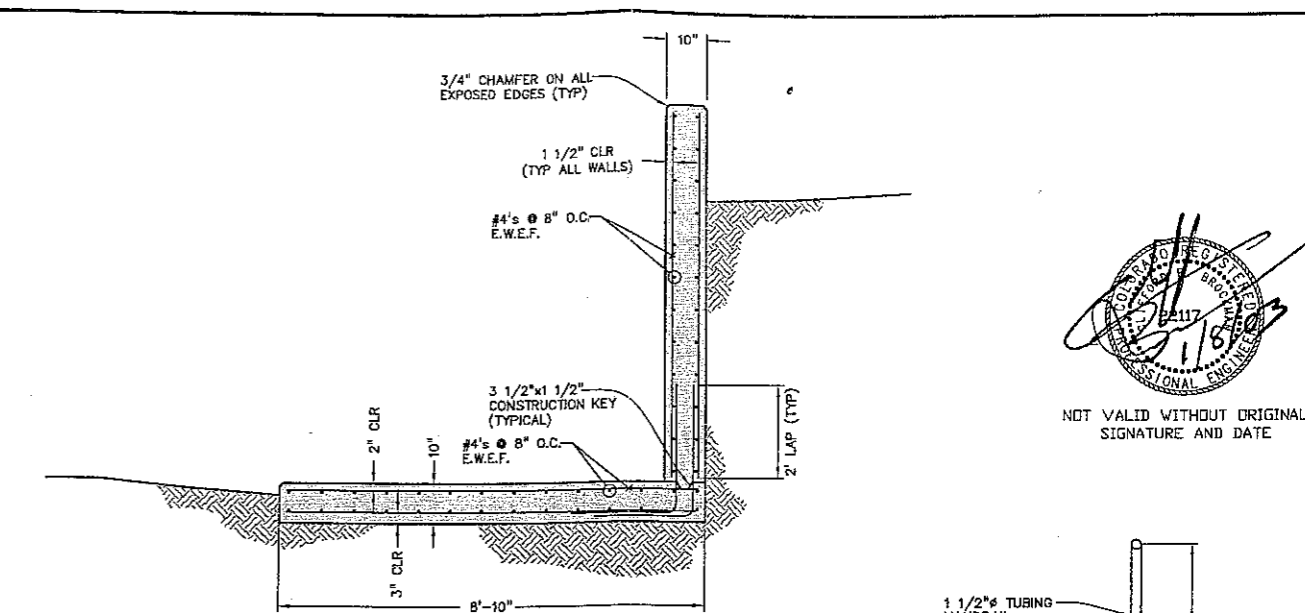


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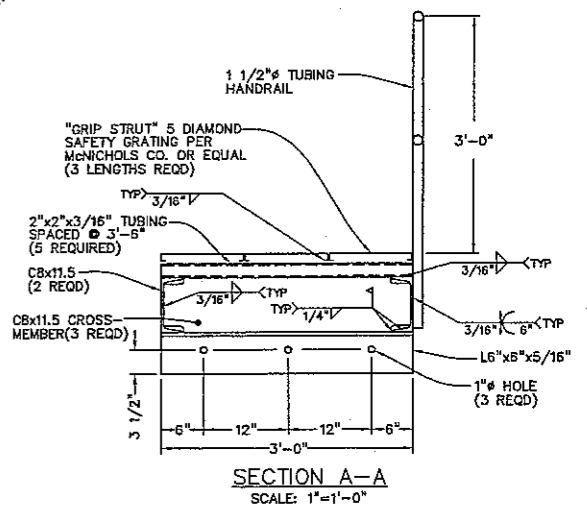
PREPARED BY: Drexel, Barrell & Co. Engineers Surveyors 4840 PEARL EAST CIRCLE, SUITE 114 BOULDER, COLORADO 80301 (303) 442-4338 8365 CORPORATE DRIVE COLORADO SPRINGS, COLORADO 80919 (719) 260-0867 910 54TH AVENUE, SUITE 210 GREELEY, COLORADO 80634 (970) 351-0646 CONTACT: CLIFF BROCKMAN	PREPARED FOR: CITY OF GREELEY 1001 9th AVENUE GREELEY, COLORADO 80631 (970) 336-4121 CONTACT: BERT LEAULTAUD	PROJECT INFO: GREELEY #3 "F" STREET DIVERSION GREELEY, COLORADO	DESIGNED BY: CRB DRAWN BY: TAW CHECKED BY:	REVISION DESCRIPTIONS 1 NEW CREST GATE, REMOVED RIPRAP DATE: 07 JAN 2003	DRAWING INFO: DEMOLITION PLAN / PROPOSED PLAN	DATE: 06 SEP 2002 SCALE: 1" = 10' v: N/A	JOB NO: EW 1174 DRAWING NO.: 5D 782	SHEET: 2 SHEETS: 5



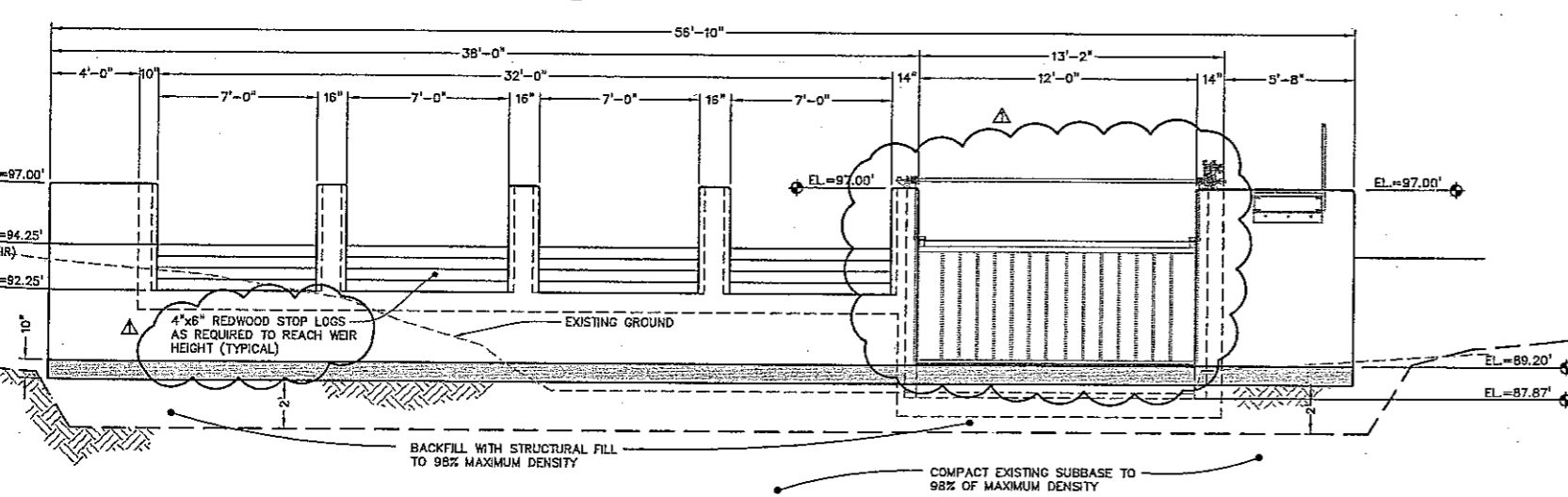
PLAN
SCALE: 1/4" = 1'-0"



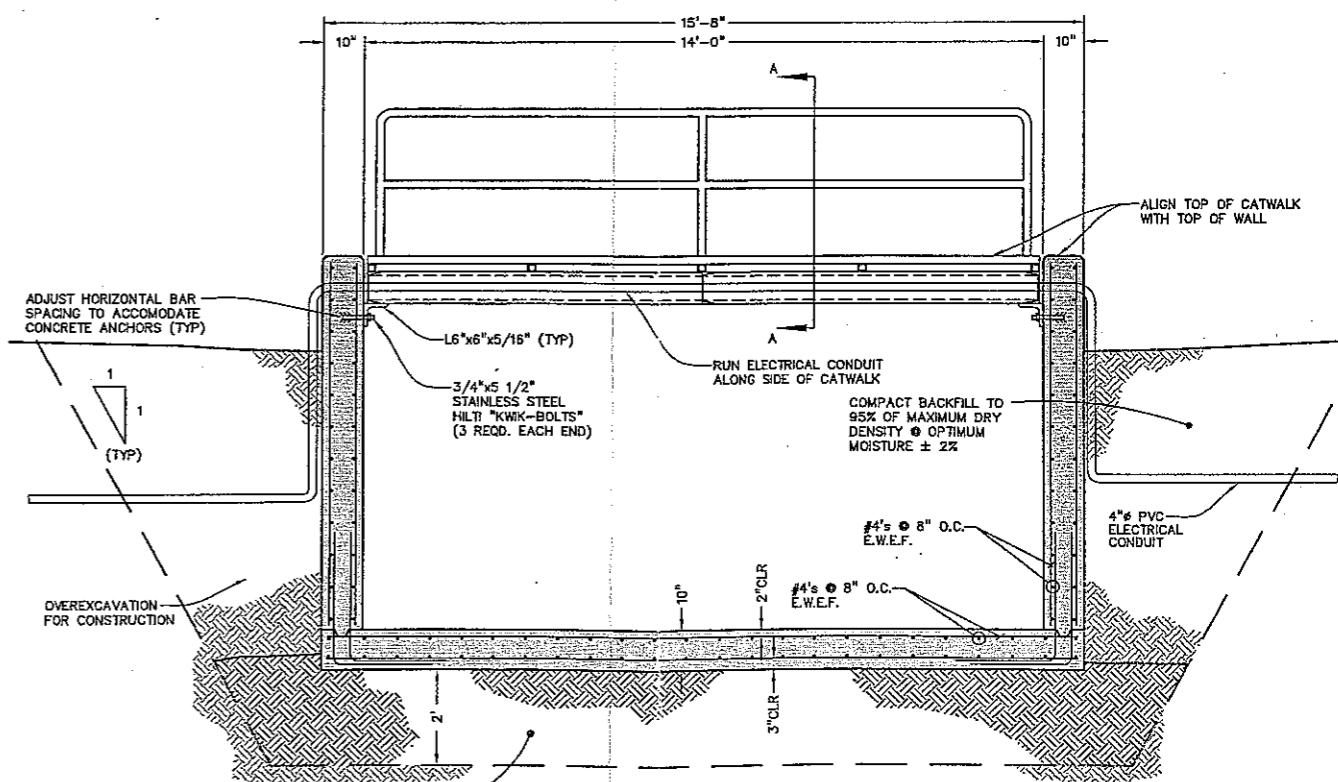
SECTION B-3
SCALE: 1/2" = 1'-0"



SECTION A-A
SCALE: 1" = 1'-0"



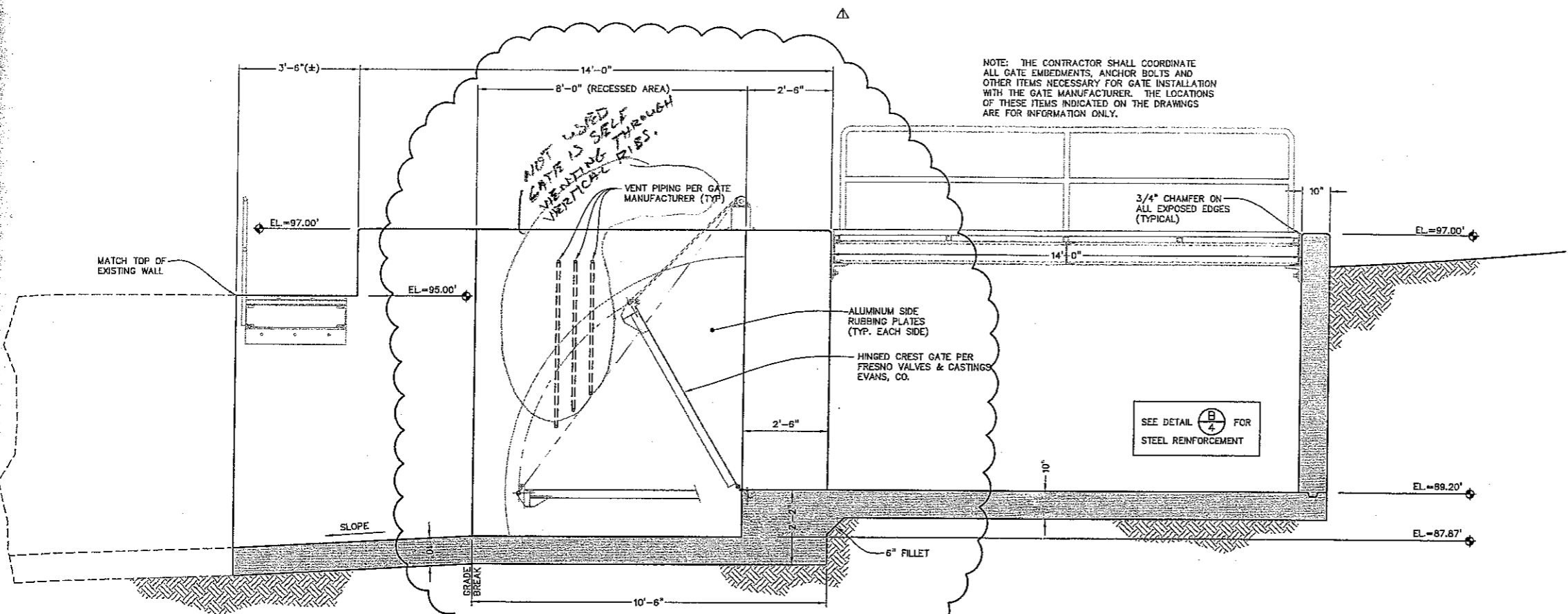
SECTION A-3
SCALE: 1/4" = 1'-0"



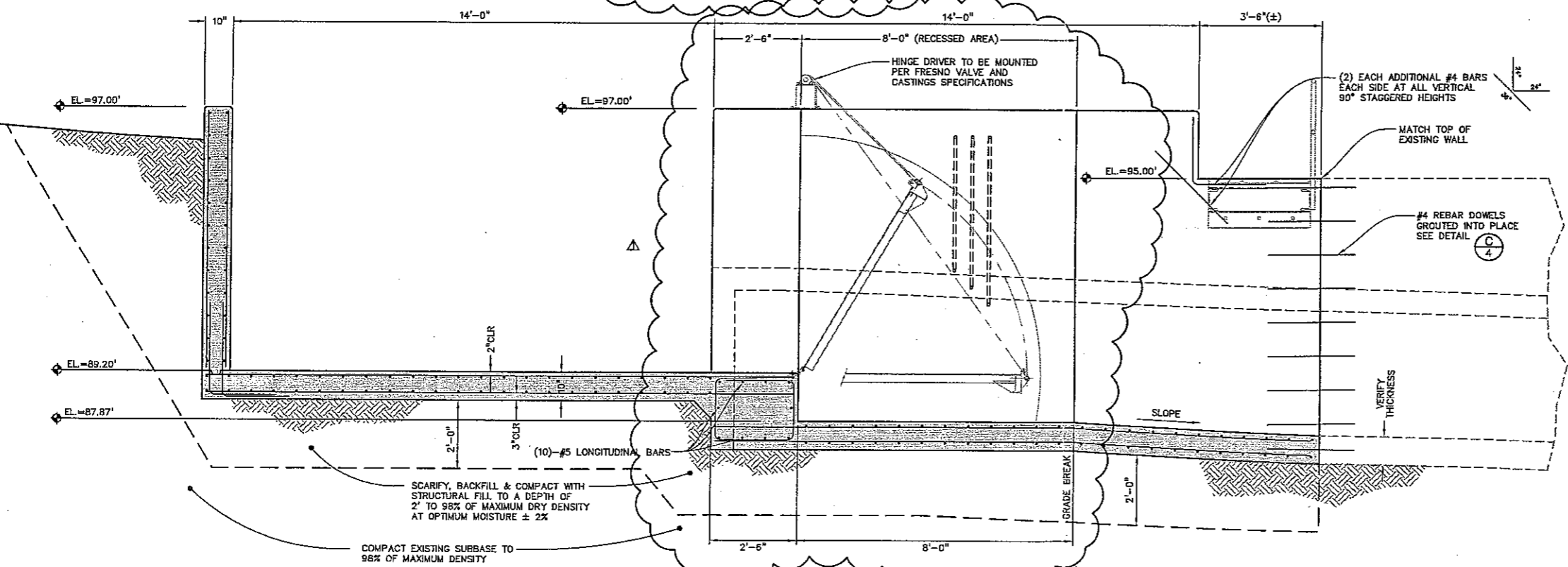
SECTION C-3
SCALE: 1/2" = 1'-0"

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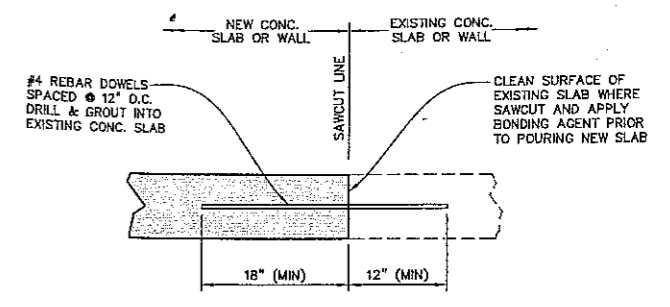
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				DRAWN BY: TAW	CHECKED BY:	DATE:		SCALE: 1" = 10' v. N/A	DRAWING NO.: 5D 782



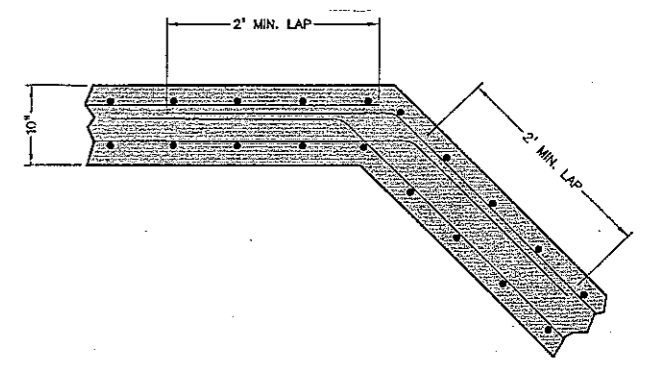
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SECTION
SCALE: 1/2" = 1'-0"



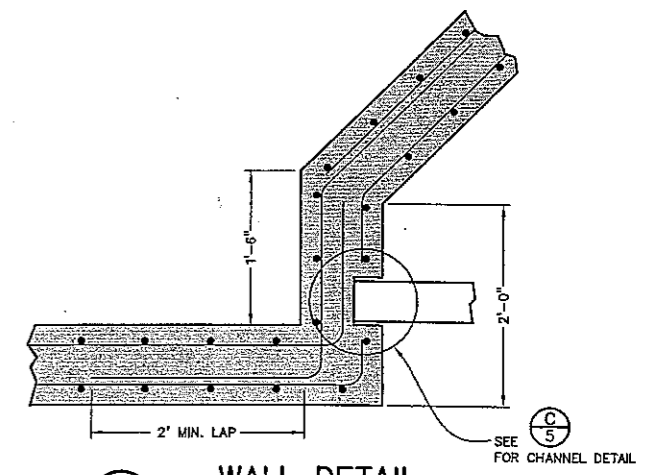
B
SECTION
SCALE: 1/2" = 1'-0"



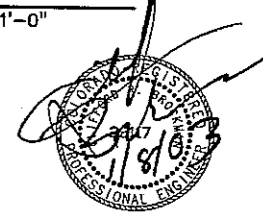
C
EXISTING TO NEW CONCRETE DOWELING DETAIL
SCALE: 1" = 1'-0"



D
WALL DETAIL
SCALE: 1" = 1'-0"



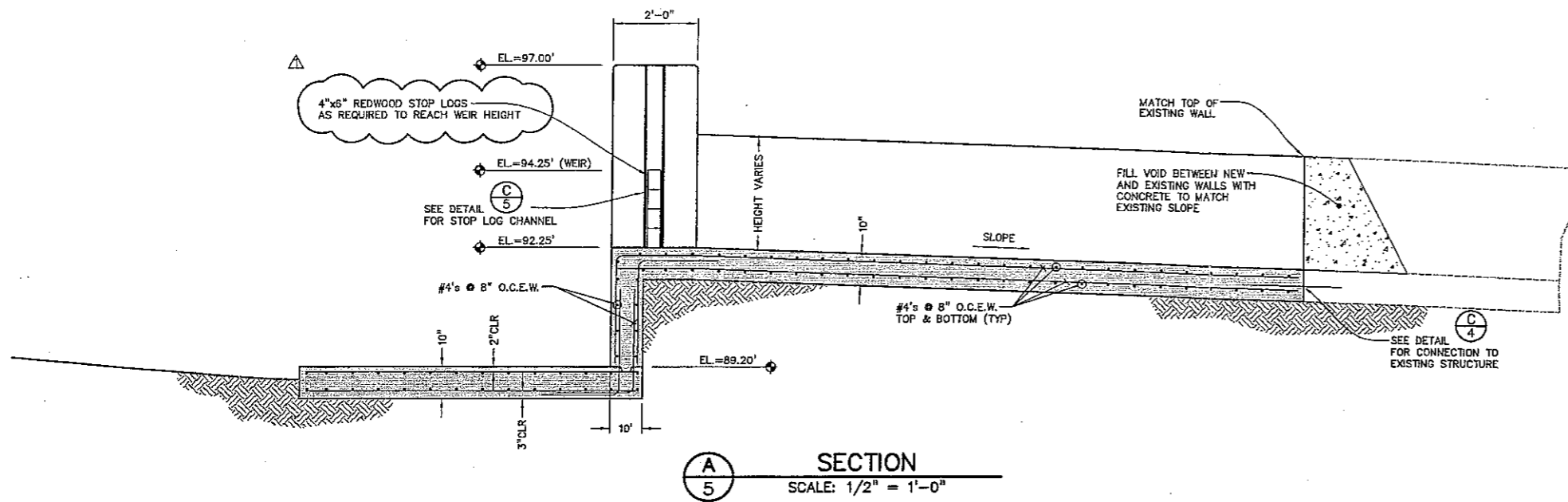
E
WALL DETAIL
SCALE: 1" = 1'-0"



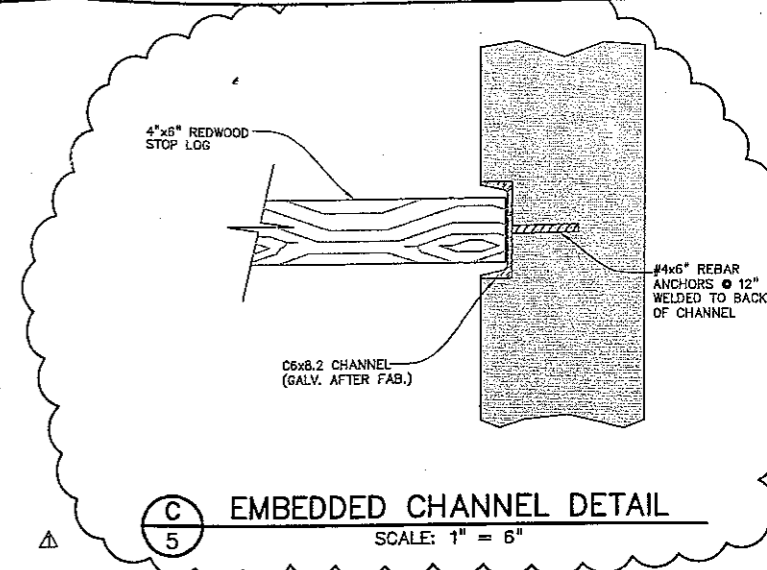
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			SCALE: AS SHOWN v. N/A	DRAWING NO.: 5D 782	SHEETS: 5				

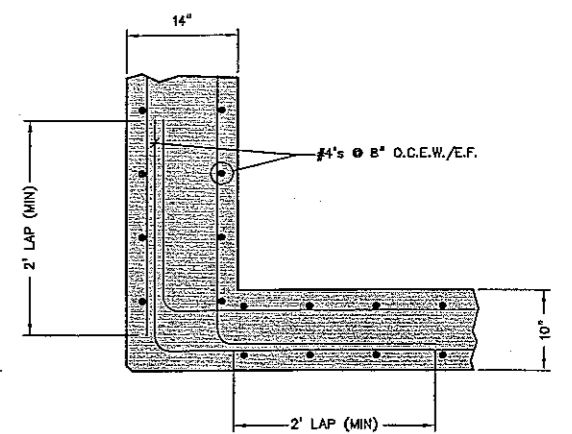
W:\ENR\174\DWG\174D\174D.T03.dwg, 1/8/2003 9:30:35 AM, Dre Barrell & Co., taw



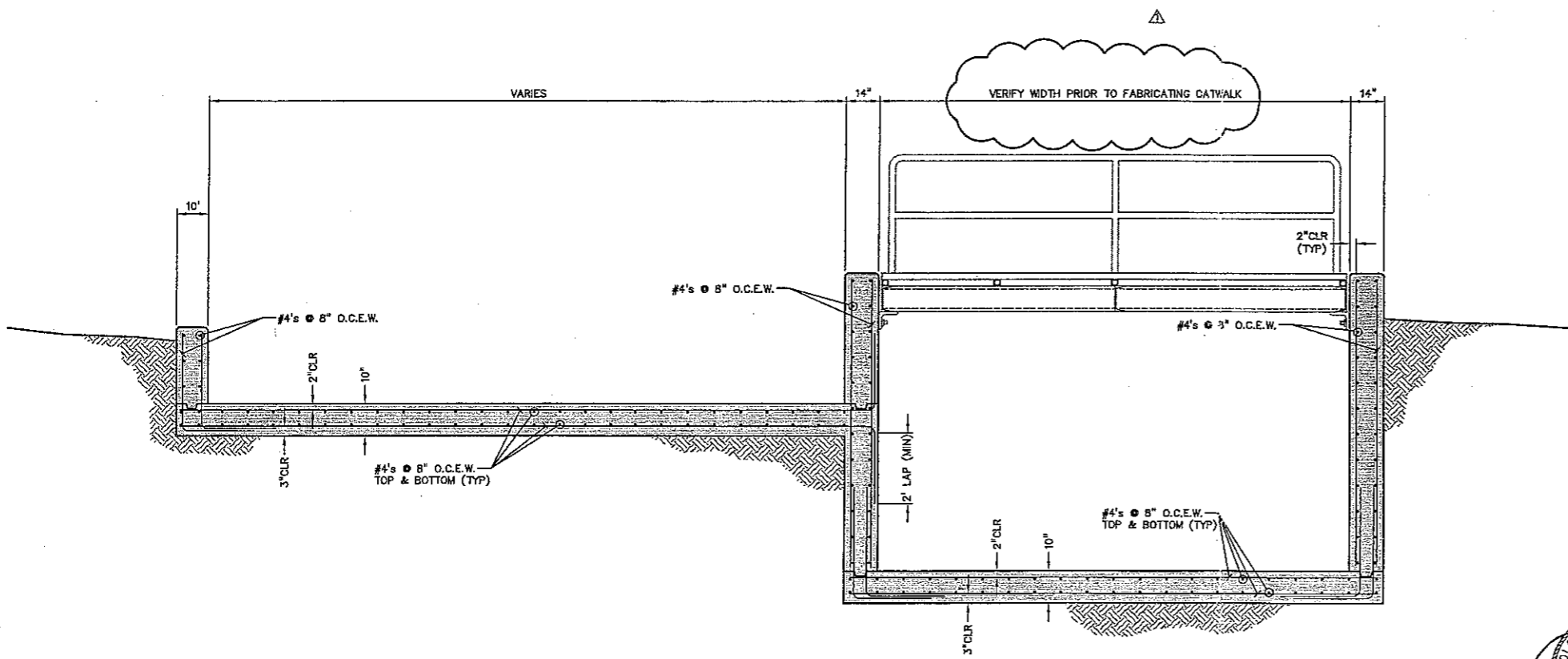
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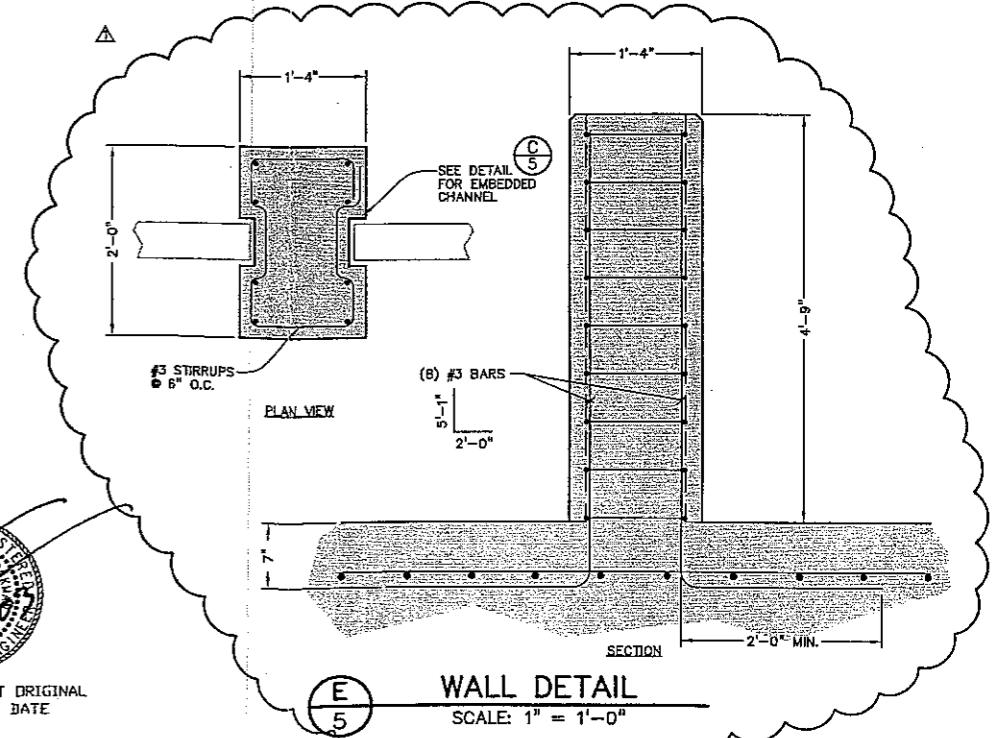
C
EMBEDDED CHANNEL DETAIL
SCALE: 1" = 6"



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WALL DETAIL
SCALE: 1" = 1'-0"



B
SECTION
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E
WALL DETAIL
SCALE: 1" = 1'-0"

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

PREPARED BY: Drexel, Barrell & Co. Engineers Surveyors 4840 PEARL EAST CIRCLE, SUITE 114 BOULDER, COLORADO 80301 (303) 442-4338 6365 CORPORATE DRIVE COLORADO SPRINGS, COLORADO 80919 (719) 260-0887 910 54TH AVENUE, SUITE 210 GREELEY, COLORADO 80634 (970) 351-0645 CONTACT: CLIFF BROCKMAN	PREPARED FOR: CITY OF GREELEY 1001 9th AVENUE GREELEY, COLORADO 80631 (970) 336-4121 CONTACT: BERT LEAUTAUD	PROJECT INFO: GREELEY #3 "F" STREET DIVERSION GREELEY, COLORADO	DESIGNED BY: CRE	REVISION DESCRIPTIONS: A REVISED GATE & STOP LOG ASSY.	DATE: 07 JAN 2003	DRAWING INFO: PROPOSED DIVERSION STRUCTURAL DETAILS	DATE: 06 SEP 2002	JOB NO.: EW 1174	SHEET: 5
			DRAWN BY: TAW	CHECKED BY:	SCALE: AS SHOWN v. N/A		DRAWING NO.: 5D 782	SHEETS: 5	

APPENDIX A.2

EAGLEVIEW SIDE CHANNEL WEIR

NORTH EAGLEVIEW DRAINAGE CHANNEL CITY OF GREELEY, CO

July, 2003

LOCATION, LEGEND, INDEX

CITY OF GREELEY, CO
NORTH EAGLEVIEW
DRAINAGE CHANNEL

p.o. box 121
Greeley, CO
80431
(970) 725-4061

burnett
consulting
engineers
L T D

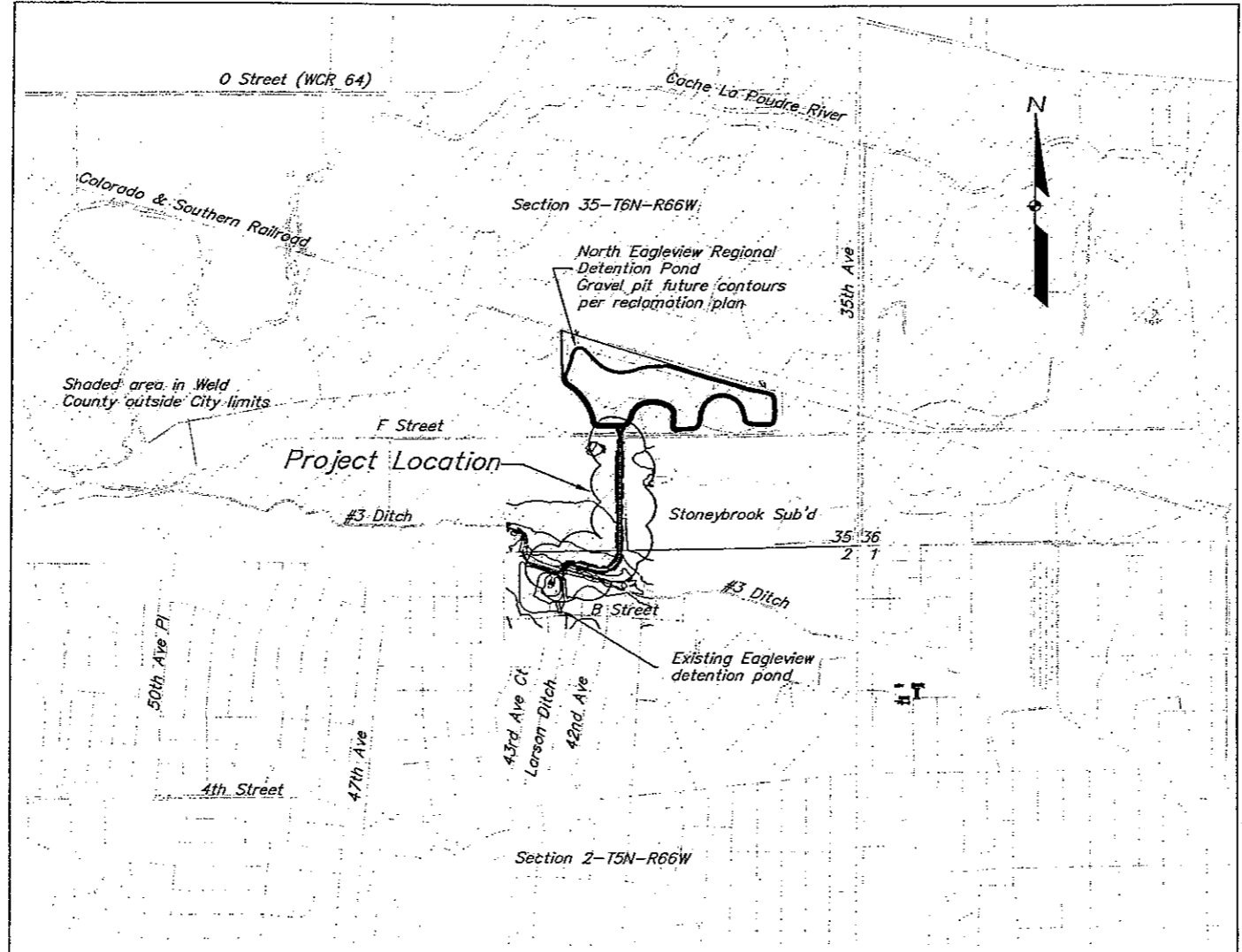
Drawn By
WIN
Checked By
TEB
Date
7/16/03
Scale
as noted
Job No.
02.08
SHEET #

1

File: gevPlan.dwg

LEGEND

Control point and Bench mark		11 4678.82 CP#11-Alum Cap
Test Bore (Soils)		
Proposed channel centerline & toes		
Proposed block retaining wall		
Proposed concrete cellular mattress		
Proposed contour line		4680
Proposed asphalt pavement		
Proposed dirt road		
Existing asphalt pavement		
Existing ROW or easement line		
Existing contour line		
Existing sanitary sewer & MH		
Existing water main, valve, hydrant		
Existing gas main		
Existing overhead power/pole		
Existing buried telephone/pedestal		
Existing edge of pavement		
Existing road		
Existing street light pole		
Existing guy assembly		
Existing irrigation ditch		
Existing fence lines		



LOCATION MAP

1" = 1,000' (24"x36")
1" = 2,000' (11"x17")

Construction of structures within #3 Ditch as shown in these plans is approved by the Board of Directors of the Greeley Irrigation Co.

Approved: _____ Date: _____
President

Approved: _____ Date: _____
Secretary



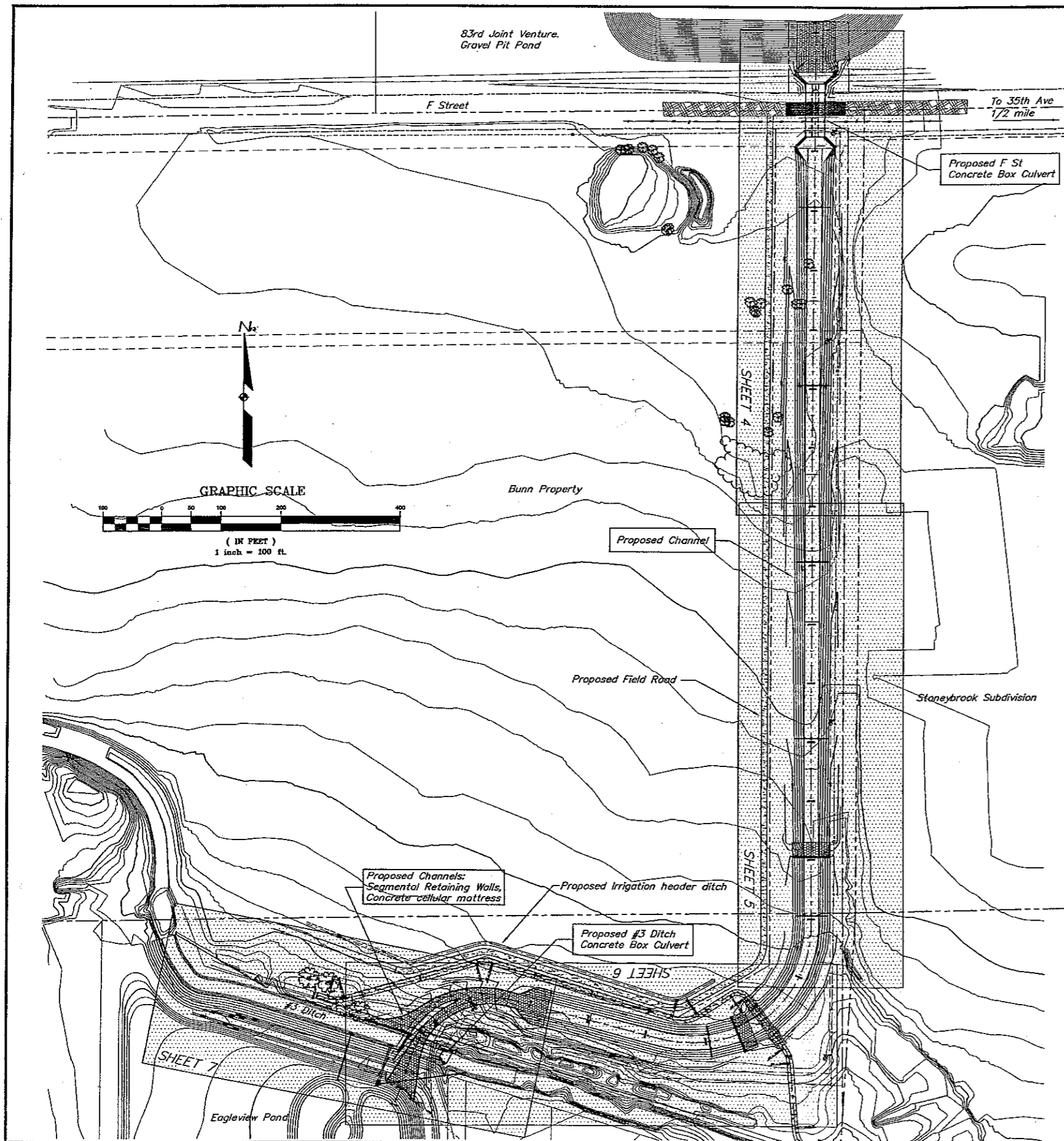
Construction must be in accordance with applicable City of Greeley construction standards. The City's acceptance allows for plan distribution and permit application. The City's acceptance shall not relieve the design engineer's responsibility for errors, omissions, or design deficiencies for which the City is held harmless.

Approved: _____ Date: _____
Director of Water & Sewer

Approved: _____ Date: _____
Director of Public Works

SHEET INDEX

SHEET 1	LOCATION, LEGEND, INDEX
SHEET 2	PROJECT OVERVIEW, GENERAL NOTES
SHEET 3	ALIGNMENTS, SOILS, CONTROLS, SEWERS
SHEET 4	CHANNEL PLAN & PROFILE 0+15 TO 8+00
SHEET 5	CHANNEL PLAN & PROFILE 8+00 TO 16+00
SHEET 6	CHANNEL PLAN & PROFILE 16+00 TO 24+03
SHEET 7	IMPROVEMENTS - EAGLEVIEW POND, #3 DITCH
SHEET 8	CHANNEL WALLS LAYOUT
SHEET 9	POND & #3 SPILL PROFILES 21+00 TO 24+12
SHEET 10	#3 BOX CULVERT LAYOUT & BAR SCHED
SHEET 11	#3 BOX CULVERT DETAILS & DIMENSIONS
SHEET 12	F ST BOX CULVERT LAYOUT & BAR SCHED
SHEET 13	F ST BOX CULVERT DETAILS & DIMENSIONS
SHEET 14	WINGWALLS
SHEET 15	TYP SECS: DROP STRUCTURE, CHANNEL, WALLS
SHEET 16	DITCH ROAD PLAN & PROFILE 0+00 TO 8+00
SHEET 17	DITCH ROAD, IRRIGATION DITCH PROFILE
SHEET 18	TRAFFIC CONTROL PLAN
SHEET 19	CROSS SECTIONS 0+50 TO 3+50
SHEET 20	CROSS SECTIONS 4+00 TO 8+50
SHEET 21	CROSS SECTIONS 9+00 TO 13+00
SHEET 22	CROSS SECTIONS 13+73 TO 16+50
SHEET 23	CROSS SECTIONS 17+00 TO 19+50
SHEET 24	CROSS SECTIONS 20+00 TO 22+25
SHEET 25	CROSS SECTIONS 22+50 TO 23+15
SHEET 26	CROSS SECTIONS 23+51 TO 24+03, VOLUMES



GENERAL NOTES:

- Construction Specifications and Plans applicable to this project are:
1. These Drawings and the Special Provisions for this project
 2. City of Greeley "Design Criteria and Construction Specifications"
 - Volume I of III - STREETS
 - Volume II of III - STORM DRAINAGE
 - Volume III of III - WATER / SEWER
 3. CDOT "Standard Specs for Road and Bridge Construction"
 4. CDOT MSS Standards Oct, 2000
 5. Manual of Uniform Traffic Control Devices

Drawings / General

1. Stations shown on plan & profile views are channel centerline unless otherwise noted.
2. Coordinates on drawings are approximate City of Greeley GIS system, NAD 27, based on GIS coordinates of sanitary sewer manholes.
3. Elevations shown on drawings are based on NAD 29 datum.
4. Existing ground contours are based on NAD 27/29 data.

Sanitary Sewer

1. Note existence of City of Greeley sanitary sewer systems.
2. Coordinate locates for excavation near sanitary sewers with City of Greeley staff.
3. Lower manhole shown on plans to Water & Sewer Dept approval.

Other utilities

1. Approximate locations of known existing utilities are shown on drawings.
2. Gas line locations are based on field locates by Duke Energy Co and by others.
3. Other utilities not shown on drawings may exist in area.
4. Call for accurate "locates" of all utilities before start of any excavation work.
5. Pothole to verify new structures will clear existing utilities before commencing excavation for structures.

Removals

1. Sawcut and remove existing asphalt pavement within limits noted on plans.
2. Haul removed asphalt to City-designated storage yard, which will be located within 5 miles of project. Keep removed asphalt segregated from other removed materials. Call Jerry Pickett at (970) 350-9335 for directions.
3. Return to the City of Greeley all removed materials deemed by the City to be reusable, including grates from Eagleview Pond discharge box. Legally dispose of all other materials removed off job site.

Excavation:

1. Stockpile three (3) truck loads or approximately 25 cu yds of clay material meeting USCS "SC" or "CL" on project site at location designated by Engineer for use by others in farming operation.
2. Project will result in excess excavated native material of approximately 18,000 cubic yards. At the Contractor's option with the property owner's concurrence, excess material may be disposed of on Gravel Pit property owned by 83rd Joint Venture immediately north of project on north side of F Street.

Topsoil & Reseed

1. Clear & Grub 50' wide each side of channel centerline, and top of north bank of Eagleview Pond, and to toe of slopes shown for channels.
2. Strip topsoil to 6" depth and stockpile. Replace topsoil on all disturbed areas except field road to minimum 6" depth, including filling open portion of concrete cellular mattresses.
3. Reseed all areas receiving topsoil.

Traffic Control and Access

1. Close F Street to thru traffic at 35th Ave and at 59th Ave with closure signs and detours signs to the east, north, and south of the F St / 35th Ave intersection and north and south of the F St / 59th Ave intersection.
2. Set minimum of 3 Type III barricades across F St 200' each side of channel centerline.
3. Set additional detour and road closed signs on F St between 35th Ave and channel and between 59th Ave and channel.
4. Road closed signs shall state that "F Street is closed between 35th Ave and 59th Ave for bridge repair".
5. Provide Traffic Control Plan per Special Provisions to the specifications.

PROJECT OVERVIEW

GENERAL NOTES

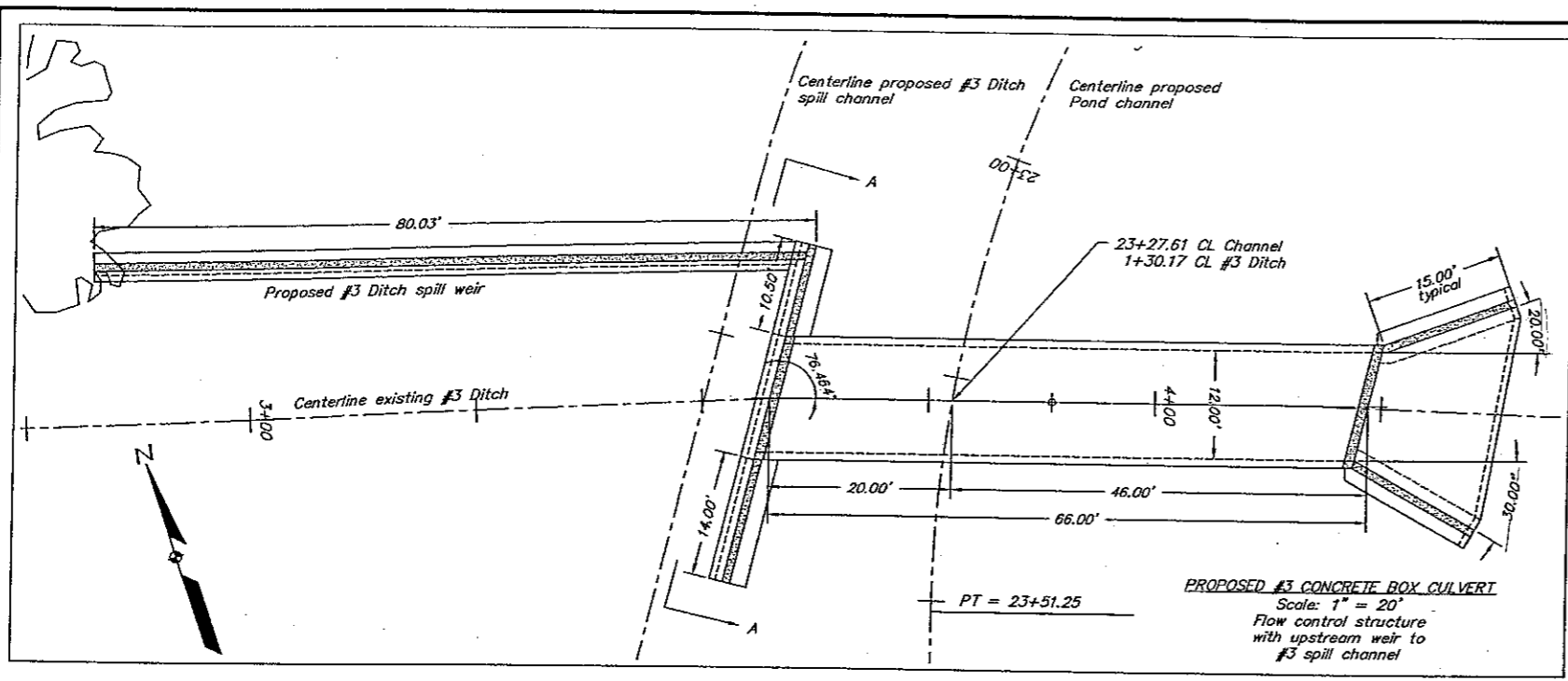
CITY OF GREELEY, CO
NORTH EAGLEVIEW
DRAINAGE CHANNEL

p.o. box 121
cowdrey, co
80434
(970) 725-4081

burnett
consulting
engineers
L T D

Drawn By
WIN
Checked By
TEB
Date
7/16/03
Scale
1"=100'
Job No.
02.08

SHEET #
2



#3 Ditch Concrete Box Culvert:
 Conform to CDOT M Standard M-601-1 for CBC
 Conform to CDOT M Standard M-601-20 for wingwalls

Design:
 Flow max = 195 cfs
 Depth, up = 4.5 ft

Dimensions:
 Length, L = 66'-0"
 Rise, R = 3'-0"
 Span, S = 12'-0"
 Top slab thickness, $T_t = 10.5"$
 Bottom slab thickness, $T_b = 12.5"$
 Wall thickness, $T_w = 10"$
 Wingwall height & angles:
 (see table on Wingwalls Details Sht)

Invert elev at upstream end = 4686.40
 Invert elev at downstream end = 4586.30
 Invert elev at CL channel = 4686.37
 Slope = 0.154%

Sta 23+27.61 finish channel elev = 4691.44
 Top of top slab at centerline channel = 4690.25

Construct concrete apron each end of CBC

Use 12' span x 6' rise by 10.5" top slab thickness
 for all steel sizes per sheet 2 of M-601-1.

SINGLE CONCRETE BOX CULVERT DIMENSIONS & QUANTITIES (EXCLUDING HEADWALLS & TOEWALLS)

BOX SIZE		FILL HEIGHT ALLOWED		SLAB & WALL THICKNESS (INCHES)			BAR SIZES						DIMENSIONS					QUANTITIES					
S	R	HT.	WIDTH	FT.-FT.	T_t	T_b	T_w	t_1	b_1	t_2	b_2	w_1	w_2	c_1	c_2	d_1	h_1	h_2	v_1	v_2	v_3	CONCRETE	REBAR STL
FT.	FT.	FT.-IN.	FT.-IN.	FT.-FT.				#	#	#	#	#	#	#	#		FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	FT.-IN.	CU.YDS./LIN.FT.	LBS./LIN.FT.
12	8	13-8	13-8	0 TO 8	10.5	12.5	10	4	7	7	7	4	5	5	5	60	3-8	3-4	11-7	3-4	3-4	1.905	328
12	8	13-8	13-8	8 TO 12	10.5	12.5	10	4	7	7	7	4	5	5	5	60	3-11	3-8	6-8	3-4	2-6	1.341	306
12	8	13-8	13-8	12 TO 16	15.5	18	10	4	8	8	8	4	5	5	5	60	3-10	2-9	6-11	3-2	2-8	1.551	345
12	8	13-8	13-8	16 TO 20	19.0	20.5	10	4	8	8	8	4	5	5	5	60	3-6	2-9	7-1	3-5	3-0	1.785	319
12	8	13-8	13-8	0 TO 8	10.5	12.5	10	4	7	7	7	4	5	5	5	68	4-1	2-9	7-5	3-7	3-2	2.037	341
12	8	13-8	13-8	8 TO 12	13	15	10	4	8	8	8	4	5	5	5	68	4-1	3-9	8-8	3-4	2-11	1.464	351
12	8	13-8	13-8	12 TO 16	15.5	18	10	4	8	8	8	4	5	5	5	68	3-4	2-9	8-11	3-6	2-9	1.675	358
12	8	13-8	13-8	16 TO 20	18.5	21	10	4	8	8	8	4	5	5	5	68	3-6	2-10	9-1	3-5	3-0	1.907	338
12	8	13-8	13-8	0 TO 8	10.5	12.5	10	4	7	7	7	4	5	5	5	68	3-6	3-0	9-4	3-8	3-3	2.160	342

HEADWALL AND TOEWALL QUANTITIES

HEADWALL SKEW ANGLE	90% TO 75%			74% TO 60%			59% TO 45%		
	SPAN - S	Z	STIRRUPS	Z	STIRRUPS	Z	STIRRUPS	Z	STIRRUPS
	#	#	LBS./LIN.FT.	#	#	LBS./LIN.FT.	#	#	LBS./LIN.FT.
6	4	4	22.1	4	4	21.9	4	4	21.3
8	4	4	22.5	4	4	22.3	5	4	28.0
10	5	4	28.2	5	4	27.9	7	4	43.2
12	5	4	27.6	6	4	34.5	8	5	56.4
14	6	4	34.0	7	4	41.9	10	5	81.5
16	6	4	32.3	8	5	53.3	*	*	*
18	7	4	39.0	9	5	62.6	*	*	*
20	7	4	38.6	11	6	96.9	*	*	*

CONCRETE QUANTITY = 0.085 CU.YDS./LIN.FT.

NOTES: QUANTITIES ARE PER LINEAR FOOT (OF HEADWALL) FOR ONE HEADWALL AND TOEWALL AND INCLUDE ALL HEADWALL AND TOEWALL REINFORCING STEEL.

* A SKEWED HEADWALL IS NOT RECOMMENDED FOR THESE SPANS. A SPECIAL DESIGN IS REQUIRED.

FOR HEADWALL AND TOEWALL DETAILS SEE PREVIOUS SHEET.

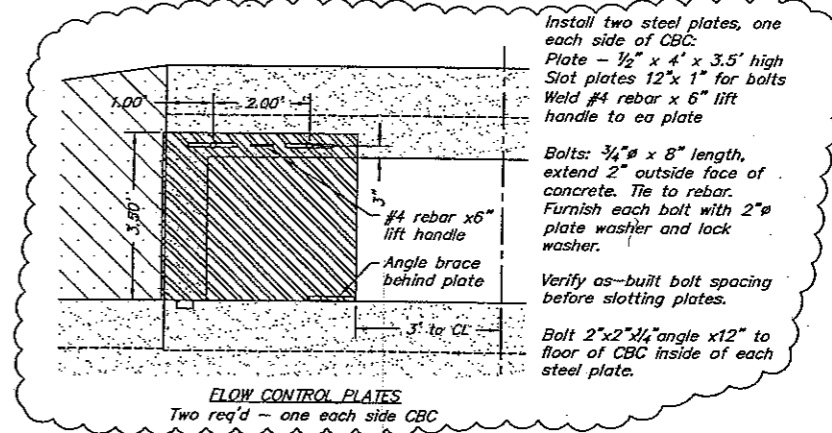
WHEN THE NOMINAL FILL HEIGHT FOR THE CONCRETE BOX CULVERT IS $\leq 2'-0"$, ALL REINFORCING STEEL IN THE HEADWALL SHALL BE EPOXY-COATED. ALSO, THOSE REINFORCING BARS DESIGNATED BY AN ASTERISK (*) AND THE d_1 BARS IN THE TOP MAT OF THE TOP SLAB SHALL BE EPOXY-COATED.

REINFORCING QUANTITIES INCLUDE BOTH EPOXY-COATED AND UNCOATED BARS.

WHEN AN R (RISE) OF LESS THAN SIX FEET IS REQUIRED, USE THE BAR SIZES AND THE SLAB AND WALL THICKNESSES FOR THE SIX FOOT RISE (IF AVAILABLE).

▲ THE SIZE OF d_1 BARS IS #4. THE NUMBER OF BARS REQUIRED IS LISTED.

Tables taken from CDOT M Standard M-601-1, sheet 2
 Use bar sizes and dimensions for 12' span x 6' rise as shown.

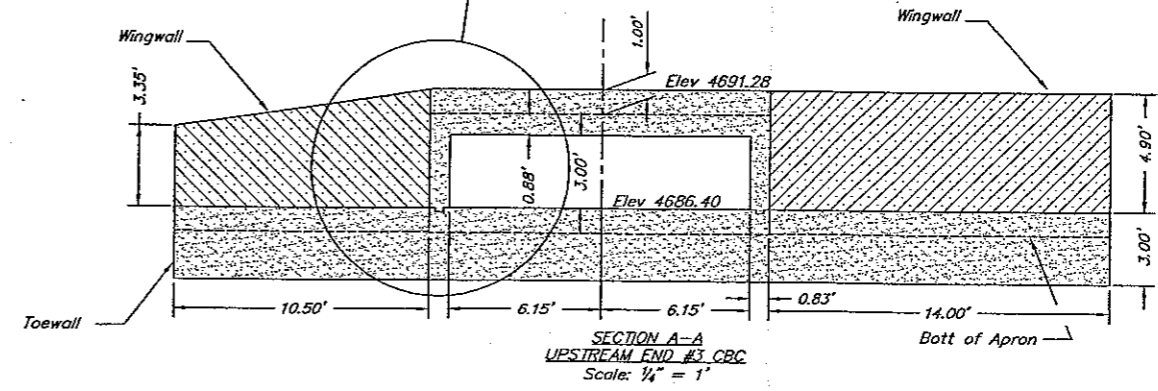


Install two steel plates, one each side of CBC.
 Plate - $1/2" \times 4" \times 3.5'$ high
 Slot plates $12" \times 12"$ for bolts
 Weld #4 rebar x 6" lift handle to ea plate

Bolts: $3/4" \times 8"$ length, extend 2" outside face of concrete. Tie to rebar. Furnish each bolt with 2" plate washer and lock washer.

Verify as-built bolt spacing before slotting plates.

Bolt $2" \times 2" \times 1/4"$ angle $x 12"$ to floor of CBC inside of each steel plate.



#3 DITCH
 CONCRETE BOX CULVERT
 LAYOUT & BAR SCHED

CITY OF GREELEY, CO
 NORTH EAGLEVIEW
 DRAINAGE CHANNEL

p.o. box 121
 cowdrey, colorado
 80434
 (970) 725-4061

urnett
 consulting
 engineers

Drawn By
 WIN
 Checked By
 TEB
 Date
 7/16/03
 Scale
 as noted
 Job No.
 02.08

SHEET #
 10

File govPlan.dwg

APPENDIX A.3

NORTHVIEW SIDE CHANNEL WEIR

FIELD SET
12/20/01

539-3291
CLAW CELL

10.00 TMS
0/1/1/2
BUT A OF C/D
CONCRETE

ENG & DRESSEL BARRELL
CLIFF BROCKMAN
*(303) 442-4338
EX 124

HEERMAN H&L
539-4599

FIELD SET 12/20/01

FINAL CONSTRUCTION PLANS
FOR
**NORTHVIEW REGIONAL DETENTION POND,
OUTFALL SYSTEM AND THE
GREELEY NO. 3 DITCH UNDERCHUTE**

A PART OF THE NORTHWEST 1/4, OF SECTION 1, TOWNSHIP 5 NORTH, RANGE 66 WEST, OF THE 6TH P.M.
CITY OF GREELEY, COUNTY OF WELD, STATE OF COLORADO



CALL UTILITY NOTIFICATION
CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR EXCAVATE
FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES.

CONTRACT DOCUMENTS
ISSUED JUNE 12, 2001

BASE BID
LIST OF APPROXIMATE QUANTITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY
1	REMOVE TREE	EA	6
2	MOBILIZATION	LS	1
3	REMOVE AND REPLACE ASPHALT	SY	330
4	REMOVE AND REPLACE BASE COURSE DRIVE	SY	27
5	STRAW BALE INLET PROTECTION	EA	2
6	5' DIAMETER CONCRETE MANHOLE	EA	5
7	30" RCP, CLASS III (COMPLETE IN PLACE)	LF	1398
8	30" RCP F.E.S. (COMPLETE IN PLACE)	EA	3
9	LOWER 16" DUCTILE IRON WATER MAIN	LS	1
10	DETENTION POND HEADWALL W/ TRASHRAIL & CONC. PAD	LS	1
11	24" RCP CLASS III Pipe Stub & Plug @ MH "E"	LS	1
12	RIPRAP (TYPE "M")	CY	22.5
13	TYPE II BEDDING MATERIAL	CY	11.3
14	SEEDING (NATIVE)	SF	25000
15	8" PVC SANITARY SEWER	LF	102
16	TRANSITE CAP	EA	1
17	4" INSIDE DROP MANHOLE PER GREELEY STD. DWG. X19	EA	1

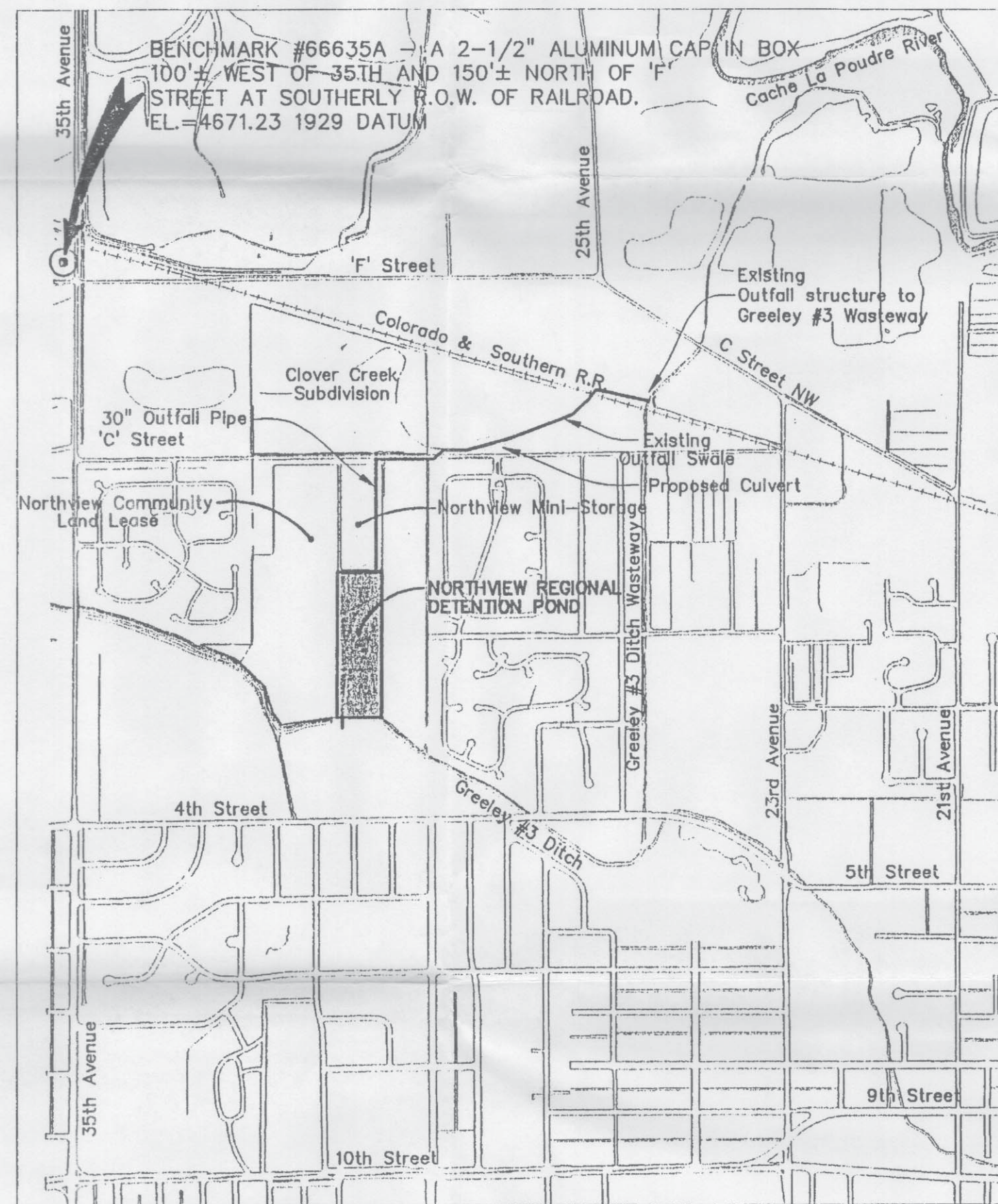
SHEET INDEX

SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET
2	HORIZONTAL CONTROL PLAN
3	DETENTION POND GRADING AND CONTROL PLAN
4	DETENTION POND DETAILS
5	BOX CULVERT UNDERCHUTE
6	DETENTION POND OUTFALL PLAN & PROFILE (1 OF 2)
7	DETENTION POND OUTFALL PLAN & PROFILE (2 OF 2)
8	DITCH UNDERCHUTE DETAILS
9	DITCH CONTROL STRUCTURE
10	DITCH SIDEWEIR DETAILS
11	CDOT M-601-20
12	MODIFIED CDOT M-601-1-1
13	PIPELINE DETAILS

BID ALTERNATE NO. 1
LIST OF APPROXIMATE QUANTITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY
1-1	UNCLASSIFIED EXCAVATION	CY	10.0
1-2	UNCLASSIFIED EMBANKMENT	CY	57.0
1-3	EXPORT OFFSITE	CY	125.0
1-4	SILT FENCE	LF	11.0
1-5	STRAW BALE INLET PROTECTION	EA	2
1-6	6" GEOLINK CONCRETE INTERLOCKING BLOCKS*	SF	8100
1-7	4" GEOLINK CONCRETE INTERLOCKING BLOCKS	SF	1080
1-8	RIPRAP (TYPE M)	CY	150
1-9	TYPE II BEDDING MATERIAL	CY	60
1-10	MIRAFI 140N FABRIC	SF	9160
1-11	CONCRETE WEIR WALL @ South end of chute	CY	2.9
1-12	EMERGENCY SPILLWAY CUTOFF WALL 7.1' @ P	CY	10.0
1-13	4" CONCRETE CHUTE PAVING	SY	198
1-14	CHUTE SIDEWALLS	CY	58.4
1-15	16'x3' BOX CULVERT W/ PARAPET WALLS	CY	22
1-16	NORTH CONCRETE HEADWALLS	CY	40
1-17	DITCH SIDE WEIR WALL	CY	9.1
1-18	6" CONCRETE BIKEPATH	SY	156
1-19	DITCH CONTROL STRUCTURE W/ CATWALK	CY	11.1
1-20	DITCH CLAY LINER	CY	200
1-21	CATWALK GUARDRAILS	LS	1
1-22	CHUTE SIDEWALL GUARDRAILS	LS	1
1-23	NORTH CULVERT HEADWALL GUARDRAIL	LS	1
1-24	SOUTH CULVERT HEADWALL GUARDRAIL	LS	1
1-25	SEEDING (NATIVE)	SF	86500
1-26	SHORE EXISTING TIMBER WALL FOR UNDERCHUTE CONSTRUCTION	LF	1
1-27	REMOVE CONCRETE TRICKLE CHANNEL	LF	20
1-28	REMOVE AND SALVAGE EXISTING RIPRAP	LS	1

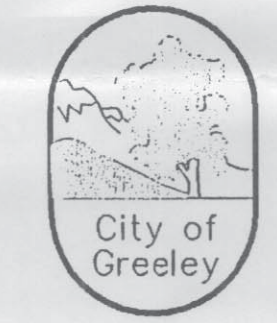
* ALL GEOLINK UNITS SHALL BE 6" HIGH (PETRAFLEX PRODUCT# PL61216) UNLESS NOTED OTHERWISE.



VICINITY MAP
NOT TO SCALE

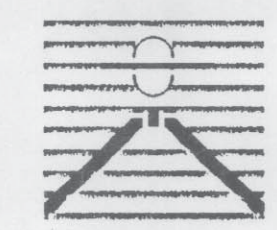
PREPARED FOR:

City of Greeley
Public Works
1000 10TH STREET
GREELEY, CO 80631
(970) 338-4031
CONTACT:
RON HOAGLAND, P.E.



PREPARED BY:

Drexel Barrell & Co.
Engineers • Surveyors
4840 PEARL EAST CIRCLE, SUITE 114
BOULDER, COLORADO 80301
(303) 442-4338
CONTACT:
CLIFFORD BROCKMAN, P.E.



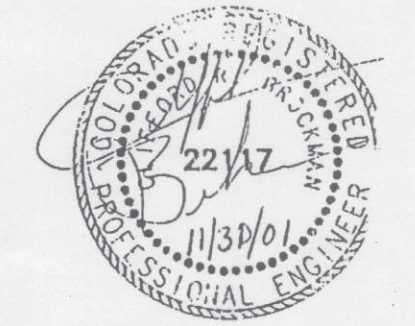
Mark Reed
371-3427

CONSTRUCTION MUST BE IN ACCORDANCE WITH APPLICABLE CITY OF GREELEY CONSTRUCTION STANDARDS. THE CITY'S ACCEPTANCE ALLOWS FOR PLAN DISTRIBUTION AND PERMIT APPLICATION. THE CITY'S ACCEPTANCE SHALL NOT RELIEVE THE DESIGN ENGINEER'S RESPONSIBILITY FOR ERRORS, OMISSIONS, OR DESIGN DEFICIENCIES FOR WHICH THE CITY IS HELD HARMLESS.

Accepted By: William Staley 12/7/01
Public Works Director Date

Accepted By: J.P. Amson 12/7/01
Water and Sewer Director Date

Accepted By: _____
Greeley Irrigation Company President Date

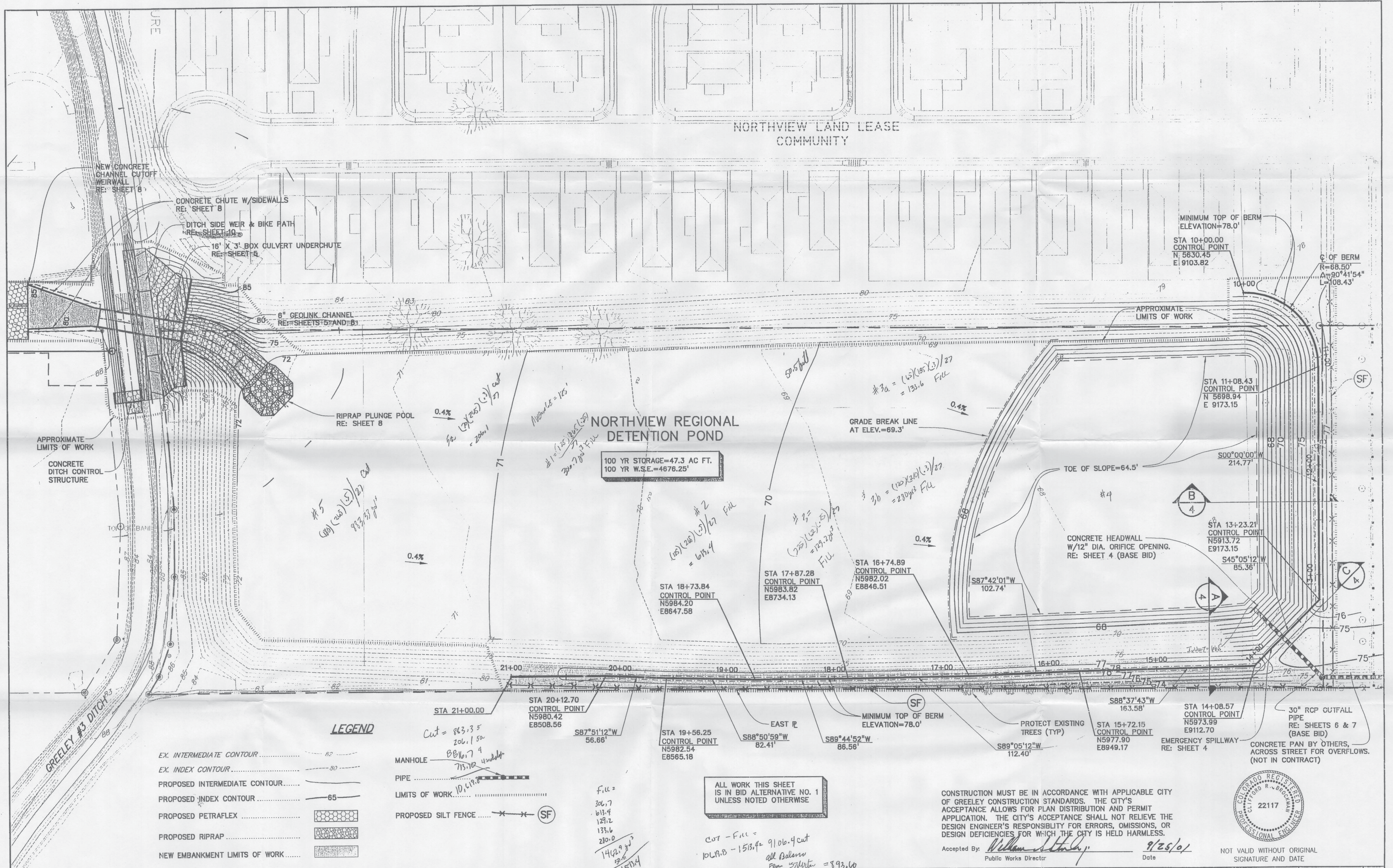


NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

REVISED PIPE ALIGNMENT 30 NOV 2001

E-W1139
SHEET 1 OF 13

FIELD SET 12/20/01



ALL WORK THIS SHEET IS IN BID ALTERNATIVE NO. 1 UNLESS NOTED OTHERWISE

CONSTRUCTION MUST BE IN ACCORDANCE WITH APPLICABLE CITY OF GREELEY CONSTRUCTION STANDARDS. THE CITY'S ACCEPTANCE ALLOWS FOR PLAN DISTRIBUTION AND PERMIT APPLICATION. THE CITY'S ACCEPTANCE SHALL NOT RELIEVE THE DESIGN ENGINEER'S RESPONSIBILITY FOR ERRORS, OMISSIONS, OR DESIGN DEFICIENCIES FOR WHICH THE CITY IS HELD HARMLESS.



NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

- LEGEND**
- EX. INTERMEDIATE CONTOUR 62
 - EX. INDEX CONTOUR 60
 - PROPOSED INTERMEDIATE CONTOUR 65
 - PROPOSED INDEX CONTOUR 65
 - PROPOSED PETRAFLIX [Symbol]
 - PROPOSED RIPRAP [Symbol]
 - NEW EMBANKMENT LIMITS OF WORK [Symbol]
 - MANHOLE [Symbol]
 - PIPE [Symbol]
 - LIMITS OF WORK [Symbol]
 - PROPOSED SILT FENCE [Symbol] (SF)

STA 21+00.00
 STA 20+12.70 CONTROL POINT N5980.42 E8508.56
 STA 19+56.25 CONTROL POINT N5982.54 E8565.18
 STA 18+73.84 CONTROL POINT N5984.20 E8647.58
 STA 17+87.28 CONTROL POINT N5983.82 E8734.13
 STA 16+74.89 CONTROL POINT N5982.02 E8846.51
 STA 14+08.57 CONTROL POINT N5973.99 E9112.70
 STA 13+23.21 CONTROL POINT N5913.72 E9173.15
 STA 11+08.43 CONTROL POINT N 5698.94 E 9173.15
 STA 10+00.00 CONTROL POINT N 5630.45 E 9103.82

Fill =
 306.7
 613.4
 129.2
 133.6
 210.0
 1429.9
 1513.42

Cut - Fill =
 1069.8 - 1513.42 = 9106.4 cut
 All Balans
 From 15/10/04 = 893.60

PREPARED BY: **Drexel, Barrell & Co.** Engineers Surveyors
 4840 PEARL EAST CIRCLE, SUITE 114 BOULDER, COLORADO 80301 (303) 442-4338
 6365 CORPORATE DRIVE COLORADO SPRINGS, COLORADO 80919 (719) 260-0887
 910 54TH AVENUE, SUITE 210 GREELEY, COLORADO 80634 (970) 351-0845
 CONTACT: CLIFF BROCKMAN, P.E.

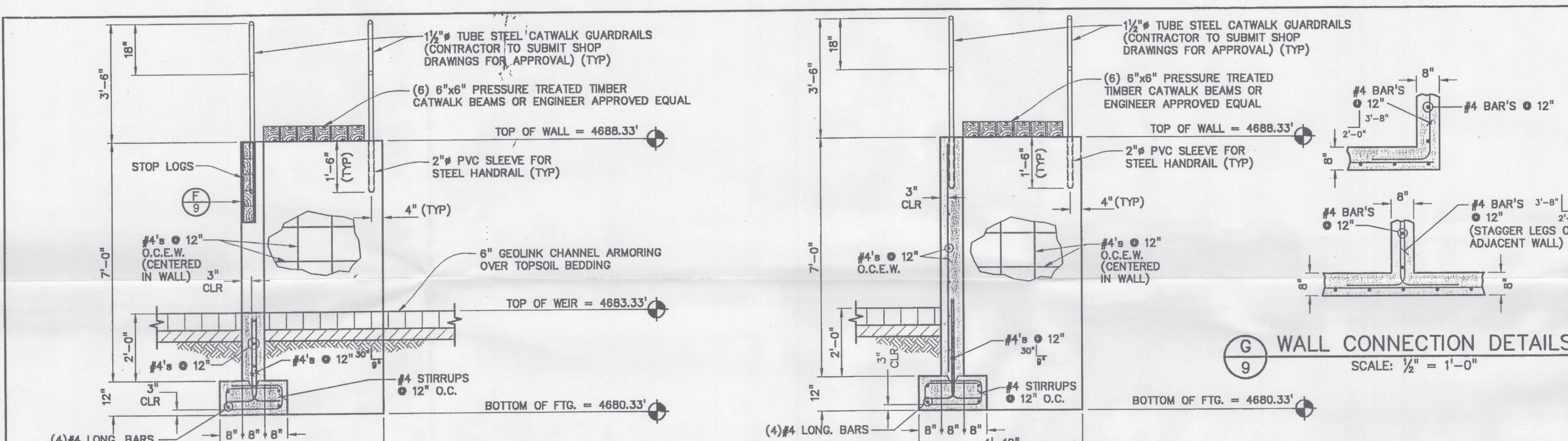
PREPARED FOR: **CITY OF GREELEY**
 1000 10TH STREET GREELEY, COLORADO 80631 (970) 336-4031
 CONTACT: RON HOAGLAND P.E.

PROJECT INFO: **NORTHVIEW REGIONAL DETENTION POND AND GREELEY #3 DITCH UNDERCHUTE**
 GREELEY, COLORADO

DESIGNED BY: CRB/DJB
 DRAWN BY: LFS/TAW
 CHECKED BY: CRB
 REVISION DESCRIPTIONS: CONTRACT DOCUMENTS ISSUE DATE
 DATE: 12 JUNE 2001

DRAWING INFO: **DETENTION POND GRADING AND CONTROL PLAN**

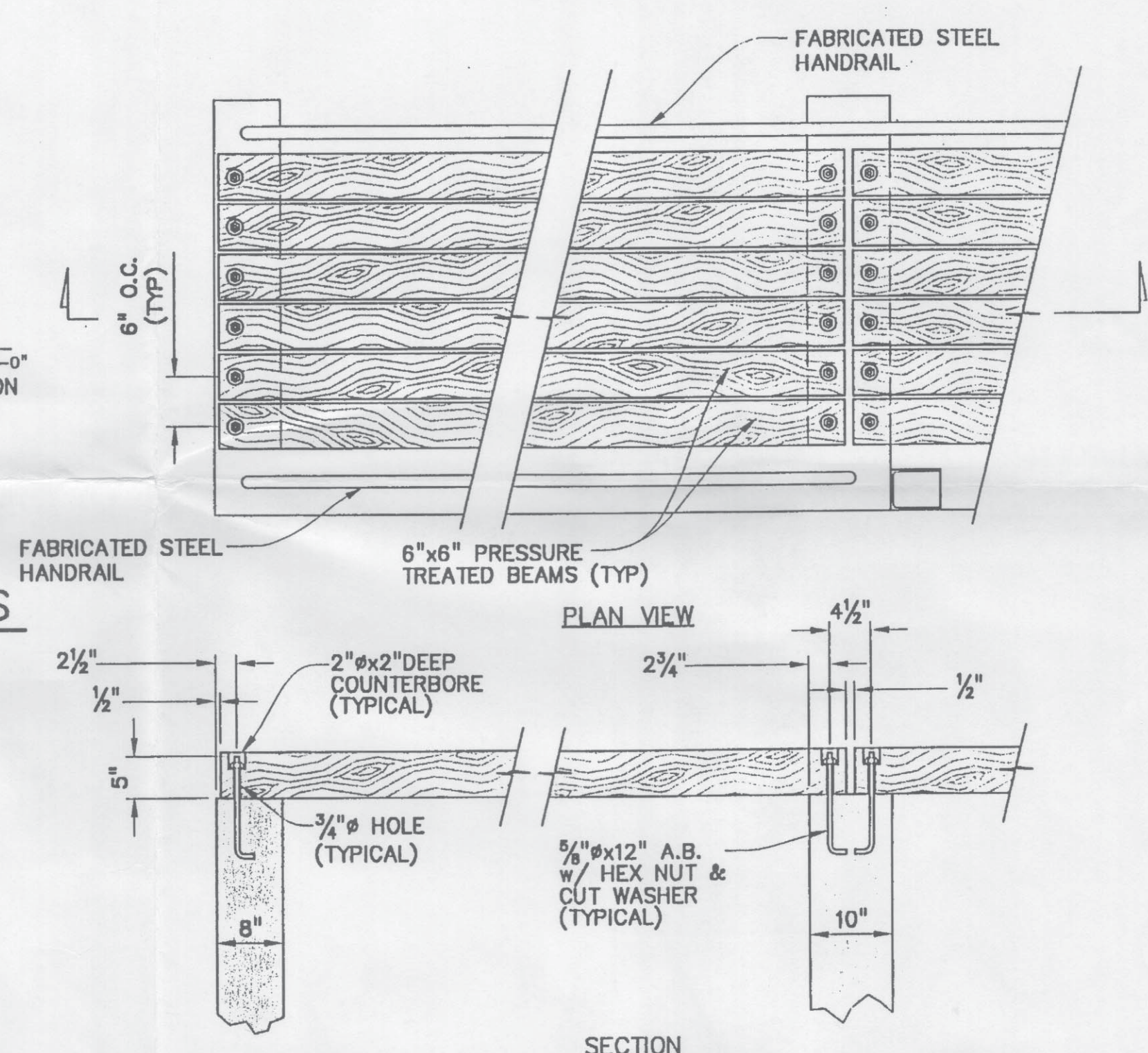
DATE: 12 JUNE 2001
 SCALE: 1"=40'
 JOB NO: EW1139.1
 DRAWING NO: 5D 272
 SHEET NO: 3 OF 13



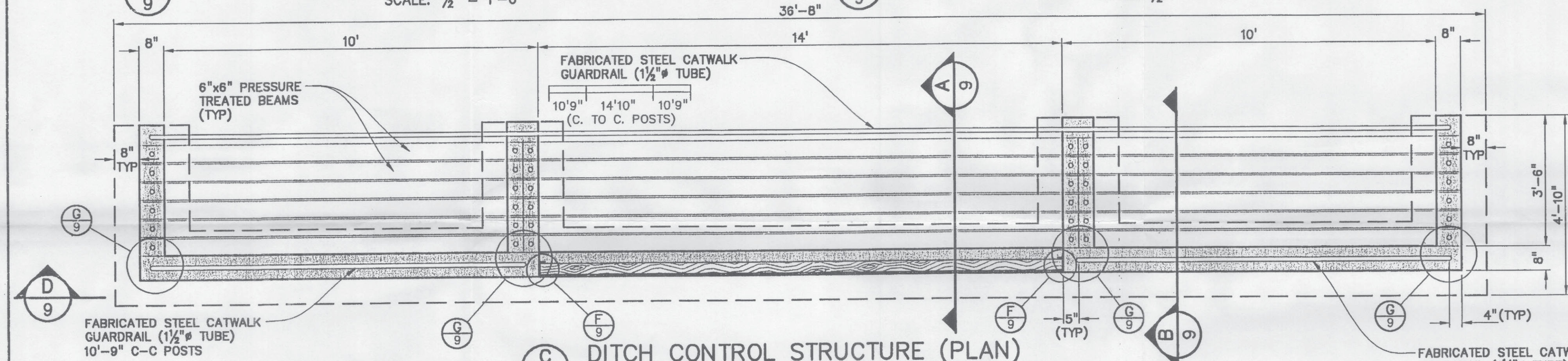
A DITCH CONTROL STRUCTURE CROSS SECTION
SCALE: 1/2" = 1'-0"

B DITCH CONTROL STRUCTURE CROSS SECTION
SCALE: 1/2" = 1'-0"

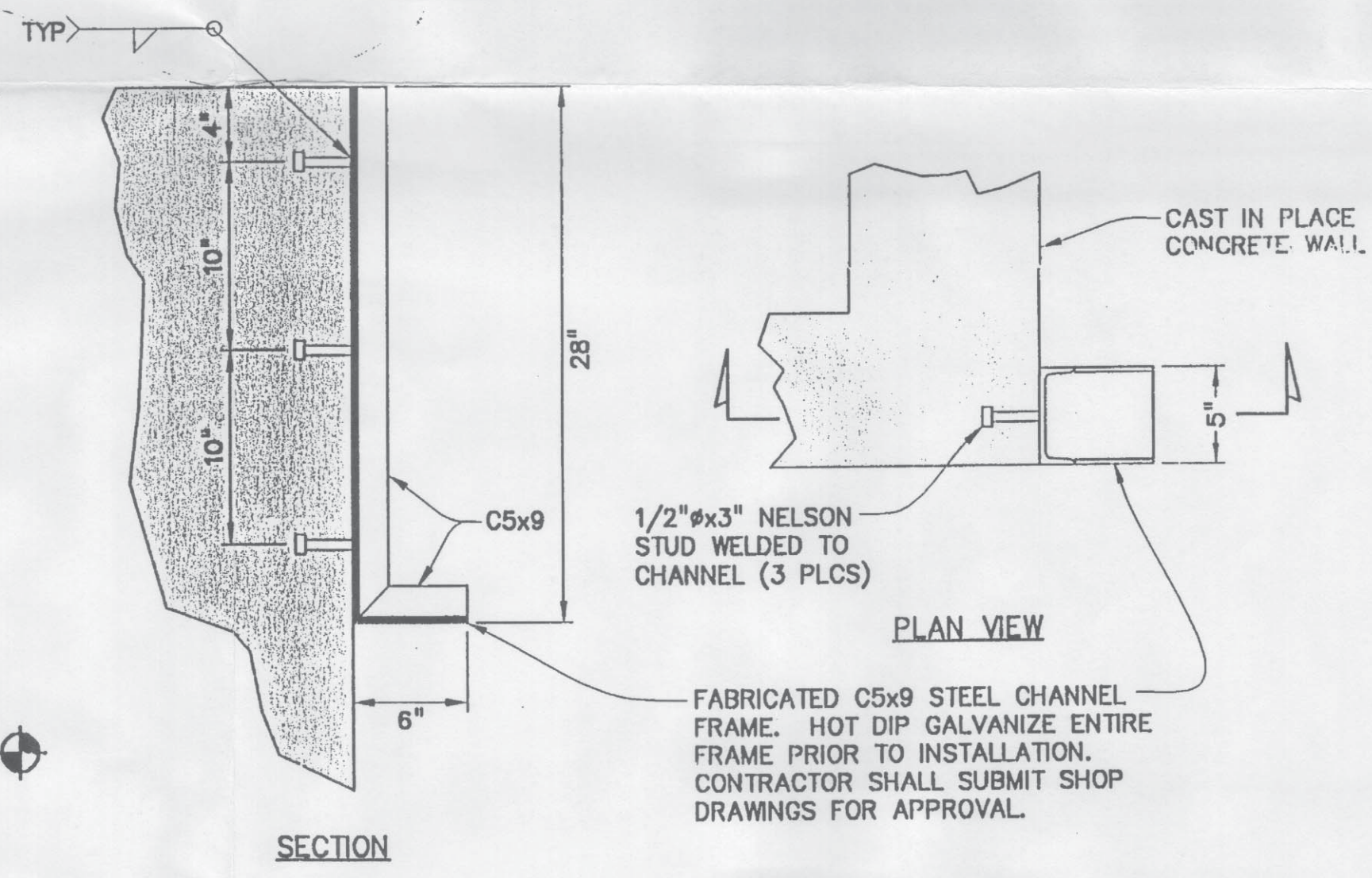
G WALL CONNECTION DETAILS
SCALE: 1/2" = 1'-0"



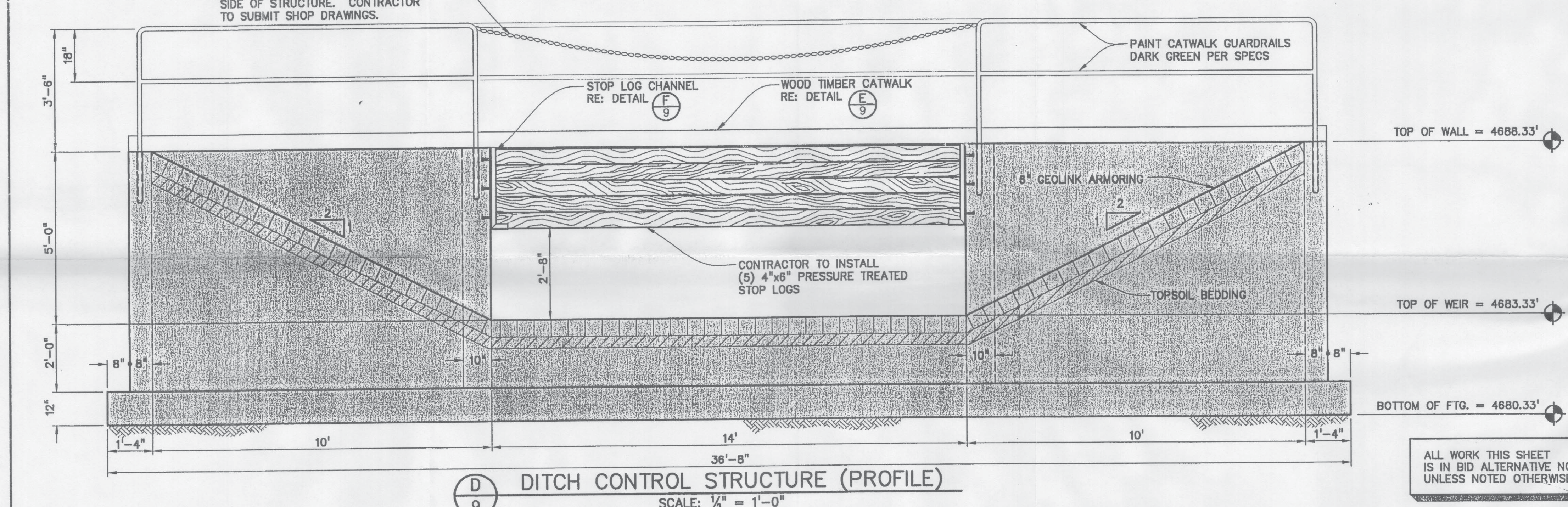
E WOOD CATWALK CONNECTION DETAIL
SCALE: 3/4" = 1'-0"



C DITCH CONTROL STRUCTURE (PLAN)
SCALE: 1/2" = 1'-0"



F STOP LOG CHANNEL
SCALE: 1/2" = 1'-0"



D DITCH CONTROL STRUCTURE (PROFILE)
SCALE: 1/2" = 1'-0"

NOTE: TWO CHANNEL ASSEMBLIES REQUIRED.

Accepted By: *William A. [Signature]* 3/25/01
Public Works Director Date

Accepted By: *[Signature]* 8/23/01
Greeley Irrigation Company President Date

CONSTRUCTION MUST BE IN ACCORDANCE WITH APPLICABLE CITY OF GREELEY CONSTRUCTION STANDARDS. THE CITY'S ACCEPTANCE ALLOWS FOR PLAN DISTRIBUTION AND PERMIT APPLICATION. THE CITY'S ACCEPTANCE SHALL NOT RELIEVE THE DESIGN ENGINEER'S RESPONSIBILITY FOR ERRORS, OMISSIONS, OR DESIGN DEFICIENCIES FOR WHICH THE CITY IS HELD HARMLESS.

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

ALL WORK THIS SHEET IS IN BID ALTERNATIVE NO. 1 UNLESS NOTED OTHERWISE

PREPARED BY: Drexel, Barrell & Co. Engineers 4840 PEARL EAST CIRCLE, SUITE 114 BOULDER, COLORADO 80301 (303) 442-4338 6365 CORPORATE DRIVE COLORADO SPRINGS, COLORADO 80919 (719) 260-0887 910 54TH AVENUE, SUITE 210 GREELEY, COLORADO 80634 (970) 351-0645 CONTACT: CLIFF BROCKMAN, P.E.	PREPARED FOR: CITY OF GREELEY 1000 10TH STREET GREELEY, COLORADO 80631 (970) 336-4031 CONTACT: RON HOAGLAND P.E.	PROJECT INFO: NORTHVIEW REGIONAL DETENTION POND AND GREELEY #3 DITCH UNDERCUTE GREELEY, COLORADO	DESIGNED BY: CRB/DJB DRAWN BY: TAW/LFS CHECKED BY: CRB	REVISION DESCRIPTIONS CONTRACT DOCUMENTS ISSUE DATE	DATE: 12 JUNE 2001	DRAWING INFO: DITCH CONTROL STRUCTURE	DATE: 12 JUNE 2001 SCALE: AS SHOWN	JOB NO: EW1139.1 DRAWING NO: 5D 272	SHEET NO: 9 SHEETS: 13
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APPENDIX A.4

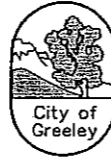
CLARKSON SPILL STRUCTURE

FINAL CONSTRUCTION PLANS
FOR
CLARKSON DIVERSION ON THE GREELEY NO. 3 DITCH
GREELEY, COLORADO

8 OCTOBER 2003



CALL UTILITY NOTIFICATION
CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR EXCAVATE
FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES.



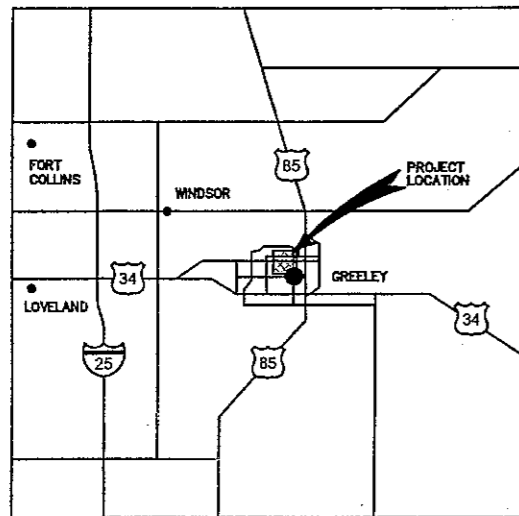
PREPARED FOR:
THE CITY OF GREELEY
1001 9th AVENUE
GREELEY, COLORADO 80631
(970) 336-4121
CONTACT: BERT LEAUTAUD, P.E.



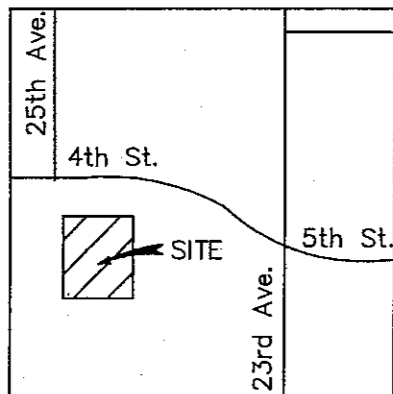
PREPARED BY:
Drexel, Barrell & Co.
Engineers • Surveyors
4840 PEARL EAST CIRCLE, SUITE 114
BOULDER, COLORADO 80301
(303) 442-4338
CONTACT:
CLIFF BROCKMAN, P.E.

STRUCTURAL NOTES

1. GENERAL REQUIREMENTS:
 - A. ALL CONSTRUCTION SHALL COMPLY WITH THE 1997 UNIFORM BUILDING CODE, OR LATER EDITION ADOPTED BY THE GOVERNMENTAL JURISDICTION, AND ALL OTHER PERTINENT GOVERNMENTAL CODES, ORDINANCES AND REGULATIONS.
2. FOUNDATIONS:
 - A. DESIGN IS BASED ON A MAT SLAB FOUNDATION, PLACED ON 2 FEET OF COMPACTED STRUCTURAL FILL. MAXIMUM BEARING PRESSURE USED IN DESIGN = 1000 psf.
3. CONCRETE:
 - A. ALL CONCRETE SHALL COMPLY WITH THE LATEST EDITIONS OF THE ACI SPECIFICATIONS FOR STRUCTURAL CONCRETE, ACI 301, AND ACI BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318.
 - B. CONCRETE MIX DESIGN, AIR ENTRAINMENT, PLACEMENT, TRANSPORT, ETC. SHALL BE PER ACI SPECS. MIX DESIGN IS SUBJECT TO THE ENGINEER'S APPROVAL.
 - C. ALL CONCRETE SHALL BE MADE USING TYPE I/II CEMENT, WITH STONE AGGREGATE, AND SHALL DEVELOPE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 psi.
 - D. MIX DESIGN SHALL HAVE THE FOLLOWING PROPERTIES:
 - MAXIMUM WATER/CEMENT RATIO: 0.51
 - SLUMP AT WALLS: 4" TO 6"
 - SLUMP AT SLABS: 3" TO 5"
 - AIR ENTRAINMENT: 5% TO 7%
 - E. WATER ADDED TO CONCRETE AT THE SITE SHALL NOT EXCEED THE AMOUNT PERMITTED BY THE BATCH TICKET. CONCRETE AT PLACEMENT TIME WHICH DOES NOT MEET THE SPECIFIED SLUMP OR AIR CONTENT SHALL BE REFUSED BY THE CONTRACTOR.
 - F. ALL REINFORCING STEEL SHALL BE ASTM A615-GRADE 60, (INCLUDING #4 AND #5 BARS).
 - G. REINFORCING STEEL SHALL BE FABRICATED AND PLACED IN ACCORDANCE WITH THE ACI MANUAL OF STANDARD PRACTICE.
 - H. CONCRETE PROTECTION FOR REINFORCEMENT:
 - 1) CONCRETE PLACED AGAINST EARTH: 3"
 - 2) CONCRETE PLACED IN FORMS AND EXPOSED TO EARTH, WEATHER OR WATER (PRINCIPAL REINFORCEMENT): 2"
 - 3) TIES AND STIRRUPS: 1 1/2"
 - I. NO SPLICES OR WELDING OF REINFORCEMENT SHALL BE MADE EXCEPT AS DETAILED OR AUTHORIZED BY THE ENGINEER. LAP SPLICES, WHERE PERMITTED, SHALL BE 24" MINIMUM UNLESS OTHERWISE NOTED.
 - J. DETAIL BARS IN ACCORDANCE WITH THE LATEST EDITIONS OF THE ACI DETAILING MANUAL AND ACI BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE. PROVIDE ALL ACCESSORIES NECESSARY TO SUPPORT REINFORCING AT THE POSITIONS SHOWN ON THE PLANS OR AS NOTED ABOVE.
 - K. SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL, IN REPRODUCIBLE FORM, OF ALL REINFORCING STEEL PRIOR TO FABRICATION.
 - L. PROVIDE 2-#5 BARS WITH 2"-0" PROJECTION AROUND ALL OPENINGS IN CONCRETE.
 - M. DOWELS FROM MAT SLABS TO WALLS AND COLUMNS SHALL BE INSTALLED PRIOR TO PLACEMENT OF CONCRETE IN THE FOOTINGS AND SHALL BE IN PLACE WHEN THE REINFORCING BAR INSPECTION FOR THE FOOTINGS TAKES PLACE.
 - N. PROVIDE CORNER BARS AT ALL WALL INTERSECTIONS. SIZE AND SPACING OF BARS SHALL MATCH HORIZONTAL WALL REINFORCING. DO NOT PLACE CORNER BARS FROM "INSIDE FACE TO INSIDE FACE". PROVIDE THREE CORNER BARS TYPICAL FOR DOUBLE MAT WALLS AT 90 DEGREE CORNERS.
 - O. SLABS, GRADE BEAMS AND WALLS SHALL NOT HAVE JOINTS IN A HORIZONTAL PLANE. ANY STOP IN CONCRETE WORK SHALL BE MADE WITH VERTICAL BULKHEADS AND HORIZONTAL KEYS, UNLESS OTHERWISE SHOWN. ALL CONSTRUCTION JOINTS SHALL BE AS DETAILED OR APPROVED BY THE ENGINEER.
 - P. CONTRACTOR SHALL PROVIDE PROTECTION AND INSULATION OF CONCRETE AGAINST MOISTURE, PREMATURE CURING, HOT WEATHER, FREEZING TEMPERATURES, ETC. DAMAGED CONCRETE SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
 - Q. CONCRETE CYLINDER TESTING SHALL BE PROVIDED FOR CONCRETE. ONE SET OF CYLINDERS SHALL BE TAKEN FROM THE FIRST TRUCKLOAD EACH DAY, AND A MINIMUM OF ONE ADDITIONAL SET FOR EACH 50 YARDS OF CONCRETE PLACED THEREAFTER. CONCRETE NOT MEETING THE SPECIFIED STRENGTH AT 28 DAYS SHALL BE TESTED WITH CORE-DRILLED SPECIMENS AS OUTLINED IN THE ACI CODE, AT THE CONTRACTOR'S EXPENSE. CONCRETE NOT MEETING THE SPECIFIED STRENGTH BASED ON CORE TESTING SHALL BE REMOVED AND REPLACED AT THE CONTRACTOR'S EXPENSE.
 - R. PERIODIC SPECIAL INSPECTION IS REQUIRED FOR PLACEMENT OF REINFORCING STEEL AND CONCRETE, PER UBC SEC. 1701.5.
4. STEEL:
 - A. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36, UNLESS OTHERWISE NOTED. STEEL PIPE SHALL CONFORM TO ASTM A53, GRADE B.
 - B. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST EDITIONS OF THE AISC MANUAL OF STEEL CONSTRUCTION—ALLOWABLE STRESS DESIGN, AND AISC CODE OF STANDARD PRACTICE.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL DIMENSIONS AND TO IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES, CONDITIONS NOT SHOWN OR THAT WHICH DIFFER FROM THOSE SHOWN ON THE DRAWINGS.
6. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING A SAFE WORKING ENVIRONMENT FOR ALL TRADES, AND FOR COMPLIANCE WITH ALL OSHA AND SAFETY RELATED REGULATIONS.



VICINITY MAP
N.T.S.



PROJECT LOCATION MAP
N.T.S.

ESTIMATED QUANTITIES		
ITEM	UNIT	QTY
DEMO EXISTING STRUCTURE	LS	1
STRUCTURAL FILL	CY	65
STRUCTURAL CONCRETE	CY	74
CATWALKS, LADDER AND GUARDRAILS	SF	205
INSTALL CITY FURNISHED CMP (16 GA.) (ESTIMATED TO BE 36")	LF	20
FURNISH & INSTALL OVERSHOT GATE	LS	1
FURNISH & INSTALL CONTROL PEDESTAL w/ SOLAR POWER	LS	1
FURNISH & INSTALL 24"x24" SLIDE GATE	EA	1
FURNISH AND INSTALL STILLING WELL ASSEMBLY	EA	1
NON-STRUCTURAL BACKFILL	CY	51
CLEANUP AND DEMOBILIZATION	LS	1

SHEET INDEX	
SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET
2	EXISTING STRUCTURE DEMOLITION PLAN
3	PROPOSED DIVERSION SITE PLAN
4	PROPOSED DIVERSION SECTIONS & STRUCTURAL DETAILS
5	PROPOSED DIVERSION SECTIONS & STRUCTURAL DETAILS
6	PROPOSED DIVERSION SECTIONS & STRUCTURAL DETAILS
7	CATWALK PLAN AND DETAILS
8	CATWALK, LADDER AND GUARDRAIL DETAILS
9	STILLING WELL AND ARMTEC POWER PEDESTAL DETAILS

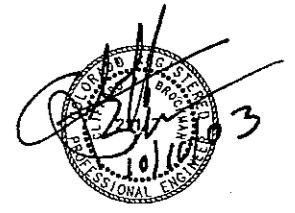
ALL WORK SHALL BE CONSTRUCTED TO THE CITY OF GREELEY STANDARD SPECIFICATIONS.

APPROVED: *Wilhelm Schuler* 10/24/03
CITY OF GREELEY DIRECTOR OF PUBLIC WORKS DATE

APPROVED: *Jimman* 10/24/03
CITY OF GREELEY DIRECTOR OF WATER & SEWER DATE

APPROVE: *Cliff Brockman* 10-29-03
THE GREELEY IRRIGATION COMPANY
REVIEW & APPROVE FOR CONSTRUCTION DATE

COG TO PROVIDE REINFORCING TESTS

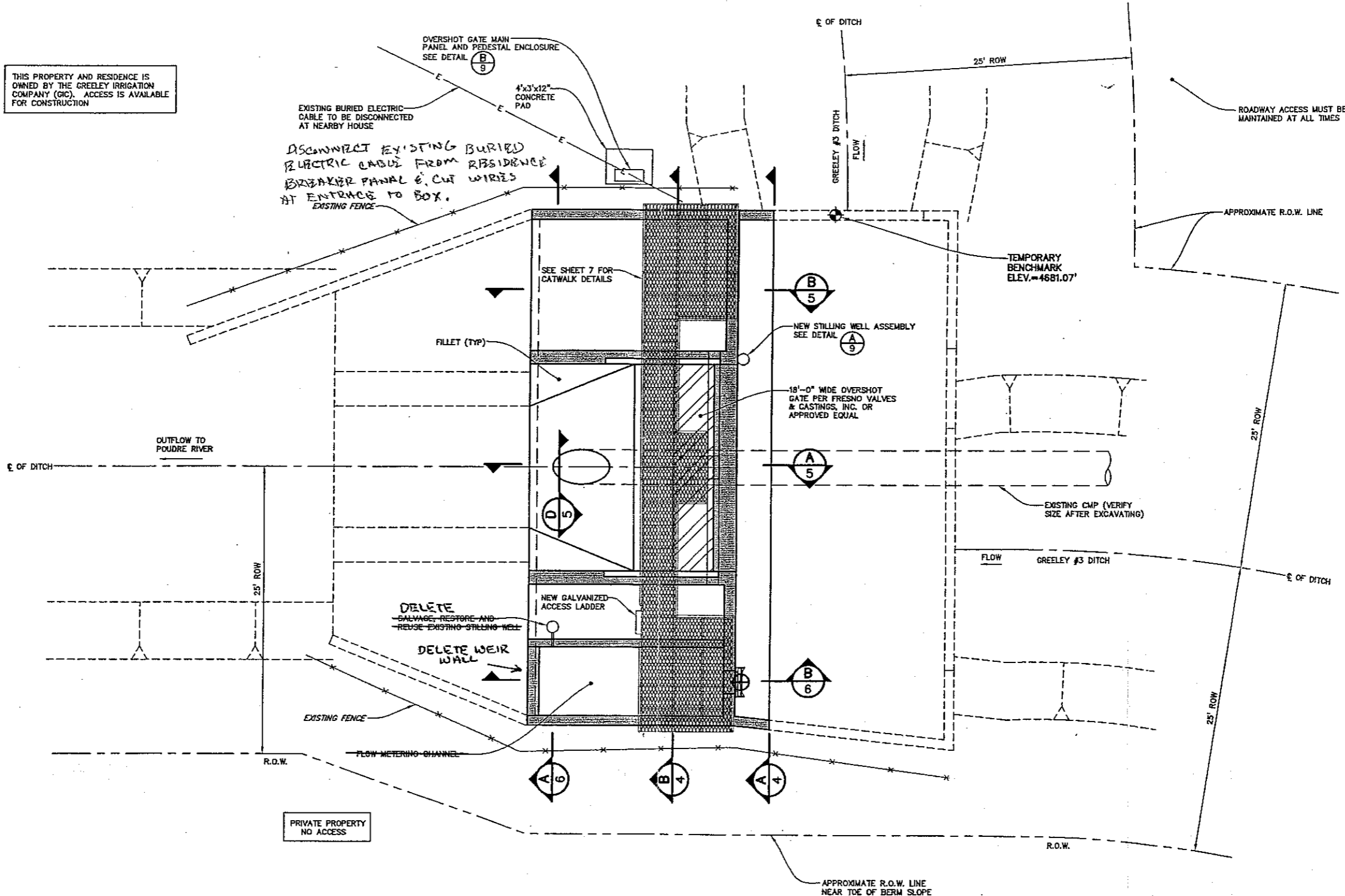


NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

REVISION DESCRIPTIONS	DATE

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W:\EW11\DWGS\1174SP01.dwg, SP01, 10/10/2003 9:24:30 AM, el, Barrell & Co., taw



PLAN VIEW
SCALE: 1" = 5'-0"

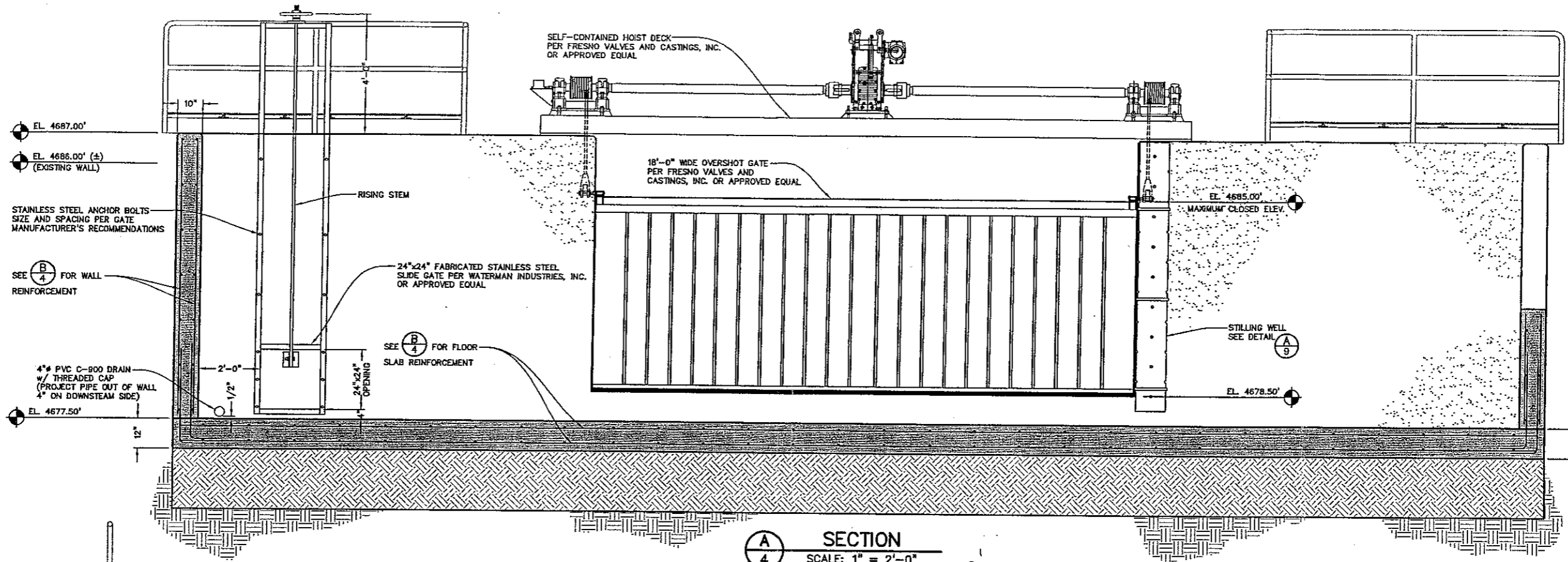
[Handwritten Signature]
10/10/03
PROFESSIONAL ENGINEER

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

PREPARED BY: Drexel, Barrell & Co. Engineers Surveyors 4840 PEARL EAST CIRCLE, SUITE 114 BOULDER, COLORADO 80301 (303) 442-4338 6365 CORPORATE DRIVE COLORADO SPRINGS, COLORADO 80919 (719) 260-0887 910 54TH AVENUE, SUITE 210 GREELEY, COLORADO 80634 (970) 351-0645 CONTACT: CLIFF BROCKMAN	PREPARED FOR: CITY OF GREELEY 1001 9th AVENUE GREELEY, COLORADO 80631 (970) 336-4121 CONTACT: BERT LEUTAUD	PROJECT INFO: CLARKSON DIVERSION ON THE GREELEY #3 DITCH GREELEY, COLORADO	DESIGNED BY: CRB	REVISION DESCRIPTIONS	DATE	DRAWING INFO.	DATE: 08 OCT 2003	JOB NO: EW 1174.1	SHEET: 3
			DRAWN BY: TAW	CHECKED BY:	SCALE: H: 1"=5' V: N/A	DRAWING NO.: 5D 903	SHEETS: 9		

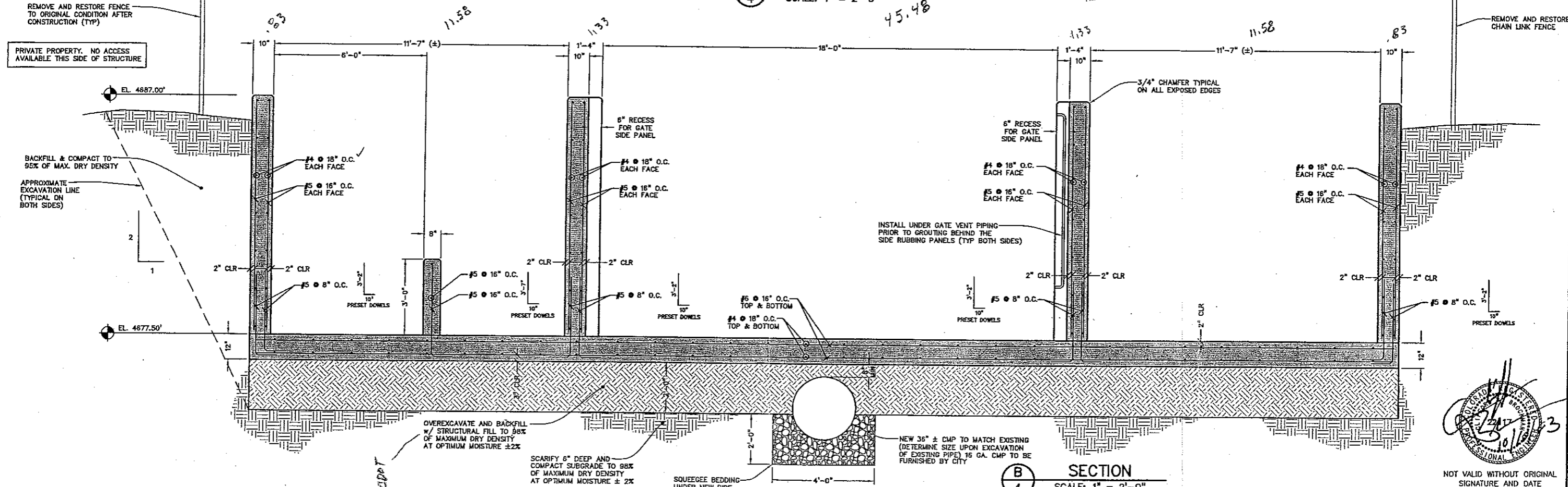
SITE PLAN

W:\EW1\DWGS\1174DT01.dwg, SHT-1, 10/10/2003 9:25:43 AM Drexel, Barrell & Co., taw



A SECTION
SCALE: 1" = 2'-0"

WASTE PIPES
MATERIAL AND
CAP STEEL



B SECTION
SCALE: 1" = 2'-0"

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

PREPARED BY: **Drexel, Barrell & Co.** Engineers - Surveyors
4840 PEARL EAST CIRCLE, SUITE 114 BOULDER, COLORADO 80301 (303) 442-4338
6365 CORPORATE DRIVE COLORADO SPRINGS, COLORADO 80919 (719) 260-0687
910 54TH AVENUE, SUITE 210 GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: CLIFF BROCKMAN

PREPARED FOR: **CITY OF GREELEY**
1001 9th AVENUE
GREELEY, COLORADO 80631
(970) 336-4121
CONTACT: BERT LEAULTAUD

PROJECT INFO: **CLARKSON DIVERSION ON THE GREELEY #3 DITCH**
GREELEY, COLORADO

DESIGNED BY: CRB
DRAWN BY: TAW
CHECKED BY:
REVISION DESCRIPTIONS
DATE

DRAWING INFO: **PROPOSED DIVERSION SECTIONS AND STRUCTURAL DETAILS**

DATE: 08 OCT 2003
SCALE: H: 1"=5' V: N/A
JOB NO: EW 1174.1
DRAWING NO: 5D 903
SHEET: 4 OF 9

APPENDIX B

***ELECTRONIC FILES:
UNSTEADY FLOW HYDRAULIC MODELS
[HEC-RAS VERSIONS 3.1.2 (EXISTING CONDITION)
AND 3.1.3 (PROPOSED CONDITION)]***
