FORM 5

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE/COASTAL MAPPING FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden, to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

Community Name: Colorado Springs, City of

Flooding Source: Peterson Field Drainage Basin

Project Name/Identifier: Peterson Field Drainage BAsin LOMR

1. MAPPING CHANGES

1. A topographic work map of suitable scale, contour interval, and planimetric definition must be submitted showing *(indicate N/A when not applicable)*:

		Included		
A.	Revised approximate 100-year floodplain boundaries (Zone A)	☐ Yes	☐ No	☒ N/A
B.	Revised detailed 100- and 500-year floodplain boundaries	☒ Yes	☐ No	☐ N/A
C.	Revised 100-year floodway boundaries	☒ Yes	☐ No	☐ N/A
D.	Location and alignment of all cross sections used in the revised hydraulic model with stationing control indicated	☒ Yes	☐ No	☐ N/A
E.	Stream alignments, road and dam alignments	☒ Yes	☐ No	☐ N/A
F.	Current community boundaries	☐ Yes	☒ No	☐ N/A
G.	Effective 100- and 500-year floodplain and 100-year floodway boundaries from the FIRM/FBFM reduced or enlarged to the scale of the topographic work map	☒ Yes	☐ No	☐ N/A
H.	Tie-ins between the effective and revised 100- and 500-year floodplains and 100-year floodway boundaries	☒ Yes	☐ No	☐ N/A
I.	The requestor's property boundaries and community easements	☐ Yes	☒ No	☐ N/A
J.	The signed certification of a registered professional engineer	☒ Yes	☐ No	☐ N/A
K.	Location and description of reference marks	☒ Yes	☐ No	☐ N/A
L.	Vertical datum (example: NGVD, NAVD etc.)	☒ Yes	☐ No	☐ N/A
M.	Coastal zone designations tie into adjacent areas not being revised	☐ Yes	☐ No	☒ N/A
N.	Location and alignment of all coastal transects used to revise the coastal analyses	☐ Yes	☐ No	☒ N/A

If any of the items above are marked no or N/A, please explain: (A)Detailed analysis was conducted for the 100 and 500 year flood. (F)Entire location within community boundary. (I)Channel located within community drainage easement. (M)(N)Analysis does not include coastal zone.

2. What is the source and date of the updated topographic information *(example: orthophoto maps, July 1985; field survey, May 1979, beach profiles, June 1987, etc.)*? Colorado Springs FIMS data, 1997

3. What is the scale and contour interval of the following workmaps?

   a. Effective FIS 500 scale N/A Contour interval

   b. Revision Request 200 scale 2' Contour interval

NOTE: Revised topographic information must be of equal or greater detail.

4. Attach an annotated FIRM and FBFM at the scale of the effective FIRM and FBFM showing the revised 100-year and 500-year floodplains and the 100-year floodway boundaries and how they tie into those shown on the effective FIRM and FBFM downstream and upstream of the revision or adjacent to the area of revision for coastal studies.

   Attach additional pages if needed.

5. Flood Boundaries and 100-year water surface elevations:

Has the 100-year floodplain been shifted or increased or the 100-year water surface elevation increased at any location on property other than the requestor's or community's ? ☒ Yes ☐ No

If yes, please give the location of shift or increase and an explanation for the increase.

The floodplain has been shifted into existing concrete channel improvements between section AB and AH. Shifting has occured near Chelton Road due to the installation of temporary drainage facilities.

a. Have the affected property owners been notified of this shift or increase and the effect it will have on their property? ..... ☒ Yes ☐ No

If yes, please attach letters from these property owners stating they have no objections to the revised flood boundaries if a LOMR is being requested.

b. What is the number of insurable structures that will be impacted by this shift or increase? 56

6. Have the floodway boundaries shifted or increased at any location compared to those shown on the effective FBFM or FIRM? ..... ☒ Yes ☐ No

If yes, explain:

Floodway boundaries have been identified within existing permanent and temporary channel improvements as shown in the attached mapping.

7. If a V- zone has been designated, has it been delineated to extend landward to the heel of the primary frontal dune? ☐ Yes ☒ No

If no, explain:

V-zone is not within analysis limits.

8. Manual or digital map submission:

☒ Manual

☐ Digital Available upon request.

Digital map submissions may be used to update digital FIRMs (DFIRMs). For updating DFIRMs, these submissions must be coordinated with FEMA Headquarters as far in advance of submission as possible.

2. EARTH FILL PLACEMENT

1. The fill is: ☐ Existing ☐ Proposed

2. Has fill been/will be placed in the regulatory floodway? ..... ☐ Yes ☑ No
   If yes, please attach completed Riverine Hydraulic Analysis Form.

3. Has fill been/will be placed in floodway fringe *(area between the floodway and 100-year floodplain boundaries)*? ..... ☑ Yes ☐ No

   If yes, then complete A, B, C, and D below.

   A. Are fill slopes for granular materials steeper than one vertical on one-and-one-half horizontal? ..... ☐ Yes ☐ No

      If yes, justify steeper slopes_____

   B. Is adequate erosion protection provided for fill slopes exposed to moving flood waters? *(Slopes exposed to flows with velocities of up to 5 feet per second (fps) during the 100-year flood must, at a minimum, be protected by a cover of grass, vines, weeds, or similar vegetation; slopes exposed to flows with velocities greater than 5 fps during the 100-year flood must, at a minimum, be protected by stone or rock riprap.)* ..... ☐ Yes ☐ No

      If no, describe erosion protection provided_____

   C. Has all fill placed in revised 100-year floodplain been compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test Method or acceptable equivalent method? ☐ Yes ☐ No

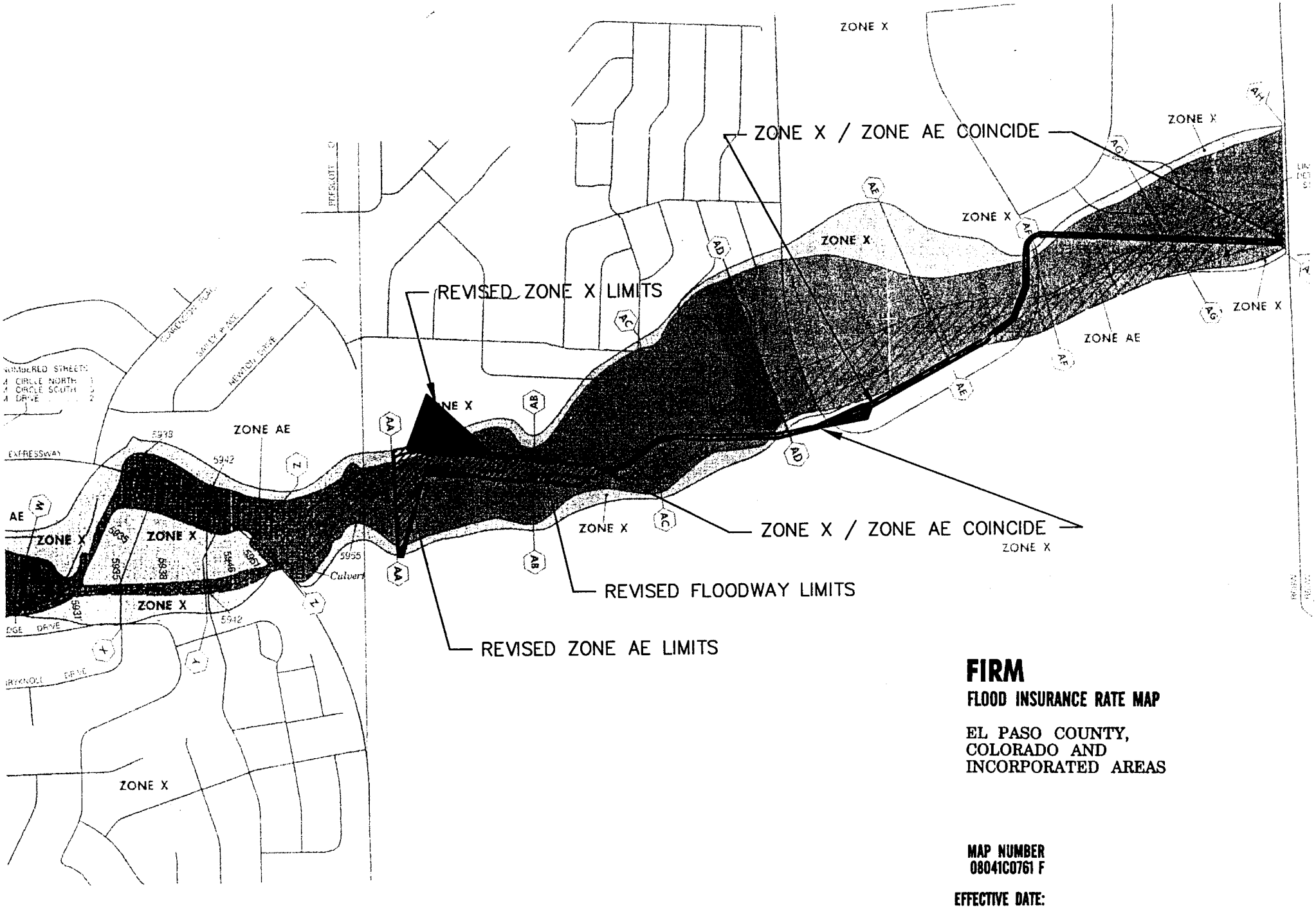
   D. Can structures conceivably be constructed on the fill at any time in the future? ☐ Yes ☐ No

   If yes, provide certification of fill compaction (item C. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer.

4. Has fill been/will be placed in a V-zone? ☐ Yes ☐ No

   If yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall? ☐ Yes ☐ No

   If yes, attach the coastal structures form.



FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

MAP NUMBER
08041C0761 F

EFFECTIVE DATE:
MARCH 17, 1997

FORM 6

FEDERAL EMERGENCY MANAGEMENT AGENCY **CHANNELIZATION FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

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Community Name: Colorado Springs, City of

Flooding Source: Peterson Field Drainage Basin

Project Name/Identifier: Peterson Field Drainage Basin LOMR

1. EXTENT OF CHANNELIZATION

Downstream limit: 11858

Upstream limit: 13000

2. CHANNEL DESCRIPTION

1. Describe the inlet to the channel Inlet is preceeded by 55 feet of rip rap lined channel

2. Briefly describe the shape of the channel *(both cross sectional and planimetric configuration)* and its lining *(channel bottom and sides)* The channel is trapezoidal with B=25' to 30', Z=3', D=5' to 6'. Channel lining consists of grass.

3. Describe the outlet from the channel Outlet of channel discharges into existing temporary improvements CONSISTING OF 5-60"x40" CMPA CROSSING CHELTON ROAD.

4. The channelization includes:

- ☐ Levees *(Attach Levee Form)*
- ☒ Drop structures
- ☐ Superelevated sections
- ☐ Transitions in cross sectional geometry
- ☐ Debris basin/detention basin
- ☐ Energy dissipater
- ☐ Other

5. Attach the following:

a. Certified engineering drawings showing channel alignment and locations of inlet, outlet, and items checked in item 4 SEE ATTACHMENT FORM 6

b. Typical cross sections and profiles of channel banks and invert

3. HYDRAULIC CONSIDERATIONS

1. What is the 100-year discharge? ..... 2470 cfs
2. Do the cross sections in the hydraulic model match the typical cross sections in the plans? ☒ Yes ☐ No
3. Are the channel banks higher than the 100- year flood elevations everywhere? ..... ☐ Yes ☒ No
4. Are the channel banks higher than the 100-year flood energy grade lines everywhere? .. ☐ Yes ☒ No
5. Is the land on both sides of the channel above the adjacent 100-year flood elevation at all points along the channel? ..... ☒ Yes ☐ No
6. What is the range of freeboard? ..... 0 – 4.9 feet
7. What is the range of the 100-year flood velocities? ..... 4.9 – 10.7 ft/sec
8. What is the lining type? (both bottom and sides) grass lined throughout

   Explain how the channel lining prevents erosion and maintains channel stability *(attach documentation)*
   Grass lining will provide adequate protection during low flow by stabilizing soil with vegetation.
9. What is the design elevation in the channel based on?

   ☒ Subcritical flow
   ☐ Critical flow
   ☐ Supercritical flow
   ☐ Energy grade line

   Is 100-year flood profile based on the above type of flow? ..... ☒ Yes ☐ No

   If no, explain: _____
10. Is there the potential for a hydraulic jump at the following locations?

    Inlet to channel ..... ☐ Yes ☒ No
    Outlet of channel ..... ☐ Yes ☒ No
    At Drop Structures ..... ☒ Yes ☐ No
    At Transitions ..... ☐ Yes ☒ No
    Other locations. Explain: Inlet to 5-60" x 40" CMP

    If the answer to any of the above is yes, please explain how the hydraulic jump is controlled and the effects of the hydraulic jump on the stability of the channel.

    Explain: The hydraulic jump will occur at the entrance to the 5-60"x40" CMPA d/s of section 11058. The drop is lined with rip rap to protect the channel at the inlet.

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year water surface elevations and/or the capacity of the channel? ..... ☐ Yes ☒ No

   B. Based on the conditions of the watershed and stream bed, is there a potential for sediment transport (including scour and deposition) to affect the 100-year water surface elevations and /or the capacity of the channel? ..... ☐ Yes ☒ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment (bed) load?
   _____cfs (attach gradation curve)

   Explain method used to estimate load_____

   _____

   _____

   _____

   _____

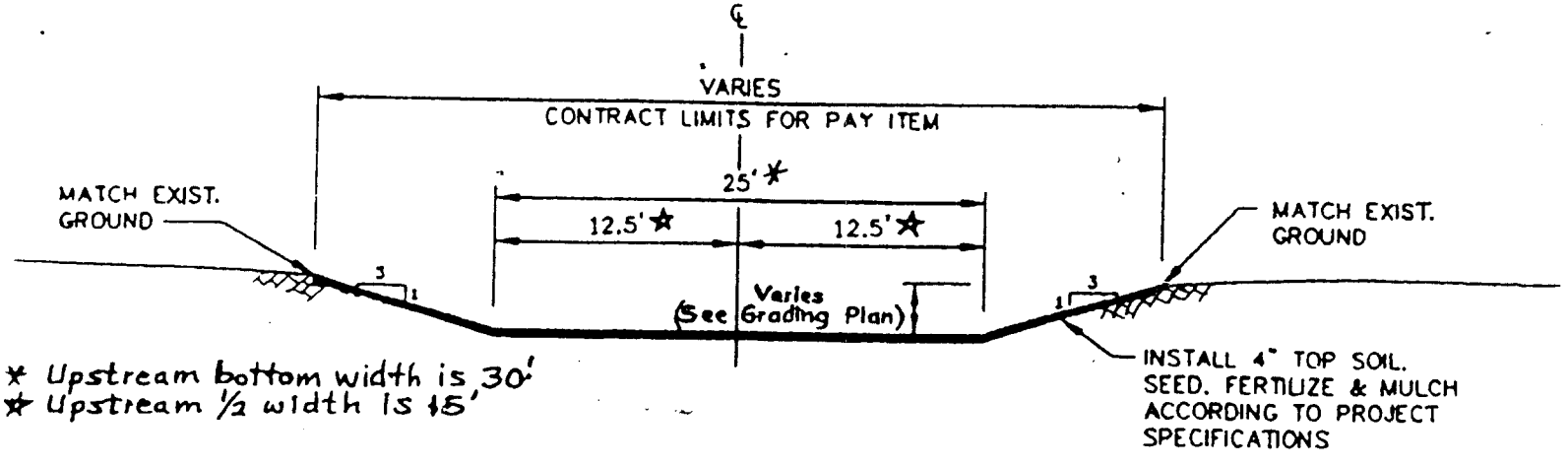
   B. Is the 100-year flood velocity anywhere within the channel less than the 100-year flood velocity of the inlet? ☐ Yes ☐ No

   C. Will sediment accumulate anywhere within the channel? ☐ Yes ☐ No

   D. Will deposition or scour occur at or near the inlet? ☐ Yes ☐ No

   E. Will deposition or scour occur at or near the outlet? ☐ Yes ☐ No

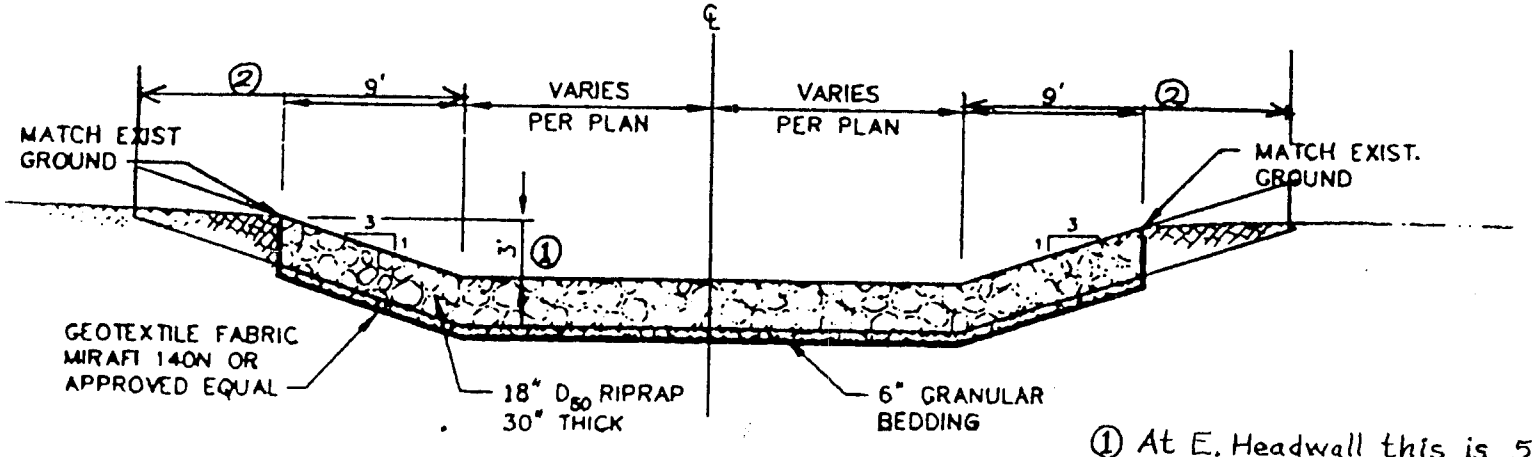
Attach documentation showing affects on the Hydrologic and Hydraulic analyses



* Upstream bottom width is 30'
☆ Upstream ½ width is 15'

SECTION A–A
TEMPORARY GRASS LINED CHANNEL

SCALE: 1" = 10'



① At E. Headwall this is 5.6'
② Varies upstream of E. Headwall. See Sht. 12 profile.

SECTION B–B
RIPRAP LINED CHANNEL

SCALE: 1" = 10'

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Community Name: Colorado Springs, City of

Flooding Source: Peterson Field Drainage Basin

Project Name/Identifier: Peterson Field Drainage Basin LOMR

1. EXTENT OF CHANNELIZATION

Downstream limit: 13000

Upstream limit: 17510

2. CHANNEL DESCRIPTION

1. Describe the inlet to the channel Inlet consists of a rip rap apron and transitions into the trapezoidal cross-section

2. Briefly describe the shape of the channel *(both cross sectional and planimetric configuration)* and its lining *(channel bottom and sides)* The channel is trapeziodal with B varies from 6' to 14', Z=1.5', D=8' to 9'

3. Describe the outlet from the channel Outlet discharges into a rip rap lined transition channel.

4. The channelization includes:

   - ☐ Levees *(Attach Levee Form)*
   - ☐ Drop structures
   - ☐ Superelevated sections
   - ☒ Transitions in cross sectional geometry
   - ☐ Debris basin/detention basin
   - ☐ Energy dissipater
   - ☒ Other Portions of the channel consist of long sections of box culverts. These culverts were modeled as open channels.

5. Attach the following:

   a. Certified engineering drawings showing channel alignment and locations of inlet, outlet, and items checked in item 4 SEE ALSO ATTACHMENT FORM 6

   b. Typical cross sections and profiles of channel banks and invert

3. HYDRAULIC CONSIDERATIONS

1. What is the 100-year discharge? ..... 1470 - 2470 cfs
2. Do the cross sections in the hydraulic model match the typical cross sections in the plans? ☒ Yes ☐ No
3. Are the channel banks higher than the 100- year flood elevations everywhere? ..... ☒ Yes ☐ No
4. Are the channel banks higher than the 100-year flood energy grade lines everywhere? .. ☐ Yes ☒ No
5. Is the land on both sides of the channel above the adjacent 100-year flood elevation at all points along the channel? ..... ☒ Yes ☐ No
6. What is the range of freeboard? ..... 1.5 - 5.1 feet
7. What is the range of the 100-year flood velocities? ..... 13.8 - 39.3 ft/sec
8. What is the lining type? (both bottom and sides) Lining is concrete throughout.

   Explain how the channel lining prevents erosion and maintains channel stability *(attach documentation)*
   Concrete is a highly durable material for channel stability
9. What is the design elevation in the channel based on?

   ☐ Subcritical flow
   ☐ Critical flow
   ☒ Supercritical flow
   ☐ Energy grade line

   Is 100-year flood profile based on the above type of flow? ..... ☒ Yes ☐ No

   If no, explain:
10. Is there the potential for a hydraulic jump at the following locations?

    Inlet to channel ..... ☐ Yes ☒ No
    Outlet of channel ..... ☒ Yes ☐ No
    At Drop Structures ..... ☒ Yes ☐ No
    At Transitions ..... ☐ Yes ☒ No
    Other locations. Explain:

    If the answer to any of the above is yes, please explain how the hydraulic jump is controlled and the effects of the hydraulic jump on the stability of the channel.

    Explain: Channel flow is predominatly supercritical flow and discharges into a subcritical flow regime. A hydraulic jump will occur at this location. A zero slope large rip rap transition channel is utilized for the anticipated length of the hydraulic jump. A series of 4' drops at the upper reach would likely experience hydraulic jumps. The jumps will be contained within the channel.

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year water surface elevations and/or the capacity of the channel? ..... ☐ Yes ☒ No

   B. Based on the conditions of the watershed and stream bed, is there a potential for sediment transport (including scour and deposition) to affect the 100-year water surface elevations and /or the capacity of the channel? ..... ☐ Yes ☒ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment (bed) load?
   _____cfs (attach gradation curve)

   Explain method used to estimate load_____

   _____

   _____

   _____

   _____

   B. Is the 100-year flood velocity anywhere within the channel less than the 100-year flood velocity of the inlet? ☐ Yes ☐ No

   C. Will sediment accumulate anywhere within the channel? ☐ Yes ☐ No

   D. Will deposition or scour occur at or near the inlet? ☐ Yes ☐ No

   E. Will deposition or scour occur at or near the outlet? ☐ Yes ☐ No

Attach documentation showing affects on the Hydrologic and Hydraulic analyses

FORM 7

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	FEMA USE ONLY

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Community Name: Colorado Springs, City of

Flooding Source: PETERSON FIELD DRAINAGE BASIN

Project Name/Identifier: PETERSON FIELD DRAINAGE BASIN LOMR

1. IDENTIFIER

1. Name of roadway, railroad, etc.: MASON DRIVE
2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier): SECTION 13525 TO 13000
3. This revision reflects *(check one of the following)*:
   - ☒ New bridge/culvert not modeled in the FIS
   - ☐ Modified bridge/culvert previously modeled in the FIS
   - ☐ New analysis of bridge/culvert previously modeled in the FIS

   (Explain why new analysis was performed)

2. BACKGROUND

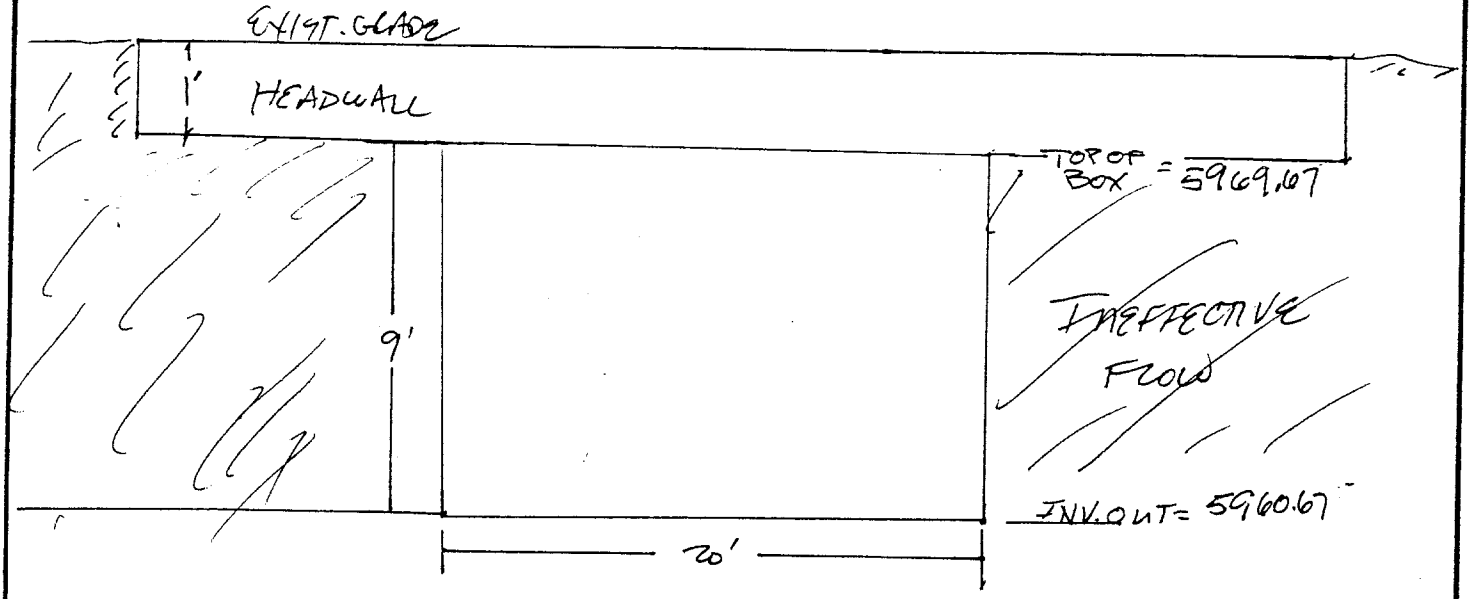
Provide the following information about the structure:

1. Dimension, material, and shape (e.g. two 10 x 5 feet reinforced concrete box culvert; three 30-foot span bridge with 2 rows of two 3- foot diameter circular piers; 40-foot wide ogee shape spillway) CAST-IN-PLACE 20 x 9 feet REINFORCED CONCRETE BOX CULVERT
2. Entrance geometry of culvert/type of bridge opening (e.g. 30 ° - 75 ° wing walls with square top edge, sloping embankments and vertical abutments) 10° WINGWALLS WITH SQUARE TOP EDGE, GRADUAL TRANSITION
3. Hydraulic model used to analyze the structure (*e.g., HEC-2 with special bridge routine, WSPRO, HY8*) CULVERT MODELED AS OPEN CHANNEL USING EXPANSION/CONTRACTION COEFF @ ENTRANCE/EXIT.

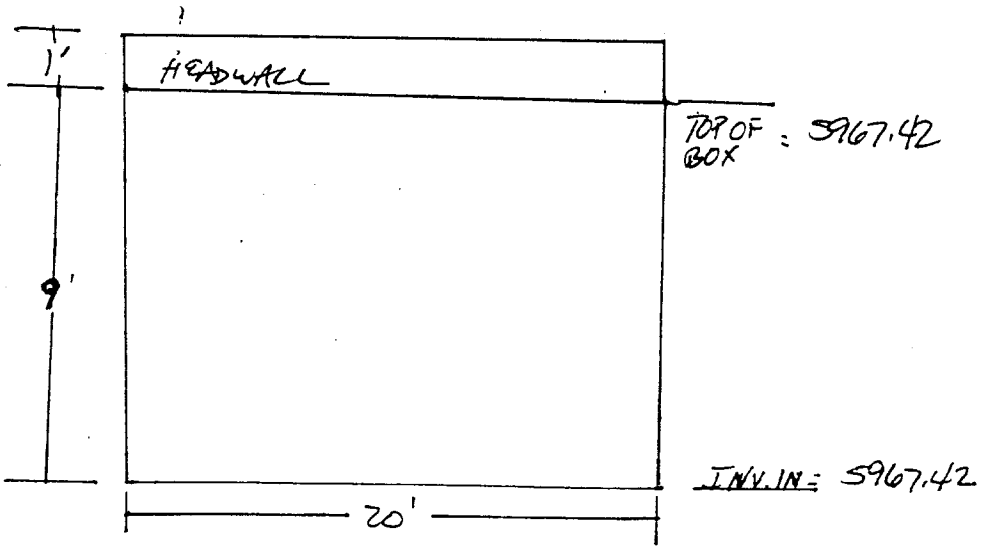
   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Note: If any items do not apply to submitted hydraulic analysis, indicate by N/A
*** One form per new/revised bridge/culvert**

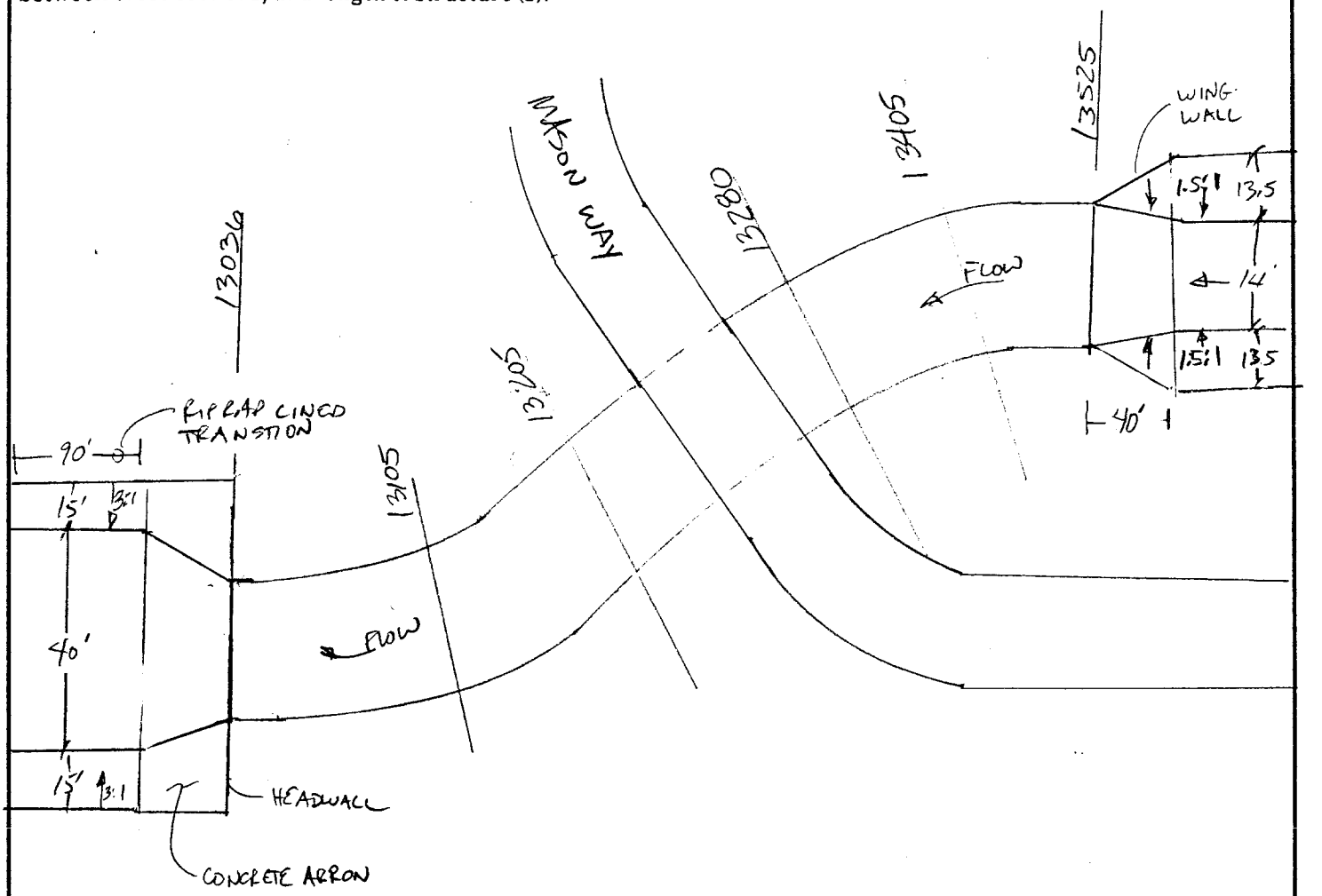
Sketch the downstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, minimum top of road elevation, and ineffective flow widths.



Sketch the upstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, and minimum top of road elevation.



Sketch the plan view of the structure(s) Show, at a minimum, the skew angle, cross-section locations, distances between cross sections, and length of structure (s).



Attach plans of the structure (s) certified by a registered Professional Engineer.

Culvert length or bridge width (ft)	489
Calculated culvert/bridge area (ft²) by the hydraulic model, if applicable	180 ft²
Total culvert/bridge area (ft²)	180 ft²

Elevations Above Which Flow is Effective for Overbanks

	Left Overbank	Right Overbank
Upstream face	5968.67	5968.67
Downstream face	5970.67	5970.67

Minimum Top of Road Elevation

	Left Overbank	Right Overbank
Upstream face	5976.42	5976.42
Downstream face	5996.67	5996.67

100-Year Elevations	Water Surface Elevations	Energy Gradient Elevations
Upstream face	5972.02	5983.22
Downstream face	5965.47	5975.60

Discharge	Low Flow	Pressure Flow	Weir Flow	Total Flow
Amount of flow through/over the structure (s) (cfs)	2470	0	0	2470

The maximum depth of flow over the roadway/railroad (ft.)	0
Weir length (ft.)	0

Top Widths	Total Floodplain Width	Total Effective Flow Width	Floodway Width
Upstream face	20'	20'	20'
Downstream face	20'	20'	20'

Loss Coefficients

Entrance loss coefficient	N/A
Manning's "n" value assigned to the structure(s)	.013
Friction loss coefficient through structure (s)	
Other loss coefficients (e.g., bend manhole, etc.)	N/A
Total loss coefficient	N/A
Weir coefficient	N/A
Pier coefficient	N/A
Contraction loss coefficient	.50
Expansion loss coefficient	.30

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport *(including scour and deposition)* can affect the 100-year water surface elevations? ..... ☐ Yes ☒ No

   B Based on the conditions *(such as geomorphology, vegetative cover and development of the watershed and stream bed, and bank conditions)*, is there a potential for debris and sediment transport *(including scour and deposition)* to affect the 100-year water surface elevations and/or conveyance capacity through the bridge/culvert? ..... ☐ Yes ☒ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment *(bed material)* load?
   _____cfs *(attach gradation curve)*

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition_____

   B. Will sediment accumulate anywhere through the bridge/culvert? ☐ Yes ☐ No

   If yes, explain the impact on the conveyance capacity through the bridge/culvert?_____

5. FLOODWAY ANALYSIS

Explain method of bridge encroachment (floodway run) Encroachment station is based on left/right overbank station along culvert.

Comments (*explain any unusual situations*):

THIS CULVERT WAS MODELED AS AN OPEN CHANNEL DUE TO THE length. THE 100 & 500 YR FLOWS ARE CONTAINED WITHIN THE CULVERT.

Attach analysis.

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	FEMA USE ONLY

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Community Name: Colorado Springs, City of

Flooding Source: Petersonfield Drainage Basin

Project Name/Identifier: Peterson Field Drainage Basin LOMR

1. IDENTIFIER

1. Name of roadway, railroad, etc.: Powers Blvd.
2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier): Section 14317
3. This revision reflects *(check one of the following)*:

   XX New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

   (Explain why new analysis was performed)

2. BACKGROUND

Provide the following information about the structure:

1 Dimension, material, and shape (e.g. two 10 x 5 feet reinforced concrete box culvert; three 30-foot span bridge with 2 rows of two 3- foot diameter circular piers; 40-foot wide ogee shape spillway) Double 9x8 reinforced concrete box culvert with 0.83 foot wide pier

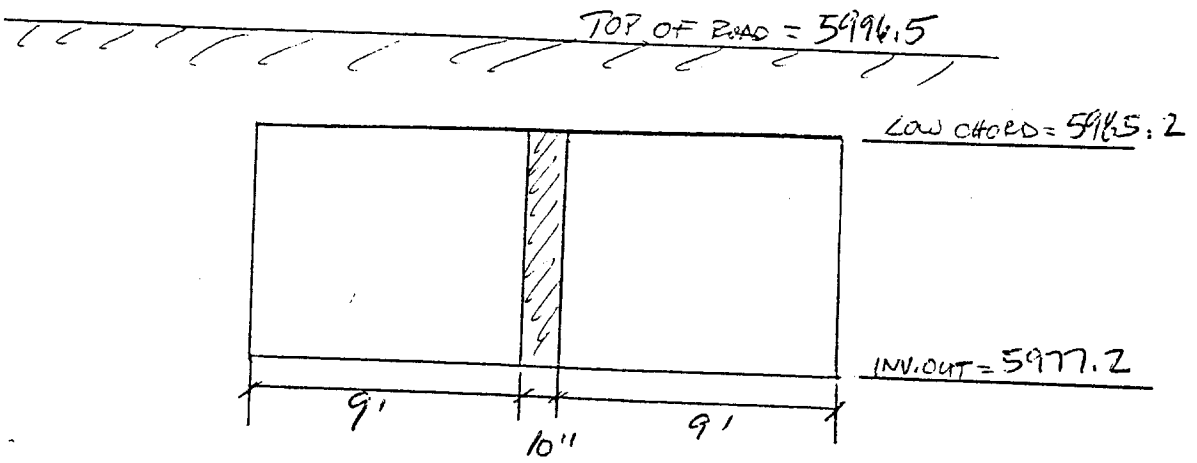
2. Entrance geometry of culvert/type of bridge opening (e.g. 30 ° - 75 ° wing walls with square top edge, sloping embankments and vertical abutments) 30°-75° wing walls with square top edge smooth transition from channel

3. Hydraulic model used to analyze the structure (*e.g., HEC-2 with special bridge routine, WSPRO, HY8*) HY-8

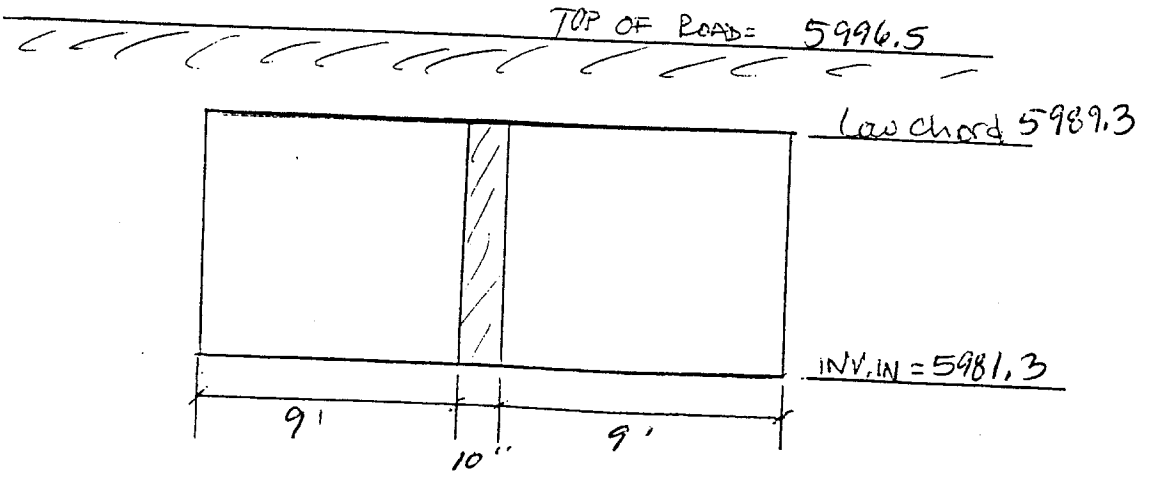
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Note: If any items do not apply to submitted hydraulic analysis, indicate by N/A
* One form per new/revised bridge/culvert

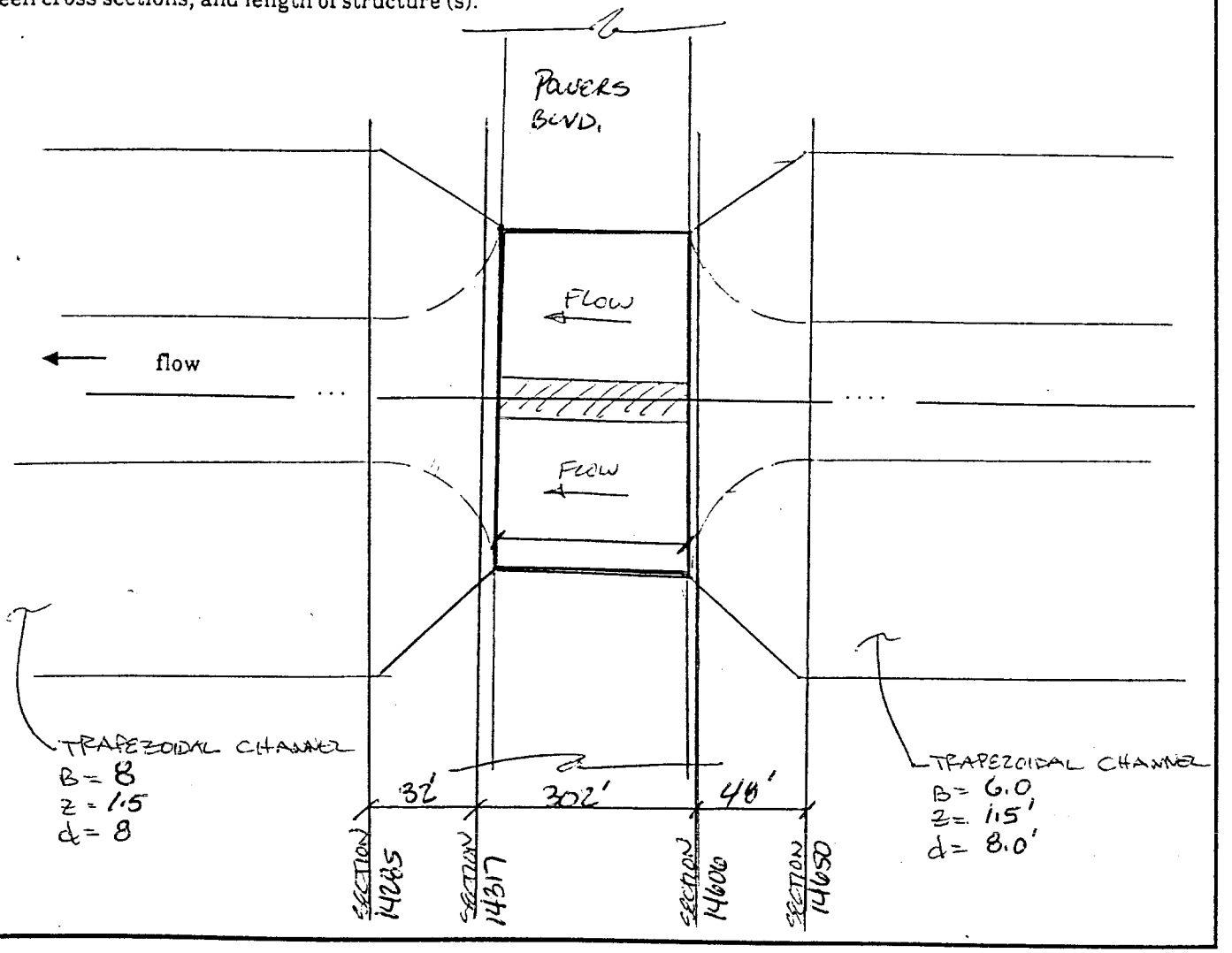
Sketch the downstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, minimum top of road elevation, and ineffective flow widths.



Sketch the upstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, and minimum top of road elevation.



Sketch the plan view of the structure(s) Show, at a minimum, the skew angle, cross-section locations, distances between cross sections, and length of structure (s).



Attach plans of the structure (s) certified by a registered Professional Engineer.

Culvert length or bridge width (ft)	302'
Calculated culvert/bridge area (ft²) by the hydraulic model, if applicable	144'
Total culvert/bridge area (ft²)	150.7'

Elevations Above Which Flow is Effective for Overbanks

	Left Overbank	Right Overbank
Upstream face	5989.3	5989.3
Downstream face	5988	5988

Minimum Top of Road Elevation

	Left Overbank	Right Overbank
Upstream face	5996.5	5996.5
Downstream face	5994.4	5994.4

100-Year Elevations	Water Surface Elevations	Energy Gradient Elevations
Upstream face	5987.1	5990.1
Downstream face	5983.0	5986.0

Discharge	Low Flow	Pressure Flow	Weir Flow	Total Flow
Amount of flow through/over the structure (s) (cfs)	1470	0	0	1470

The maximum depth of flow over the roadway/railroad (ft.)	0
Weir length (ft.)	0

Top Widths	Total Floodplain Width	Total Effective Flow Width	Floodway Width
Upstream face	20.2	20.2	20.2
Downstream face	20.2	20.2	20.2

Loss Coefficients

Entrance loss coefficient	N/A
Manning's "n" value assigned to the structure(s)	.012
Friction loss coefficient through structure (s)	N/A
Other loss coefficients (e.g., bend manhole, etc.)	N/A
Total loss coefficient	N/A
Weir coefficient	2.5
Pier coefficient	N/A
Contraction loss coefficient	N/A
Expansion loss coefficient	N/A

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport *(including scour and deposition)* can affect the 100-year water surface elevations? ..... ☐ Yes ☒ No

   B Based on the conditions *(such as geomorphology, vegetative cover and development of the watershed and stream bed, and bank conditions)*, is there a potential for debris and sediment transport *(including scour and deposition)* to affect the 100-year water surface elevations and/or conveyance capacity through the bridge/culvert? ..... ☐ Yes ☒ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment *(bed material)* load?
   _____cfs *(attach gradation curve)*

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition_____

   B. Will sediment accumulate anywhere through the bridge/culvert? ☐ Yes ☐ No

   If yes, explain the impact on the conveyance capacity through the bridge/culvert?_____

5. FLOODWAY ANALYSIS

Explain method of bridge encroachment (floodway run) Left / Right overbank Station used for Encroachment

Comments (*explain any unusual situations*):

Headwater / Tailwater water surface elevation used for Card X5 in channel analysis

Attach analysis.

CURRENT DATE: 06-11-1998 FILE DATE: 06-11-1998
CURRENT TIME: 18:07:32 FILE NAME: 167PWR

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

CULVERT NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS	SHAPE	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	5981.28	5977.17	302.17	2	RCB	9.00	8.00	.012	CONVENTIONAL
2									
3									
4									
5									
6									

SUMMARY OF CULVERT FLOWS (cfs) FILE: 167PWR DATE: 06-11-1998

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
0.00	360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5986.07	568.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5987.20	776.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5988.24	984.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5989.27	1192.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5990.33	1400.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5990.71	1470.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5992.76	1816.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5994.18	2024.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5995.76	2232.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5997.51	2440.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 167PWR DATE: 06-11-1998

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
0.00	0.000	360.00	0.00	0.00
5986.07	0.000	568.00	0.00	0.00
5987.20	0.000	776.00	0.00	0.00
5988.24	0.000	984.00	0.00	0.00
5989.27	0.000	1192.00	0.00	0.00
5990.33	0.000	1400.00	0.00	0.00
5990.71	0.000	1470.00	0.00	0.00
5992.76	0.000	1816.00	0.00	0.00
5994.18	0.000	2024.00	0.00	0.00
5995.76	0.000	2232.00	0.00	0.00
5997.51	0.000	2440.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 06-11-1998 FILE DATE: 06-11-1998
CURRENT TIME: 18:07:32 FILE NAME: 167PWR

PERFORMANCE CURVE FOR CULVERT 1 - 2(9.00 (ft) BY 8.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
360.00	5984.79	3.51	1.23	1-S2n	1.32	2.32	1.38	-1.75	14.48	25.84
568.00	5986.07	4.79	1.91	1-S2n	1.82	3.15	1.93	-1.34	16.39	29.73
776.00	5987.20	5.92	2.67	1-S2n	2.26	3.87	2.43	-1.00	17.72	32.61
984.00	5988.24	6.96	3.51	1-S2n	2.67	4.54	2.92	-0.71	18.74	34.93
1192.00	5989.27	7.99	4.45	1-S2n	3.06	5.16	3.36	-0.44	19.73	36.89
1400.00	5990.33	9.05	5.50	1-S2n	3.44	5.74	3.83	-0.20	20.31	38.59
1470.00	5990.71	9.43	5.87	1-S2n	3.56	5.93	3.98	-0.13	20.52	39.12
1816.00	5992.76	11.48	7.91	1-S2n	4.17	6.83	4.69	0.23	21.53	41.47
2024.00	5994.18	12.90	9.28	5-S2n	4.52	7.34	5.10	0.43	22.05	42.71
2232.00	5995.76	14.48	10.76	5-S2n	4.86	7.83	5.50	0.61	22.53	43.86
2440.00	5997.51	16.23	12.20	6-FFc	5.20	8.00	5.20	0.79	26.05	44.92

El. inlet face invert 5981.28 ft El. outlet invert 5977.17 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	5981.28 ft
OUTLET STATION	302.14 ft
OUTLET ELEVATION	5977.17 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0136
CULVERT LENGTH ALONG SLOPE	302.17 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	9.00 ft
BARREL RISE	8.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 06-11-1998 FILE DATE: 06-11-1998
CURRENT TIME: 18:07:32 FILE NAME: 167PWR

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH	8.00 ft
SIDE SLOPE H/V (X:1)	1.5
CHANNEL SLOPE V/H (ft/ft)	0.047
MANNING'S n (.01-0.1)	0.013
CHANNEL INVERT ELEVATION	5974.04 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	5977.17 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
360.00	5975.42	3.872	1.38	25.84	4.02
568.00	5975.83	3.918	1.79	29.73	5.20
776.00	5976.17	3.941	2.13	32.61	6.18
984.00	5976.46	3.955	2.42	34.93	7.04
1192.00	5976.73	3.966	2.69	36.89	7.81
1400.00	5976.97	3.974	2.93	38.59	8.51
1470.00	5977.04	3.977	3.00	39.12	8.74
1816.00	5977.40	3.987	3.36	41.47	9.77
2024.00	5977.60	3.992	3.56	42.71	10.34
2232.00	5977.78	3.997	3.74	43.86	10.87
2440.00	5977.96	4.001	3.92	44.92	11.39

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT	2.50
EMBANKMENT TOP WIDTH	300.00 ft

***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X ft	Y ft
1	0.00	5998.00
2	143.00	5996.00
3	217.00	5994.00
4	358.00	5992.00

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

Community Name: Colorado Springs, City of

Flooding Source: Peterson Field Drainage Basin

Project Name/Identifier: Peterson Field Drainage Basin LOMR

1. IDENTIFIER

1. Name of roadway, railroad, etc.: Zeplin Dr.
2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier): Section16010
3. This revision reflects *(check one of the following)*:
   - [X] New bridge/culvert not modeled in the FIS
   - [ ] Modified bridge/culvert previously modeled in the FIS
   - [ ] New analysis of bridge/culvert previously modeled in the FIS

   (Explain why new analysis was performed)

2. BACKGROUND

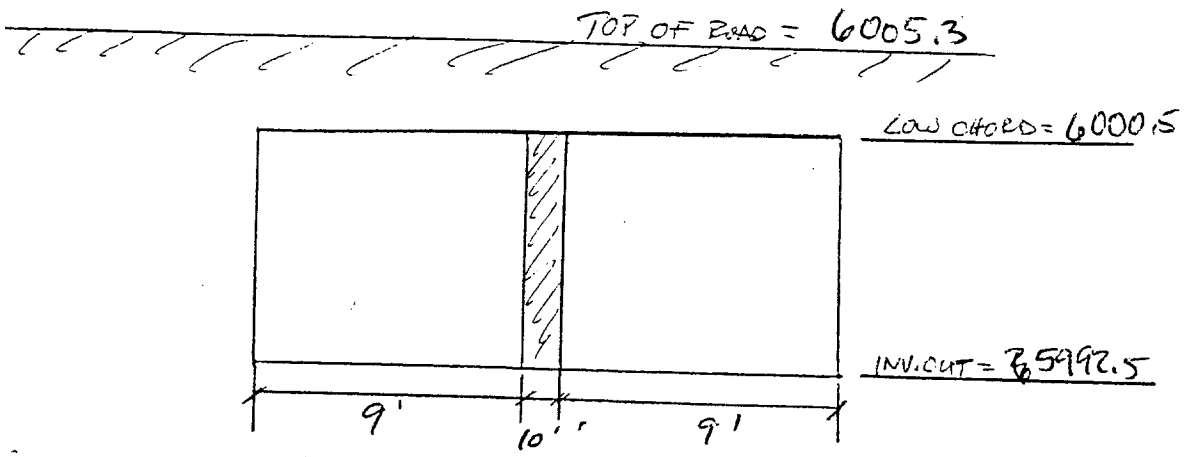
Provide the following information about the structure:

1. Dimension, material, and shape (e.g. two 10 x 5 feet reinforced concrete box culvert; three 30-foot span bridge with 2 rows of two 3- foot diameter circular piers; 40-foot wide ogee shape spillway) Double 9x8 reinforced concrete box culvert with 0.83 foot wide pier
2. Entrance geometry of culvert/type of bridge opening (e.g. 30°-75° wing walls with square top edge, sloping embankments and vertical abutments) 30°-75° wing walls with square top edge, smooth transition from channel.
3. Hydraulic model used to analyze the structure (*e.g., HEC-2 with special bridge routine, WSPRO, HY8*) HY-8

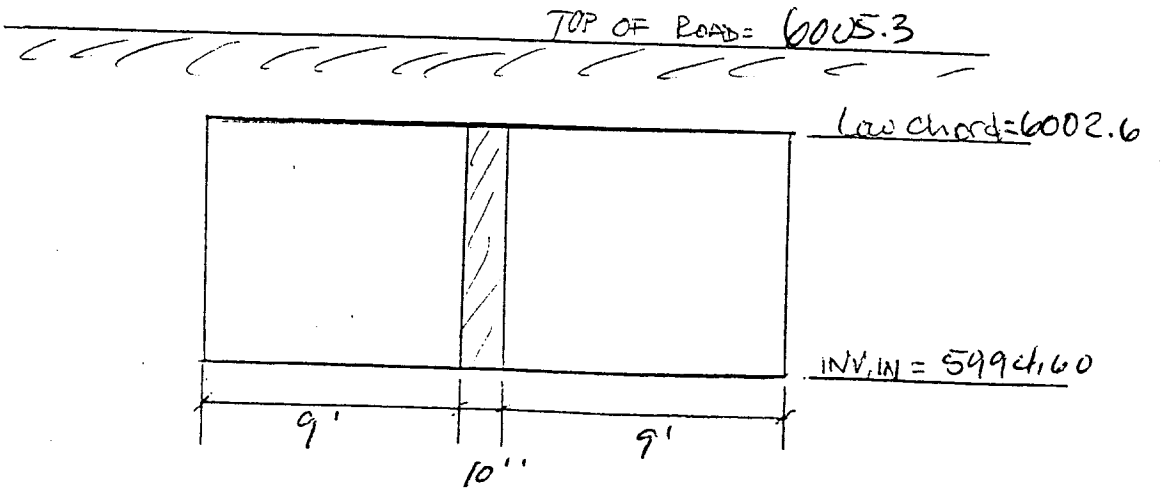
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Note: If any items do not apply to submitted hydraulic analysis, indicate by N/A
*** One form per new/revised bridge/culvert**

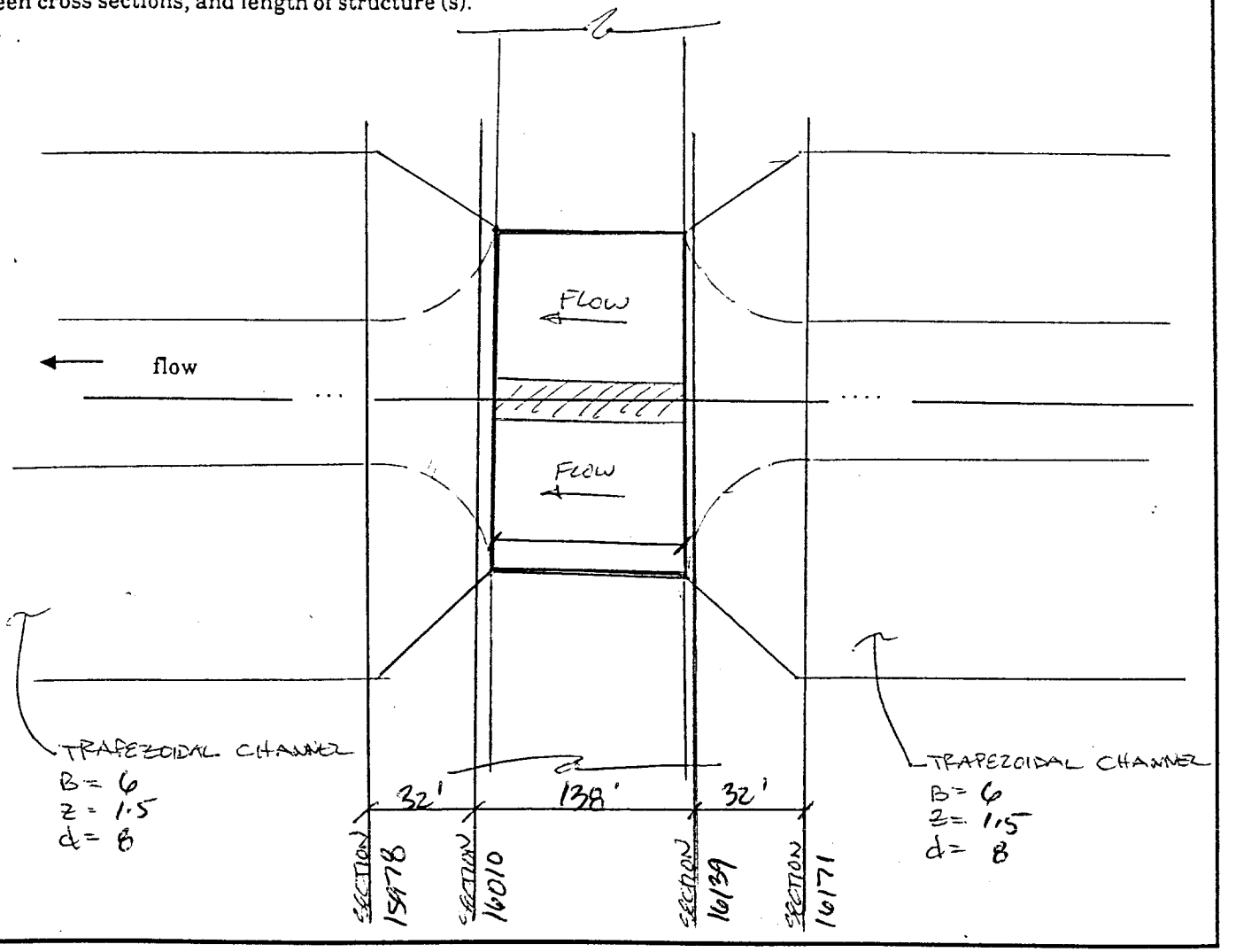
Sketch the downstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, minimum top of road elevation, and ineffective flow widths.



Sketch the upstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, and minimum top of road elevation.



Sketch the plan view of the structure(s) Show, at a minimum, the skew angle, cross-section locations, distances between cross sections, and length of structure (s).



Attach plans of the structure (s) certified by a registered Professional Engineer.

Culvert length or bridge width (ft)	137.8
Calculated culvert/bridge area (ft²) by the hydraulic model, if applicable	144.0
Total culvert/bridge area (ft²)	150.7

Elevations Above Which Flow is Effective for Overbanks

	Left Overbank	Right Overbank
Upstream face	6002.6	6002.6
Downstream face	6000.5	6000.5

Minimum Top of Road Elevation

	Left Overbank	Right Overbank
Upstream face	6005.3	6005.3
Downstream face	6005.3	6005.3

100-Year Elevations	Water Surface Elevations	Energy Gradient Elevations
Upstream face	5997.7	6008.3
Downstream face	5998.4	6001.5

Discharge	Low Flow	Pressure Flow	Weir Flow	Total Flow
Amount of flow through/over the structure (s) (cfs)	1470	0	0	1470

The maximum depth of flow over the roadway/railroad (ft.) ..... NA

Weir length (ft.) ..... NA

Top Widths	Total Floodplain Width	Total Effective Flow Width	Floodway Width
Upstream face	20.2	20.2	20.2
Downstream face	20.2	20.2	20.2

Loss Coefficients

Entrance loss coefficient	N/A
Manning's "n" value assigned to the structure(s)	0.012
Friction loss coefficient through structure (s)	N/A
Other loss coefficients (e.g., bend manhole, etc.)	N/A
Total loss coefficient	N/A
Weir coefficient	2.5
Pier coefficient	N/A
Contraction loss coefficient	N/A
Expansion loss coefficient	N/A

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport *(including scour and deposition)* can affect the 100-year water surface elevations? ..... ☐ Yes ☒ No

   B Based on the conditions *(such as geomorphology, vegetative cover and development of the watershed and stream bed, and bank conditions)*, is there a potential for debris and sediment transport *(including scour and deposition)* to affect the 100-year water surface elevations and/or conveyance capacity through the bridge/culvert? ..... ☐ Yes ☒ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment *(bed material)* load?
   _____cfs *(attach gradation curve)*

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition_____

   B. Will sediment accumulate anywhere through the bridge/culvert? ☐ Yes ☐ No

   If yes, explain the impact on the conveyance capacity through the bridge/culvert?_____

5. FLOODWAY ANALYSIS

Explain method of bridge encroachment (floodway run) Left / right overbank Station used for encroachment.

Comments (*explain any unusual situations*):

Tailwater / Headwater elevation used for CAD X-S in channel analyses.

Attach analysis.

CURRENT DATE: 06-10-1998 FILE DATE: 06-10-1998
CURRENT TIME: 15:16:09 FILE NAME: 167ZEP

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

CU LV NO.	SITE DATA: INLET ELEV. (ft)	SITE DATA: OUTLET ELEV. (ft)	SITE DATA: CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS / SHAPE / MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	5994.60	5992.48	137.80	2 RCB	9.00	8.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: 167ZEP DATE: 06-10-1998

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
0.00	360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
5999.39	568.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6000.51	776.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6001.55	984.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6002.58	1192.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6003.64	1400.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6004.02	1470.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6006.07	1816.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6007.49	2024.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6009.07	2232.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
6010.82	2440.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 167ZEP DATE: 06-10-1998

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
0.00	0.000	360.00	0.00	0.00
5999.39	0.000	568.00	0.00	0.00
6000.51	0.000	776.00	0.00	0.00
6001.55	0.000	984.00	0.00	0.00
6002.58	0.000	1192.00	0.00	0.00
6003.64	0.000	1400.00	0.00	0.00
6004.02	0.000	1470.00	0.00	0.00
6006.07	0.000	1816.00	0.00	0.00
6007.49	0.000	2024.00	0.00	0.00
6009.07	0.000	2232.00	0.00	0.00
6010.82	0.000	2440.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 06-10-1998
CURRENT TIME: 15:16:09

FILE DATE: 06-10-1998
FILE NAME: 167ZEP

PERFORMANCE CURVE FOR CULVERT 1 - 2(9.00 (ft) BY 8.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
360.00	5998.11	3.51	3.20	1-S2n	1.27	2.32	1.44	2.18	13.88	14.30
568.00	5999.39	4.79	3.84	1-S2n	1.74	3.15	2.04	2.86	15.50	16.17
776.00	6000.51	5.91	4.54	1-S2n	2.16	3.87	2.57	3.41	16.76	17.55
984.00	6001.55	6.95	5.32	1-S2n	2.56	4.54	3.11	3.88	17.59	18.67
1192.00	6002.58	7.98	6.17	1-S2n	2.93	5.16	3.60	4.29	18.42	19.63
1400.00	6003.64	9.04	7.12	1-S2n	3.29	5.74	4.04	4.66	19.25	20.46
1470.00	6004.02	9.42	7.45	1-S2n	3.41	5.93	4.23	4.78	19.31	20.72
1816.00	6006.07	11.47	9.27	5-S2n	3.98	6.83	4.93	5.33	20.48	21.86
2024.00	6007.49	12.89	10.49	5-S2n	4.31	7.34	5.41	5.62	20.79	22.48
2232.00	6009.07	14.47	11.81	5-S2n	4.64	7.83	5.83	5.90	21.26	23.04
2440.00	6010.82	16.22	13.06	6-FFc	4.96	8.00	4.96	6.17	27.31	23.57

El. inlet face invert 5994.60 ft El. outlet invert 5992.48 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	100.00 ft
INLET ELEVATION	5994.60 ft
OUTLET STATION	237.78 ft
OUTLET ELEVATION	5992.48 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0154
CULVERT LENGTH ALONG SLOPE	137.80 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	9.00 ft
BARREL RISE	8.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 06-10-1998 FILE DATE: 06-10-1998
CURRENT TIME: 15:16:09 FILE NAME: 167ZEP

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH	6.00 ft
SIDE SLOPE H/V (X:1)	1.5
CHANNEL SLOPE V/H (ft/ft)	0.008
MANNING'S n (.01-0.1)	0.013
CHANNEL INVERT ELEVATION	5992.10 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	5992.48 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
360.00	5994.66	1.575	2.56	14.30	1.28
568.00	5995.34	1.584	3.24	16.17	1.62
776.00	5995.89	1.590	3.79	17.55	1.89
984.00	5996.36	1.595	4.26	18.67	2.13
1192.00	5996.77	1.601	4.67	19.63	2.33
1400.00	5997.14	1.605	5.04	20.46	2.52
1470.00	5997.26	1.607	5.16	20.72	2.58
1816.00	5997.81	1.613	5.71	21.86	2.85
2024.00	5998.10	1.617	6.00	22.48	3.00
2232.00	5998.38	1.620	6.28	23.04	3.14
2440.00	5998.65	1.623	6.55	23.57	3.27

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT	2.50
EMBANKMENT TOP WIDTH	44.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	6005.32 ft

APPENDIX B

CORRESPONDENCE

URS Greiner
8415 Explorer Drive, Suite 110
Colorado Springs, CO 80920
Telephone: (719) 531-0001
Facsimile: (719) 531-0007

URS Greiner

October 22, 1998

Michael Baker Jr., Inc.
Attn: Ms. Pernille Buch-Pedersen
3601 Eisenhower Avenue, Suite 600
Alexandria, VA 22304

Subject: **Petersen Field Drainage Channel**
FIRM Letter of Map Revision
Case No. 98-08-372P
City of Colorado Springs, Colorado
URSG Project No. 67-42167.08

Dear Ms. Buch-Pedersen:

The purpose of this letter is to respond to the comments in FEMA's inventory review letter dated July 30, 1998. The following responses are provided in the order of your review comments:

1. The limits of detailed study at the downstream end have been revised to Cross Section Q, with the tie-in at Cross Section P, to provide the required transition at the downstream end of the revised reach. The revised BFE's do not tie into the effective BFE's within 0.5 foot due to the fact that we have modeled this reach as supercritical.

2. The required floodway analysis is included in Appendices D-F (Volume 2), and the floodway limits are delineated on the topographic work map attached to FORM 5.

3. According to a conversation between Dan Bunting, Pikes Peak Regional Floodplain Administrator, and Mr. Mike Grimm, FEMA, the requirement for Colorado Water Conservation Board (CWCB) approval has been waived. The state approval is typically granted after FEMA approval of the LOMR.

4. A subcritical hydraulic analysis has been performed for Segment 1, and is included in Appendix E (Volume 2). The topographic work map attached to FORM 5 shows the SFHA and floodway boundary delineations based on the subcritical analysis.

5. A FORM 7 has been completed for the culvert downstream of Powers Boulevard at Mason Drive.

6. The headwater and tailwater elevations used for the post-project HEC-2 model have been revised to correspond with the HY-8 output.

7. As stated in our report, Segment 2 from Cross Section 11015 to 13000 is a temporary grass-lined channel. The City of Colorado Springs plans a future capital improvement project to complete the concrete-lined channel improvements in this segment. Until funding becomes available for the permanent channel improvement project, the City recognizes that the base flood will result in erosion of the temporary grass-lined channel.

8. The hydraulic analysis for Segment 4 modeling the overtopping of Hancock Expressway at the undersized 72" culvert has been revised to include ground elevations for the entire width of the SFHA.

9. URSG conducted field surveys to verify the culvert inverts and roadway crowns at all culvert crossings, and field measurements were taken to verify channel geometry in the study area. As a result, this letter is provided to certify that submitted plans reflect "as-built" conditions. Certified "as-built" plans for the project elements downstream of Hancock Expressway were not found in City records.

10. Updated topographic work maps are enclosed in report, attached to FORM 5. The existing contour lines have been more clearly defined on the work maps, and updated SFHA boundary delineations are shown on these maps.

    URSG conducted field surveys to tie into the Colorado Springs Facilities Information System (FIMS) base map topography. As such, this letter is provided to certify that the contours on the topographic work maps represent existing conditions at the time of our survey, to the best of my knowledge.

11. A copy of all hydraulic models is included in the pocket in Appendix F (Volume 2).

According to Dan Bunting, Pikes Peak Regional Floodplain Administrator, the review and processing fee of $3,700 stated in your letter is not required, as this LOMR request is for a public flood control project (FORM 1, Line #19). Please advise if we are not interpreting this issue correctly, and the City of Colorado Springs will pay any required fees.

Please call if you have any questions or need any additional information.

Sincerely,
URS Greiner, Inc.

John P. Schwab, P.E.
Project Manager

Ronald Sanchez, E.I.T.
Project Engineer

cc: Mike Chaves, Colorado Springs Engineering Division
Dan Bunting, Pikes Peak Regional Floodplain Administrator

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Federal Emergency Management Agency

Washington, D.C. 20472

July 30, 1998

Mr. Michael A. Chaves
Project Manager
City of Colorado Springs
30 South Nevada Avenue
Colorado Springs, Colorado 80901

IN REPLY REFER TO:
Case No.: 98-08-372P
Community: City of Colorado Springs, Colorado
Community No.: 080060

316-ACK.FRQ

Dear Mr. Chaves:

This responds to your request dated June 19, 1998, that the Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for El Paso County, Colorado and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Peterson Field Drainage Basin
Flooding Source:	Peterson Field Drainage Channel
FIRM Panel(s) Affected:	08041C0742 F and 0761 F

To minimize the financial burden on the policyholders while maintaining the National Flood Insurance Program (NFIP) as self-sustaining, FEMA implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. Effective October 1, 1996, FEMA revised the fee schedule, establishing flat review and processing fees for most types of requests. Effective March 10, 1997, FEMA modified the fee schedule that became effective on October 1. A copy of the notice published in the *Federal Register* is enclosed for your information. The fee for your request is $3,700, and must be submitted before we can continue processing your request. Payment of this fee must be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program (NFIP), or credit card payment. For identification purposes, the case number referenced above must be included on the check or money order. We will not perform a detailed technical review of your request until payment is received.

Payment must be forwarded to one of the addresses listed below.

Using U.S. Postal Service:	Using overnight service:
Federal Emergency Management Agency	Fee-Collection System Administrator
Fee-Collection System Administrator	c/o Dewberry & Davis, METS Division
P.O. Box 3173	8401 Arlington Boulevard
Merrifield, VA 22116-3173	Fairfax, VA 22031

We have completed an inventory of the items that you submitted. The items identified below are required before we can begin a detailed review of your request.

1. As discussed in Paragraph 65.2(a)(2) of the NFIP regulations, to avoid discontinuities between revised and effective flood data, submitted hydraulic analyses must be extensive enough to ensure that a logical transition can be shown between the revised elevations of the flood having a 1-percent

chance of being equaled or exceeded in any given year (base flood) and those shown on the effective flood profile for areas not affected by the revision. The submitted post-project HEC-2 hydraulic computer model does not show the required transition at the downstream end of the revised reach. Please extend the model a sufficient distance downstream so that the revised base flood elevations (BFEs) tie into the effective BFEs within 0.5 foot.

2. When a floodway revision is requested in association with changes in BFEs, the requirements of Paragraph 65.7(b) of the NFIP regulations must be met. Please provide a floodway analysis for all segments of the revised reach and show the revised floodway boundary delineations on the same topographic map used to show the revised boundary delineations of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood.

3. Please provide documentation that the Colorado Water Conservation Board has approved the revised floodway, as required by Paragraph 65.7(b)(3) of the NFIP regulations.

4. Please provide a HEC-2 hydraulic computer model for Segment 1 that computes the BFEs based on a subcritical flow regime. Please include the culverts in the subcritical model. Also, please provide a topographic work map that shows the SFHA boundary delineations based on the subcritical analysis.

5. Please submit a completed copy of Application/Certification Form 7, entitled "Bridge/Culvert Form," for the culvert downstream of Powers Boulevard that has been modeled as an open channel.

6. The submitted report entitled "Letter of Map Revision for Peterson Field Drainage Channel, Colorado Springs, Colorado, El Paso County," prepared by URS Greiner, dated June 1998, states that the BFEs for Cross Section 11015 at the upstream end and Cross Section 10900 at the downstream end of the culvert under Hancock Expressway were determined using the HY-8 culvert analysis program. The BFEs at Cross Sections 11015 and 10900 shown in the post-project HEC-2 models do not match the headwater and tailwater elevations shown in the HY-8 output included in the report. In addition, the HEC-2 and HY-8 outputs indicate that the invert elevation of the culvert outlet is higher than the BFE at Cross Section 10900. Please revise the post-project HEC-2 models to correspond with the HY-8 output, or revise the HY-8 analysis to match the information shown in the HEC-2 models.

7. The submitted copy of Application/Certification Form 6, entitled "Channelization Form," for the grassed-lined trapezoidal channel states that the grass lining will provide adequate protection against erosion during low flow. The form indicates that the velocities through the channel during the base flood range from 2.91 feet per second (fps) to 11.33 fps. We require that slopes exposed to flows with velocities greater than 5 fps during the base flood be protected. Please provide documentation to show that the existing erosion protection measures will adequately protect the banks of the grassed-lined channel during the base flood.

8. The output of the HEC-2 model for Segment 4 shows "cross section extended" messages at several locations. Please revise the model to include ground elevations for the entire width of the SFHA at all locations.

9. The construction and grading plans for the culverts under Chelton Road, Zeppelin Road, and Powers Boulevard and the plans entitled "Powers Boulevard/Hancock Expressway Drainage

Channel Outfall," prepared by URS Greiner, dated February 10, 1996, were not certified as-built by a registered professional engineer. Please provide a letter certifying that the submitted plans reflect as-built conditions, or submit a copy of the plans that have been stamped "record copy" or "as-built." In addition, please submit certified as-built plans for all project elements downstream of Hancock Expressway.

10. The topographic information shown on the submitted topographic work maps entitled "Peterson Field Drainage Basin, Revised Floodplain Map," prepared by URS Greiner, dated January 26, 1998, is unclear, particularly in the shaded areas. Please provide topographic work maps with clearly defined contour lines. These maps must be certified as reflecting existing conditions by a registered professional engineer. In addition, if the SFHA boundary delineations change as a result of the model revisions requested in Items 1, 6, and 8 above, please include the revised SFHA boundary delineations based on the revised models on the topographic work maps.

11. Please submit a copy of all hydraulic models on disk.

If all required items are not submitted within 90 days of the date of this letter, we will treat any subsequent request as an original submittal, and it will be subject to all submittal/payment procedures.

Please direct all required items (except the required fee) and questions concerning your request to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Ms. Pernille Buch-Pedersen
(703) 317-6224

When you write us about your request, you must include the case number referenced above in your letter.

If you have any questions concerning FEMA policy, or the NFIP in general, please contact Mr. Mike Grimm of our staff in Washington, DC, either by telephone at (202) 646-2878 or by facsimile at (202) 646-4596.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosure(s)

cc: Mr. Dan Bunting
Regional Floodplain Administrator
Pikes Peak Regional Building Department

URS Greiner Woodward Clyde
A Division of URS Corporation

8415 Explorer Drive, Suite 110
Colorado Springs, CO 80920
Tel: 719.531.0001
Fax: 719.531.0007
Offices Worldwide

January 26, 1999

Michael Baker Jr., Inc.
Attn: Ms. Pernille Buch-Pedersen
3601 Eisenhower Avenue, Suite 600
Alexandria, VA 22304

Subject: **Petersen Field Drainage Channel**
FIRM Letter of Map Revision
Case No. 98-08-372P
City of Colorado Springs, Colorado
URSG Project No. 67-42167.08

Dear Ms. Buch-Pedersen:

The purpose of this letter is to respond to the comments in FEMA's inventory review letter dated November 24, 1998. The following responses are provided in the order of your review comments:

1. The limits of this LOMR have been revised, deleting Segment 1, downstream of Hancock Expressway.

2. The limits of this LOMR have been revised, deleting Segment 1, downstream of Hancock Expressway.

3. Based on the revised limits of the LOMR, a cursory review of the culvert under Hancock Expressway was conducted. Recent temporary improvements do not alter the performance of the existing culvert; therefore the existing FIS study WSEL is still considered valid. A detailed analysis will be conducted in conjunction with another LOMR when permanent channel improvements are constructed.

4. The limits of this LOMR have been revised, deleting Segment 1 and the Overflow model. As a result, the existing FIS study delineating the overflow of Hancock Expressway remains valid at this time. A detailed analysis will be conducted in conjunction with another LOMR when permanent channel improvements are constructed.

5. The limits of this LOMR have been revised, deleting Segment 1, downstream of Hancock Expressway.

6. The limits of this LOMR have been revised, deleting Segment 1 and the Overflow model. As a result, the existing FIS study delineating the overflow of Hancock Expressway remains valid at this time. A detailed analysis will be conducted in conjunction with

another LOMR when permanent channel improvements are constructed.

7. A letter has been included as an attachment to LOMR Form 1, acknowledging the City's responsibility for the maintenance of the temporary channel features.

8. Updated topographic work maps based on updated changes are enclosed in report, attached to Form 5. The work maps have been revised to show location and alignment of all cross-sections used in all models.

   URSG conducted field surveys to tie into the Colorado Springs Facilities Information System (FIMS) base map topography. As such, this letter is provided to certify that the contours on the topographic work maps represent existing conditions at the time of our survey, to the best of my knowledge.

9. A copy of all hydraulic models is included in the pocket in Appendix F.

The review and processing fee of $3,700 stated in your letter is currently being processed and will be mailed separately by the City of Colorado Springs.

Please call if you have any questions or need any additional information.

Sincerely,
URS Greiner, Inc.

John P. Schwab, P.E.
Project Manager

Ronald Sanchez, E.I.T.
Project Engineer

cc: Mike Chaves, Colorado Springs Engineering Division
Dan Bunting, Pikes Peak Regional Floodplain Administrator

Federal Emergency Management Agency

Washington, D.C. 20472

NOV 24 1998

Mr. Michael A. Chaves
Project Manager
City of Colorado Springs
30 South Nevada Avenue
Colorado Springs, Colorado 80901

IN REPLY REFER TO:
Case No.: 98-08-372P
Community: City of Colorado Springs, Colorado
Community No.: 080060

316-AD/PRE

Dear Mr. Chaves:

This acknowledges receipt of your recent submission of data in support of your request for a Letter of Map Revision for the above-referenced community.

As discussed in a November 12, 1998, telephone conversation with Mr. Ron Sanches, E.I.T., Project Engineer, URS Greiner, your request does not meet the fee exemption requirements described in Section 72.5 of the National Flood Insurance Program (NFIP) regulations. Therefore, we are required to charge review and processing fees for our review. As stated in our letter dated October 10, 1998, the fee for your request is $3,700 and must be submitted before we can continue processing your request. Payment of this fee must be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or credit card payment. For identification purposes, the case number referenced above must be included on the check or money order. We will not perform a detailed technical review of your request until payment is received.

Payment must be forwarded to one of the addresses listed below.

Using U.S. Postal Service:
Federal Emergency Management Agency
Fee-Collection System Administrator
P.O. Box 3173
Merrifield, VA 22116-3173

Using overnight service:
Fee-Collection System Administrator
c/o Dewberry & Davis, METS Division
8401 Arlington Boulevard
Fairfax, VA 22031

Our review of the submitted data indicates we do not have all of the data requested in our earlier letter. The data required to complete our review are listed on the enclosed summary.

Unless otherwise directed by you in writing, the submitted data will not be returned. We will not begin a detailed review of the submitted data until we receive the additional required data.

We have suspended processing of your request pending our receipt of the data. Once we receive all required data, we will continue our review.

If the requested data are submitted more than 90 days after the date of this letter, they will be treated as a new submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type.

If you are unable to meet the 90-day deadline for submittal of required items, and would like FEMA to continue processing your request, you must request an extension of the deadline. This request must be submitted to our Technical Evaluation Contractor in writing and must provide (1) the reason why the data cannot be submitted within the requested timeframe, and (2) a new date for the submittal of the data. We receive a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, the fees will be forfeited for any request for which neither the requested data nor a written extension request is received within 90 days.

For identification purposes, you must include the case number referenced above on all correspondence. If you have any questions about the status of your request or the required data, please call our Technical Evaluation Contractor, Michael Baker Jr., Inc. The Revisions Coordinator for your state, Ms. Pernille Buch-Pedersen, may be reached at (703) 317-6224.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

cc: Mr. Dan Bunting
Regional Floodplain Administrator
Pikes Peak Regional Building Department

Mr. Ron Sanches, E.I.T. ✓
Project Engineer
URS Greiner, Inc.

Summary of Additional Data Required to Support a
Letter of Map Revision (LOMR)

Case No.: 98-08-372P Requester: Mr. Michael A. Chaves

Community: City of Colorado Springs, Colorado Community No.: 080060

The issues listed below must be addressed before we can continue the review of your request.

1. The submitted data indicate that Deerfield Road and Monica Drive will be overtopped during the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood). Because the base flood will not be contained in the concrete-lined channel throughout the entire reach between Colony Hills Drive and Hancock Expressway (Segment 1), the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, must be mapped based on the subcritical flow regime. Therefore, the submitted subcritical model and topographic work map showing the SFHA boundary delineations based on that subcritical model will be used to complete our analysis of the reach. As requested in our October 10 letter and as required by Paragraph 65.6(a)(2) of the National Flood Insurance Program (NFIP) regulations (copy enclosed), please extend the HEC-2 subcritical model for Segment 1 a sufficient distance downstream so that the revised water-surface elevations (WSELs) tie into the effective WSELs within 0.5 foot.

2. The output of the subcritical floodway model for Segment 1 shows negative surcharges as well as surcharges greater than 1.0 foot. As stated in Paragraph 60.3(d)(2) of the NFIP regulations, surcharges may not exceed 1.0 foot. Please revise the floodway model to eliminate the negative surcharges and to produce surcharges that do not exceed 1.0 foot.

3. The WSELs at the upstream and downstream ends of the culvert under Hancock Expressway shown in the subcritical HEC-2 models do not match the headwater and tailwater elevations shown in the HY-8 output included in the report entitled "Letter of Map Revision for Peterson Field Drainage Channel, Volume 1," prepared by URS Greiner, dated June 1998. It is unclear which WSELs reflect existing conditions at the upstream and downstream ends of the culvert and how these WSELs tie into those calculated by the subcritical models for the upstream and downstream channels. Please provide documentation to support existing conditions at the upstream and downstream ends of the culvert and to show how these conditions tie into the subcritical conditions of the upstream and downstream channels.

4. Our review of the HEC-2 model for the floodwater that will leave the main channel between Chelton Road and Hancock Expressway (overflow model) compared to the HEC-2 subcritical models for Segments 1 and 2 of the main channel revealed several discrepancies. For example, the overflow model indicates that at Cross Section 10600, floodwater will inundate the entire area between the overflow channel and the main channel. At the next downstream cross section, Cross Section 10200, the overflow model indicates that the entire base flood discharge will be conveyed by the overflow channel only. The HEC-2 model for Segment 1 indicates that at Cross Section 10200, the entire base flood is contained in the main channel. Both models show that at the next downstream cross section, Cross Section 10000, floodwater will be conveyed by both the main channel and the overflow channel. In addition, the overflow model does not tie into the main channel models at the upstream and downstream ends of the overflow model. Please revise the main channel and overflow models to resolve these discrepancies. Please ensure that the WSELs

of the overflow model tie into the main channel WSELs within 0.5 foot and the topwidths of the overflow model tie into the topwidths of the main channel models at the upstream and downstream ends of the overflow model.

5. At several locations along the reach, the SFHA and floodway topwidths shown in the output of the main channel and overflow models do not match the topwidths shown on Sheets 2 and 3 of the topographic work maps entitled "Peterson Field Drainage Basin Revised Floodplain Map, Letter of Map Revision, Colony Hills Drive to Airport Boundary," prepared by URS Greiner, revised October 23, 1998. In addition, the overflow model shows that at Cross Section 10600, the area between Hancock Expressway and Clarendon Channel will be inundated during the base flood; however, Sheet 3 of the work map shows that this area will not be inundated. Please revise the work maps or the models so that the topwidths shown in the model output match those shown on the work maps at all locations. The work maps must show the location and alignment of all cross sections used in the models and be certified by a registered professional engineer.

6. Sheet 1 of the above-referenced work map shows the floodway boundary delineations in the vicinity of Hancock Expressway. The delineation indicates that under floodway conditions, the entire base flood will overtop the Expressway and join the main channel downstream. The submitted floodway models indicate that no additional floodwater will overtop the Expressway under floodway conditions. Please provide analyses to show how much floodwater will overtop the Expressway under floodway conditions and the effects that the additional floodwater will have on the downstream channel. If floodwater will flow in the overflow channel under floodway conditions, please analyze a floodway for the overflow channel. Please note that the floodway for the main and overflow channels must meet the requirements of Paragraph 60.3(d)(2) of the NFIP regulations. In addition, the floodway is shown as wider than the SFHA across the Expressway. Please resolve this discrepancy.

7. As discussed in our November 13, 1998, telephone conversation, please provide a letter from the City acknowledging its awareness of the erosion potential along the grass-lined channel and certifying that no insurable structures are located near the channel. The letter should also include the City's development plans for the channel, requirements that the City would impose on future development of the area by other entities, and a statement that the City would apply for a LOMR within 6 months of completing any channelization, as specified in Section 65.3 of the NFIP regulations. In addition, please provide a maintenance plan for the channel, specifying the actions that would be taken in the event that the base flood would occur.

8. If the SFHA and floodway boundary delineations change as a result of the items requested in Items 1 through 6 above, please provide topographic work maps that show the revised SFHA and floodway boundary delineations based on these changes. The work maps must show the location and alignment of all cross sections used in the models and must be certified by a registered professional engineer.

9. Please provide hard copies and copies on diskette of the input and output files for all hydraulic models.

Please send the required data directly to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Ms. Pernille Buch-Pedersen
(703) 317-6224

For identification purposes, you must include the case number referenced above on all correspondence.

URS Greiner Woodward Clyde
A Division of URS Corporation

8415 Explorer Drive, Suite 110
Colorado Springs, CO 80920
Tel: 719.531.0001
Fax: 719.531.0007
Offices Worldwide

May 5, 1999

Michael Baker Jr., Inc.
Attn: Ms. Pernille Buch-Pedersen
3601 Eisenhower Avenue, Suite 600
Alexandria, VA 22304

Subject: **Petersen Field Drainage Channel**
FIRM Letter of Map Revision
Case No. 98-08-372P
City of Colorado Springs, Colorado
URSG Project No. 67-42167.08

Dear Ms. Buch-Pedersen:

The purpose of this letter is to respond to the comments in FEMA's inventory review letter dated March 26, 1999. The following responses are provided in the order of your review comments:

1. The limits of this LOMR have been revised modifying Segment 2 to demonstrate a logical transition to the existing FIS Study.

2. Updated topographic work maps based on updated changes are enclosed in report, attached to Form 5. The work maps have been revised to show location and alignment of all cross-sections used in all models.

   URSG conducted field surveys to tie into the Colorado Springs Facilities Information System (FIMS) base map topography. As such, this letter is provided to certify that the contours on the topographic work maps represent existing conditions at the time of our survey, to the best of my knowledge.

3. A copy of all hydraulic models is included in the pocket in Appendix F.

Please call if you have any questions or need any additional information.

Sincerely,
URS Greiner, Inc.

John P. Schwab, P.E.
Project Manager

Ronald J. Sanchez, P.E.
Project Engineer

cc: Mike Chaves, Colorado Springs Engineering Division
Dan Bunting, Pikes Peak Regional Floodplain Administrator

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Federal Emergency Management Agency

Washington, D.C. 20472

MAR 26 1999

Mr. Michael A. Chaves
Project Manager
Engineering Division
City of Colorado Springs
30 South Nevada Avenue
Colorado Springs, CO 80901

IN REPLY REFER TO:
Case No.: 98-08-372P
Community: City of Colorado Springs, Colorado
Community No.: 080060

316-AD

Dear Mr. Chaves:

This is in reference to your June 19, 1998, request for a Letter of Map Revision for the above-referenced community. In our earlier letter to you, we indicated additional data might be required to complete our review of the request.

As discussed in a telephone conversation on March 16, 1999, the following items, which must be submitted within 90 days of the date of this letter, are required before we can complete our review of your request.

1. Paragraph 65.6(a)(2) of the National Flood Insurance Program (NFIP) regulations states that, to avoid discontinuities between revised and unrevised flood data, hydraulic analyses must be extensive enough to ensure that a logical transition can be shown between the revised elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) and floodplain and floodway boundary delineations and those developed previously for areas not affected by the revision. The submitted HEC-2 subcritical analysis for Segment 2 does not show the required logical transitions at the downstream end of the revised reach. As requested in our October 10 and November 24, 1998, letters and as required by Paragraph 65.6(a)(2) of the NFIP regulations, please modify the HEC-2 subcritical model for Segment 2 so that the revised water-surface elevations (WSELs) tie into the effective WSELs shown on the effective Flood Profile within 0.5 foot at the downstream end of the revised reach. Also, please ensure that a logical transition between the revised and unrevised floodplain and floodway boundary delineations is shown at the downstream end of the revised reach.

2. If the modifications requested above result in changes to the floodplain and floodway boundary delineations shown on the submitted work map entitled "Peterson Field Drainage Basin, Revised Floodplain Map," prepared by URS Greiner, dated January 21, 1999, please provide a revised topographic work map that shows the modified floodplain and floodway boundary delineations based on the revised model submitted in response to Item 1. The map must be certified by a registered professional engineer.

3. Please provide hard copies and copies on diskette of all revised hydraulic models.

Please send the required data directly to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Ms. Pernille Buch-Pedersen
(703) 317-6224

For identification purposes, you must include the case number referenced above on all correspondence.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures, including the flat review and processing fee for requests of this type established by the revised fee schedule that became effective on October 1, 1996. A copy of the notice summarizing the revised fee schedule, which was published in the *Federal Register,* is enclosed for your information.

If you are unable to meet the 90-day deadline for submittal of required items, and would like FEMA to continue processing your request, you must request an extension of the deadline. This request must be submitted to our Technical Evaluation Contractor in writing and must provide (1) the reason why the data cannot be submitted within the requested timeframe, and (2) a new date for the submittal of the data. We receive a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, the fees will be forfeited for any request for which neither the requested data nor a written extension request is received within 90 days.

If you have any questions regarding this matter, please contact Ms. Sally Magee of our staff in Washington, DC, either by telephone at (202) 646-8242 or by facsimile at (202) 646-4596.

Sincerely,

Matthew B. Miller

Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

cc: Mr. Dan Bunting
Regional Floodplain Administrator
Pikes Peak Regional Building Department

Mr. Ron Sanchez, E.I.T. √
Project Engineer
URS Greiner Woodward Clyde

APPENDIX C

COMPUTER DISK OF HYDRAULIC MODEL FILES

POWERS BOULEVARD / HANCOCK EXPRESSWAY
DRAINAGE CHANNEL OUTFALL

City of Colorado Springs

LEGEND

- EXISTING BARBED WIRE FENCE
- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE / R.O.W.
- PROPOSED DRAINAGE EASEMENT
- CONSTRUCTION EASEMENT LINE
- EDGE OF PAVEMENT
- EXISTING CURB & GUTTER
- PROPOSED CURB & GUTTER
- BURIED TELEPHONE LINE
- BURIED ELECTRICAL LINE
- NEW STREET LIGHT BASE
- EXISTING LIGHT STANDARDS
- SIGNS (SINGLE POST / DOUBLE POST)
- GAS MAIN
- WATER MAIN
- WATER VALVE
- GAS VALVE
- FIRE HYDRANT
- SANITARY SEWER
- EXISTING SANITARY SEWER MANHOLE
- PROPOSED SANITARY SEWER MANHOLE
- EXISTING STORM DRAIN
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING OVERHEAD ELECTRIC POLE
- PROPOSED STORM DRAIN WITH INLET
- DETAIL DESIGNATION (LETTER) / SECTION DESIGNATION (NUMBER)
- SHEET CROSS-REFERENCE

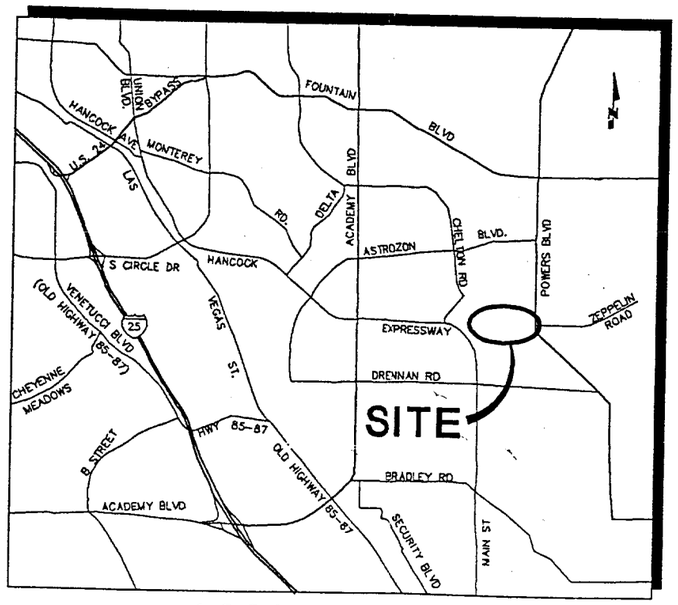
SIGNATURES

APPROVED	CITY ENGINEER	DATE
APPROVED	CITY TRAFFIC ENGINEER	DATE
APPROVED	ELECTRICAL DIVISION	DATE
APPROVED	GAS DIVISION	DATE
APPROVED	WASTEWATER DIVISION	DATE
APPROVED	WATER DIVISION	DATE
APPROVED	WATER SERVICE	DATE
APPROVED	U.S. WEST	DATE
APPROVED	CABLE VISION	DATE
APPROVED	PARKS AND RECREATION	DATE

C:\HANCOCK\CDI\PERSNT 62496 125859 10/16/96

PREPARED FOR:

CITY OF COLORADO SPRINGS ENGINEERING DIVISION
30 SOUTH NEVADA AVE. SUITE 403
COLORADO SPRINGS, COLORADO 80903



LOCATION MAP

INDEX OF SHEETS

DESIGN DATA (TEMP.)

- MAXIMUM GRADE = 8.00%
- MINIMUM GRADE = 0.50%
- MINIMUM SSD-VERTICAL = 300'
- MINIMUM SSD-HORIZONTAL = 300'
- DESIGN SPEED = 30 MPH

DESIGN DATA (ULTIMATE)

- MAXIMUM GRADE = 6.00%
- MINIMUM GRADE = 0.50%
- MINIMUM SSD-VERTICAL = 400'
- MINIMUM SSD-HORIZONTAL = 400'
- DESIGN SPEED = 40 MPH

AS CONSTRUCTED INFORMATION

- CONTRACTOR _____
- _____ ENGINEER _____ (Project or Resident)
- PROJECT STARTED _____
- PROJECT COMPLETED _____
- AS CONSTRUCTED PLANS APPROVED _____ TITLE _____ DATE

PREPARED BY:

URS CONSULTANTS, INC.
1040 SOUTH 8TH ST.
COLORADO SPRINGS, COLORADO 80906

URS CONSULTANTS, INC.

COL-TERRA Investments II

FKF Group

(CHELTON ROW LINE)

(SECTION LINE)

GRASS LINED CHANNEL B=30'

RIPRAP DROP STRUCTURE

GRASS LINED CHANNEL B=20'

8' WIDE BERM

PC = 1+98.56

PT = 3+28.56

Δ = 49°22'32"
R = 160.00'
L = 137.88'

2+65.00 END 20' GRASS LINED CHANNEL BEGIN TRANSITION

3+00.00 END TRANSITION BEGIN 30' GRASS LINED CHANNEL

3+90.00 END 30' GRASS LINED CHANNEL BEGIN TRANSITION

4+25.00 END TRANSITION BEGIN 40' GRASS LINED CHANNEL

8' WIDE BERM

7+20.00 END 8' WIDE BERM

PERMANENT DRAINAGE EASEMENT.

LIMITS OF GRADING OF GRASS LINED CHANNEL

GRASS LINED CHANNEL B=40'

TEMPORARY CHANNEL TRANSITION. SEE DETAIL

PT = 12+82.15

MATCH LINE STA. 13+92.76 SEE SHEET 4

CONSTRUCTION EASEMENT

STA 0+00 BEGIN 20' GRASS LINED CHANNEL MATCH EXISTING

50 0 50 100

Soaring Eagle Orchards, Inc.
c/o Joseph Coleman

5970
5960
5950
5940

NORTH SIDE

SOUTH SIDE

GRADE TO DAYLIGHT

TOP OF 8' WIDE PROPOSED BERM

EXIST. GROUND AT CHANNEL ℄

PROPOSED GRADE AT INVERT OF GRASS LINED CHANNEL

4"

5' TYP.

0.08%

8.44%

0.44%

0.00%

1.46%

CUTOFF WALL (2/8)

STA 0+00 BEGIN 20' GRASS LINED CHANNEL MATCH EXIST INV. = 5953.0

STA 3+00.00 BEGIN RIP RAP CHAN. INV. 5951.26

STA 3+28.00 GRADE BREAK CHAN. INV. 5951.35

STA 3+40.00 GRADE BREAK CHAN. INV. 5955.79

STA 3+40.00 END RIPRAP CHANNEL CHAN. INV. 5955.79

STA 13+02.76 END TEMP CHANNEL BEGIN RIPRAP CHAN. INV. 5958.85

STA 13+57.78 GRADE BREAK CHAN. INV. 5958.85

STA 13+92.76 END RIPRAP BEGIN SLOPE PAVING INV. 5961.15

NOTE: ALL INVERTS LOCATED ON THIS SHEET TO COINCIDE WITH FIMS CONTROL

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00

MATCH LINE SEE SHEET 4

REVIEW:
STREET DESIGN:
ROUGH CUT REVIEW _____ DATE: _____
FINAL REVIEW _____ DATE: _____
DRAINAGE DESIGN

DESIGN DATA:
SIDEWALKS: WIDTH _____
LOCATION ATTACHED ☐
DETACHED, 6" FROM P/L ☐
CURB TYPE 1 ☐ 2 ☐ 3 ☐
R/W WIDTH _____ F/C-F/C _____
STREET TYPE _____
HWEEM _____
ASPHALT THICKNESS:
AC SURFACE _____
AC BASE _____
AGGREGATE BASE THICKNESS:
CLASS 6 _____
CLASS 5 _____
CLASS 2 _____

SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5'
BENCH MARK:
BOTTOM BOLT, EAST SIDE BRICK COLUMN, FENCE BOUNDARY SOUTHEAST CORNER MOBILE HOME PARK.
DATUM ELEV. = 5989.58

REVISIONS:
NO. DESCRIPTION

ENGINEER:
DESIGNED BY: CLP DATE: 1/31/96
DRAWN BY: BLS/NNB DATE: 1/31/96
CHECKED BY: JPS DATE: 2/02/96

URS CONSULTANTS, INC.
1040 SOUTH 8th STREET
COLORADO SPRINGS, CO
(719) 634-6699

SHEET TITLE CHANNEL PLAN & PROFILE
FROM 4-82 TO 13-93
DRAINAGE BASIN PETERSON FIELD
JOB NO. 6742167 SHEET 3 OF 21

POWERS BOULEVARD / HANCOCK EXPRESSWAY DRAINAGE CHANNEL OUTFALL

City of Colorado Springs

C:\HANCOCK\CHAN-1A 10/96 23968

MATCH LINE STA. 13+92.76 SEE SHEET 3

44 L.F. 42" RCP SEE PROFILE H SHEET 12.

10' D-10-R INLET (SPECIAL) SEE DETAIL M/12

235 L.F. 42" RCP SEE PROFILE H SHEET 12

Δ = 52°22'26"
R = 270.00'
L = 246.81'

LIMITS OF ROADSIDE DITCH

CONSTRUCTION EASEMENT

146 L.F. 8" SS PROFILE SS3 SEE SHEET 12.

TEMPORARY TRANSITION, SEE DETAIL K/10

35 L.F. 42" RCP @ 5.43%

42" PLUG INV. 5966.40

Δ = 51°31'03"
R = 270.00'
L = 242.77'

20'x9' C.B.C. SEE DETAIL H/8

REMOVE 60 L.F. OF EXIST. 12" SS AND REPLACE W/ 60 L.F. 12" D.I.P.

70 L.F. 30" STEEL CASING SLEEVE (⅜" WALL THICKNESS) LOCATED 25' RT. OF HANCOCK ℄ AT STA. 34+31.00 TO STA. 35+01.00 @ INV. EL. 5958.33 W/ PLUG AT EACH END.

Glenn C. & Marvin J. Mason & Wilma A. Kimbly

Soaring Eagle Orchards, Inc. c/o Joseph Coleman

CONSTRUCTION EASEMENT

CHANNEL TRANSITION SEE DETAIL H/9

EMBANKMENT PROTECTOR TYPE 5 PER CDOT M&S STANDARD M-615-2 FROM C&G TO CHANNEL 3:1 SLOPE.

10' D-10-R INLET

4" GAS MAIN TO BE INSTALLED BY CITY AFTER ROAD IS ROUGH CUT.

REMOVE EXIST. FENCE FROM ROAD STA. 34+50 TO STA. 43+70.

131 L.F. 36" RCP SEE PROFILE J SHEET 12.

36" PLUG INV. 5974.91

STA. 24+86.00 PT BEGIN CONCRETE CHANNEL CONFLUENCE SEE DETAIL C/8

Δ = 03°48'03"
R = 490.00'
L = 49.51'

Δ = 10°17'11"
R = 278.50'
L = 50.00'

MATCH EXIST. CHANNEL

ADJUST MANHOLE (TYP 2)

EXIST. POWER POLES TO BE REMOVED AFTER ELECTRIC LINES ARE RELOCATED UNDERGROUND BY CITY OF COLORADO SPRINGS ELECTRIC DIVISION

REINSTALL EXIST. 16" W PLUG W/ 4" BLOW OFF VALVE ASSEMBLY AND CONCRETE REVERSE ANCHOR.

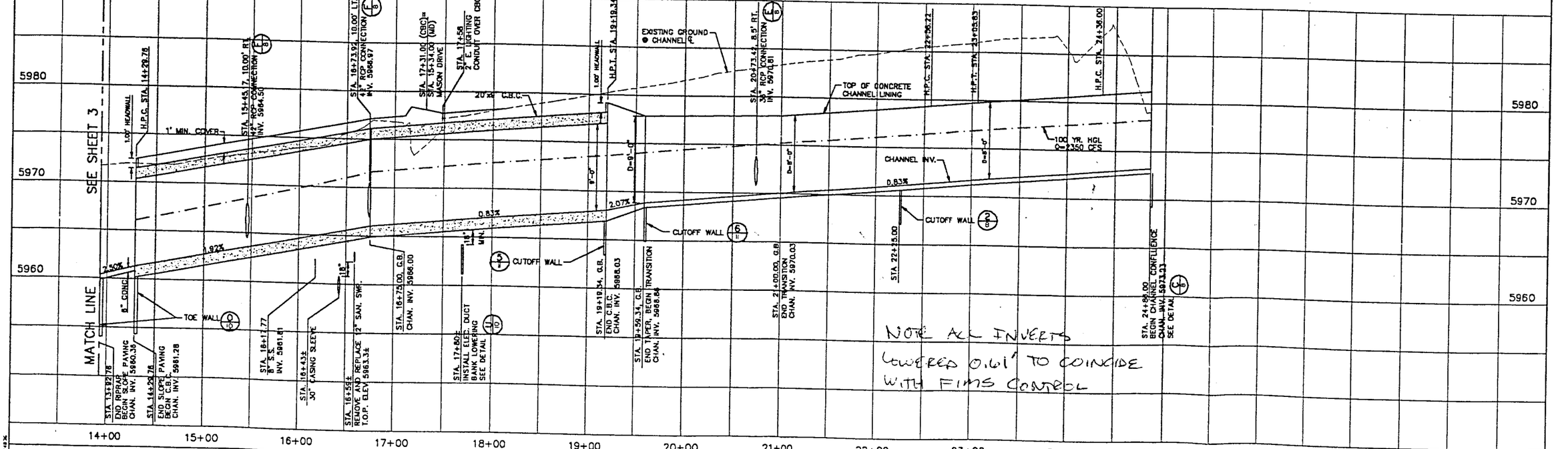
REMOVE EXIST. PLUG & BLOW OFF VALVE ASSEMBLY AND RELOCATE TO END OF NEW 16" W.

115 L.F. 16" DIP WATERLINE, SEE 16" WATERLINE EXTENSION PROFILE, SHEET 12.

N

50 0 50 100

NOTE: SEE SHEET 7 FOR LIGHTING & ELECTRICAL PLAN



REVIEW:
STREET DESIGN:
ROUGH CUT REVIEW _____ DATE: _____
FINAL REVIEW _____ DATE: _____
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH _____
LOCATION: ATTACHED ▫ DETACHED, 6" FROM P/L ▫
CURB TYPE 1 ▫ 2 ▫ 3 ▫
R/W WIDTH _____ F/C-F/C _____
STREET TYPE _____
HVEEM _____

ASPHALT THICKNESS:
AC SURFACE _____
AC BASE _____
AGGREGATE BASE THICKNESS:
CLASS 6 _____
CLASS 5 _____
CLASS 2 _____

SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5'
BENCH MARK:
BOTTOM BOLT, EAST SIDE BRICK COLUMN, FENCE BOUNDARY SOUTHEAST CORNER MOBILE HOME PARK.
DATUM ELEV. = 5989.58

REVISIONS:
NO. DESCRIPTION

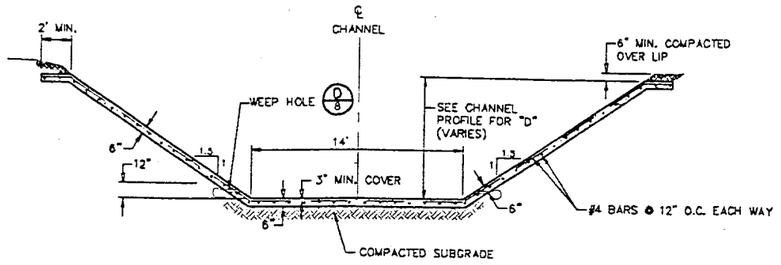
ENGINEER:
DESIGNED BY: CLP DATE: 1/31/96
DRAWN BY: BLS/NMB DATE: 1/31/96
CHECKED BY: JPS DATE: 2/01/96

URS CONSULTANTS, INC.
1040 SOUTH 8th STREET
COLORADO SPRINGS, CO
(719) 634-5699

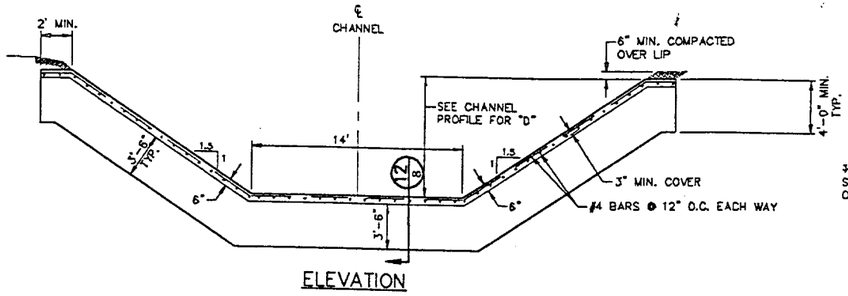
CHANNEL PLAN & PROFILE AND UTILITY PLAN
FROM 13+93 TO 24+86
DRAINAGE BASIN PETERSON FIELD
JOB NO 674267 SHEET 4 OF 21

POWERS BOULEVARD / HANCOCK EXPRESSWAY DRAINAGE CHANNEL OUTFALL

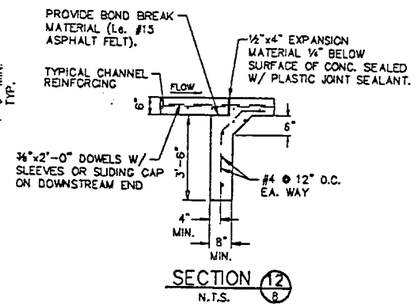
City of Colorado Springs



TYPICAL CONCRETE CHANNEL SECTION 1/8

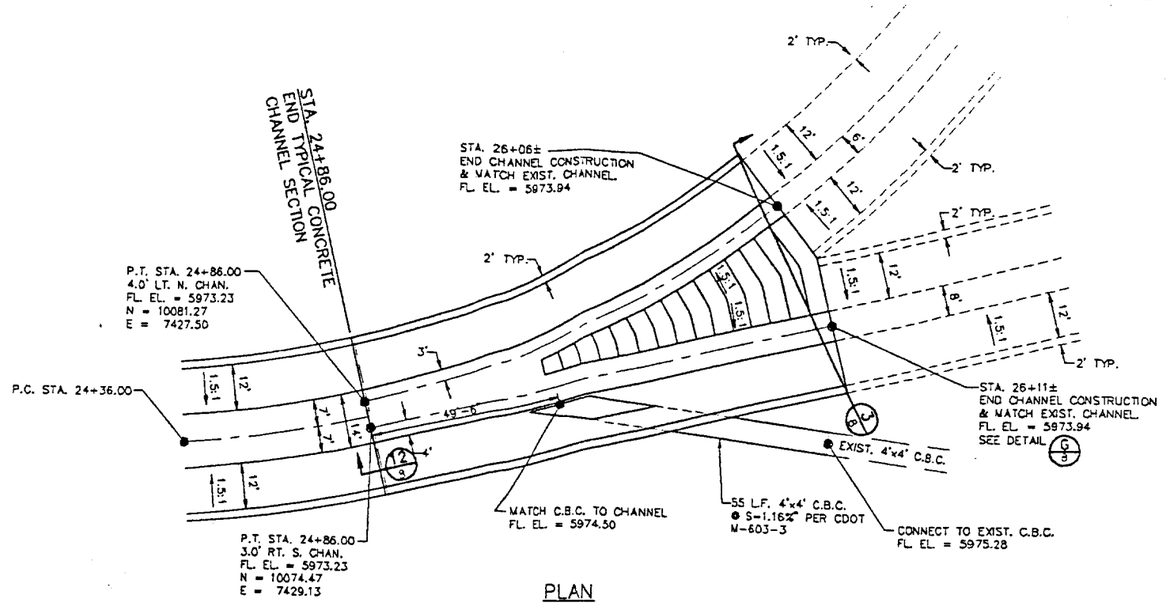


ELEVATION

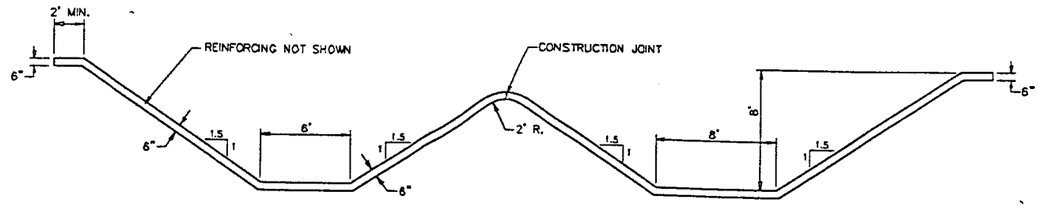


SECTION 12/8
N.T.S.

TYPICAL CHANNEL CUTOFF WALL SECTION 2/8



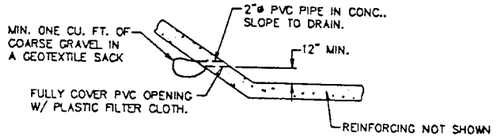
PLAN



SECTION 3/8

CONCRETE CHANNEL CONFLUENCE DETAIL C/8

SCALE: 1"=20'

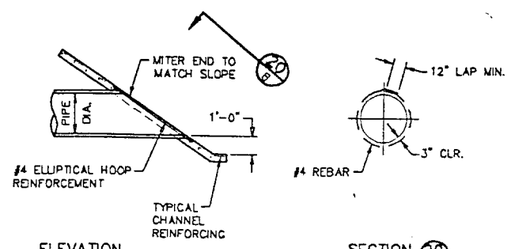


WEEP HOLE DETAIL D/8

NOTES:

1.) TO BE USED FOR ALL SECTIONS OF CONCRETE CHANNEL AND TRANSITIONS – MAXIMUM SPACING SHALL BE 20' O.C. FOR CHANNEL AND 10' O.C. FOR TRANSITION.

2.) MITER PVC PIPE FLUSH WITH CONC.

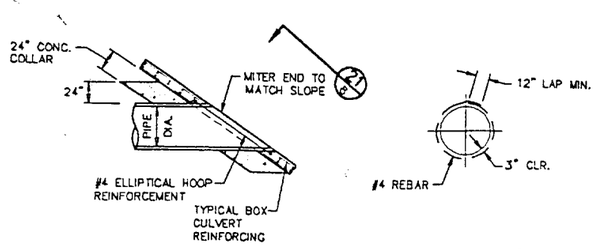


ELEVATION

SECTION 20/8

PIPE CONNECTION TO CONCRETE CHANNEL DETAIL E/8

N.T.S.

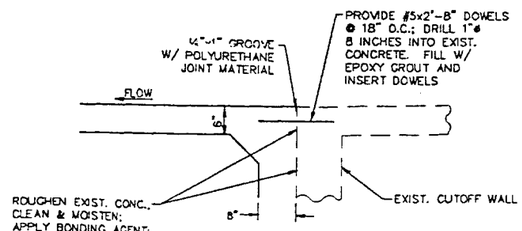


PLAN

SECTION 21/8

PIPE CONNECTION TO BOX CULVERT DETAIL F/8

N.T.S.



CONNECTION TO EXISTING CHANNEL G/8

N.T.S.

REVIEW:
STREET DESIGN:
ROUGH CUT REVIEW _____ DATE: _____
FINAL REVIEW _____ DATE: _____
DRAINAGE DESIGN

DESIGN DATA:
SIDEWALKS: WIDTH _____
LOCATION: ATTACHED ☐
DETACHED, 6' FROM P/L ☐
CURB TYPE 10 20 30
R/W WIDTH _____ F/C-F/C _____
STREET TYPE _____
HVEEM _____
ASPHALT THICKNESS:
AC SURFACE _____
AC BASE _____
AGGREGATE BASE THICKNESS:
CLASS 6 _____
CLASS 5 _____
CLASS 2 _____

SCALE: HORIZONTAL N/A VERTICAL N/A
BENCH MARK:
BOTTOM BOLT, EAST SIDE BRICK COLUMN, FENCE BOUNDARY SOUTHEAST CORNER MOBILE HOME PARK.
DATUM ELEV. = 5989.58

REVISIONS:
NO. DESCRIPTION

ENGINEER:
DESIGNED BY: CLP DATE: 1/31/96
DRAWN BY: BLS DATE: 1/31/96
CHECKED BY: JPS DATE: 2/01/96

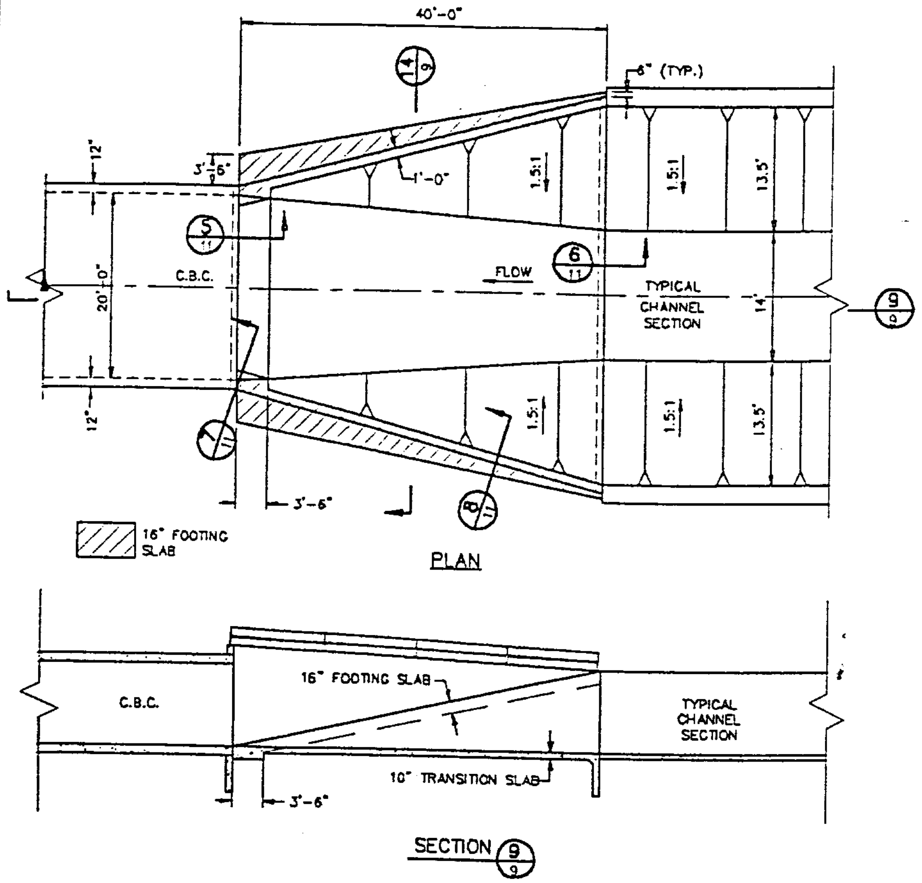
URS CONSULTANTS, INC.
1040 SOUTH 8th STREET
COLORADO SPRINGS, CO
(719) 634-6699

SHEET TITLE TYPICAL CHANNEL SECTIONS & DETAILS
FROM - TO -
DRAINAGE BASIN PETERSON FIELD
JOB NO. 5742167 SHEET 8 OF 21

POWERS BOULEVARD / HANCOCK EXPRESSWAY DRAINAGE CHANNEL OUTFALL

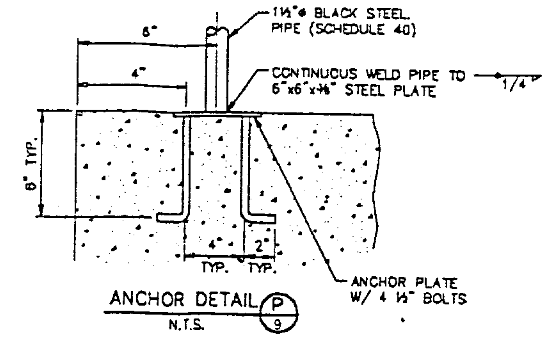
City of Colorado Springs

C:\HANCOCK\CHAN8.T7916 5323



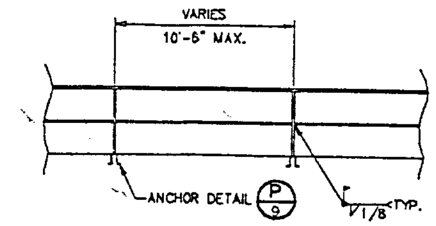
CHANNEL TRANSITION DETAIL (H/9)

SCALE: 1"=10'



ANCHOR DETAIL (P/9)

N.T.S.



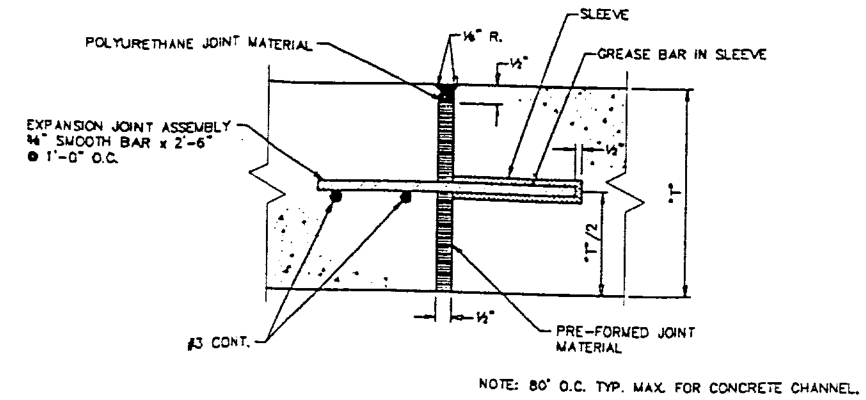
NOTES:

1.) ALL HANDRAILS SHALL MEET OSHA REQUIREMENTS.

2.) HANDRAIL FINISH SHALL BE ONE SHOP COAT RED METAL PRIMER AND TWO FINISH COATS OF ENAMEL (RUSTOLEUM OR EQUIVALENT). COLOR SHALL BE APPROVED BY ENGINEER PRIOR TO APPLICATION.

HANDRAIL DETAIL (J/9)

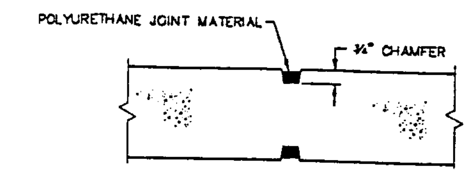
N.T.S.



NOTE: 80' O.C. TYP. MAX. FOR CONCRETE CHANNEL.

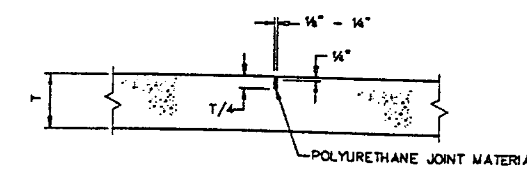
EXPANSION JOINT DETAIL

N.T.S.



BOX CULVERT

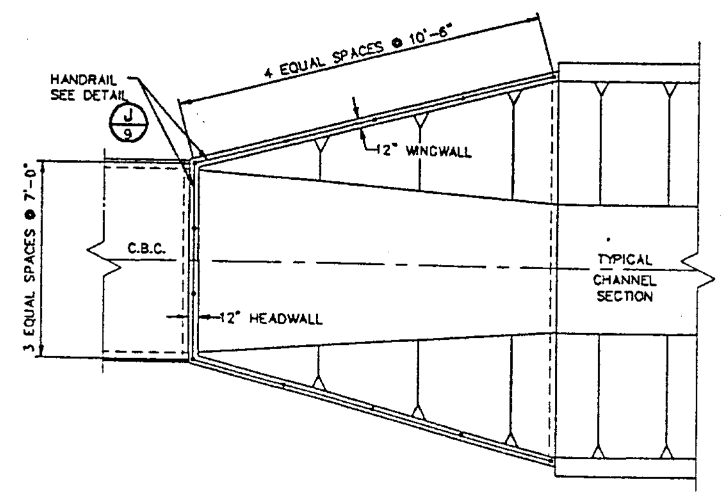
NOTE: INSTALL CONTROL JOINTS IN C.B.C. @ 50' O.C.



CHANNEL LINING

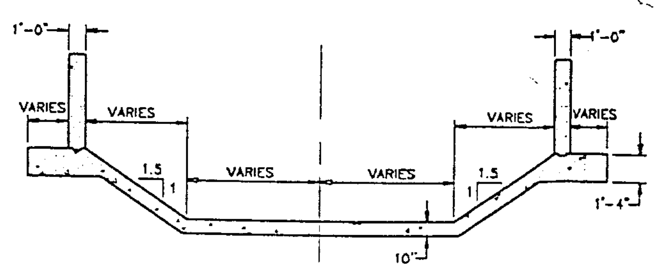
CONTRACTION JOINT DETAIL

N.T.S.



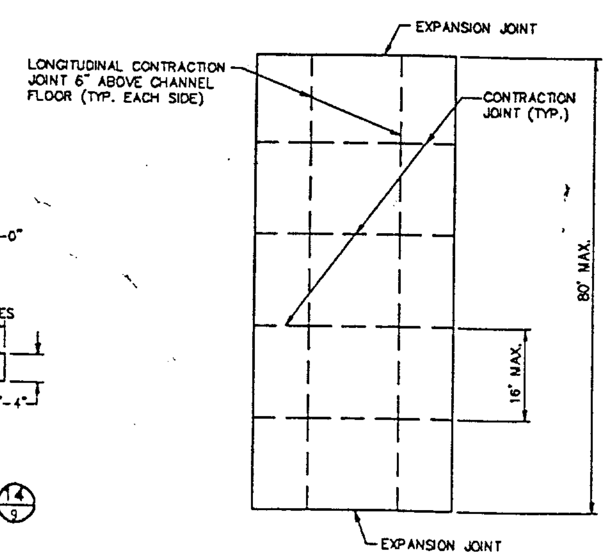
HANDRAIL PLAN (I/9)

SCALE: 1"=10'



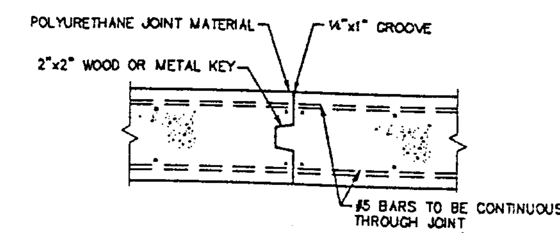
TYPICAL TRANSITION SECTION (14/9)

REINFORCING NOT SHOWN

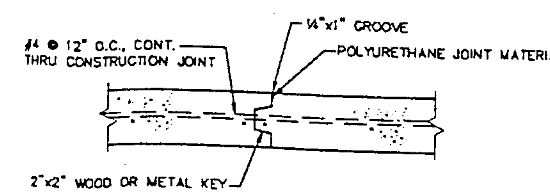


TYPICAL CHANNEL JOINT LAYOUT

N.T.S.



BOX CULVERT



CHANNEL LINING

TYPICAL CONSTRUCTION JOINT DETAIL

N.T.S.

REVIEW:
STREET DESIGN:
ROUGH CUT REVIEW ____ DATE: ____
FINAL REVIEW ____ DATE: ____
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH ____
LOCATION: ATTACHED □
DETACHED, 6" FROM P/L □
CURB TYPE 1 □ 2 □ 3 □
R/W WIDTH ____ F/C-F/C ____
STREET TYPE ____
HVEEM ____
ASPHALT THICKNESS:
AC SURFACE ____
AC BASE ____
AGGREGATE BASE THICKNESS:
CLASS 6 ____
CLASS 5 ____
CLASS 2 ____

SCALE: HORIZONTAL N/A VERTICAL N/A
BENCH MARK:
BOTTOM BOLT, EAST SIDE BRICK COLUMN, FENCE BOUNDARY SOUTHEAST CORNER MOBILE HOME PARK.
DATUM ELEV. = 5989.58

REVISIONS:

NO.	DESCRIPTION

ENGINEER:

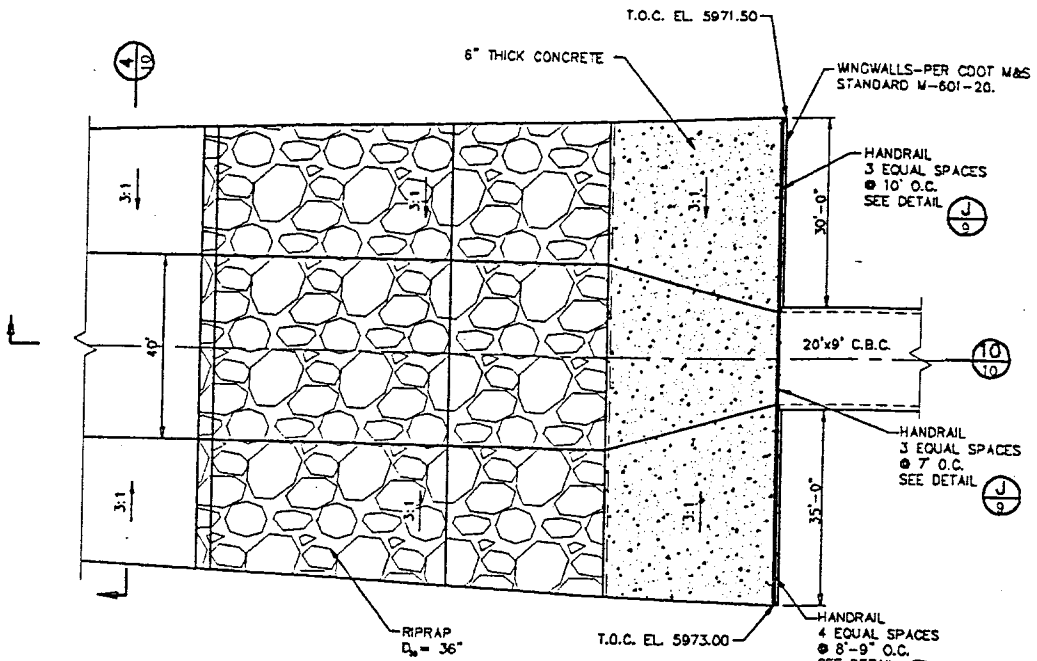
DESIGNED BY: CLP DATE: 1/31/96
DRAWN BY: BLS DATE: 1/31/96
CHECKED BY: JPS DATE: 2/01/96

URS CONSULTANTS, INC.
1040 SOUTH 8th STREET
COLORADO SPRINGS, CO
(719) 634-6699

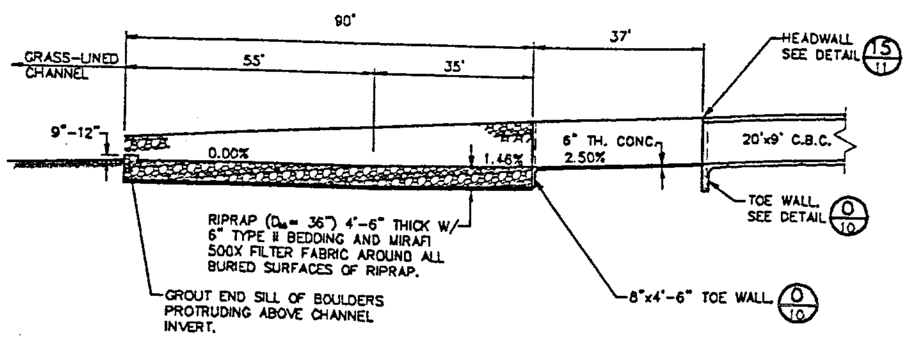
SHEET TITLE CHANNEL DETAILS
FROM - TO -
DRAINAGE BASIN PETERSON FIELD
JOB NO. 6742167 SHEET 9 OF 21

POWERS BOULEVARD / HANCOCK EXPRESSWAY DRAINAGE CHANNEL OUTFALL

City of Colorado Springs



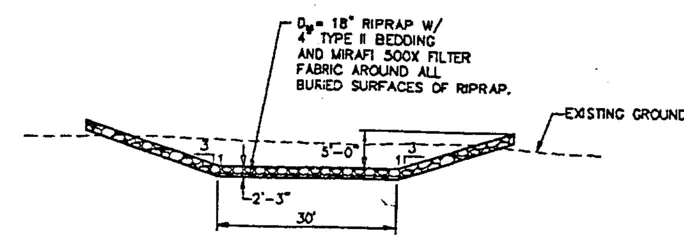
PLAN



SECTION 10/10

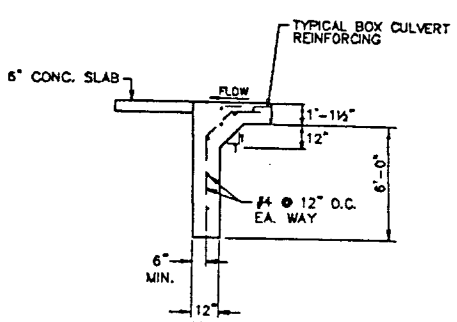
TEMPORARY CHANNEL TRANSITION DETAIL K/10

SCALE: 1"=20'



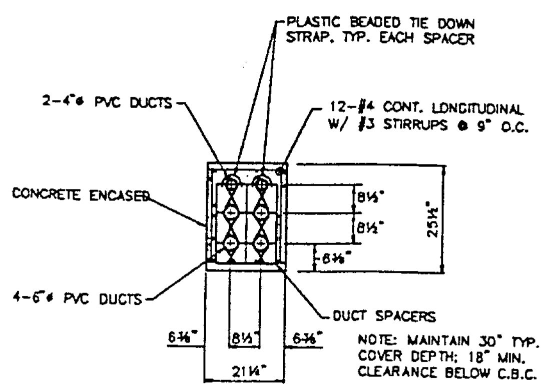
RIPRAP DROP STRUCTURE SECTION 5/10

N.T.S.



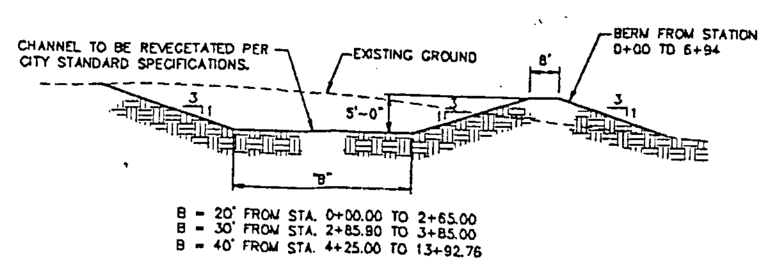
TOE WALL DETAIL O/10

N.T.S.



ELECTRIC DUCT BANK DETAIL U/10

N.T.S.



TYPICAL GRASS LINED CHANNEL SECTION 4/10

N.T.S.

REVIEW:
STREET DESIGN:
ROUGH CUT REVIEW ____ DATE: ____
FINAL REVIEW ____ DATE: ____
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH ____
LOCATION: ATTACHED
DETACHED, 6' FROM P/L
CURB TYPE 1 2 3
R/W WIDTH ____ F/C-F/C
STREET TYPE ____
HVEEM ____
ASPHALT THICKNESS:
AC SURFACE ____
AC BASE ____
AGGREGATE BASE THICKNESS:
CLASS 6 ____
CLASS 5 ____
CLASS 2 ____

SCALE: HORIZONTAL 1"=20' VERTICAL N/A
BENCH MARK:
BOTTOM BOLT, EAST SIDE BRICK COLUMN, FENCE BOUNDARY SOUTHEAST CORNER MOBILE HOME PARK.
DATUM ELEV. = 5989.58

REVISIONS:

NO.	DESCRIPTION

ENGINEER:

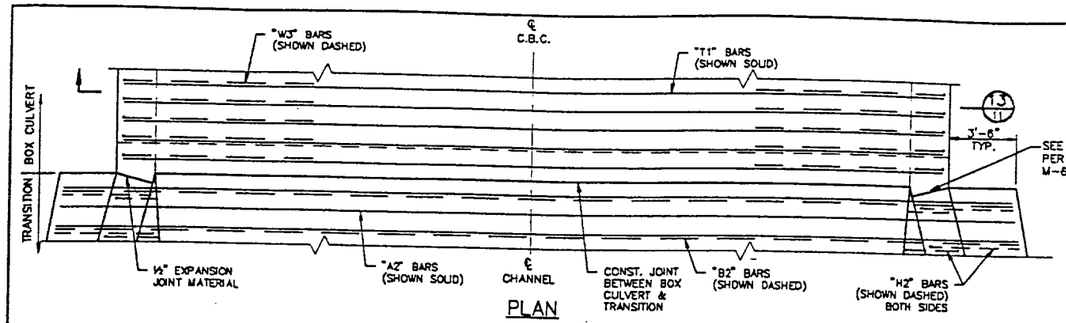
DESIGNED BY: CLP DATE: 1/31/96
DRAWN BY: BLS DATE: 1/31/96
CHECKED BY: JPS DATE: 2/01/96

URS CONSULTANTS, INC.
1040 SOUTH 8th STREET COLORADO SPRINGS, CO (719) 634-6699

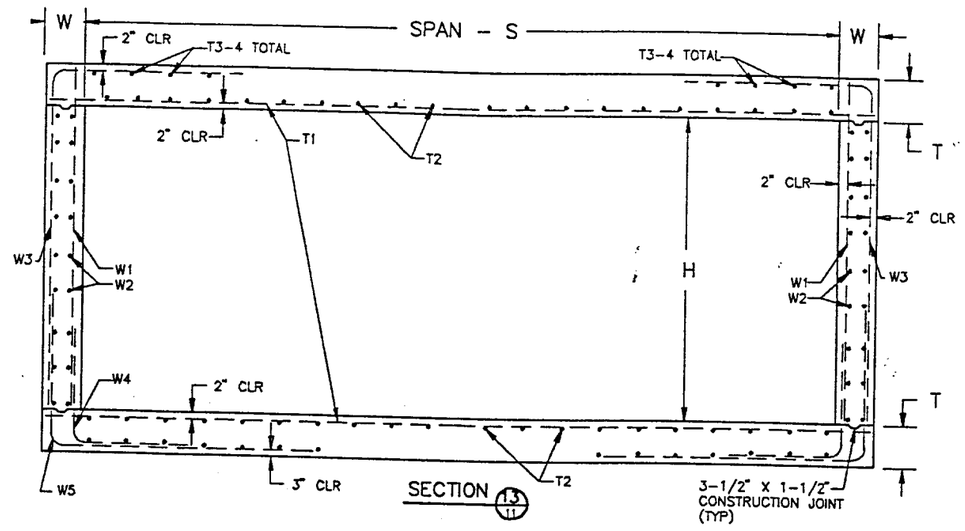
SHEET TITLE CHANNEL DETAILS AND STANDARD ELECTRIC DETAILS
FROM - TO -
DRAINAGE BASIN PETERSON FIELD
JOB NO. 6742167 SHEET 10 OF 21

POWERS BOULEVARD / HANCOCK EXPRESSWAY DRAINAGE CHANNEL OUTFALL

City of Colorado Springs



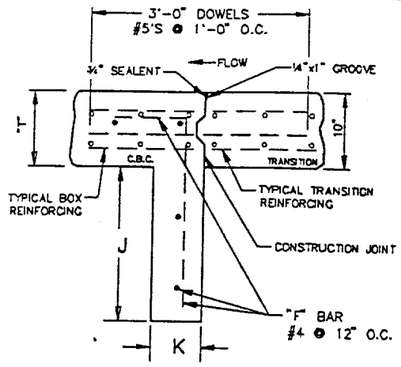
PLAN



SECTION 13/11

BOX CULVERT 5/11

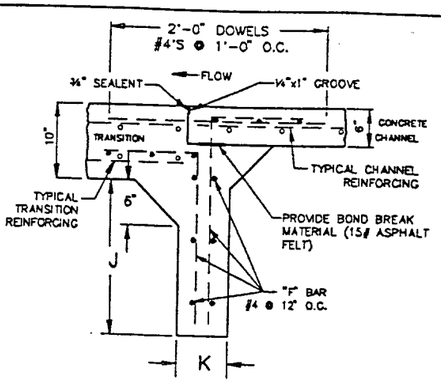
N.T.S.



CUTOFF WALL 5/11

AT BOX CULVERT TO TRANSITION

N.T.S.



CUTOFF WALL 6/11

AT TRANSITION TO CHANNEL

N.T.S.

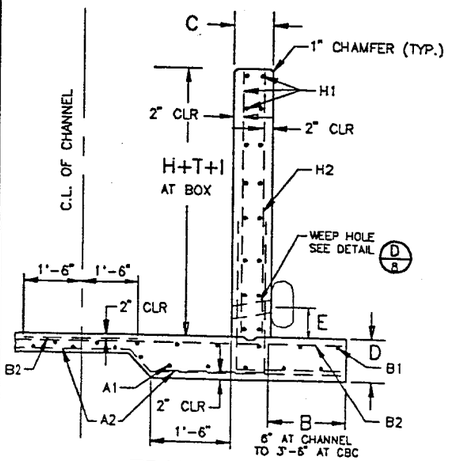
BOX				TRANSITION					HEADWALL			CUTOFF WALL		
SPAN S	HEIGHT H	SLAB T	WALL W	A	B (H/9)	C	D	E	F	G	I	J	K	H+T+I
20'-0"	9'-0"	1'-1½"	12"	13'-5" TO 0"	VAR.	12"	16"	12"	12"	4"	SEE PROFILE	2'-8"	8"	11'-1½"

BAR SIZE & SPACING - BOX CULVERT															
T1		T2		T3		W1		W2		W3		W4		W5	
SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.
#8	6"	#5	12" (CONT)	#5	12" (CONT)	#5	12"	#4	12"	#6	6"	#5	12"	#6	6"

BAR SIZE & SPACING - TRANSITION WALL																	
A1		A2		B1		B2		H1		H2		F BARS					
SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.
#4	1'-6"	#7	6"	#4	12"	#4	12"	#4	12"	#4 #5*	12" (I.F.) 12" (O.F.)	#4	AS SHOWN				

*-SEE BENDING DIAGRAMS

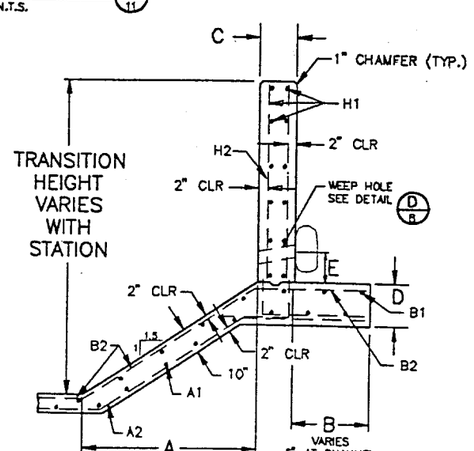
PLAN



TRANSITION WALL 7/11

AT VERTICAL SECTION

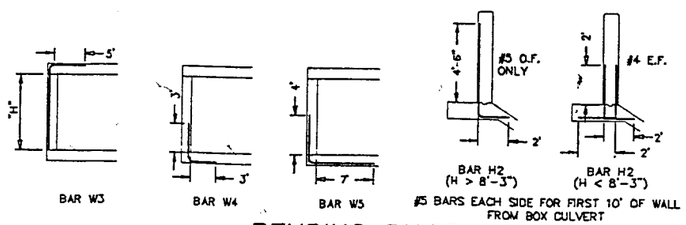
N.T.S.



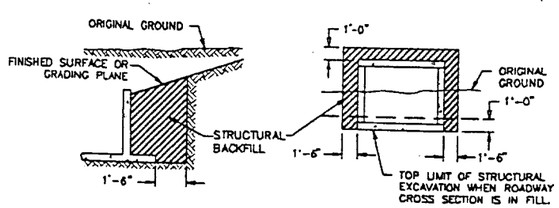
TRANSITION WALL 8/11

AT SLOPED SECTION

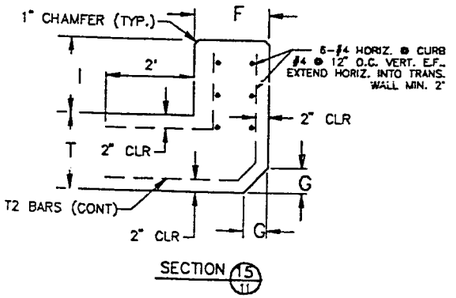
N.T.S.



BENDING DIAGRAMS



EXCAVATION DETAILS



SECTION 15/11

C.B.C. HEADWALL REINFORCING

N.T.S.

REVIEW:
STREET DESIGN:
ROUGH CUT REVIEW _____ DATE: _____
FINAL REVIEW _____ DATE: _____
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH _____
LOCATION: ATTACHED ▫
DETACHED, 6" FROM P/L ▫
CURB TYPE 1 ▫ 2 ▫ 3 ▫
R/W WIDTH _____ F/C-F/C _____
STREET TYPE _____
HVEEM _____
ASPHALT THICKNESS:
AC SURFACE _____
AC BASE _____
AGGREGATE BASE THICKNESS:
CLASS 6 _____
CLASS 5 _____
CLASS 2 _____

SCALE: HORIZONTAL N/A VERTICAL N/A
BENCH MARK:
BOTTOM BOLT, EAST SIDE BRICK COLUMN, FENCE BOUNDARY SOUTHEAST CORNER MOBILE HOME PARK.
DATUM ELEV. = 5989.58

REVISIONS:
NO. DESCRIPTION

ENGINEER:
DESIGNED BY: GMH DATE: 1/10/96
DRAWN BY: BLS DATE: 1/29/96
CHECKED BY: CLP DATE: 2/01/96

URS CONSULTANTS, INC.
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SHEET TITLE BOX CULVERT DETAILS
FROM - TO -
DRAINAGE BASIN PETERSON FIELD
JOB NO. 6742167 SHEET 11 OF 21

POWERS BOULEVARD / HANCOCK EXPRESSWAY DRAINAGE CHANNEL OUTFALL

City of Colorado Springs

C:\HANCOCK\BXCULDTL 7-20-96 6:29:12 pm mst