

ROCKRIMMON DBPS  
ALTERNATIVE ANALYSIS

October 18, 1990

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Colorado Springs, CO 80907

RECEIVED

MAY 20 1999

City Engineering/Stormwater

## SCHEDULE OF ALTERNATES

### Alternate A - Natural Channel

This alternative involves leaving the channel bed and banks essentially as it exists or with some improvements to troubled areas, by way of sloping the bank back or straightening the channel. Drop structures may optionally be installed. The banks or any disturbed areas are to be revegetated. A multi-use trail may or may not be incorporated into an individual corridor.

### Alternate B - Natural bottom with riprap side slopes

This alternative provides for a natural stream bed and rip-rap lined side slopes. The side slopes may be covered with shrubs. Drop structures may optionally be installed. One or both sides of the channel may be lined for a specific trouble spot or an extended reach as needed. A multi-use trail may or may not be incorporated into an individual corridor.

### Alternate C - Concrete lining

This alternative involves full channel bed and side slopes lining with concrete. Drop structures may be required to maintain velocity control and energy dissipators will probably be utilized at the discharge point of concrete lined channels to prevent erosion of the natural channel. A multi-use trail may or may not be incorporated into an individual corridor.

ROCKRIMMON DBPS  
KLH NO. 88 548 00  
Summary of Alternatives

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AREA 1

Rockrimmon South Channel  
Monument to West Side D&RGW RR

100-yr. flow = 3382 cfs  
100-yr. velocity ranges from 10 to 20 fps

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DESCRIPTION

The majority of this reach consists of existing concrete box culverts under an office complex parking area, Mark Dabling Blvd., I-25 and the D & RGW Railroad. The remainder of the channel consists of a 160 L.F. section of concrete channel with vertical side walls and a 50 L.F. section of open ditch at a change in box culvert direction. All of this reach is stable under the present conditions, but it is all inadequate for the 100-yr. storm runoff. Proposed measures for increasing the capacity of this reach are included in the report being prepared. If these improvements are implemented, the 50 L.F. section of open ditch will have to be protected to avoid erosion. Land uses for this reach are already completely in place and include mostly transportation corridors with one office complex.

Wetland vegetation and wildlife habitat is limited to the area surrounding the outfall point at Monument Creek. The major vegetation type along this reach is native grasses. Any construction impacts should be minimal if properly handled and if disturbed areas are revegetated. Multi-objective activities are limited along this reach. The potential for a recreational trail is very limited or nonexistent because of existing transportation corridor and land use barriers. Wildlife migration routes are also severely hampered for the same reasons.

If future improvements are made to expand the capacity of the existing channel, short term impacts such as erosion and increased sedimentation should be handled in an acceptable manner. If flows or velocities are increased along this reach, the potential for increased erosion will exist at the outfall point to Monument Creek. Acceptable methods of mitigating this impact should be considered before any improvements occur upstream.

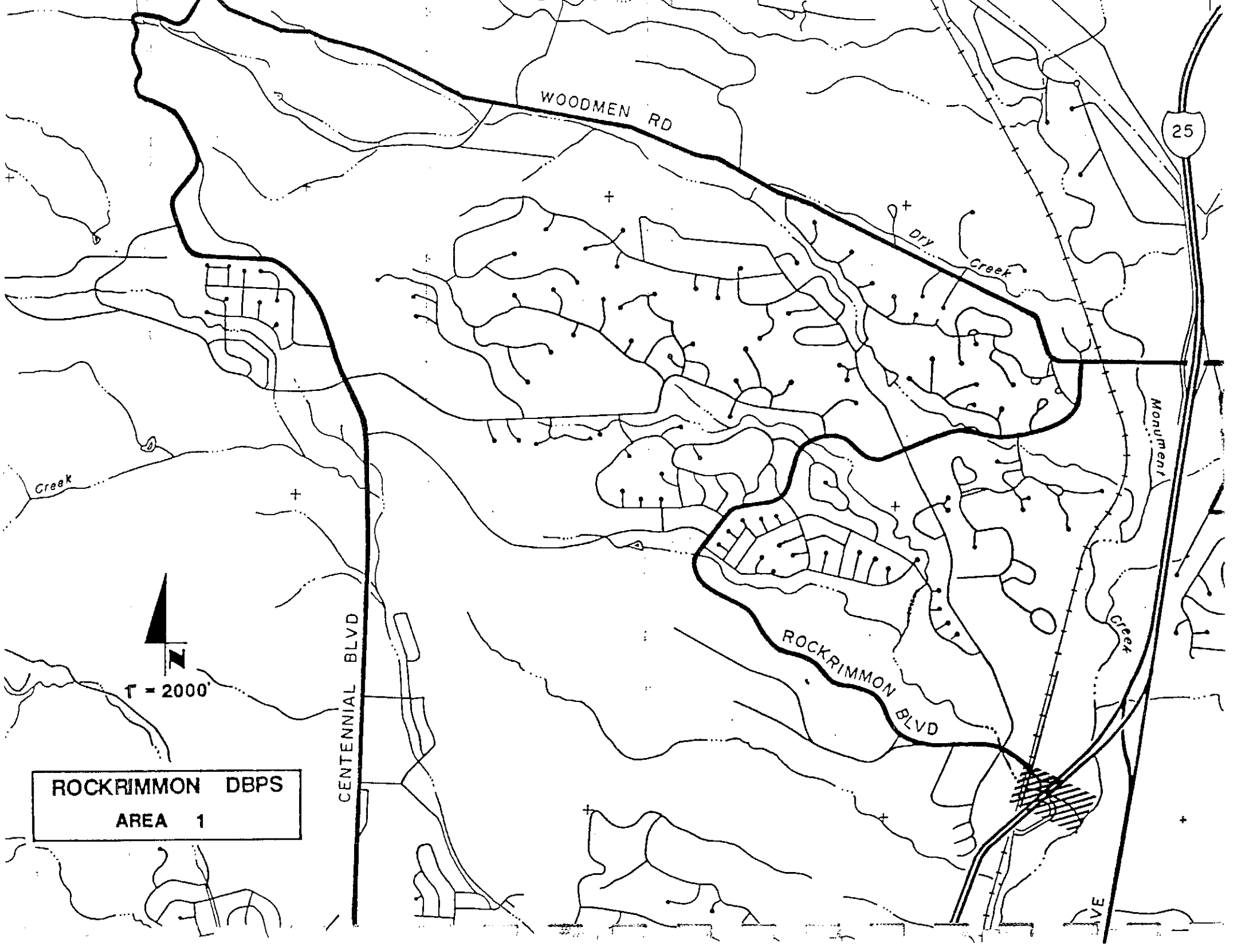
<u>Alternative*</u>	<u>Advantages</u>	<u>Disadvantages</u>
A	None	Significant erosion potential. Will require significant maintenance.
B	Protect property from erosion.	Will require maintenance program.
C	Minimum space requirement for channels. Control of future erosion problems.	Aesthetically displeasing visual quality.

\* Alternative consideration is for open channel areas only.

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RECOMMENDATIONS

It is recommended that an attempt be made to reduce the flow with detention facilities to the capacity of this reach. If this proves to be impossible or unfeasible, additional culverts will be required. Recommend Alternative B for open channel area.



WOODMEN RD

25

Dry Creek

Monument Creek

Creek

ROCKRIMMON BLVD

CENTENNIAL BLVD

AVE



1" = 2000'

ROCKRIMMON DBPS  
AREA 1

ROCKRIMMON DBPS  
KLH NO. 88 548 00  
Summary of Alternatives

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AREA 2

Rockrimmon South Channel  
West Side of D & RGW RR to 450 W. of Rockrimmon Blvd.

100-yr. flow ranges from 2742 to 3382 cfs  
100-yr. velocity ranges from 2 to 11 fps

DESCRIPTION

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Half of this reach consists of concrete lined channel and a concrete box culvert. Neither is adequate for the 100-year flow, though neither shows any signs of erosion, except at the discharge point of the culvert. The remainder of this reach consists of an open dirt channel with relatively minor erosion occurring. If the culverts through reach 1 are made adequate for the 100-year flows, the increased velocities in this area will cause significant erosion. There are no wetlands or wildlife habitats in this reach. Land use in the surrounding area is commercial/industrial.

Native grasses are the dominate vegetation along this section of drainage corridor. Any future channel improvements or construction impacts to the existing vegetation system should be minimal if properly conducted. Short term environmental impacts such as increased erosion and sedimentation caused by construction activities should be carefully monitored and handled in an acceptable manner. As it now exists, multi-objective activities such as trail construction and wildlife migration routes/habitat are very limited or nonexistent due to existing transportation and land use barriers and the existing concrete channel.

<u>Alternative*</u>	<u>Advantages</u>	<u>Disadvantages</u>
A	Limited permitting involved. Use of drop structures could significantly reduce erosion. Provides for better wildlife habitat and higher visual quality.	Significant erosion problems for future flows. High maintenance cost.
B	Minimum right-of-way required. Use of drop structures could significantly reduce velocities and maintenance required.	Some maintenance required.
C	Minimum right-of-way required. Maximum channel protection. Reduces maintenance costs.	Aesthetically displeasing visual quality.

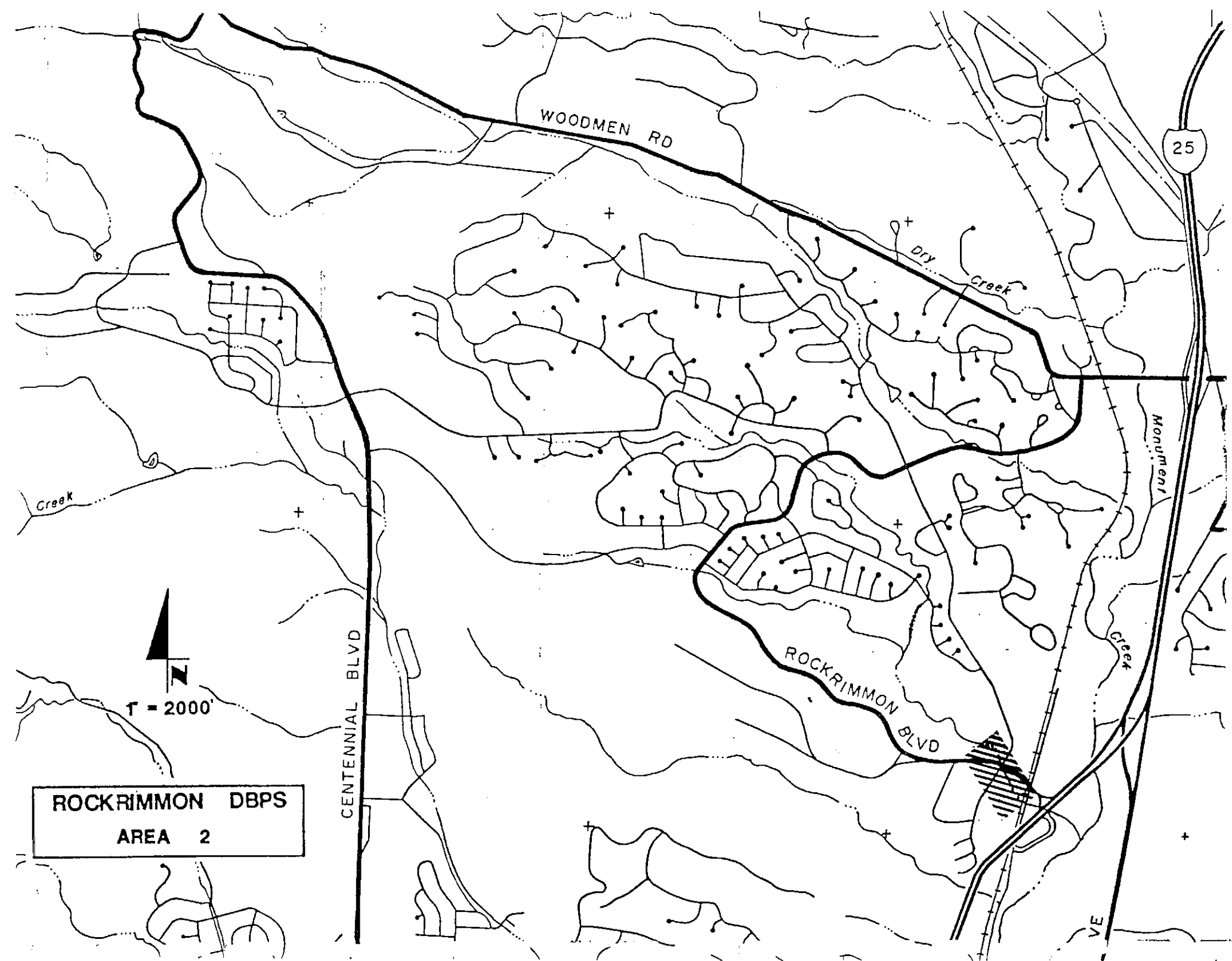
\*Alternative consideration is for open channel area only.

RECOMMENDATIONS

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It is recommended that an attempt be made to reduce the flow with detention facilities to the capacity of this reach. If this proves to be impossible or unfeasible, additional culverts will be required. Recommend Alternative A for open channel area.

Existing concrete lined channel is adequate for 100-year storm, but does not have required freeboard. Detention upstream will reduce flows and provide required freeboard. Recommend no improvements of this section. Also recommend the construction of a drop structure with associated bed and bank stabilization at the discharge end of the culvert under the intersection of Delmonico and Rockrimmon.



WOODMEN RD

25

Dry Creek

Monument

Creek

Creek

ROCKRIMMON BLVD

CENTENNIAL BLVD

VE



1" = 2000'

ROCKRIMMON DBPS  
AREA 2

AREA 3

Rockrimmon South Channel  
450' North of Rockrimmon to Rockrimmon North Channel

100-yr. flow ranges from 2511 to 2742 cfs  
100-yr. velocity ranges from 7 to 14 fps

DESCRIPTION

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Approximately the lower half of this reach has a relatively mild gradient and scattered sandstone formations which is preventing all but minor erosion in isolated areas. There is an adequately vegetated buffer area in these areas to accommodate minor erosion. The upper half of this reach is slightly steeper with sharper bends in the channel. Some more erosion is occurring here, particularly on the outside of curves. The main channel lies entirely on private property. Therefore, private developer(s) will need to construct selected improvements or R.O.W. acquired by the City of Colorado Springs. Two smaller channels entering the main channel from the west are experiencing major erosion. These areas will probably be improved when this land is developed by the land owner.

More diversity of vegetation, wildlife habitat, and variety of wildlife species is encountered along this reach. Vegetation mainly consists of native grasses with pockets of shrubs and scattered trees. Proposed surrounding land uses include commercial business uses along the southern portion of the corridor with higher density residential and private open space along the remaining portion. Because this channel is located on private lands, there is very limited or no potential for a coordinated trail development program along this section. To maintain and promote the environmental integrity of this area, the majority of this reach should be left in a natural or near natural condition. Any necessary spot improvements should be made to problem (erosion) areas by utilizing one of the various natural channel improvement treatments. The use of geofabrics, interlocking blocks, bio-engineering, or other "natural" bank stabilization methods should be explored as viable alternatives to a concrete or rip-rap lined channel.

Alternative

Advantages

Disadvantages

A

Limited permitting involved.  
No mitigation required.  
Preserves wetland and wildlife habitat.  
Use of drop structures could enhance wildlife and wetlands habitat.

Some on-going maintenance will be required.  
Not sufficient for all areas in this reach.

B

Minimal additional right-of-way requirements.  
Can control erosion currently occurring.  
Most economical for isolated areas of erosion.  
Use of drop structures can be very beneficial economically and environmentally.

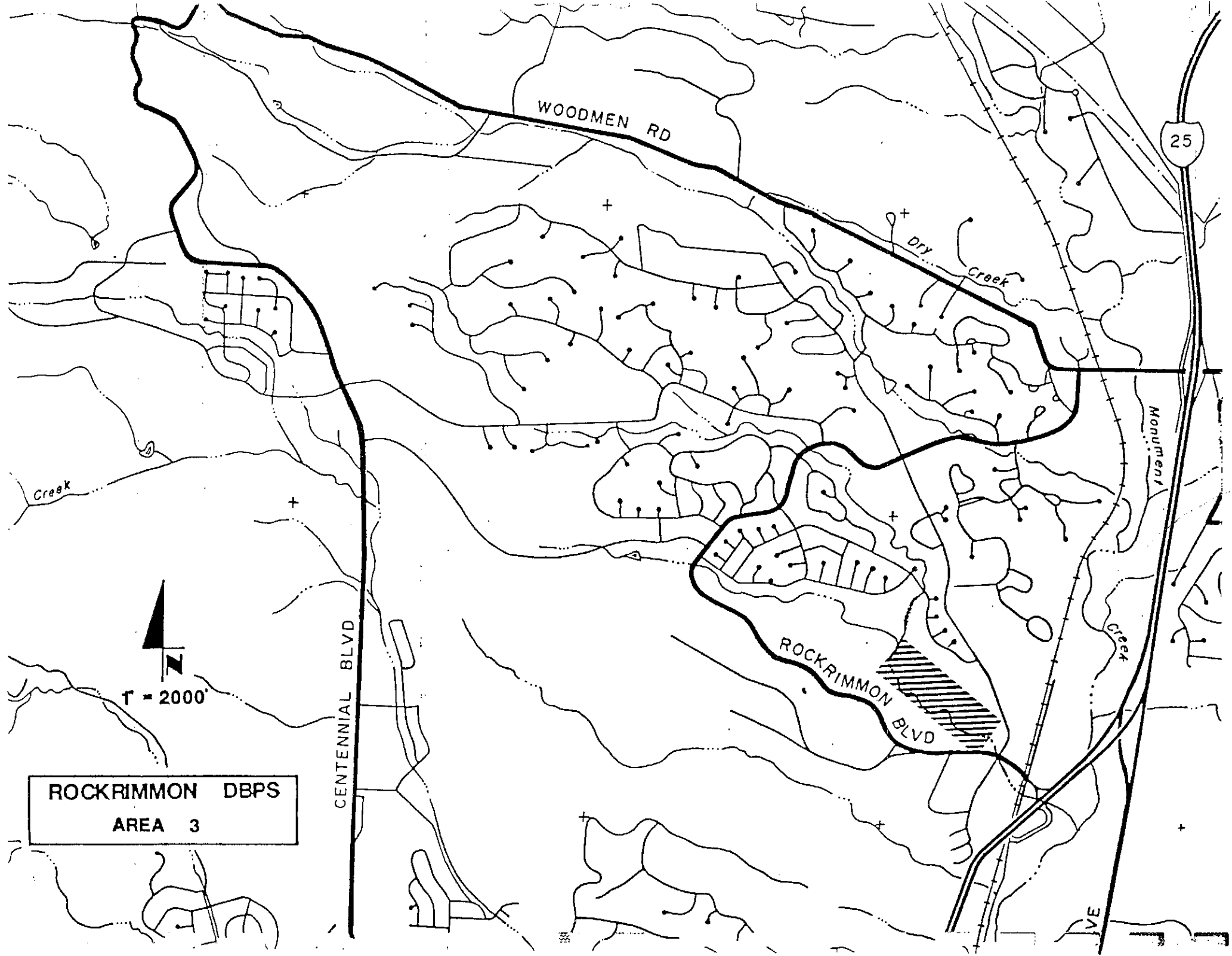
May require removal of some existing vegetation/trees.  
May cause destruction of wildlife habitat.  
Visually obtrusive.

C None This alternative eliminated due to high cost of construction.

RECOMMENDATIONS

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It is recommended for this reach that the stream channel and banks be left in a natural state (Alternative A), except that drop structures be installed in such a way and at intervals to limit flow velocities to 3 fps. Also recommend that Alternative B be used on outside of a couple of sharp bends where erosion is currently occurring.



WOODMEN RD

25

Dry Creek

Creek

Monument

Creek

ROCKRIMMON BLVD

1" = 2000'

ROCKRIMMON DBPS  
AREA 3

IVE



AREA 4

Rockrimmon South Channel  
Rockrimmon North Channel to concrete channel

100-yr. flow ranges from 772 to 2511 cfs  
100-yr. velocity ranges from 6 to 17 fps

DESCRIPTION

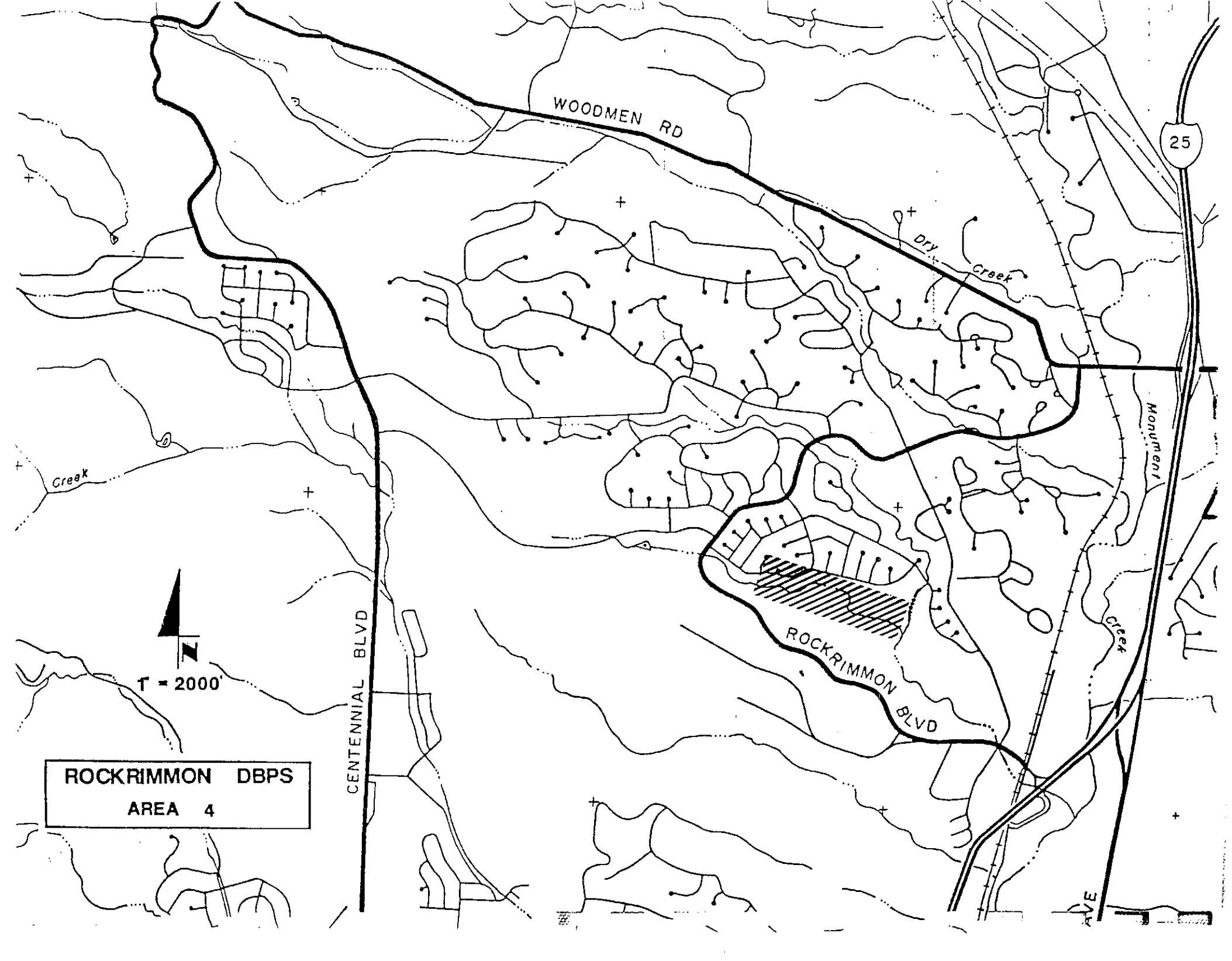
The lower 600'± of this reach is relatively flat with little or no erosion occurring. The remainder of this reach is steeper with high, steep banks which are exhibiting severe erosion. There is a substantial buffer area here, but because of the extreme depth of the channel in this area, continued erosion will encroach further into private property. Several outfall points for local drainage in this reach are seriously eroded and in need of repair/improvement. The channel in this reach lies entirely within private property. Private developer(s) would need to construct these improvements or R.O.W. acquired by the City of Colorado Springs.

The diversity of vegetation and wildlife habitat is very limited along this reach. Because of the steep side slopes and severe erosion occurring along portions of this channel, vegetation is limited to native grasses and invader species of weeds. Surrounding land uses include private open space along both sides of the channel. A narrow strip of undeveloped park land exists north of this area. Because the channel is located on private property and trail linkages to the west are nonexistent, there is very little or no potential for trail development along this reach. More natural bank stabilization techniques, rather than a total rip-rap treatment, are a possibility for this reach. Because there is some area (width) to work with along here, the possibility exists of laying the side banks back to a more gentle slope. This would decrease erosion potential and provide more suitable conditions for vegetation establishment, also improving the wildlife habitat.

<u>Alternative</u>	<u>Advantages</u>	<u>Disadvantages</u>
A	Permitting not required. Economical. Use of drop structures will reduce velocities to acceptable levels, create wildlife habitat and increase possibilities for enhanced vegetative cover. Higher visual quality.	Some areas will require additional work.
B	Needed to stabilize some areas. Will maintain current right-of-way width requirements. Use of drop structures will control velocities.	Extreme diligence must be used. This method has failed in this reach in the past. Private property.
C	Positive erosion control.	High cost of construction. Visually obtrusive. Private property. Higher velocities generated may cause erosion in downstream natural channels.

RECOMMENDATIONS

For this reach, we recommend the use of Alternative A with drop structures and Alternative B at the outside of curves as required. Velocities should be reduced to a maximum of 3 fps.



WOODMEN RD

25

Dry Creek

Monument Creek

Creek

Creek

↑ = 2000'

ROCKRIMMON DBPS  
AREA 4

CENTENNIAL BLVD

ROCKRIMMON BLVD

AVE

ROCKRIMMON DBPS  
KLH NO. 88 548 00  
Summary of Alternatives

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AREA 5

Rockrimmon South Channel  
Concrete Channel to Rockrimmon Blvd.

100-yr. flow = 772 cfs  
100-yr. velocity ranges from 9 to 32 fps

DESCRIPTION

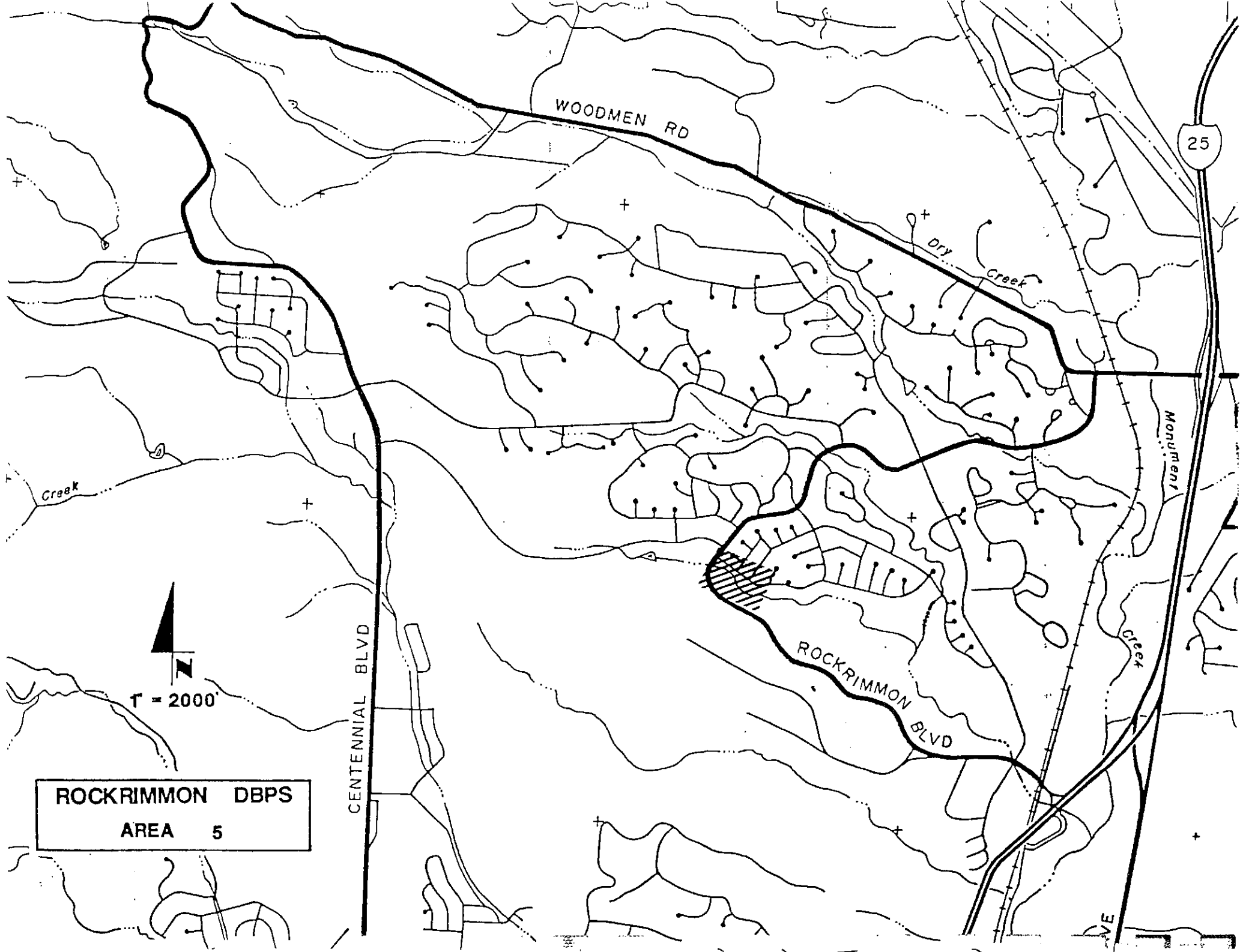
This entire reach is currently concrete lined. The concrete channel is adequate for only part of its length to convey the 100-year flow, but the grassed channel area outside the concrete is more than adequate and is showing no signs of erosion. No alternatives are evaluated for this reach as no remedial work is required.

Because of the existing concrete-lined channel, vegetation and wildlife habitat is nonexistent. In its current form, the multi-objective planning concept for this channel is limited to transporting stormwater runoff. If this reach is left in its present form, it will be very unlikely that multi-objective activities such as recreational/trail experiences, improved wildlife habitat, and improved water quality will be achieved.

RECOMMENDATIONS

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We recommend no remedial action be taken in this reach.



WOODMEN RD

25

Dry Creek

Monument

Creek

Creek

1" = 2000'

ROCKRIMMON DBPS  
AREA 5

CENTENNIAL BLVD

ROCKRIMMON BLVD

AVE

ROCKRIMMON DBPS  
KLH NO. 88 548 00  
Summary of Alternatives

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AREA 6

Rockrimmon North Channel  
Rockrimmon South Channel to old lake bed

100-yr. flow = 1325 cfs  
100-yr. velocity = 22 fps

DESCRIPTION

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This reach is short but very steep. It is the channel from the old lake bed to the South Rockrimmon main channel. It was originally riprap lined. The west bank is stable, but the bottom and east bank have failed totally. This section of channel lies entirely on private property. The improvements would have to be undertaken by private developer(s) or R.O.W. acquired by the City of Colorado Springs.

The existing steep banks and severe erosion conditions along this section have severely limited vegetation, wildlife and wildlife habitat abundance and diversity. This reach is buffered by private open space and undeveloped park land along and near both sides of the channel. Because of terrain conditions and private land ownership along this section, the possibility of a trail linkage through here is very limited or nonexistent. Cleaning out the present rip-rap debris and laying the side slopes back to a more gentle slope with a more "natural" bank stabilization and revegetation program is a possibility. A more "natural" treatment could greatly improve not only the aesthetics of this reach, but also the diversity of vegetation and wildlife habitat.

Alternative

Advantages

Disadvantages

A

This alternative was eliminated as being inadequate for channel protection.

B

Use of drop structures could reduce velocities to acceptable levels.

Costly with required maintenance.  
Doubtful that riprap can be installed to be permanent on this slope.

C

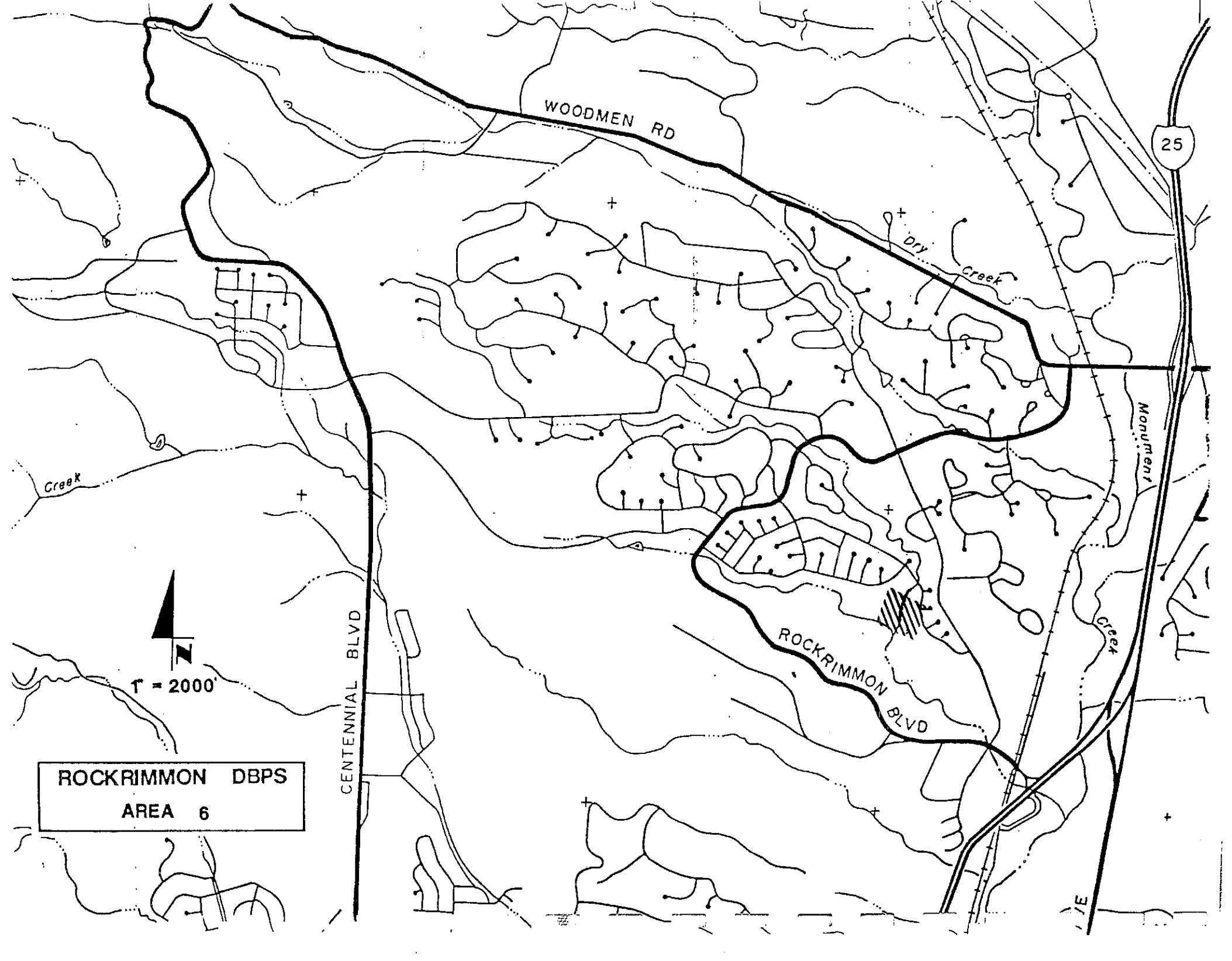
Positive control of erosion.  
Use of drop structures may control velocities at discharge point.  
Reduced maintenance requirements and costs.

High cost of initial construction.  
Eliminates chance of wildlife habitat or vegetative cover.  
Visually obtrusive.

RECOMMENDATIONS

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For this reach, Alternate B is recommended with drop structures to reduce velocities. An energy dissipator may be required at the point of connection with the South channel.



WOODMEN RD

Dry Creek

Creek

25

Monument

Creek

ROCKRIMMON BLVD

↑ = 2000'

ROCKRIMMON DBPS  
AREA 6

E

AREA 7

Rockrimmon North Channel  
Thru lake bed to 400' ± north of Saddle Mountain Road

100-yr. flow ranges from 1256 to 1290 cfs  
100-yr. velocity ranges from 6 to 11 fps

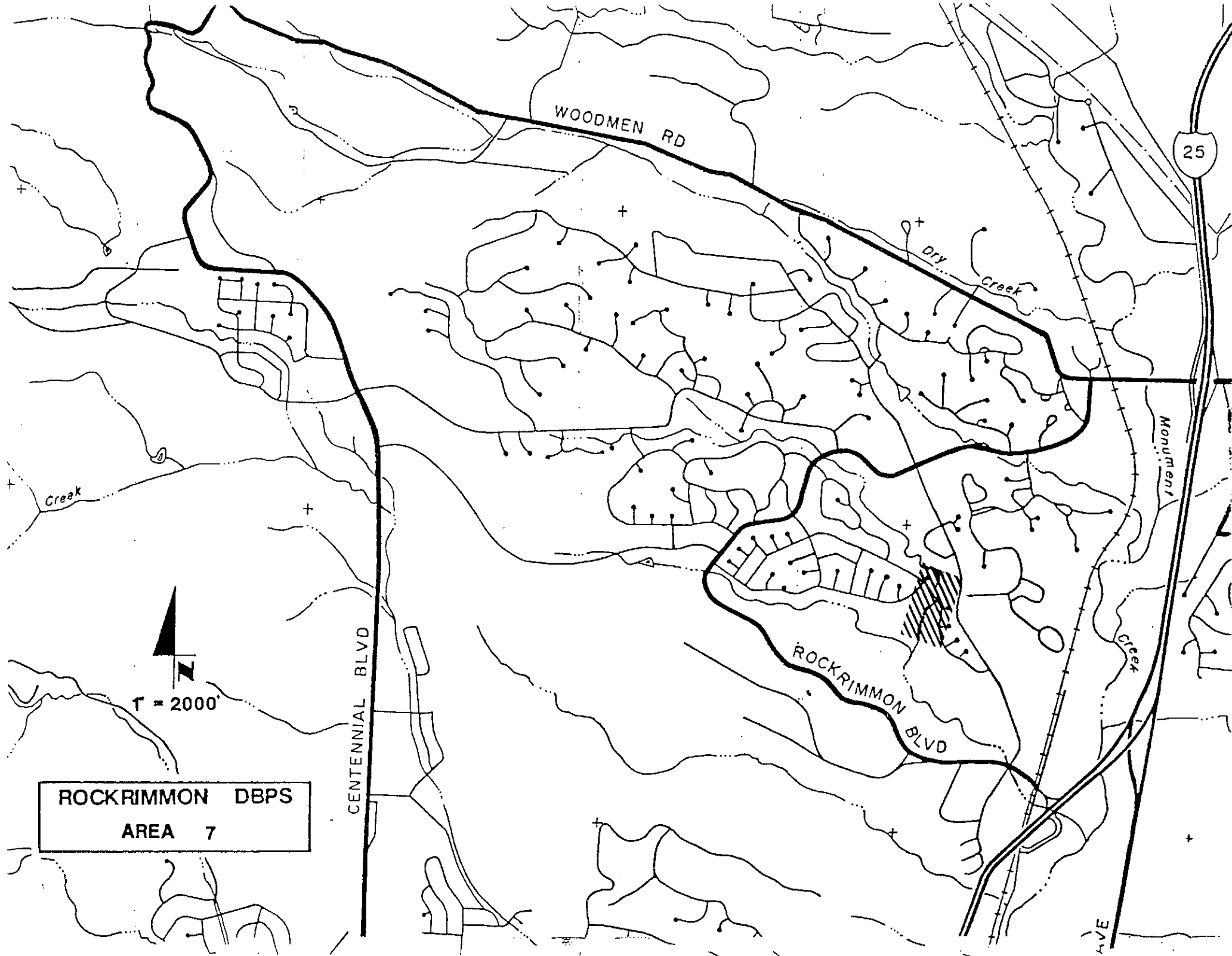
DESCRIPTION

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The portion of this reach under Saddle Mountain Road is piped with an energy dissipator at the discharge end. The remainder of this reach is relatively mild and supports wetlands on both sides of Saddle Mountain Road. There is very little erosion except at three specific points toward the north end of this reach.

This reach of channel contains two diverse wetlands or "near" wetlands environment of vegetation and wildlife, including excellent bird and small animal habitat. Riparian vegetation such as willows, cattails, and scattered cottonwoods are abundant. The area is currently acting as a large sponge to help filter out pollutants and sediments and also helps slow storm water velocities. The majority of this reach is surrounded by undeveloped, public park lands with single family residential areas in the nearby vicinity. Any construction work done along this section should be done with extreme caution and sensitivity to the existing environment. Aesthetically pleasing and more natural methods of improvements should be explored to the fullest extent. This area provides an excellent opportunity for the multi-objective concept of stormwater runoff and pollution control, wildlife and vegetation preservation and recreational/trails opportunities. Placement of a trail system through and along this reach should be done with a great deal of planning and environmental sensitivity.

<u>Alternative</u>	<u>Advantages</u>	<u>Disadvantages</u>
A	Preservation of natural wetlands. No permitting involved. No mitigation required. Sediment filtration in wetlands. Potential for multi-objective activities. Preservation of existing wildlife habitat.	Existing erosion, though minor, will continue to be a problem.
B	Potential for multi-use of area. Ability to control existing erosion problems. Minimum right-of-way requirements beyond existing channel width.	Some onsite mitigation may be required. Removal of some vegetation may be required. Some disturbance of wetlands will occur during construction. Diminishing of visual quality. Destruction of wildlife habitat and impedance of wildlife migration. Destruction of vegetative cover.
C	None	This alternative was eliminated as being inappropriate for this area.



WOODMEN RD

25

Dry Creek

Monument Creek

Creek



1" = 2000'

ROCKRIMMON DBPS  
AREA 7

CENTENNIAL BLVD

ROCKRIMMON BLVD

AVE



AREA 7

Page 2

Rockrimmon North Channel  
Thru lake bed to 400' ± north of Saddle Mountain Road

100-yr. flow ranges from 1256 to 1290 cfs  
100-yr. velocity ranges from 6 to 11 fps

RECOMMENDATIONS

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Recommend Alternative A for this reach with the exception of one bend north of Saddle Mountain Road. There is progressive erosion on the outside of two (2) curves and Alternative B is recommended at these locations. Several judiciously placed drop structures are recommended for the section north of Saddle Mountain Road. An additional pipe arch culvert is recommended above the existing culvert under Saddle Mountain Road to prevent overtopping of the roadway.

AREA 8

Rockrimmon North Channel  
from Area 7 to Rockrimmon Blvd.

100-yr. flow ranges from 897 to 1256 cfs  
100-yr. velocity ranges from 7 to 17 fps

DESCRIPTION

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This reach is relatively steep (2-3%) and has active erosion occurring and some downcutting of the bed. There are a number of sharp bends in the channel alignment and the erosion is most evident on the outside of bends. There are a number of locations in this reach where erosion is on, or very near, private property.

This reach of channel contains a diverse and abundant environment of native grasslands with scattered clumps of shrubs and pockets of riparian or "near" wetlands vegetation. There is also an abundance of excellent wildlife and bird habitat along this portion of the channel. Throughout its reach, this area provides for an excellent opportunity for multi-objective activities. In many cases, because of the close proximity to single family residences, erosion problem areas should be handled in as environmentally sensitive and aesthetically pleasing a manner as possible. This would include a "softer" approach to channel improvements where possible. During channel improvements, every attempt should be made to cause the least amount of disruption to the existing environment. Placement of the proposed trail through this reach should involve thorough planning and design with regards to visual quality and environmental sensitivity.

Alternative

Advantages

Disadvantages

A

Preservation of natural wetlands and wildlife habitats.  
Minimum permitting involved.  
Minimum mitigation required.  
Strong potential for multi-use of area.  
Use of drop structures may actually enhance wildlife habitats.

Significant erosion presently occurring.  
Downcutting and erosion will continue to occur.  
Access difficulty and erodibility of soils will increase maintenance costs.

B

Minimum right-of-way requirements beyond existing channel channel width.  
High potential for multi-use in this area.  
Use of drop structures could enhance wetlands and wildlife habitats.  
Positive control of existing erosion areas.

Will require removal of some existing vegetation.  
Some mitigation may be required.  
Some disturbance of wetlands and wildlife habitat will occur during construction.  
Will decrease visual aesthetics.

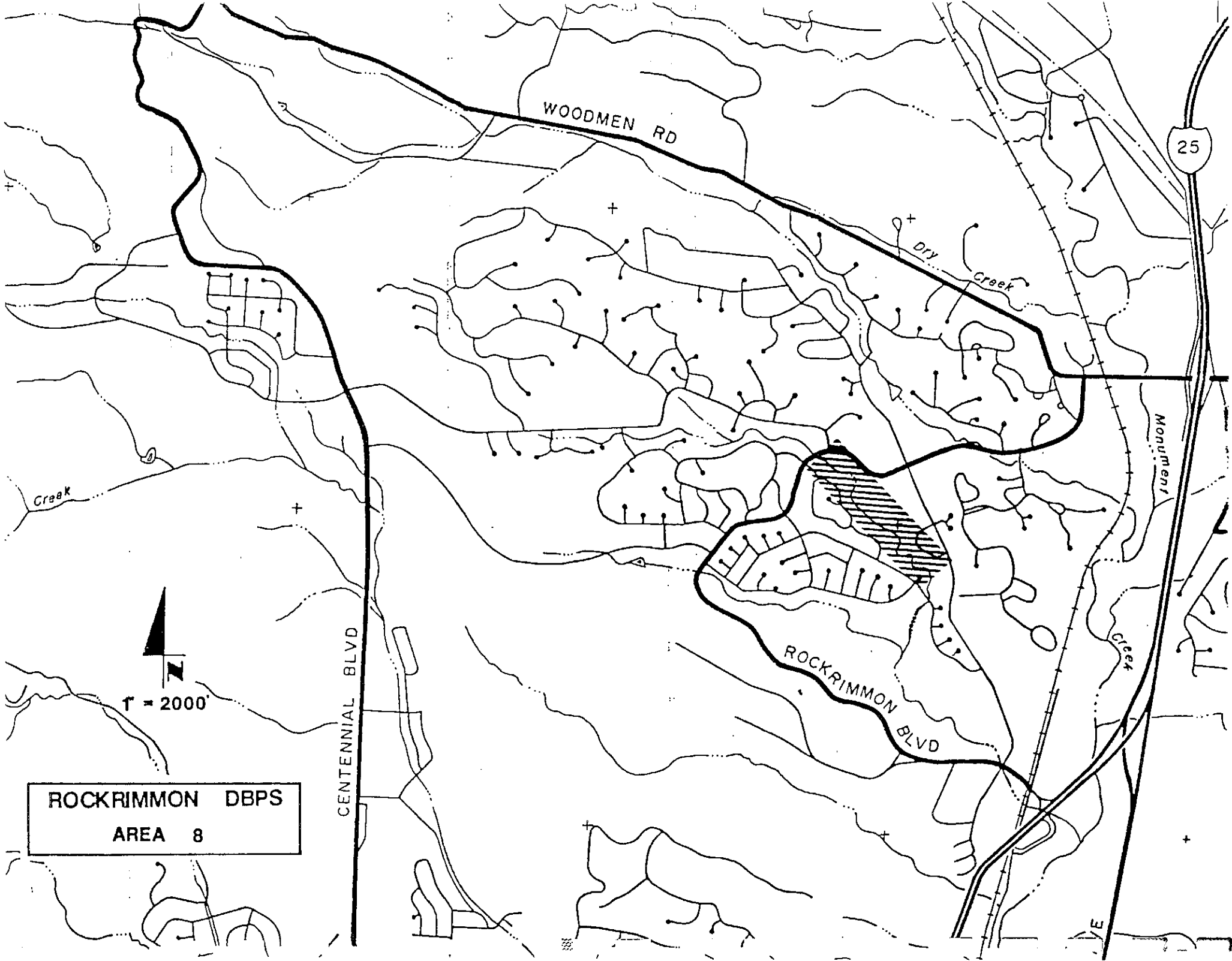
C

This alternative was eliminated because it was inappropriate for this area and the cost of construction and mitigation would be prohibitive.

RECOMMENDATIONS

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A combination of Alternatives A and B is recommended for this reach. Alternative A with drop structures sufficient to reduce velocities to 3 fps or less is recommended for most of this reach with Alternative B protection for the outside of some exceptionally troublesome curves. A drop structure with bed and bank protection should also be installed at the discharge point of the culvert under Rockrimmon Blvd.



WOODMEN RD

25

Dry Creek

Creek

Monument

Creek

ROCKRIMMON BLVD

CENTENNIAL BLVD



1" = 2000'

ROCKRIMMON DBPS  
AREA 8

E

AREA 9

Rockrimmon North Channel  
Rockrimmon Blvd. to existing concrete lining near War Eagle Place

100-yr. flow ranges from 613 to 848 cfs  
100-yr. velocity ranges from 6 to 14 fps

DESCRIPTION

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Portions of this reach are shallow channels and other portions are deeply cut. Much of the reach has sharp bends with accompanying erosion. There is substantial erosion occurring throughout the entire length of this reach except in the lower 400 feet. The channel through this reach does not have the capacity to carry the 100-year flow, but it is contained within the available buffer area.

A diverse and abundant vegetation and wildlife community is located along this reach. The majority of the vegetation is native grasses, but clumps of various shrubs and scattered ponderosa pines and scrub oaks are also present. The channel is surrounded by a relatively narrow strip of undeveloped park land with single family residences located next to this strip. Because of the close proximity to single family residences any erosion problem areas should be addressed in as sensitive and aesthetically pleasing a manner as possible. To protect the environmental integrity and promote the multi-objective concept of stormwater drainage, future channel improvements should include investigation of the various alternatives to a concrete or rip-rap lined channel. Placement of the proposed trail through and along this reach should be done with a great deal of planning and environmental sensitivity.

Alternative

Advantages

Disadvantages

A

Preserve wildlife habitats.  
Limited permitting involved.  
Limited mitigation required.  
Use of drop structures could control velocities and erosion.  
Aesthetically more appealing than hard lining.

Existing channel has significant erosion occurring.  
Erosion and downcutting will continue to be a problem.  
High maintenance costs are likely due to erosiveness of soil and steepness of channel bed.

B

Minimal right-of-way requirements beyond existing banks.  
Use of drop structures could benefit wetlands and wildlife habitats.  
High potential for multi-use of area.  
Able to control erosion occurring now.

Will require removal of some vegetation.  
Will require some mitigation.  
Some disturbance of wildlife habitats during construction.  
May impede deer migration.  
Visually obtrusive.

C

Positive control of erosion.  
Minimum right-of-way requirements.

Requires removal of existing vegetation.  
Off-site mitigation may be required.  
Eliminates wetlands and wildlife habitats in area where it is built.  
Difficult to fit into park setting.  
Aesthetically undesirable to local residents and park and trail users.  
May impede wildlife migration.  
Increased velocity may cause erosion in downstream natural channel.  
Construction and mitigation costs would be high.

AREA 9

Page 2

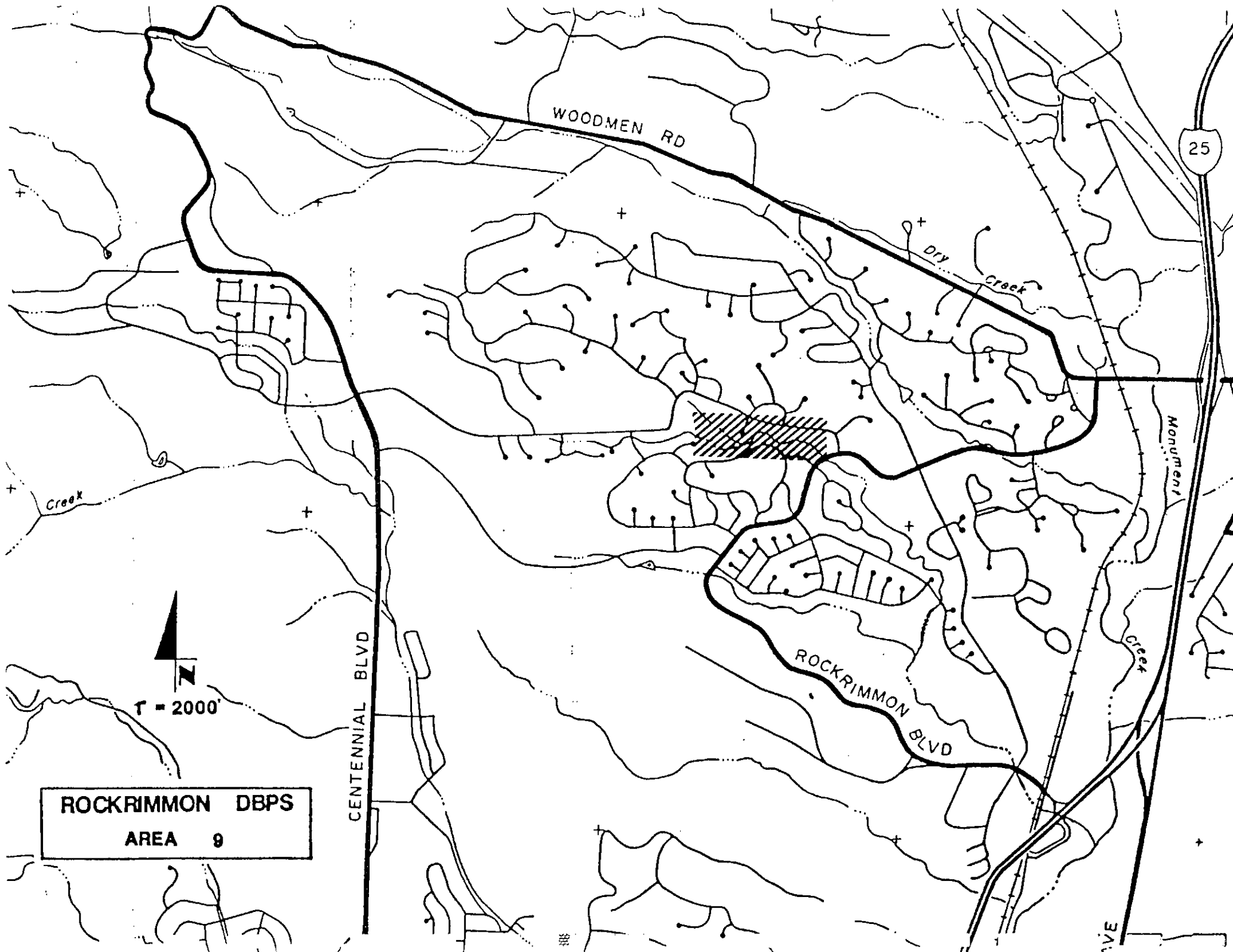
Rockrimmon North Channel  
Rockrimmon Blvd. to existing concrete lining near War Eagle Place

100-yr. flow ranges from 613 to 848 cfs  
100-yr. velocity ranges from 6 to 14 fps

RECOMMENDATIONS

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Alternative A is recommended for the lower portion of this reach (approximately 800'). Recommend straightening of S-turn approximately 500' northwest of Rockrimmon Blvd. and installation of a drop structure. Recommend Alternate A with drop structures for the remainder of this reach. In the first 500'+ of this section (800'-1300' northwest of Rockrimmon Blvd.), it is recommended that the channel be straightened. At the upper end of this reach, an energy dissipator is recommended at the discharge point of the concrete lined channel.



WOODMEN RD

Dry Creek

Creek

Monument

Creek

ROCKRIMMON BLVD

1" = 2000'

ROCKRIMMON DBPS  
AREA 9

CENTENNIAL BLVD

AVE

AREA 10

Rockrimmon North Channel  
Concrete lined channel from near War Eagle Place to detention facility

100-yr. flow ranges from 410 to 613 cfs  
100-yr. velocity ranges from 15 to 24 fps

DESCRIPTION

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This entire reach is presently concrete lined and is functioning well, except for two areas. The downstream end is head cutting and beginning to fail. Also, where the 42" RCP is connected, the bottom has been built up with mortar and aggregate and is creating sediment deposits upstream. The concrete channel is inadequate to convey the 100-year flow. However, the surrounding buffer area is sufficient to carry this runoff without threat to any private property, except two homes located northwest of the channel above the inflow from the 48" RCP. These two houses are very near, but outside the anticipated 100-year storm high water level.

The existing concrete lined channel along this reach severely limits an abundance or diversity of vegetation or wildlife. Near the channel, surrounding vegetation consists mainly of native grasses. Wildlife, especially the larger species such as deer, have difficulty crossing or migrating along this reach. Very little habitat and cover is available along this section. Increased velocities through this area have caused severe erosion problems to the reach below, especially where stormwaters discharge into the natural channel.

Alternative

Advantages

Disadvantages

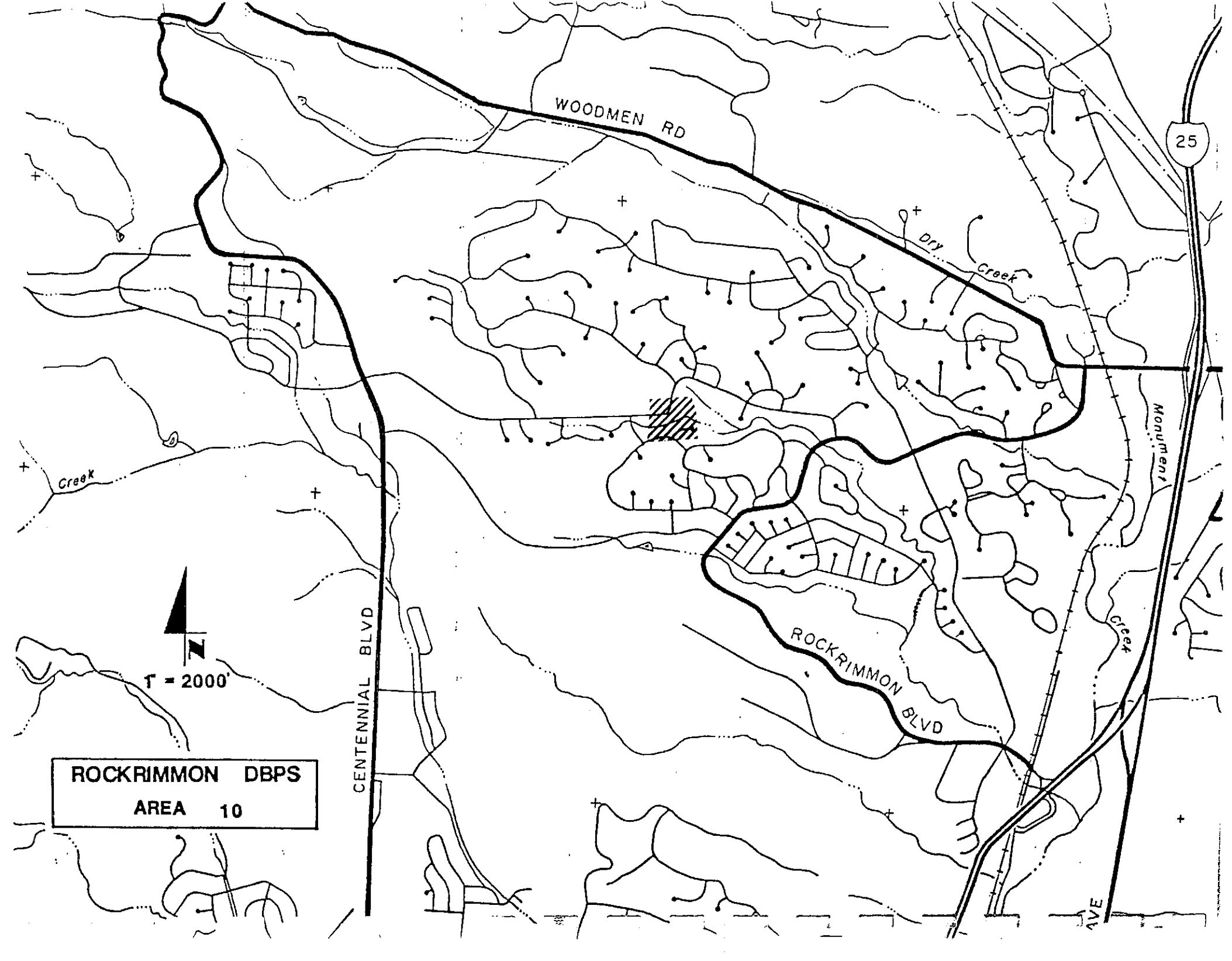
A/B/C

These alternatives were eliminated because channel is already concrete lined.

RECOMMENDATIONS

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Recommend no remedial action to this reach.



WOODMEN RD

Dry Creek

Creek

Monument

Creek

ROCKRIMMON BLVD

CENTENNIAL BLVD

AVE

25

1" = 2000'

ROCKRIMMON DBPS  
AREA 10



AREA 11

Rockrimmon North Channel  
Detention facility to War Eagle Lane

100-yr. flow = 410 cfs  
100-yr. velocity ranges from 0.4 to 7 fps

DESCRIPTION

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Most of this reach is the detention facility which appears to be in good repair and functioning properly. The remaining 200 feet is a wide shallow area with a small meandering channel for low flows. Very minor erosion is occurring, except at the discharge of the 36" pipe culverts under War Eagle Lane. This area is predominantly wildlife habitat. The 100-year storm water level will encroach onto private property with a low velocity flow, but will not endanger any existing structures.

Vegetation along this section of channel consists of a thick cover of native grasses with scattered pines, junipers and clumps of scrub oaks. This reach provides excellent wildlife habitat for numerous wildlife and bird species. Surrounding land use consists of undeveloped parkland surrounded by single family residential to the north and south. Because this section is highly visible from War Eagle Lane, any improvements such as the discharge point from the west or trail improvements should be conducted in an environmentally sensitive and visually pleasing manner.

Alternative

Advantages

Disadvantages

A

Preserve wildlife habitat.  
No permitting involved.  
No mitigation required.  
Aesthetically appealing.

Minor erosion will continue.  
Minor maintenance costs may be required.

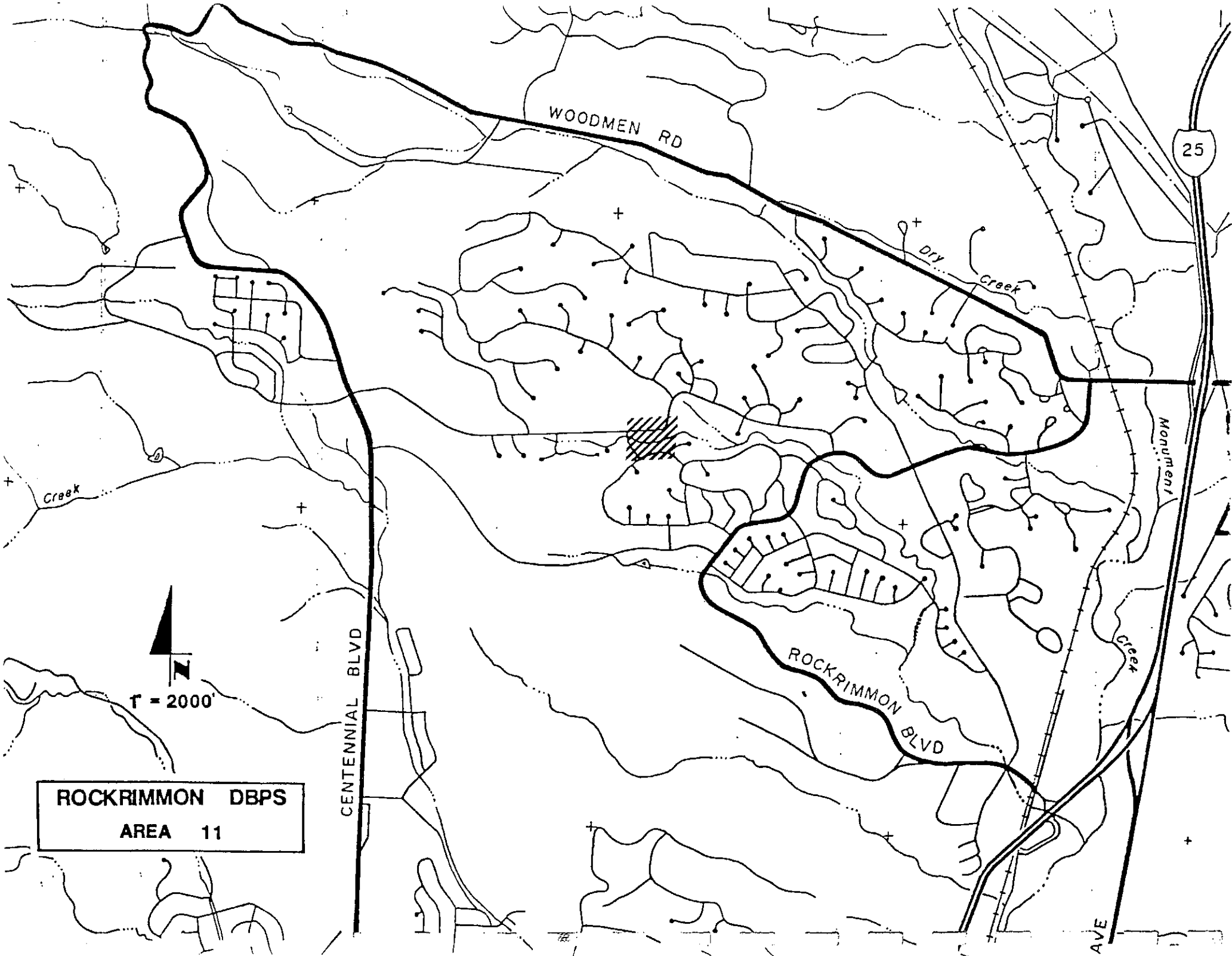
B/C

These alternatives were eliminated, due to cost of construction and mitigation, as well as anticipated local opposition.  
Destruction of wildlife habitat.

RECOMMENDATIONS

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Alternative A is recommended through this reach from the spillway up to War Eagle Lane. Some erosion protection in the form of Alternative B is recommended at the discharge point of flow through the culvert under War Eagle Lane.



WOODMEN RD

25

Dry Creek

Creek

Monument

Creek



1" = 2000'

**ROCKRIMMON DBPS**  
**AREA 11**

CENTENNIAL BLVD

ROCKRIMMON BLVD

AVE

AREA 12

Rockrimmon North Channel  
War Eagle Lane to detention facility near Northface Lane

100-yr. flow ranges from 330 to 410 cfs  
100-yr. velocity ranges from 5 to 10 fps

DESCRIPTION

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This reach has a small well-defined channel that does not appear to be eroding past its present condition. The channel itself is inadequate to carry the 100-year flow, but the surrounding vegetated buffer area is large enough to serve this function without threat to any existing structures. Wildlife habitats in the upper end of this reach are predominant.

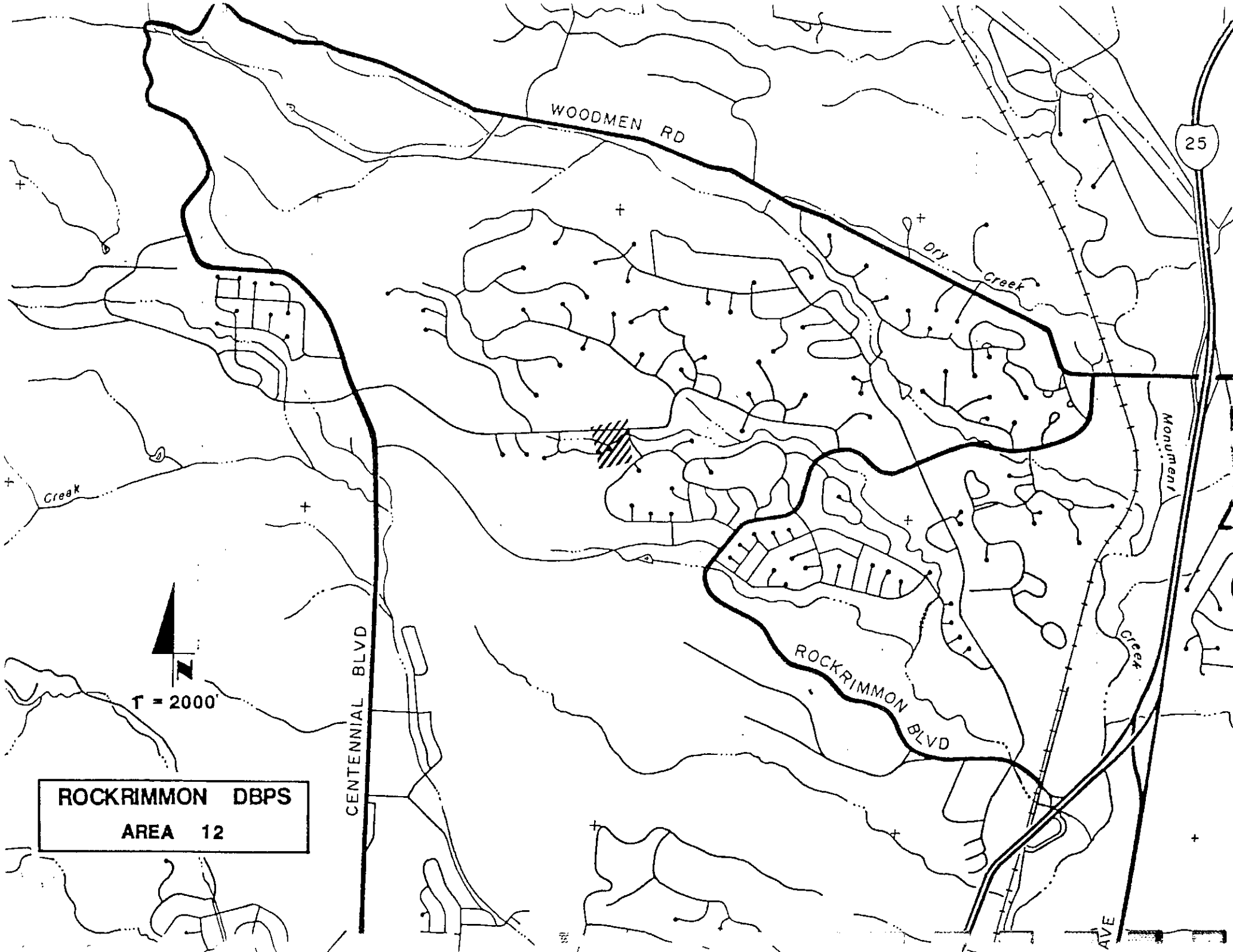
This small reach of channel includes a diverse and abundant vegetated area that supports an excellent wildlife habitat. Vegetation includes native grasses, pines, shrubs and clumps of scrub oak. The channel is located within a small parcel of undeveloped parkland with single family residences to the south. Because of private lands and lack of trail linkages to the west, this area will most likely not contain a planned trail system. Other multi-objective activities can be met by the preservation of this area.

<u>Alternative</u>	<u>Advantages</u>	<u>Disadvantages</u>
A	Preserve wildlife habitat. No permitting involved. No mitigation required. Aesthetically appealing.	Minor erosion will continue. Minor maintenance costs may be required.
B/C	None	Destruction of wildlife habitat. Mitigation required. High construction costs. Visually obtrusive.

RECOMMENDATION

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For this reach, Alternative A with a few judiciously placed drop structures is recommended.



WOODMEN RD

Dry Creek

Creek

Monument

ROCKRIMMON BLVD

AVE

25

1" = 2000'

ROCKRIMMON DBPS  
AREA 12

ROCKRIMMON DBPS  
KLH NO. 88 548 00  
Summary of Alternatives

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AREA 13

Rockrimmon North Channel  
Detention facility to Northface Lane

100-yr. flow ranges from 0 to 16 cfs  
100-yr. maximum velocity of 4 fps

DESCRIPTION

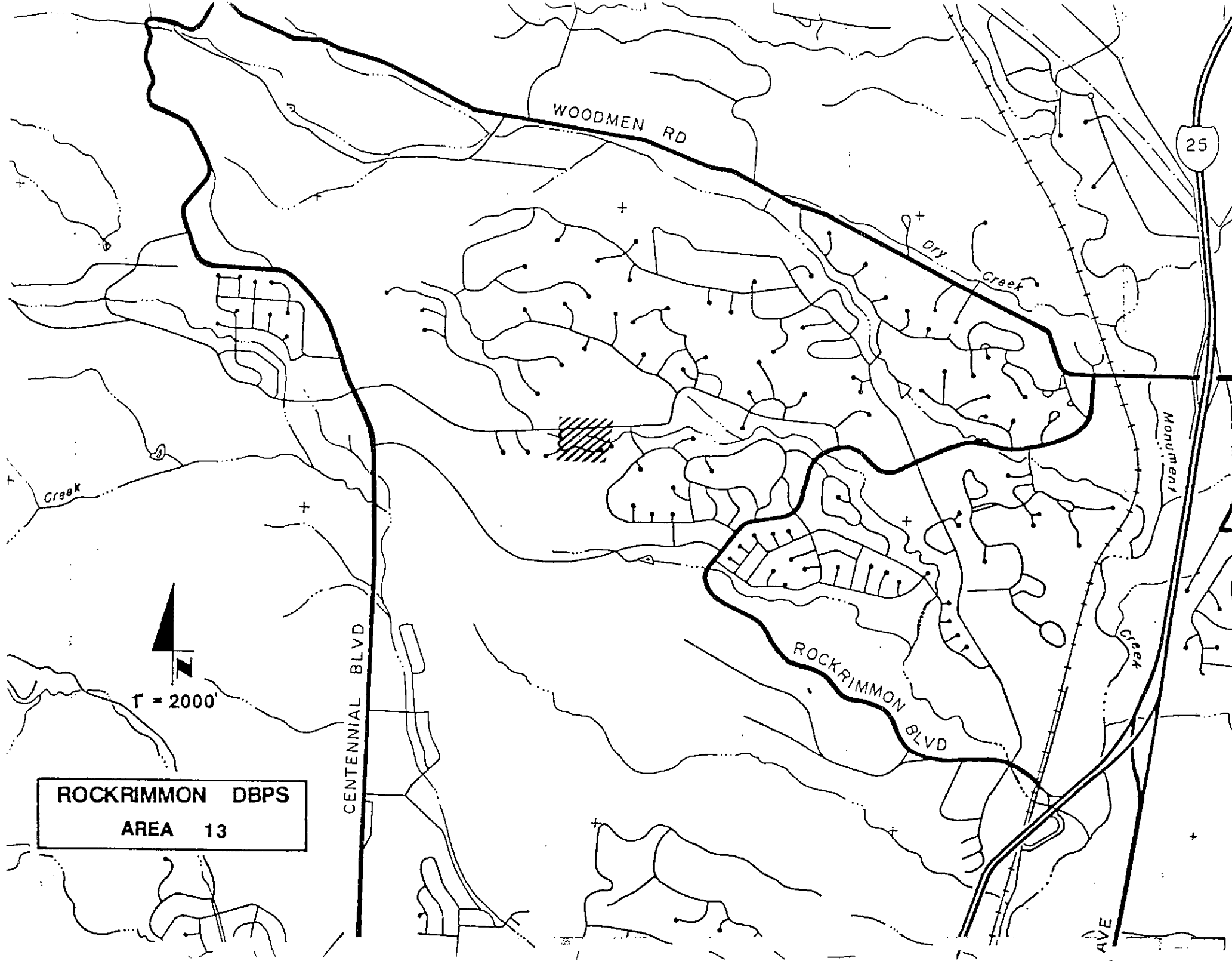
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The channel in this area is relatively very steep (5%) and is more of a broad, poorly defined swale. Very little erosion is occurring in this reach and there is sufficient capacity for the 100-year storm runoff without threat to any structures. Furthermore, this entire reach is on private property. No wetlands or wildlife habitats are in evidence in this area.

RECOMMENDATIONS

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Since this entire reach is on private property and there is very little erosion, we recommend that no remedial measures be taken.



WOODMEN RD

Dry Creek

25

Monument

Creek



1" = 2000'

CENTENNIAL BLVD

ROCKRIMMON BLVD

AVE

ROCKRIMMON DBPS  
AREA 13

ROCKRIMMON DBPS  
KLH NO. 88 548 00  
Summary of Alternatives

---

AREA 14

Rockrimmon North Channel  
Northface Lane to Allegheny Drive

100-yr. flow = 9 cfs  
100-yr. maximum velocity of 3 fps

DESCRIPTION

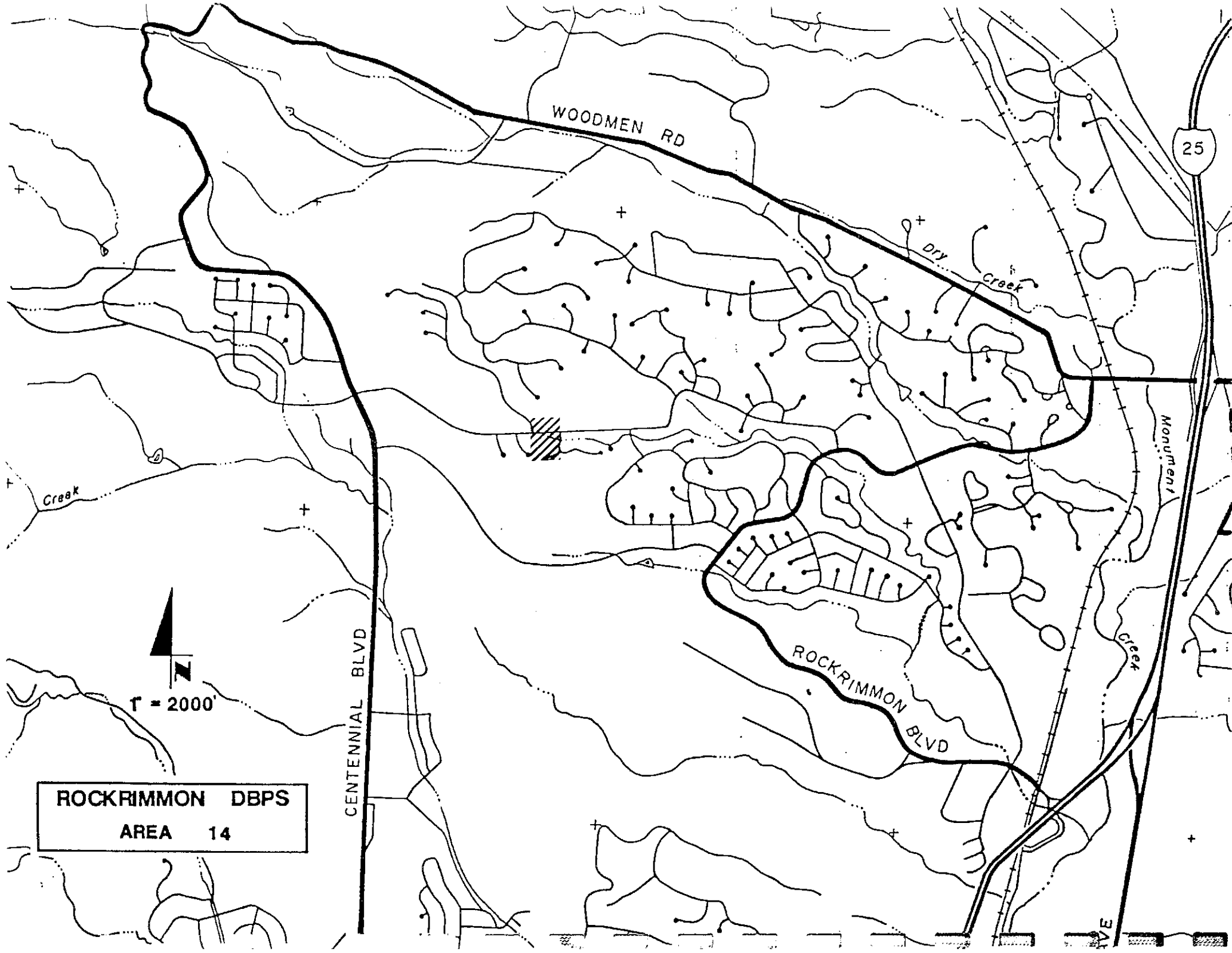
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The channel in this area is relatively very steep (5%) and is more of a broad, poorly defined swale. Very little erosion is occurring in this reach and there is sufficient capacity for the 100-year storm runoff without threat to any structures. Furthermore, this entire reach is on private property.

RECOMMENDATIONS

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Since this entire reach is on private property and there is very little erosion, we recommend that no remedial measures be taken.



WOODMEN RD

25

Dry Creek

Monument Creek

Creek

ROCKRIMMON BLVD

CENTENNIAL BLVD

1" = 2000'

ROCKRIMMON DBPS  
AREA 14

1" = 2000'



AREA 15

Golden Hills Channel  
Monument Creek to Mark Dabling Blvd.

100-yr. flow = 342 cfs  
100-yr. velocity = 10 fps

DESCRIPTION

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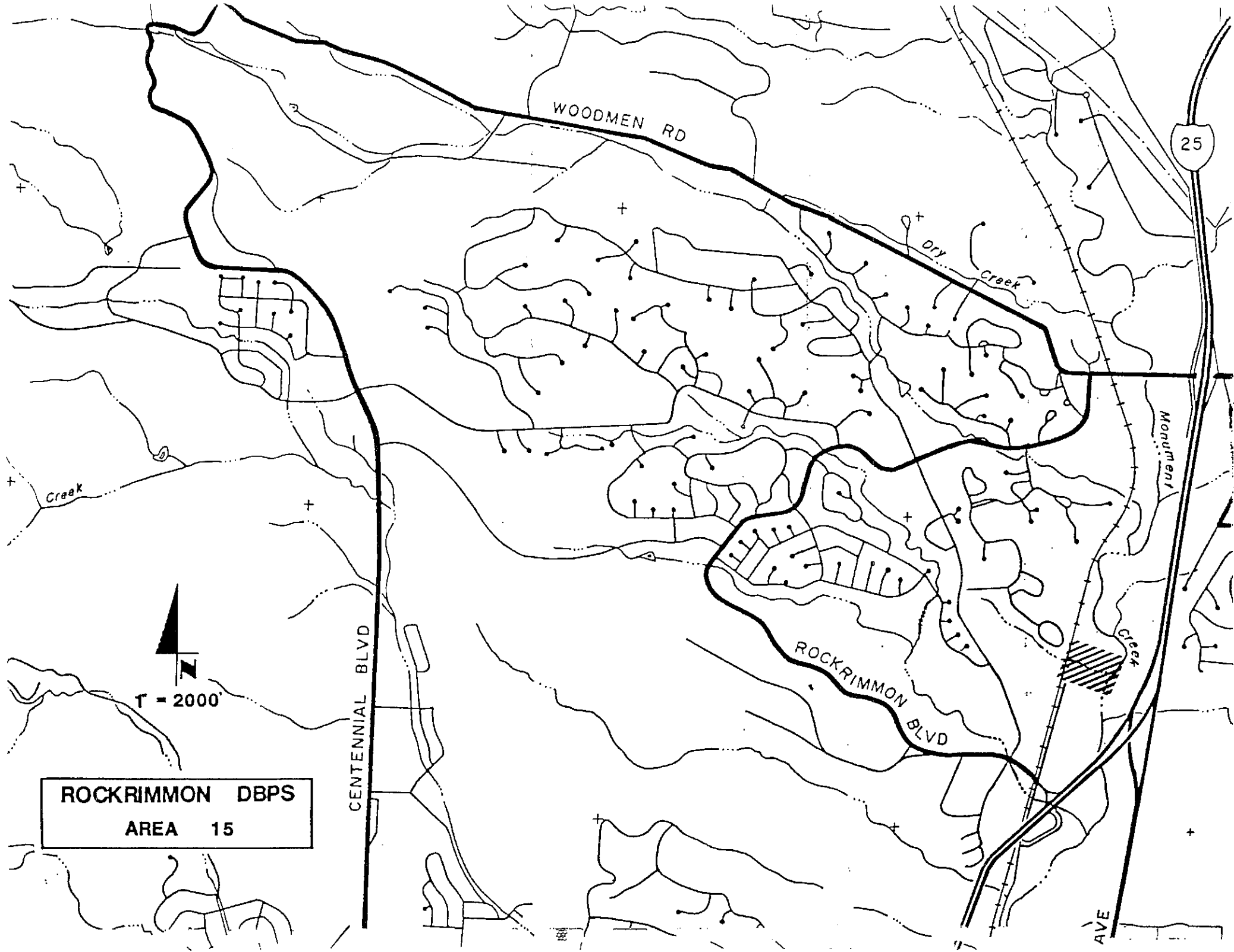
This reach is a very poorly defined channel, essentially sheet flow, through sparsely wooded underbrush. The 100-year storm runoff would spread out over a large area. The channel does not appear to be badly eroded at this time and it is not anticipated that it would. The adjacent land use is industrial and when this land is developed, a concrete lined channel would be appropriate if this is to remain private property. As this is all private property, the developer would have the responsibility of this work as a public improvement. The discharge point into Monument Creek has been improved with riprap which is fairly stable. It is beginning to fail in two locations and immediate maintenance to prevent further deterioration would be appropriate.

This reach contains a mature stand of cottonwood trees, elms, native grasses and various shrubs. This environment should be preserved and enhanced for erosion control and wildlife and bird habitat, if the City is willing to acquire R.O.W. Better channel definition is needed but should be accomplished with a soft lining, if City property. This channel provides an excellent opportunity for a trail system that will link the Rockrimmon area with a future trail corridor along Monument Creek.

RECOMMENDATIONS

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Because this is private land and there is little apparent erosion, we recommend no action be taken in this reach at this time, except repair of the riprap at the discharge point. At such time as this site is developed, the streambed would probably be channelized with the use of Alternative A with drop structures reducing the velocities to 3 fps or less, Alternative B with drop structures or Alternative C. All alternatives would require an appropriate energy dissipator at Monument Creek to prevent damage to the existing rip rap point bank protection.



**ROCKRIMMON DBPS**  
**AREA 15**

AREA 16

Golden Hills Channel  
Westward 1050 feet from Mark Dabling

100-yr. flow ranges from 267 to 342 cfs  
100-yr. maximum velocity = 10 fps

DESCRIPTION

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This reach is a small, incised channel generally straight with some meanders. There are very few points of ongoing erosion, but two of those are quite serious. A curve in the channel immediately upstream of the railroad culvert is eroding and should be repaired. The major erosion damage is from a diversion ditch across the property to the south that discharges high on the south bank of this channel approximately 400 feet west of the railroad culvert. This has created a very large erosion problem that is progressing rapidly. Several other locations are exhibiting minor erosion. The channel proper is inadequate to convey the 100 year flow, but the draw in which it is located is very adequate without threat to any private property.

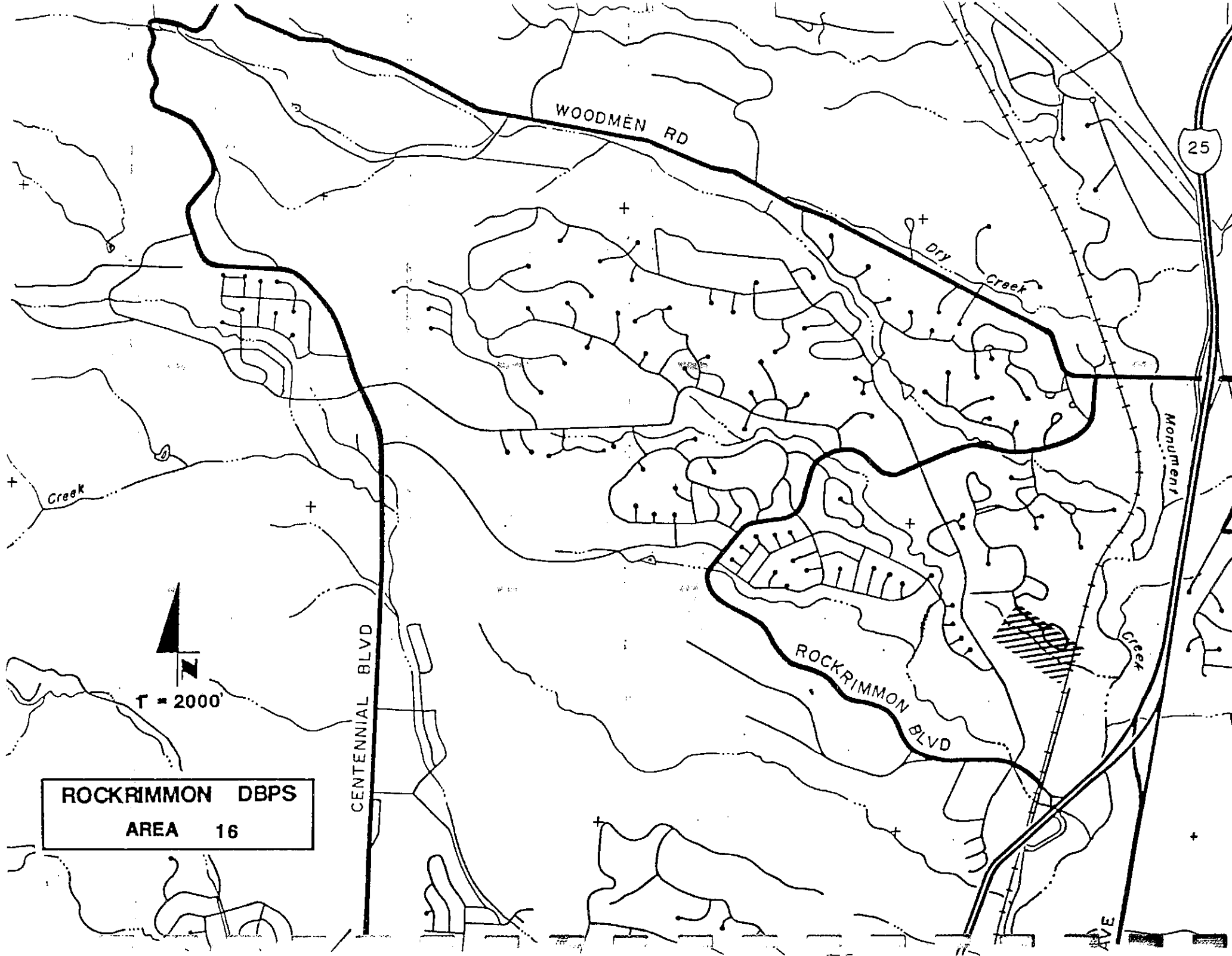
This section of channel consists of a relatively narrow channel section with steeper side slopes along the upper reaches that tend to flatten out towards the bottom. Vegetation consists of a nice stand of mature ponderosa pine along the upper reaches and a mixture of deciduous trees, bushes, shrubs and native grasses near the lower end. Numerous signs of wildlife migration are present along and near the channel. Because of the relatively steep side slopes, the placement of a trail system will have to be accomplished with a great deal of planning and environmental sensitivity and will very likely be highly objectionable to the local residents. Because of the maturity and size of the existing vegetation disruption of the existing environment should be kept to a minimum. To preserve the environmental and aesthetic integrity of this reach, erosion control to existing problem areas should include more "natural" treatments if possible.

<u>Alternative</u>	<u>Advantages</u>	<u>Disadvantages</u>
A	Preserve wildlife habitat. No permitting involved. No mitigation required. Aesthetically appealing.	Minor erosion will continue. Minor maintenance costs may be required.
B	Minimum requirement for additional right-of-way beyond existing channel banks. Positive control of existing erosion.	Will require removal of some vegetation. Some disturbance of wildlife habitat may occur. Some mitigation may be required. Construction access will be difficult. Visually obtrusive.
C	None	This alternative was eliminated due to the cost of construction and the incompatibility with surroundings.

RECOMMENDATIONS

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For this reach, Alternative A is recommended with infrequent, judiciously placed drop structures. For a few isolated spots, Alternative B is recommended.



WOODMEN RD

25

Dry Creek

Creek

Monument

Creek

ROCKRIMMON BLVD

CENTENNIAL BLVD



1" = 2000'

ROCKRIMMON DBPS  
AREA 16

AVE

AREA 17

Golden Hills Channel  
Area 16 to end

100-yr. flow = 180 cfs  
100-yr. maximum velocity = 9 fps

DESCRIPTION

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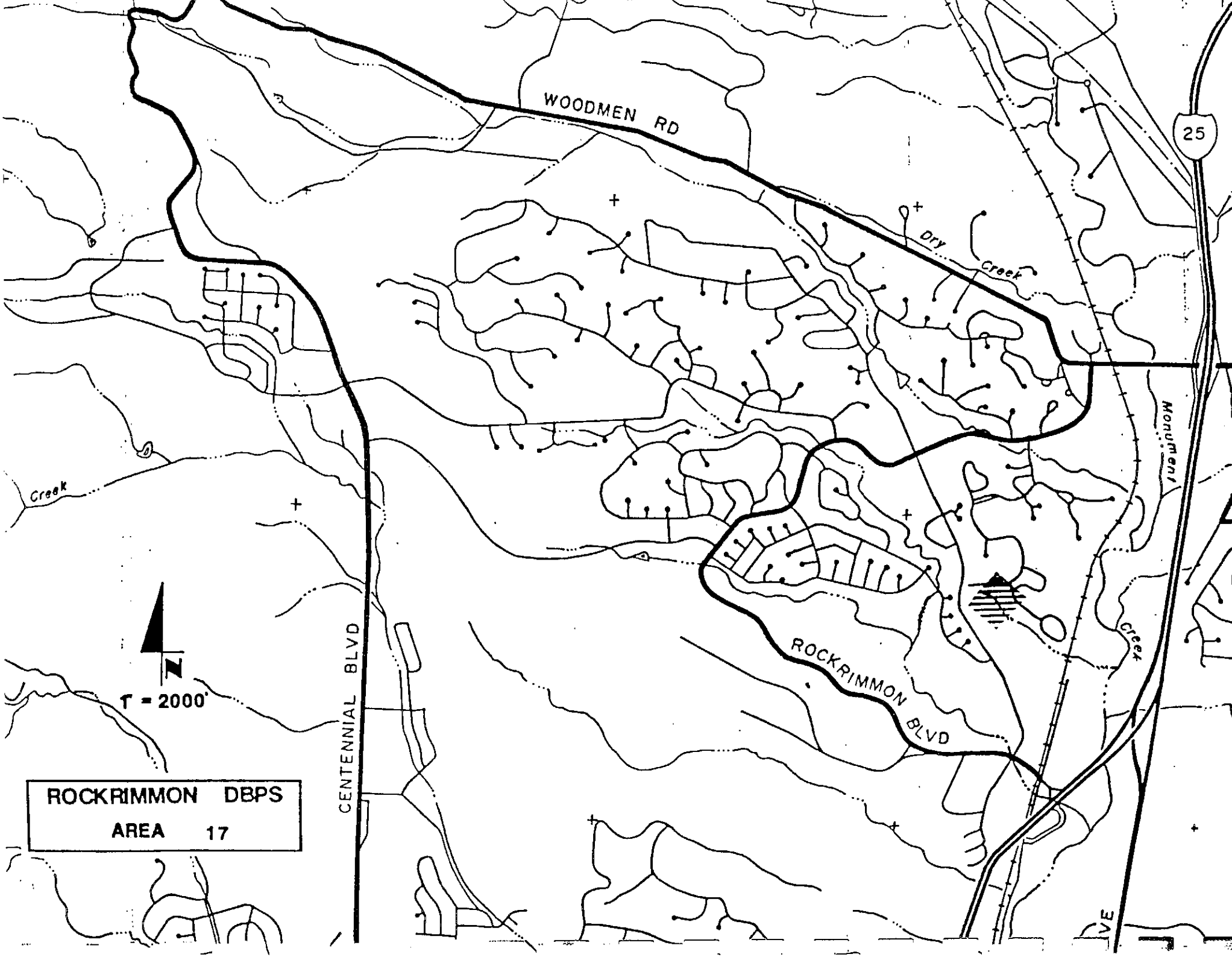
This reach is very overgrown with vegetation and exhibits very little sign of erosion. The waterway is capable of transporting the 100-year runoff without danger to private property.

This section of channel consists of a relatively narrow channel section with steeper side slopes along the middle and lower reaches. Recent drainage improvements, a rip-rap outfall area, have taken place along the upper reach of this section. Vegetation consists of native grasses along the upper reaches and a mature stand of ponderosa pine along the middle and lower reaches. Numerous signs of wildlife migration are present along and near the channel. Because of the relatively steep side slopes and the lack of erosion controlling vegetation beneath the ponderosa pines, the placement of a trail system will have to be accomplished with a great deal of planning and environmental sensitivity. Because of the maturity and size of the existing vegetation disruption of the existing environment should be kept to a minimum. To preserve the environmental and aesthetic integrity of this reach, any erosion control should include more "natural" treatments where possible. An old coal deposit near the channel should be cleaned up because of its destruction to vegetation and wildlife habitat in the vicinity.

RECOMMENDATIONS

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Because of the excellent condition of this reach, we recommend no treatment.



WOODMEN RD

25

Dry Creek

Monument Creek

Creek

ROCKRIMMON BLVD

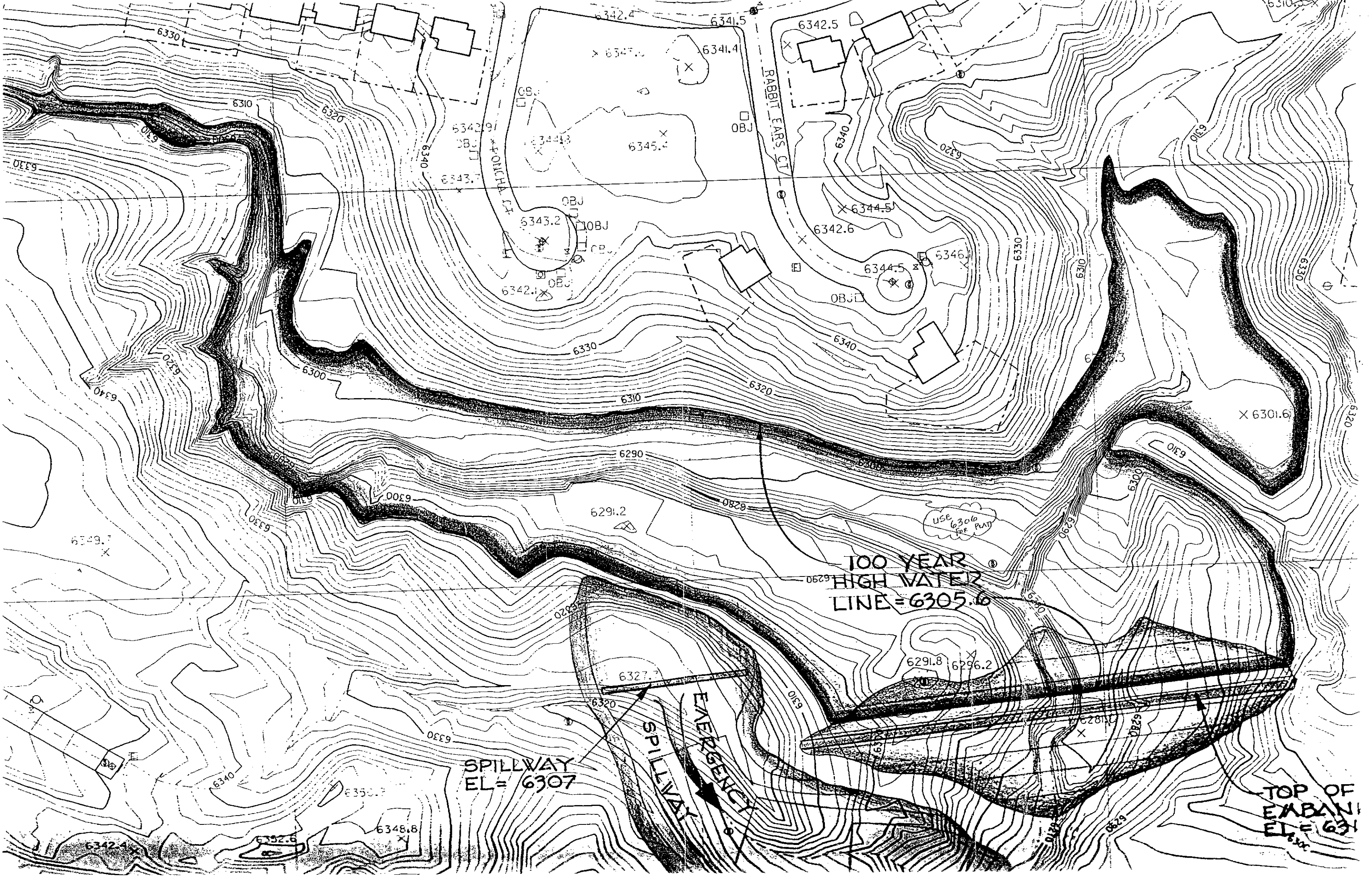


1" = 2000'

ROCKRIMMON DBPS  
AREA 17

CENTENNIAL BLVD

IVE



RABBIT EARS CT

PONCHA CT

100 YEAR  
HIGH WATER  
LINE = 6305.6

SPILLWAY  
EL = 6307

SPILLWAY  
EMERGENCY

TOP OF  
EMBANKMENT  
EL = 6314.6

USE  
6306  
FOR PAD

6342.4

6341.5

6342.5

6347.0

6341.4

6342.9

6344.3

6345.4

6343.7

6343.2

6342.1

6342.6

6344.5

6346.1

6330

6310

6320

6290

6291.2

6291.8

6296.2

6327.7

6320

6330

6340

6350.7

6348.8

6352.6

6342.4

6330

6320

6310

6300

6290

6310

6290

6280

6270

6260

6310

6320

6330

6340

6350

6360

6370

6380

6390

6400

6410

6420

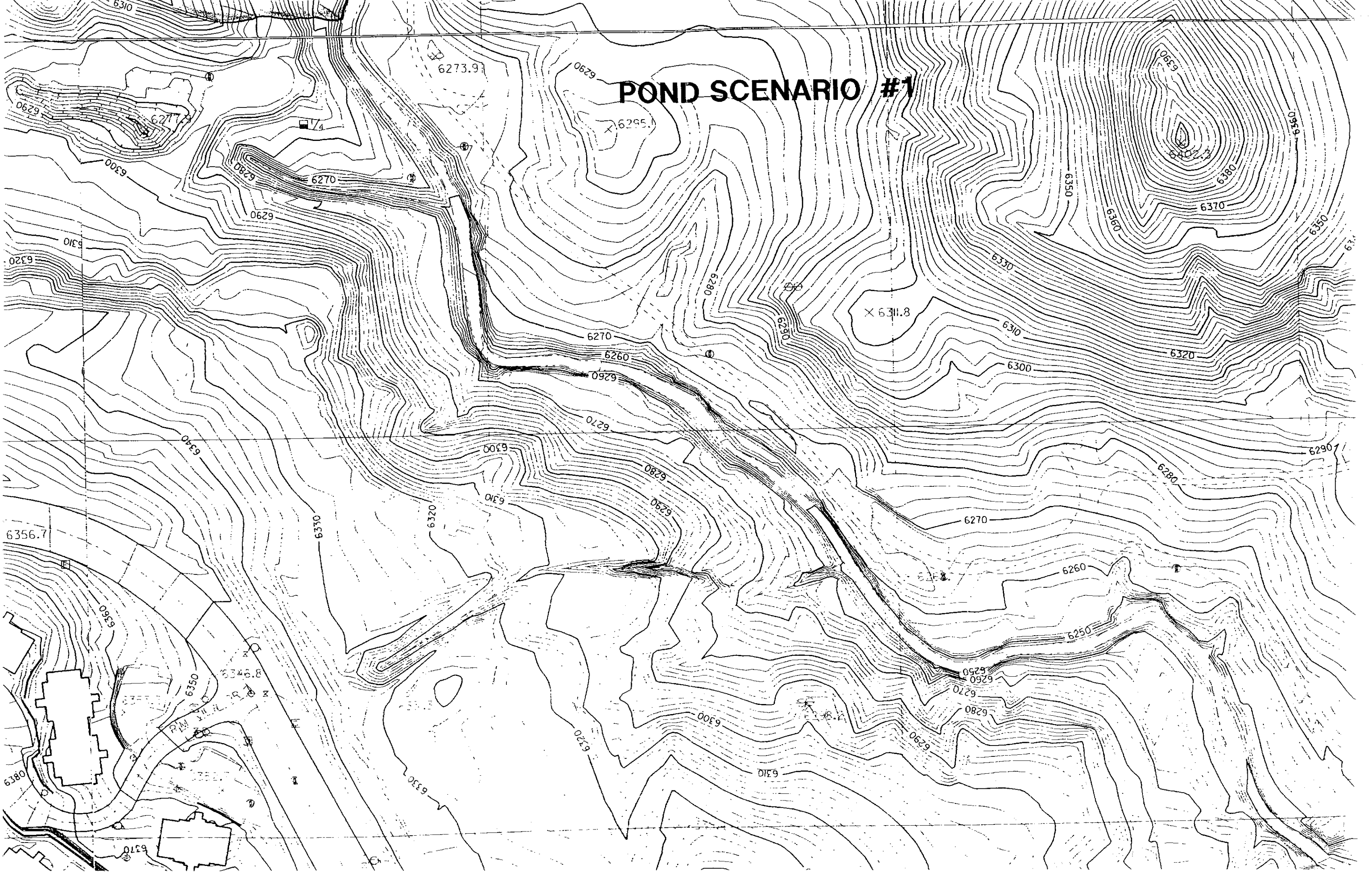
6430

6440

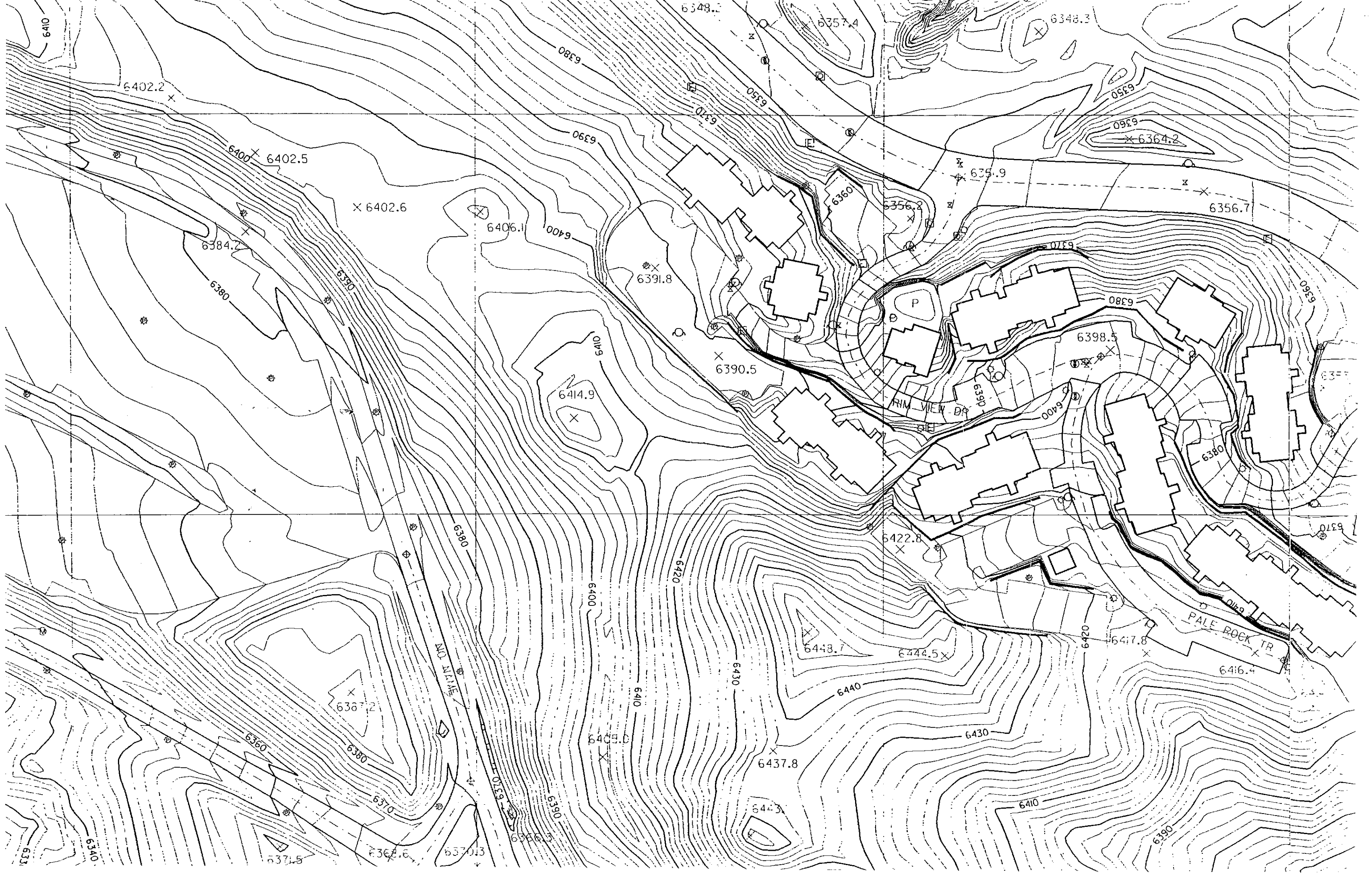
6450



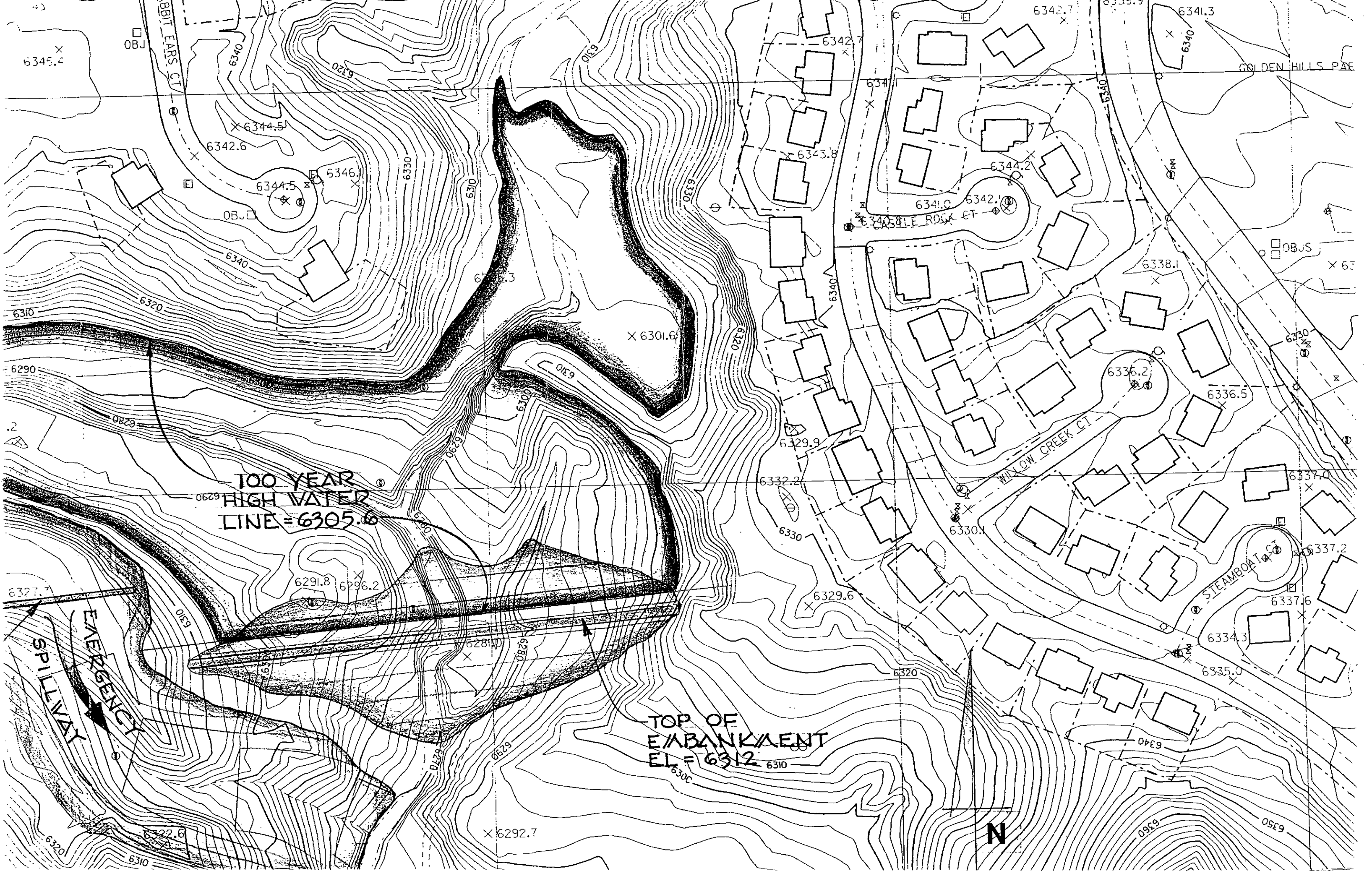
# POND SCENARIO #1











100 YEAR  
HIGH WATER  
LINE = 6305.6

TOP OF  
EMBANKMENT  
EL = 6312

N

6345.4

6342.6

6344.5

6346

6342.7

6343.8

6341.0

6344.2

6341.3

6338.1

6301.6

6329.9

6336.2

6336.5

6290

6332.2

6337.0

6327.7

6291.8

6296.2

6329.6

6337.2

6337.6

6281.0

6334.3

6335.0

6280

6320

6340

6292.7

6310

6350

6350

6320

6310

BBIT EARS CT

CASTLE ROCK ET

WILLOW CREEK CT

STEAMBOAT CT

GOLDEN HILLS PAV

SPILLWAY

EMERGENCY

OBJ

OBJ

OBJ

OBJ

OBJ

OBJ

OBJ

OBJ

OBJ

OBJ