

THE SOUTHERN SLIDE POLYGON OF COLTON ET AL. (1975)

In the southern “landslide” polygon of Colton et al. (1975), the most prominent landforms are a series of ridges and troughs that trend roughly E-W (Fig. 4). These types of landforms are anomalous for the Eagle Valley Evaporite, but elsewhere are a common expression of deep-seated gravitational spreading and some types of landslides. A third possible origin is that the troughs were formed by dissolution of evaporites and subsidence. The purpose of this Phase 2 field checking was to determine the origin of these anomalous landforms and determine if they pose a geologic constraint to road building. Our Phase 1 literature/photo study (GEO-HAZ, 2009) concluded that much of this southern polygon was a landslide.

Field observations indicate that the hillslope here is composed of intact bedrock of the Eagle Valley Evaporite, rather than landslide debris. The dominant lithology is a pale yellow, friable medium-grained sandstone that weathers by dissolution and granular distintegration. Outcrops are rare, and the ground surface is littered by irregular, pitted chunks of sandstone, many of which can be crushed with little effort. The weathering patterns suggest that the cement of the sandstone is soluble, probably gypsum.

Field observations also indicate that the L-shaped “headscarp” interpreted by GEO-HAZ (2009) is not a landslide headscarp. Instead, the East-West-trending part of the “headscarp” is a linear, graben-bounding scarp (Fig. 5) similar to those found in the northern “landslide” polygon described previously. We name this scarp “S1” because it is the northernmost and highest of all the scarps on the hillslope. The North-South-trending part of the “headscarp” interpreted by GEO-HAZ (2009) is actually erosional, formed by an intermittent stream that flows south down the face of the hill.

South of scarp S1 are at least four uphill-facing scarps. The northernmost of these exposes steeply north-dipping slabs of sandstone bedrock on its face, which is in contrast to the gently north-dipping bedding found elsewhere on this slope (i.e., the regional dip). These north-dipping slabs are similar to those observed on graben-margin scarps in the northern “landslide” polygon (described previously), and suggest that the graben below scarp S1 formed in a similar manner. The remaining uphill-facing scarps do not possess good bedrock exposures on their scarp faces, so their underlying structure is unknown.

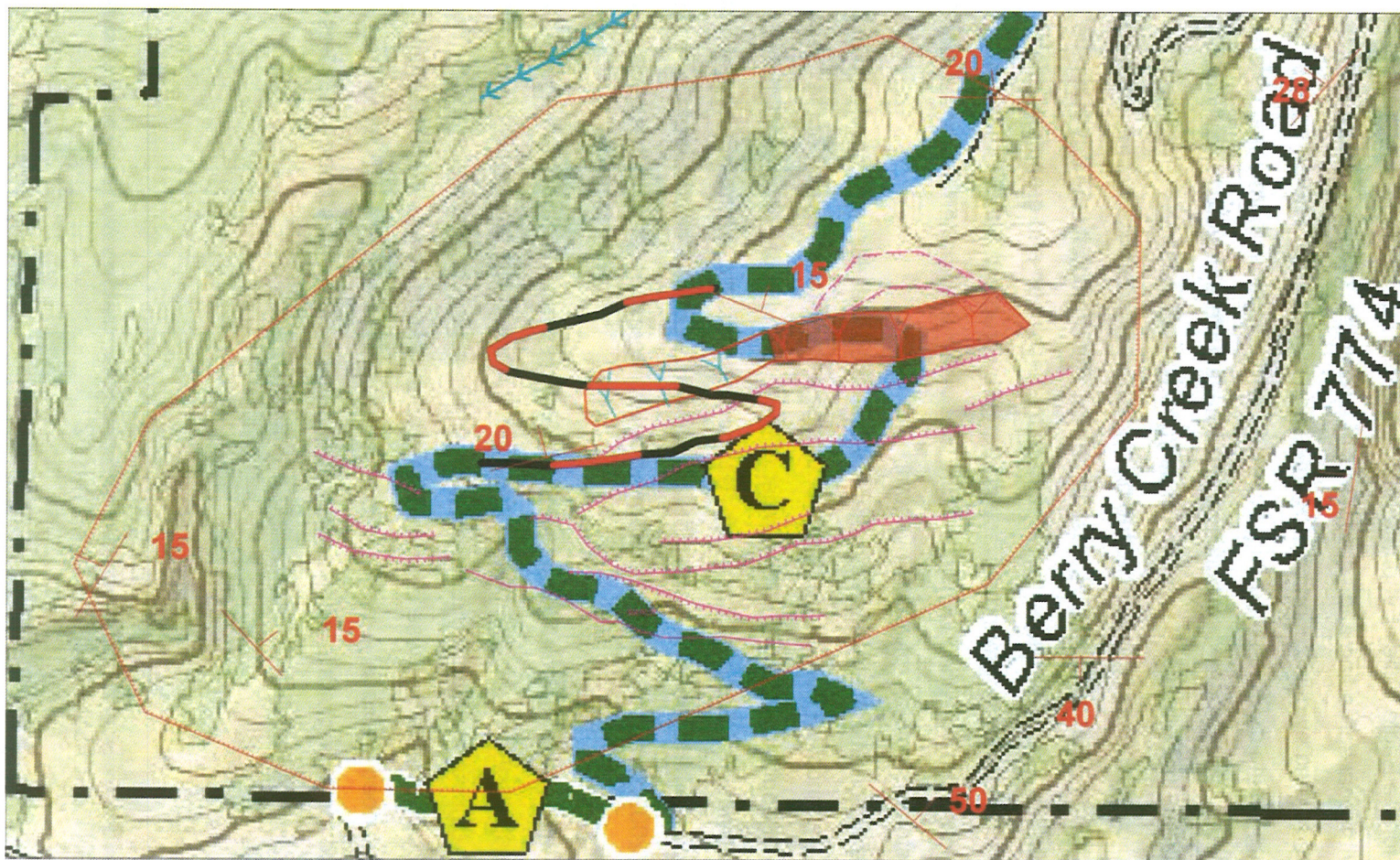


Fig. 4. Revised map of subsidence scarps (purple) in the southern "landslide" polygon of Colton et al. (1975; red outline with hachures). Scarp S1 is outlined in red; more active eastern portion is shaded red. Thick green-blue line shows the originally-proposed Alternative 5 alignment; thinner red-black line shows a partial realignment recommended in this report.

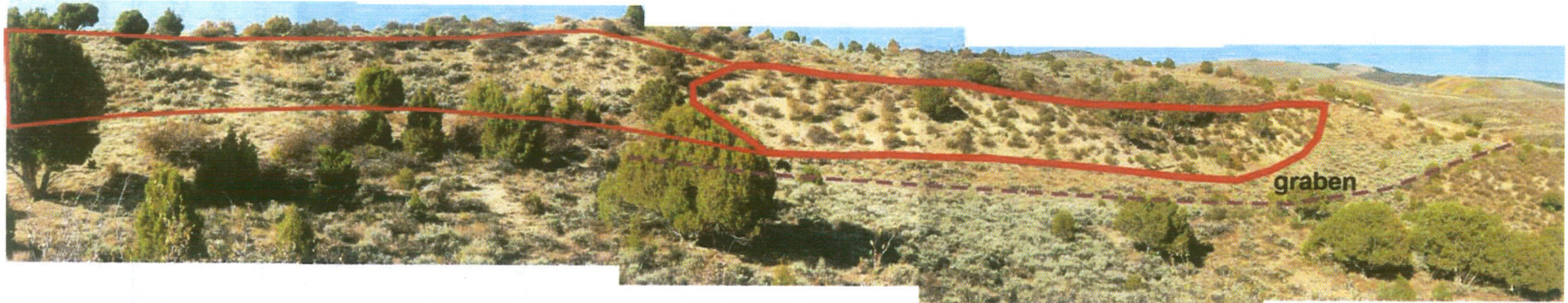


Fig. 5. Panoramic photograph of the northernmost scarp (S1) in the southern “landslide” polygon of Colton et al. (1975). View is to the north (at left) and northeast (at right). Red lines outline the south-facing scarp S1, which was interpreted as a landslide headscarp in our Phase 1 report (GEO-HAZ, 2009). However, field observations show that the hill downslope of this scarp is composed of intact bedrock of the Eagle Valley Formation, not landslide debris. The thicker red line outlines the oversteepened and sparsely vegetated eastern half of scarp S1, which lies upslope of a prominent graben bounded by an uphill-facing scarp (purple line). The presence of exposed bedrock on this scarp section is anomalous for the entire ridge, and suggests that the scarp/graben has been reactivated in the late Quaternary. In contrast, the western half of scarp S1 is less steep, more vegetated, does not expose bedrock, and does not appear to have been reactivated.

The original alignment of road Alternative 5 was planned to ascend the steep, reactivated (?) section of scarp S1 about in its center. We recommend that this upper part of the Alternative 5 alignment be shifted westwards so it ascends the gentler, western half of scarp S1 (e.g., red-and-black line shown in Fig. 4).

The eastern half of scarp S1 is so steep that bedrock ledges are exposed on it, and it is lying near the angle of repose, as indicated by the sparse vegetation. This steep slope angle is anomalous for the entire ridge and cannot be explained by stream erosion. Instead, it appears that the eastern half of scarp S1 has been reactivated by vertical displacement in relatively recent geologic time. Downslope of this oversteepened section the graben formed by the uphill-facing scarp is best developed. This coincidence further suggests that the eastern part of scarp S1 is the most active. In contrast, the western half of scarp S1 is less steep, more vegetated, and does not appear to have been reactivated.

Although the surface exposures here are not definitive, we feel that the grabens and scarps on this slope were created by evaporate dissolution and subsidence, rather than by landsliding. By analogy with our interpretation of scarps in the northern "landslide" polygon, we infer that the subsidence is generally slow and gradual. However, the steepness and height of the eastern half of scarp S1 indicates that in that region, the subsidence may be younger and/or more rapid.

The originally-proposed Alternative 5 road alignment was to have ascended the steep, eastern half of scarp S1 on a diagonal grade. However, if our interpretation of young and/or rapid displacement on this scarp is correct, such an alignment might pose maintenance and safety problems for the road. *To avoid such problems, we suggest that the original Alternative 5 alignment be shifted in part to the west, so that it ascends the western half rather than the eastern half of scarp S1 (red-and-black line on Fig. 4).*

GEOLOGY ALONG THE ALTERNATIVE 3 ALIGNMENT

We drove most of the Alternative 3 alignment with Jason Marks of SE Group, covering road segments D, E, F, and the southern half of I (Fig. 6). The only anomalous landform noted was a steep, concave, east-facing slope on the lower western wall of Thames Creek. This slope is so steep at the top that it is unvegetated and exposes Minturn Formation dipping northwest at a shallow angle (i.e., normal regional dip). In contrast, almost all the other slopes in the area are much gentler and covered with colluvium. The slope lies west of an anomalously wide section of Thames Creek (shaded yellow in Fig. 6). The slope is not a landslide headscarp, because there are no landslide deposits below it. For example, HP (2009) shows 12 ft of "silt and clay, some rock fragments" below the steep slope, a texture they define as colluvium elsewhere in their

report. One possible explanation of this steep, concave slope and widened stream section is that they represent an old evaporite subsidence feature. However, even if true the feature would be geologically old. We looked for young subsidence pits or other anomalies in the stream alluvium where crossed by the road, but did not observe any. Therefore, even if this slope is the margin of an old evaporite subsidence area, the processes appears to no longer be active.

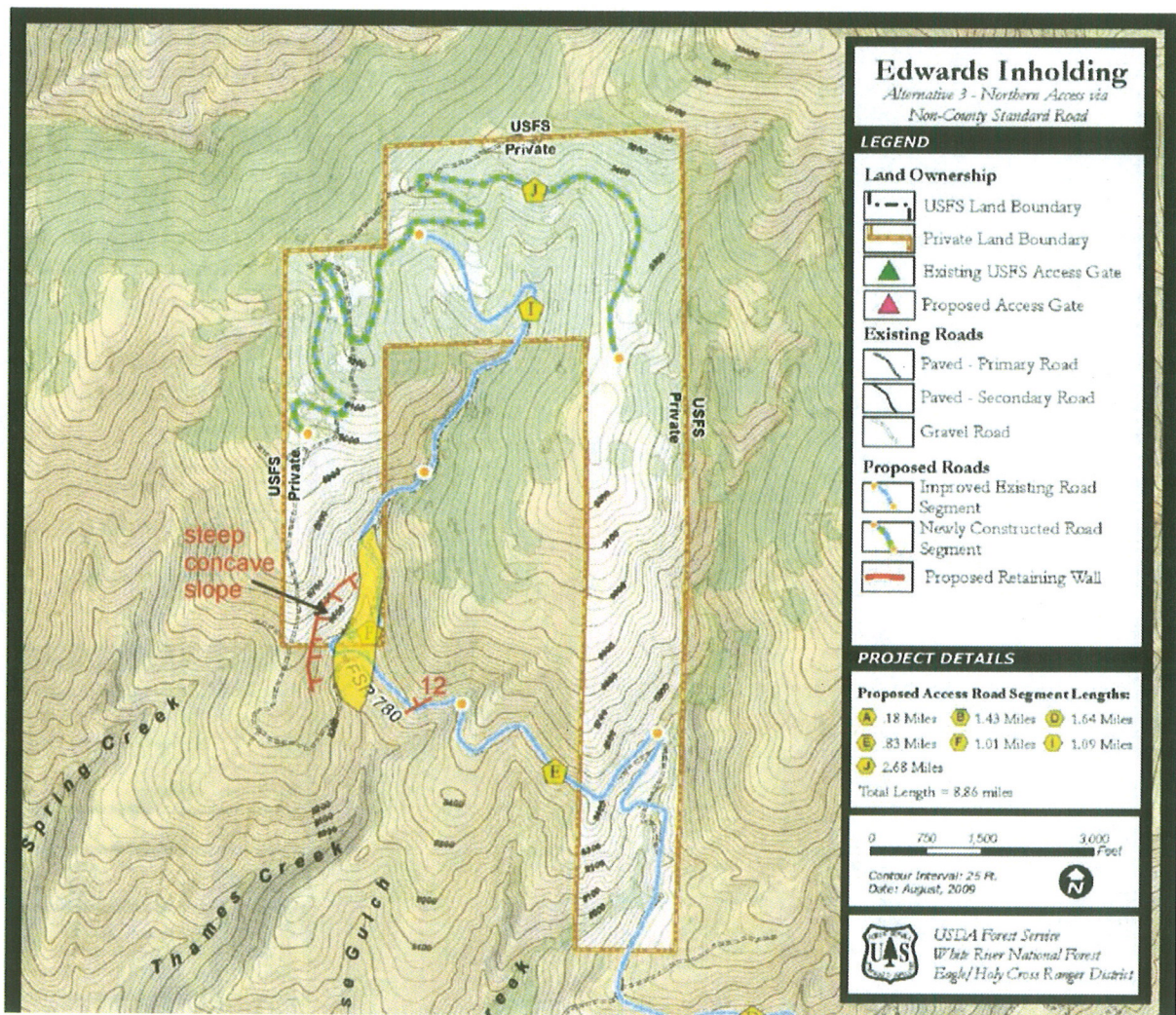


Fig. 6. Part of the map of the Alternative 3 road alignment, showing the anomalous steep concave slope (in red) and widened section of Thames Creek (yellow). Although the origin of these anomalies is ambiguous they appear to be rather old, and should not pose a constraint to road building.

GEOLOGY ALONG THE ALTERNATIVE 4 ALIGNMENT

The Alternative 4 road alignment is similar to that of Alternative 3, but does not travel north up the bed of Thames Creek (Alt. 3, segment I; see Fig. 6). Instead, the southern part of Alternative 4 travels north on the eastern valley wall of Thames Creek (segment G in Fig. 7), in what will presumably be a cut-and-fill road section.

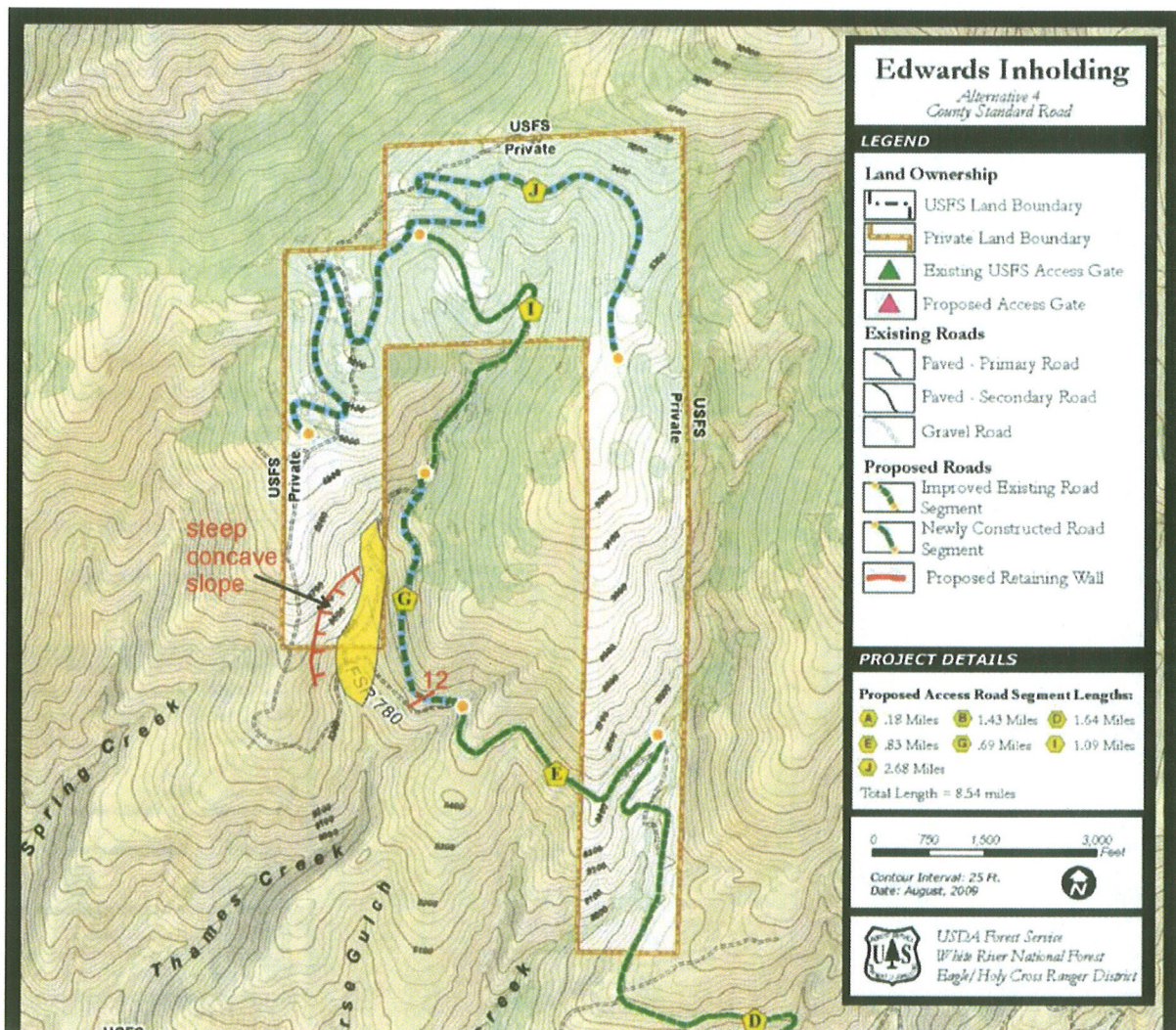


Fig. 7. Part of the map of the Alternative 4 road alignment, showing segment G in relation to the anomalous landforms of Thames Creek (red, yellow) and local dip (red strike-and-dip symbol).

The only geologic concern on Alternative 4 is whether the inslope cuts on segment G would undermine (daylight) the local bedding in the Minturn Formation. However, the closest

bedding dip measured (red symbol, Fig. 7) and regional dip are to the north rather than to the west, so this does not appear to be a constraint.

CONCLUSIONS AND RECOMMENDATIONS

ALL ALTERNATIVES (2, 3, 4, 5): The linear scarps and grabens crossing the road alignment of all Alternatives in the USGS northern "landslide" polygon evidently formed by an evaporite dissolution/subsidence process sometime in the Quaternary. The process does not appear to be currently active, although movement on the grabens (purple lines, Fig. 3) appears to be younger than that on the east-west troughs (green lines, Fig. 3). Even when the subsidence process was active it was probably a slow, discontinuous process, active only during periods of extreme precipitation. Therefore, in our opinion it does not constitute a hazard to life safety nor a serious geological constraint to road building. Even if the process resumes operation during the lifespan of the road, it should only cause a slow subsidence of the roadbed within the graben. Such subsidence would warp/stretch the pavement where the road crosses the graben boundaries, but pavement damage could be fixed by spot repaving.

ALTERNATIVE 3: There are two anomalous landforms on Thames Creek that could be the result of old evaporate subsidence. However, the landforms look old (before the late Quaternary) and no sign of contemporary subsidence could be found in the stream alluvium. Therefore, we do not think that Alternative 3 is limited by any geological constraints in the Thames Creek area.

ALTERNATIVE 4: Segment G of the Alternative 4 alignment will traverse a west-facing slope on the eastern side of Thames Creek. Inslope cuts, even if they do encounter bedrock, should not underline the bedding layers because dip appears to be to the north here, not to the west. Therefore, we do not think that Alternative 4 is limited by any geological constraints in the Thames Creek area.

ALTERNATIVE 5 (Southern slide polygon): The linear scarps crossing the southern Alternative 5 road alignment, in the USGS southern "landslide" polygon, evidently formed by an

evaporite dissolution/subsidence process sometime in the late Quaternary. The process may be ongoing currently on the northernmost mapped scarp (S1), based on the steep unvegetated appearance of the eastern half of that scarp. Field reconnaissance could not distinguish whether past displacement episodes were rapid or a slow, progressive subsidence process. The apparently large and recent displacement on the eastern half of scarp S1 may not constitute a life safety hazard, but would constitute a significant maintenance issue if movement occurred during the lifespan of the road. *To avoid such problems, we suggest that the original Alternative 5 alignment be shifted in part to the west, so that it ascends the western half rather than the eastern half of scarp S1 (see Fig. 4).*

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HP GEOTECH SOILS REPORT



**PRELIMINARY GEOTECHNICAL ENGINEERING STUDY
PROPOSED ACCESS ROAD ALIGNMENT ALTERNATIVES
BERLAIMONT ESTATES
EAGLE COUNTY, COLORADO**

JOB NO. 109 275A

SEPTEMBER 17, 2009

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PURPOSE AND SCOPE OF STUDY

This report presents the findings of a preliminary geotechnical study for the proposed access road alignment alternatives for the Berlaimont Estates, Eagle County, Colorado. The Berlaimont Estates property and access road alignment alternatives are shown on Figure 1. The purpose of this study was to evaluate the geology along the road alignment alternatives and to develop preliminary geotechnical information for use in the preliminary cut and fill slope design and cost evaluations. The study was performed according to our July 20, 2009 proposal to English and Associates.

A field exploration program consisting of geologic mapping and exploratory pits was conducted to obtain geologic and subsurface information in the vicinity of the proposed access road alignment alternatives. The geologic field review was performed between August 20 and 24, 2009. In addition to our geologic field observations we have also reviewed relevant published regional geologic reports and have looked at aerial photographs of the area. Samples of the subsoils and formation rock obtained during the field exploration were tested in the laboratory to determine their classification and engineering characteristics. Results of the field exploration and laboratory testing were analyzed to develop preliminary recommendations for cut and fill slopes and other geotechnical information for the preliminary design of the access roads. This report summarizes the information obtained during this study and presents our conclusions and recommendations.

PROPOSED ACCESS ROAD ALIGNMENT ALTERNATIVES

The proposed access road alignment alternatives under consideration are shown on Figure 1. The 24-foot wide access road will provide the primary access to 19 building sites located on the 681 acre Berlaimont Estates property. Preliminary grading plans have been prepared along the several alignment alternatives by Alpine Engineering. These preliminary plans show several retaining wall in areas where the alignments cross slopes steeper than 67 percent (1.5:1 horizontal to vertical). In the less steeply sloping areas, Alpine Engineering's preliminary plan shows cut and fill slopes at 1.5:1 (horizontal to

vertical). Most cut and fill slopes are less than 30 feet high, but a few are higher. The higher cut slopes are from 40 and 120 feet high and the higher fill slopes are from 40 to 80 feet high.

ROAD ALIGNMENTS CONDITIONS

The access road will start in Edwards on a high level river terrace just to the west of Berry Creek Ranch (Singletree) and extend to the north along the northern Eagle River valley side as shown on Figure 1. The north valley side in the area of the alignment alternatives is a dissected upland bench. The bench has an average regional slope of about 15 percent down to the south towards the river and is characterized by strongly rolling, dissected upland surfaces with slopes in the range of 10 to 30 percent. The proposed building sites are located on this bench. The main tributary drainages to the Eagle River such as Berry Creek, Beard Creek, Deadhorse Gulch and Tames Creek have eroded steep, narrow valleys below the rolling bench surface. Slopes along these narrow valley sides is in the range of 35 to 70 percent. Streams in the tributary drainages are either intermittent or ephemeral. The project area is essentially undeveloped land. Vegetation in the lower elevations below about 8,800 feet is mostly sparse grass, sage and other brush. An aspen forest with some conifer trees and some open grass lands are present above about elevation 8,800 feet.

REGIONAL GEOLOGIC SETTING

The regional geology in the project area is shown on Figure 2. The northwest-trending Burns syncline lies to the north of the project area and the Sawatch Range uplift lies to the south. Both of these regional structures formed during the Laramide orogeny about 40 to 80 million years ago. Formation rock at the project site is sedimentary and includes Pennsylvanian-age evaporites (Pze) and younger Paleozoic-age (Pz) sedimentary rocks. The Pennsylvanian-age evaporites include the Eagle Valley Evaporite (Pee) and the Eagle Valley Formation (Pe), see Figure 1. The younger Paleozoic-age sedimentary rock in the project area are part of the Maroon Formation (PPm). These sedimentary rocks were deposited in the Eagle basin that was part of the central Colorado trough during the Ancestral Rocky Mountain orogeny around 300 million years ago. The evaporites are

soluble in circulating groundwater and subsurface solution voids and associated surface sinkholes are occasionally present in the region where the evaporites are near the surface. Sinkholes present in the project area are shown on Figure 1. None are located along the proposed access road alignment alternatives, however subsurface voids that have not yet developed into sinkholes could locally be present in the southern part of the proposed alignment alternatives.

SUBSURFACE EXPLORATION AND LABORATORY TESTING

Twenty-eight exploratory pits were excavated on August 20 and 21, 2009 with a Cat 420D backhoe at the locations shown on Figures 3 and 4. The pits were logged by a representative of Hepworth-Pawlak Geotechnical. Graphic logs of the pits are shown on Figures 5 through 8. Relatively undisturbed samples of the subsoil and rock were obtained with a 2-inch diameter, hand drive sampler. Disturbed bulk samples were also obtained in the pits. Sample depths are shown on Figures 5 through 8. The samples were returned to our laboratory for review and testing. Tests performed included natural moisture content and density, percent passing the number 200 sieve (silt and clay fraction), and Atterberg limits. Test results are shown on Figures 5 through 8 and summarized on Table 1.

SUBSURFACE CONDITIONS

Graphic logs of the exploratory pits are presented on Figures 5 through 8. The pit depths varied from 4 to 16 feet. Topsoil from 1 to 5 feet thick was encountered in most of the pits below the ground surface. The underlying subsoils are colluvium and small alluvial fan deposits and overlie formation rock. Formation rock was encountered at depths up to 12 feet in twenty-one of the twenty-eight pits. The subsoil is typically a nonstratified deposit of angular rocks from gravel to boulder-size in a matrix of sandy, low plasticity ($PI < 10$) silt and clay. The formation rock consisted of siltstone, claystone and sandstone. Practical backhoe digging refusal was encountered in the formation rock or on boulders in sixteen of the twenty-eight exploratory pits. Groundwater was not encountered in any of the twenty-eight exploratory pits and the subsoils were relatively dry.

ROAD ALIGNMENTS GEOLOGY

The main geologic features in the project area are shown on Figures 3 and 4.

Formation rock is the Maroon Formation (PPm) and Eagle Valley Formation (Pe).

Surficial soils include colluvium and small alluvial fans (Qc) and local areas of stream valley alluvium (Qa).

FORMATION ROCK UNITS

Eagle Valley Formation

The middle Pennsylvanian-age Eagle Valley Formation (Pe) is present in the southern part of the project area. The Eagle Valley Formation is a reddish-brown, reddish-gray, gray, light-green and tan interbedded shale, siltstone, claystone and fine-grained sandstone with distinctive, dark- to light gray finely crystalline limestone beds that are less than one-foot to three feet thick. The Eagle Valley Formation also locally contains evaporite beds mostly in the lower 160 to 300 foot thick transition with the underlying middle Pennsylvanian-age Eagle Valley Evaporite (Lidke, 1998). Rock cementation is variable. The sandstone and limestone beds are usually cemented and hard. The shale, siltstone and claystone beds are usually noncemented but firm. The Eagle Valley Evaporite intertongues with the overlying Maroon Formation in the middle part of the project area. The Eagle Valley Formation is about 2,300 feet thick in the project area.

Maroon Formation

The early Permian- and Pennsylvanian-age Maroon Formation is present in the northern part of the project area. The Maroon is mostly interbedded brick-red and reddish-brown, micaceous, fine- to medium-grained, arkosic sandstone, siltstone, claystone and shale that locally contains coarse-grained to pebbly sandstone lenses, thin mottled gray and red clayey limestone beds and light-greenish-gray to white sandstone beds (Lidke, 1998). Rock cementation is variable. The sandstone and limestone beds are usually cemented and hard. The shale, siltstone and claystone beds are usually noncemented but firm. The contact with the underlying Eagle Valley Formation is gradational. The Maroon Formation is about 500 feet thick in the project area.

FORMATION ROCK STRUCTURES

Bedding Structure

The project site is on the southwest limb of the northwest-trending Burns syncline and the regional dip on the limb of the syncline is to the northeast. Rock outcrops are common on the steeper valley sides in the project area and bedding orientations at these outcrops are shown on Figure 3 and 4. At most of the outcrops the bedding strikes to the northwest and dips between 3 and 28 degrees to the northeast, but at some outcrops the bedding dips from 15 to 45 degrees to the southwest. A few outcrops have bedding that strikes to the northeast with dips between 3 and 27 degrees to the northwest. The bedding structure in the project area is consistent with secondary, minor folds or faults on the southwestern limb of the Burns syncline.

Rock Joints

The Maroon and Eagle Valley Formations are cut by a complex set of joints with variable spacing that range from less than 1-foot to about 3 feet. One joint set occurs along the bedding and several other sets occur at nearly 90 degrees to the bedding joints. The joint orientations are important in the stability of road cut slopes in formation rock.

SURFICIAL SOIL DEPOSITS

Surficial soil deposits along the proposed access road alignment alternatives are mostly colluvium and small alluvial fans (Qc). Stream valley alluvium (Qa) is present along Tames Creek. Information from the exploratory pits indicates that on valley sides where the deeper cut and fill will be located, the colluvium and small alluvial fan deposits will likely be less than 12 feet thick. The colluvium and small alluvial fan soils are typically a nonstratified deposits of angular rocks from gravel- to boulder-size in a matrix of sandy, low plasticity ($PI < 10$) silt and clay.

PRELIMINARY ROAD CUT AND FILL DESIGN INFORMATION

The information presented in this section can be used for preliminary design and cost evaluations of the proposed access road alternatives described in this report. When the actual access road alignment has been determined, additional geotechnical exploration and evaluation may show that steeper cuts in rock may be possible in some areas.

CUT AND FILL SLOPES

The slope design information presented below should produce slopes that are globally stable and not requiring unusually high levels of maintenance.

<u>Slope Type</u>	<u>Maximum Slope Angle</u>	<u>Maximum Slope Height</u>
Cut Slopes in Soil	1.5:1 (horizontal to vertical)	30 ft.
Cut Slopes in Rock	1:1 (horizontal to vertical)	50 ft.
Fill Slopes on Stable Foundation	1.5:1 (horizontal to vertical)	50 ft.

Road cut and fill slope erosion should be controlled by revegetation or other means. Draped woven wire nets may be needed to control surficial slope ravel on some of the higher rock cuts. Surficial soils along most of the proposed road alignment alternatives will be colluvium and small alluvial fans as described in the *Road Alignment Geology* section of this report. These soils are expected to be less than 12 feet deep along most of the proposed road alignment alternatives. Sedimentary rocks as described in the *Road Alignment Geology* section of this report are present below the colluvium and alluvial fans and will likely be encountered in most of the deeper cut area.

Slope reinforcement or retaining walls will be needed in areas where the above design criteria cannot be achieved. In most cut areas soil nails will likely be a feasible method of slope reinforcement. Retaining walls in cut areas could be mechanically stabilized earth systems, boulder gravity walls or cantilever concrete walls. In the fill areas mechanically stabilized earth retaining systems, boulder gravity walls or cantilever concrete walls can be used. Geotechnical design information for soil nail slope reinforcement and/or retaining walls should be developed when their size and locations have been determined.

FILL COMPACTION AND MATERIALS

The road embankment fills should be placed in lifts of no more than about 1-foot thick and compacted to at least 95 percent of the maximum standard Proctor density at near optimum moisture content. Prior to placing fill, the subgrade should be prepared by removing all vegetation and topsoil, scarifying the foundation soil for a depth of at least 8-inches and compacting the scarified subgrade soils to at least 95 percent of the standard Proctor density at near optimum moisture content. On hill slopes that are steeper than about 20 percent, the fill foundations should be benched into the hillside.

The on-site soils and formation rock encountered along the road alignment should be a suitable material for the road embankments. Topsoil and frozen materials should not be used as fill material. Cemented rock blocks larger than about 8-inches that cannot be broken down by the compaction equipment should not be placed in the fills.

EXCAVATION CONDITIONS

The colluvium and small alluvial fans (Qc) and the stream valley alluvium (Qa) can typically be excavated with most types of heavy duty excavating equipment. Excavation conditions in the Maroon Formation (PPm) and Eagle Valley Formation will be variable and could change over relatively short distances. Most of the shale, siltstone and claystone beds and some thin sandstone beds can be excavated with heavy duty excavation equipment and ripping will probably be required. Thick cemented sandstone and limestone beds may require blasting. Controlled blasting techniques should be used to prevent damage to the rock cut surfaces.

ADDITIONAL STUDIES

The design information presented in this report is preliminary and should be reviewed when the actual access road alignment and grading have been determined. Additional geotechnical exploration and evaluations along the actual road alignment may show that steeper cuts in rock may be possible in some areas. Additional geotechnical studies will also be needed to provide design information for retaining walls and pavement sections.

LIMITATIONS

This study was conducted according to generally accepted engineering geology and geotechnical engineering principles and practices in this area, at this time. We make no warranty either express or implied. The conclusions and recommendations submitted in this report are based on our field observations, information from the exploratory pits shown on Figures 5 through 8, aerial photograph interpretations, published regional geology information and our experience in the area. This report has been prepared exclusively for our client and is a preliminary evaluation of the proposed access road alignment alternatives. We are not responsible for technical interpretations by others of our information. Additional geotechnical studies as discussed in this report will be needed once the actual road alignment and preliminary grading plans are available.

If there are questions or if we may be of further service, please call our office.

Respectfully Submitted,

HEPWORTH - PAWLAK GEOTECHNICAL, INC.

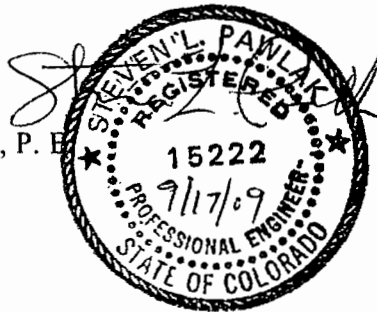
Ralph G. Mock

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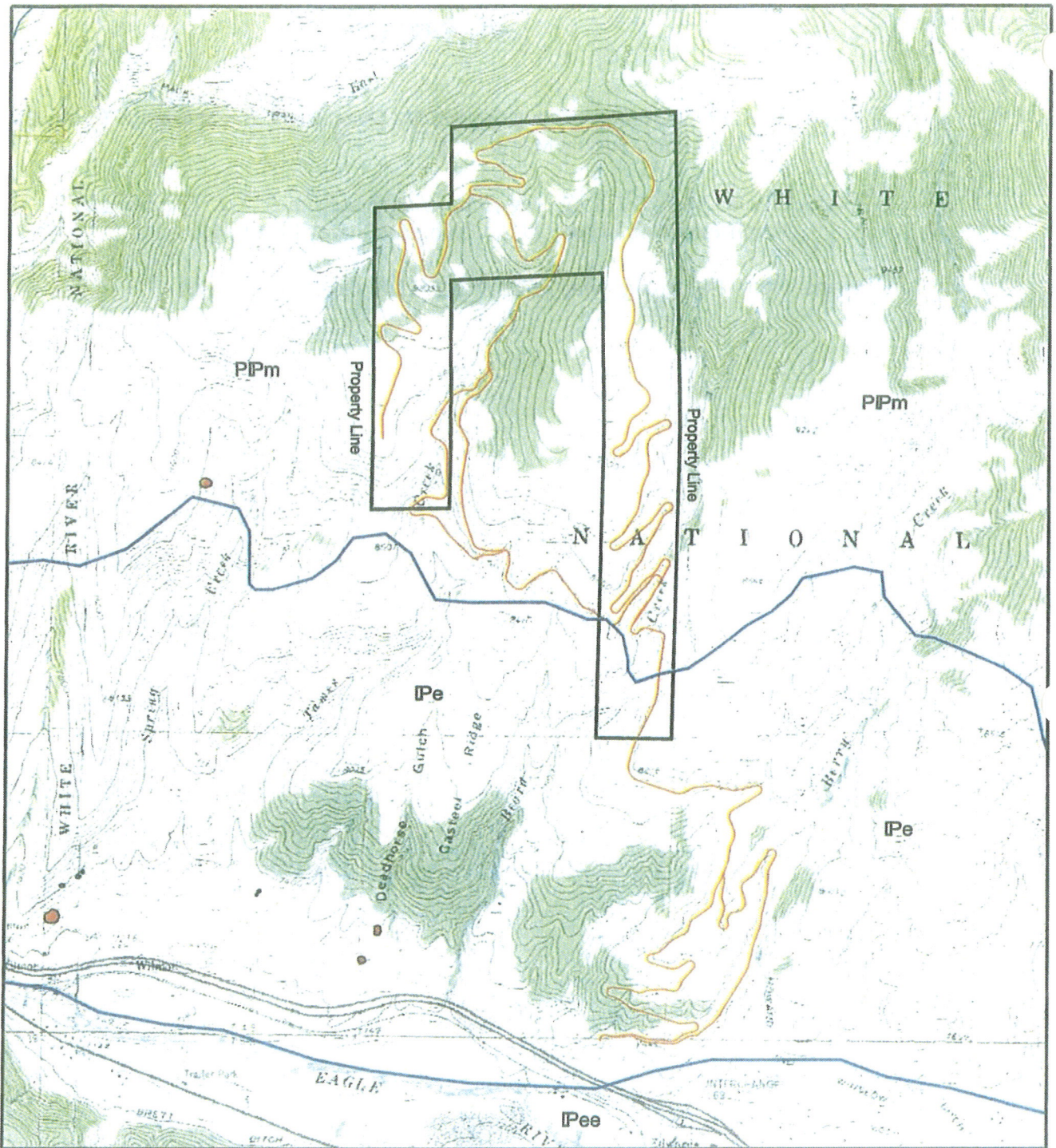
Steven L. Pawlak, P. E.

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Explanation:

PIPm Maroon Formation

IPe Eagle Valley Formation

IPee Eagle Valley Evaporite

Contact:

Approximate boundary of rock units from Tweto and Others (1978).



Sinkholes:

Approximate locations.

Property Line

Access Road Alignment Alternatives



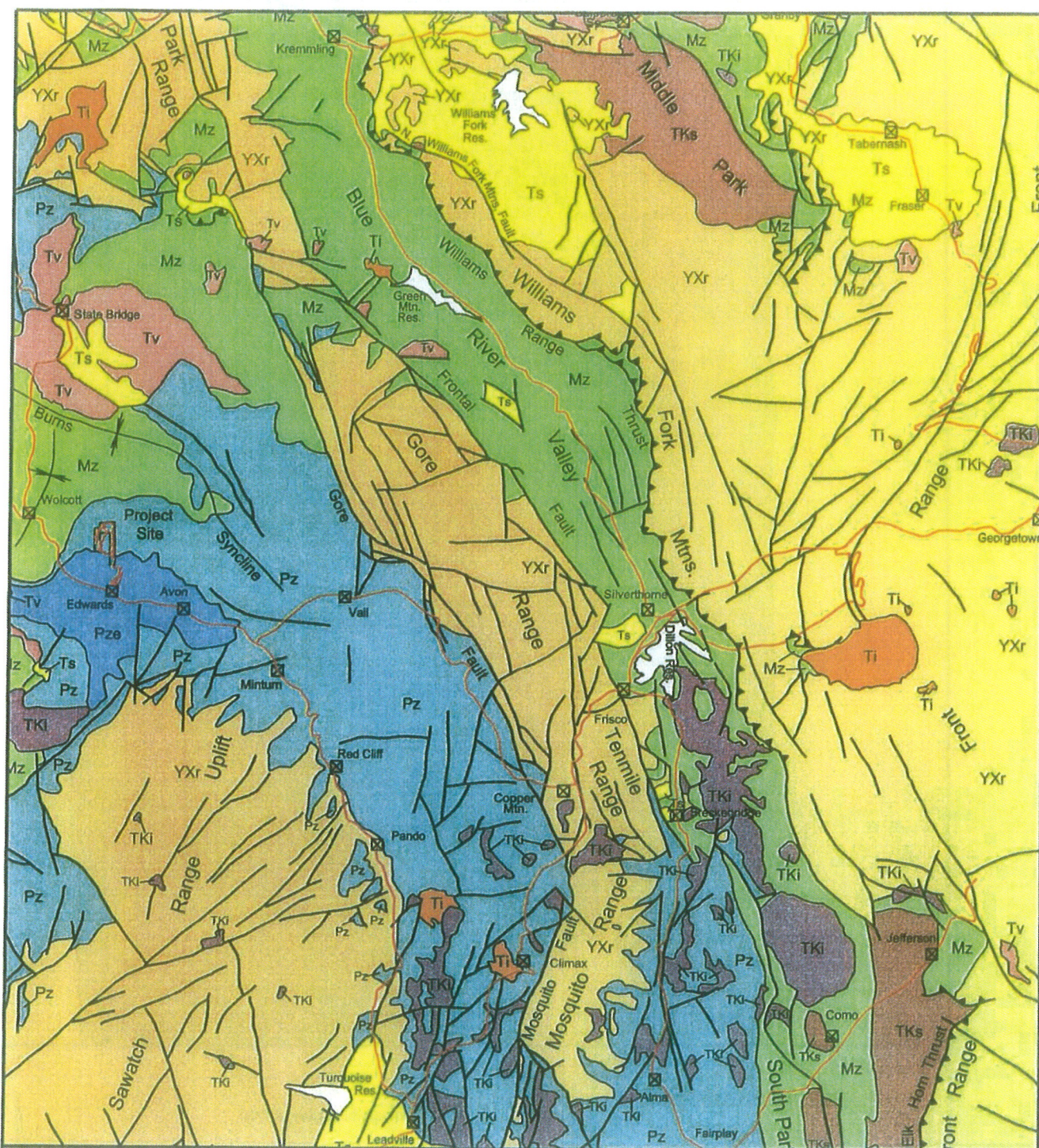
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Berlaimont Estates Access Road Alternatives
Project Site Location and Near Surface Formation Rocks

Figure 1



Explanation:

Ts Post-Laramide Sediments

Tv Post-Laramide Volcanics

Ti Post-Laramide Intrusives

TKs Laramide Basin Sediments

TKI Laramide Intrusives

Mz Pre-Laramide Mesozoic Sediments

Pz Paleozoic Sediments

Pze Pennsylvanian Evaporites

YXr Precambrian Crystalline Rocks

Contact

High-Angle Faults

Thrust Faults

Synclines

Highways

0 7 mi.

Scale 1 in. = 7 mi.

Modified from: Tweto (1979)

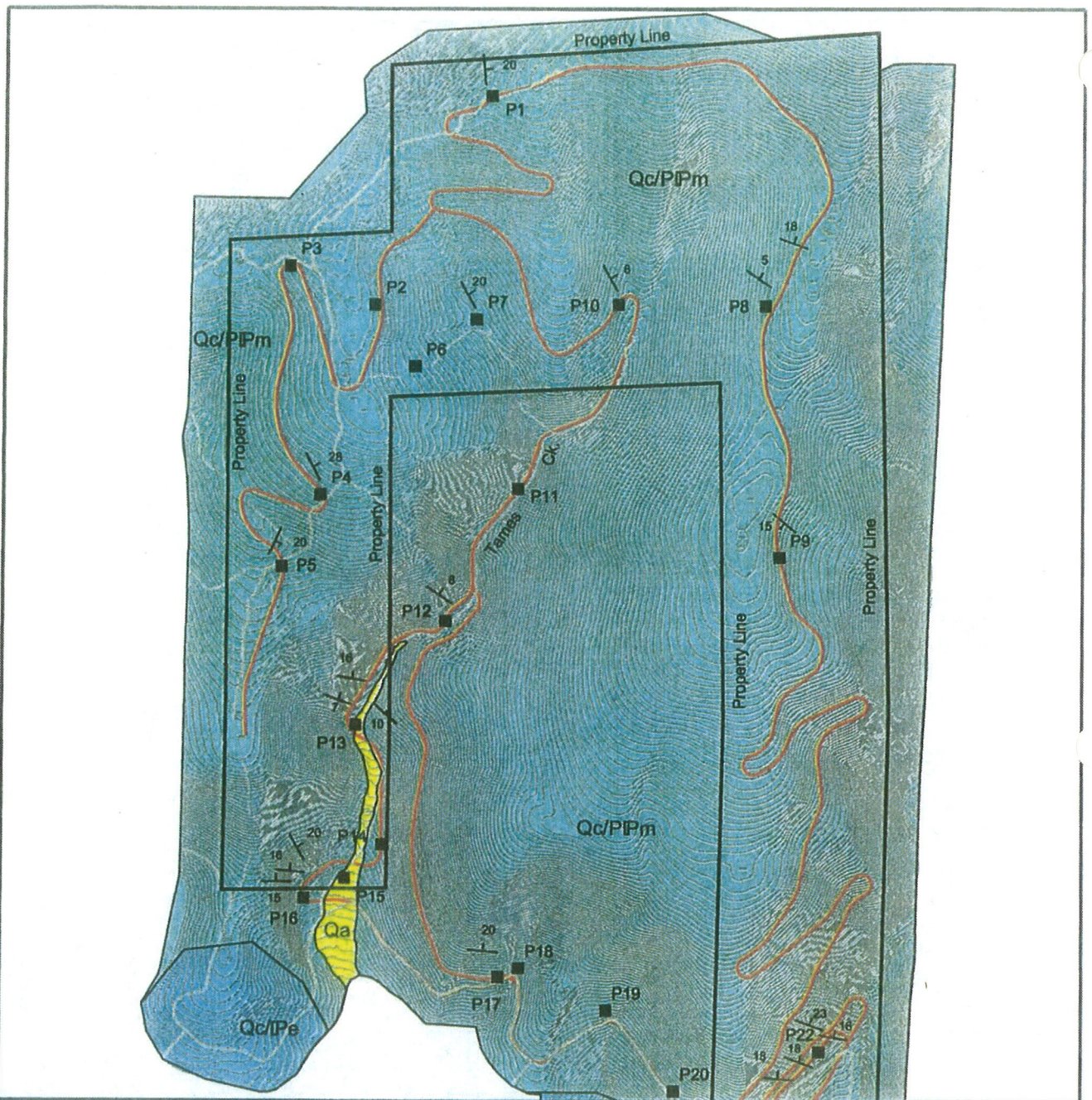
109 275A

HP
Geotech

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Berlaimont Estates Access Road Alternatives
Regional Geology Map

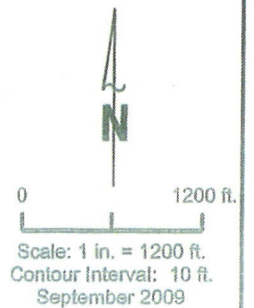
Figure 2



Explanation:

Qc	Colluvium and Small Fans
Qa	Stream Valley Alluvium
PPm	Maroon Formation
Pe	Eagle Valley Formation

	Contact: Approximate boundary of map units.
 30 P1	Strike and Dip: Strike and dip of bedding in degrees.
	Exploratory Pits: Approximate locations.
	Access Road Alignment Alternatives



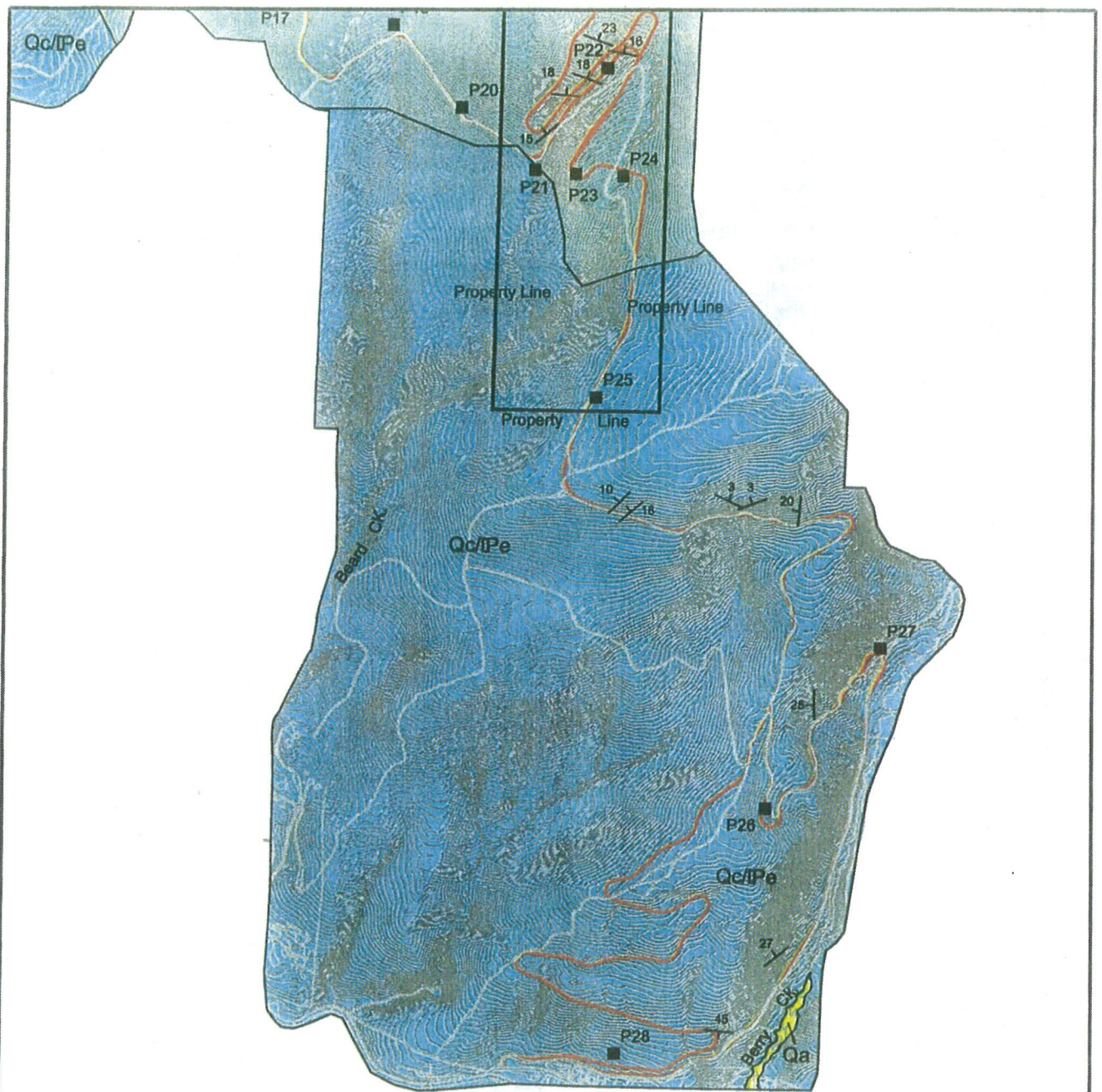
Modified from Tweto and Others (1978)

109 275A

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Berlaimont Estates Access Road Alternatives
Project Site Geology Map Northern Part

Figure 3



Explanation:

- | | |
|--|---------------------------------|
| Qc | Colluvium and Small Fans |
| Qa | Stream Valley Alluvium |
| PPm | Maroon Formation |
| Pe | Eagle Valley Formation |

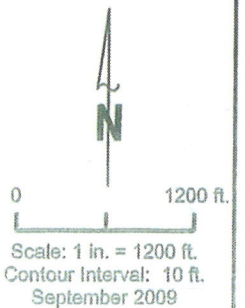


Contact:
Approximate boundary of map units.

Strike and Dip:
Strike and dip of bedding in degrees.

Exploratory Pits:
Approximate locations.

Access Road Alignment Alternatives



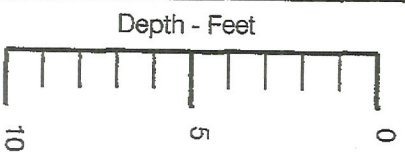
Modified from Tweto and Others (1978)

109 275A

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Berlaimont Estates Access Road Alternatives
Project Site Geology Map Southern Part

Figure 4



PIT 1
ELEV. = 9365'



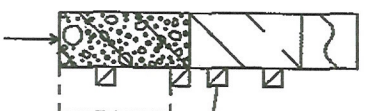
WC=13.5
DD=109

PIT 2
ELEV. = 9200'

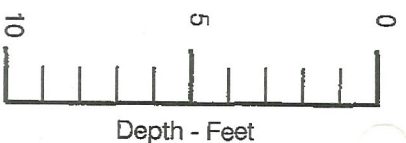


WC=11.5
DD=105
-200=51
LL=36
PI=5

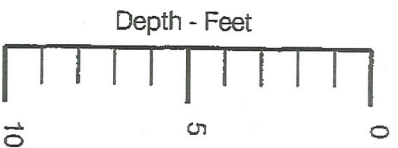
PIT 3
ELEV. = 9195'



WC=18.3
DD=93
-200=80
LL=36
PI=8



Depth - Feet



PIT 4
ELEV. = 9100'

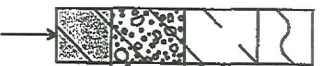


PIT 5
ELEV. = 8965'

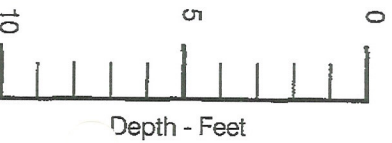


WC=9.7
DD=76
-200=63
LL=38
PI=8

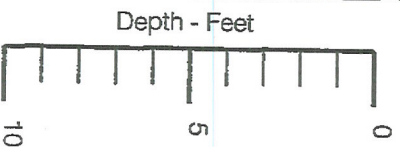
PIT 6
ELEV. = 9130'



WC=8.2
DD=103
-200=46
LL=28
PI=8



Depth - Feet



PIT 7
ELEV. = 9020'



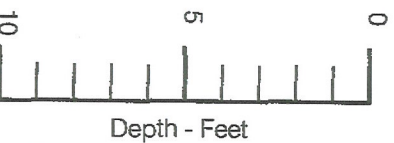
WC=9.8
DD=94

PIT 8
ELEV. = 9275'



WC=11.4
DD=115
-200=31

PIT 9
ELEV. = 9195'



Depth - Feet

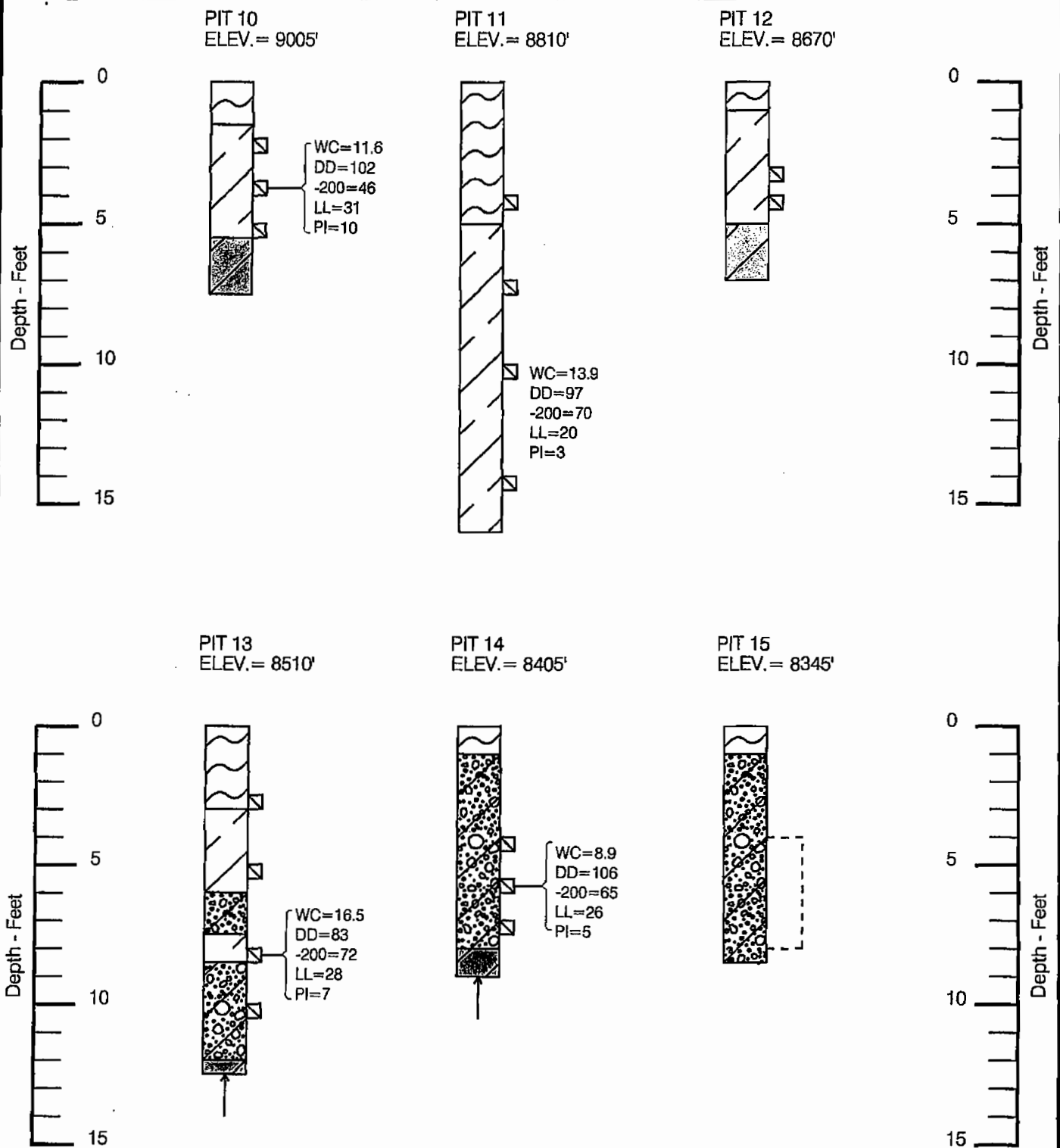
Note: Explanation of symbols is shown on Figure 9.

109 275A

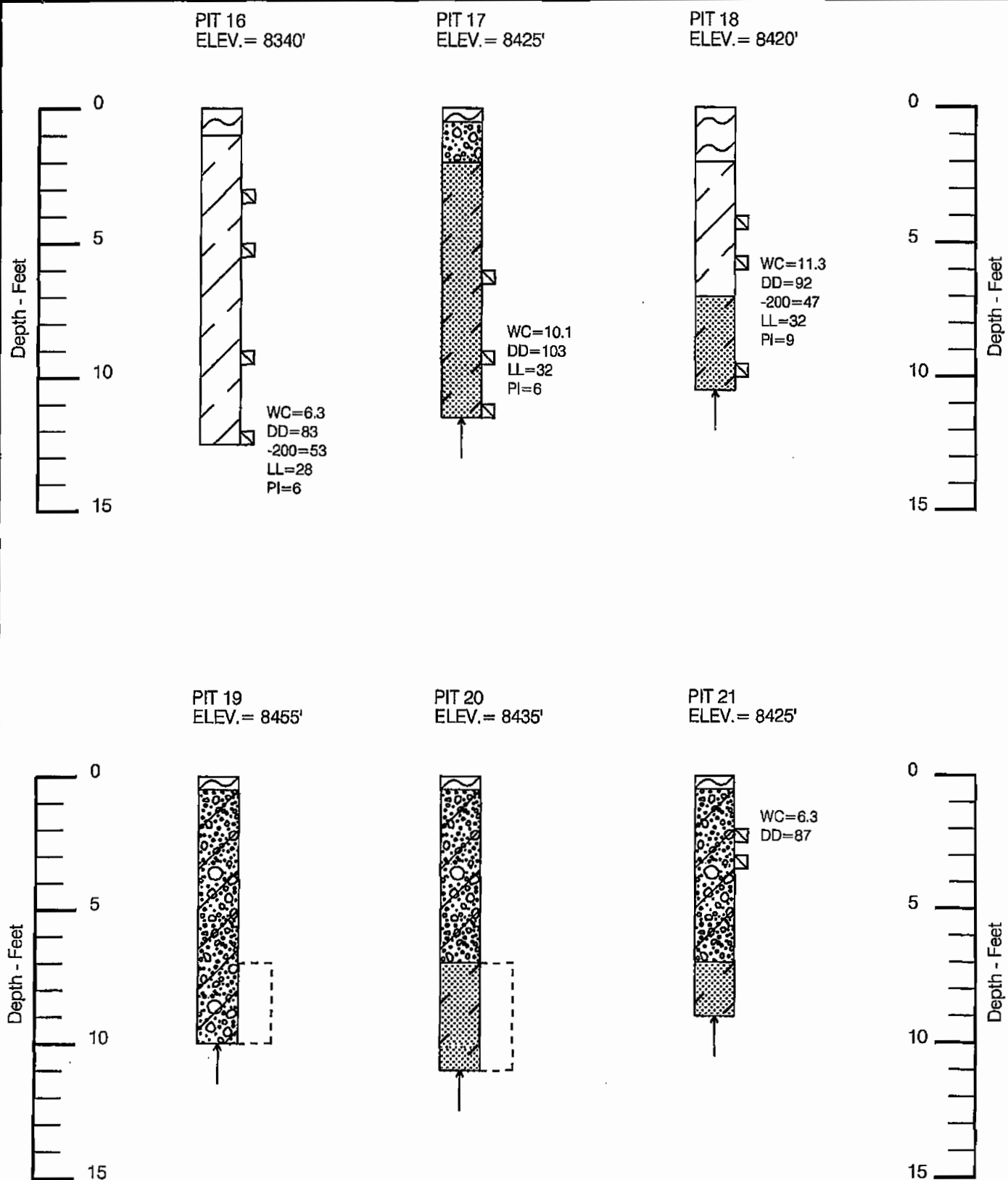
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LOGS OF EXPLORATORY PITS

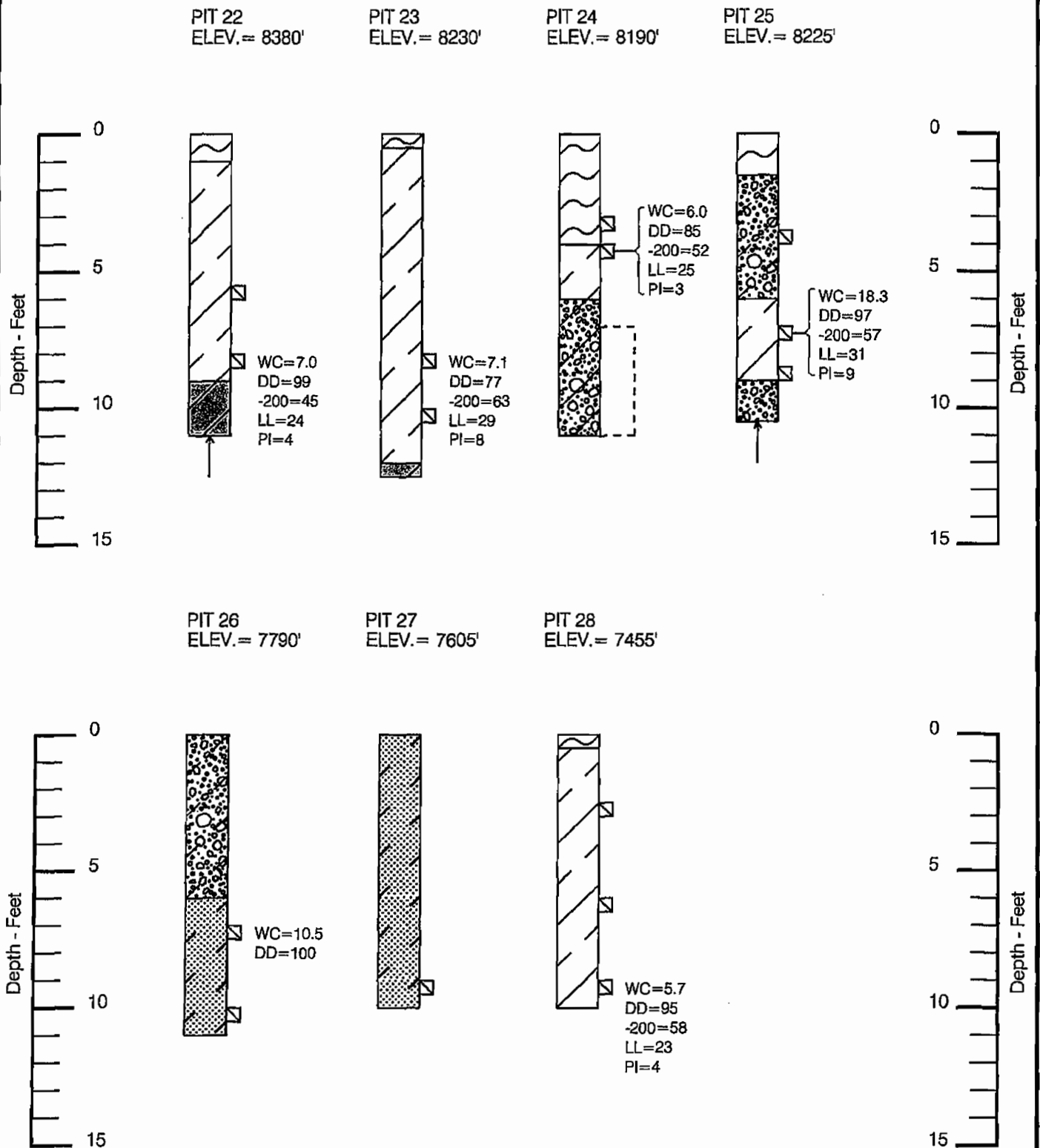
Figure 5



Note: Explanation of symbols is shown on Figure 9.



Note: Explanation of symbols is shown on Figure 9.



Note: Explanation of symbols is shown on Figure 9.

LEGEND:



TOPSOIL; organic sandy silt, dark brown.



SILT AND CLAY (ML-CL); sandy to very sandy, some rock fragments, slightly moist, light brown to brown, some organics.



SAND AND GRAVEL (SC-GC); clayey, some sandy clay matrix, medium dense, slightly moist, brown, low plasticity, rock fragments.



SAND AND GRAVEL (SM-GM); silty, slightly clayey, some sandy silt matrix, medium dense, slightly moist, mixed brown, rock fragments.



CLAYSTONE / SILTSTONE; medium hard to hard, slightly moist to moist, grey.



SILTSTONE / SANDSTONE; medium hard to very hard with depth, thinly to thickly bedded, red-brown.



2" Diameter hand driven liner sample.



Disturbed bulk sample.



Practical digging refusal, typically in bedrock.

NOTES:

1. Exploratory pits were excavated on August 20 and 21, 2009 with a Cat 420D backhoe.
2. Locations of exploratory pits were approximated from features shown on the site plan provided.
3. Elevations of exploratory pits were obtained by interpolation between contours shown on the site plan provided.
4. The exploratory pit locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between materials shown on the exploratory pit logs represent the approximate boundaries between material types and transitions may be gradual.
6. No free water was encountered in the pits at the time of excavating. Fluctuation in water level may occur with time.
7. Laboratory Testing Results:
 - WC = Water Content (%)
 - DD = Dry Density (pcf)
 - 200 = Percent passing No. 200 sieve
 - LL = Liquid Limit (%)
 - PI = Plasticity Index (%)

HEPWORTH-PAWLAK GEOTECHNICAL, INC.

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Job No. 109 275A

1 of 2

SAMPLE LOCATION		NATURAL MOISTURE CONTENT	NATURAL DRY DENSITY	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH	AASHTO CLASS.	SOIL OR BEDROCK TYPE
PIT	DEPTH (ft)			GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTIC INDEX (%)			
1	4	13.5	109								Weathered siltstone
2	3	11.5	105			51	36	5		A-4(1)	Clayey silt and sand w/gravel
3	4½	18.3	93			80	36	8		A-4(7)	Sandy silty clay
5	2	9.7	76			63	38	8		A-4(4)	Sandy silty clay w/organics
6	3	8.2	103			46	28	8		A-4(1)	Silty sand and clay
7	7½	9.8	94								Weathered siltstone
8	5	11.4	115			31					Silty sand and gravel
10	3½	11.6	102			46	31	10		A-4(2)	Silty sand and clay
11	10	13.9	97			70	20	3		A-4(0)	Sandy silt
13	8	16.5	83			72	28	7		A-4(3)	Sandy silt and clay
14	5½	8.9	106			65	26	5		A-4(1)	Sandy clayey silt w/gravel
16	12	6.3	83			53	28	6		A-4(1)	Very sandy silt and clay
17	9	10.1	103				32	6			Weathered siltstone/claystone
18	5½	11.3	92			47	32	9		A-4(1)	Silty sand and clay w/gravel
21	2	6.3	87								Sand and silt w/gravel
22	8	7.0	99			45	24	4		A-4(0)	Clayey sand and silt
23	8	7.1	77			63	29	8		A-4(3)	Sandy silty clay
24	4	6.0	85			52	25	3		A-4(0)	Very sandy silt

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

page 2 of 2

[illegible]

APPENDIX B

BIOTIC ASSESSMENT

**BIOTIC ASSESSMENT
OF THE BERLAIMONT ESTATES ACCESS ROAD,
EAGLE COUNTY, COLORADO**

Prepared for:

SE Group

P.O. Box 2729

Frisco, Colorado 80443

and

Berlaimont Estates, LLC

P.O. Box 2395

Edwards, Colorado 81632

JUNE, 2010

Western Ecosystems, Inc.

Ecological Consultants

905 West Coach Road, Boulder, Colorado 80302 (303) 442-6144

BIOTIC ASSESSMENT
OF THE BERLAIMONT ESTATES ACCESS ROAD,
EAGLE COUNTY, COLORADO

Prepared by:

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Prepared for:

SE Group
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Frisco, Colorado 80443

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JUNE, 2010

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1.0 INTRODUCTION

The Berlaimont Estates parcel, formerly known as the Overlook and Edwards, then Edwards Overlook, is an undeveloped, 680.6-acre private inholding (Secs. 20 & 29, T. 4 S, R. 82 W.) within National Forest System (NFS) land managed by the White River National Forest (WRNF) that is north of the I-70 Edwards Interchange, in Eagle County, Colorado. The private property is under conceptual consideration for 35-acre residential development. Such development would require road access along an alignment providing suitable grades. Under the Alaska National Interest Lands Conservation Act (ANILCA), the U.S. Forest Service (USFS) is required to "...provide such access to non-federally owned land within the boundaries of the National Forest System... to secure the owner's reasonable use and enjoyment thereof..." (16 USC 3210, Title I, §1323). The ANILCA is not limited to the State of Alaska, but has nationwide application to NFS lands.

Berlaimont Estates, LLC (The Applicant) is currently seeking road access to the private parcel with the ultimate intent of building 19, single-family homes on the parcel. As a use by right pursuant to C.R.S., the lots on the private parcel would be exempt from subdivision and/or Planned Unit Development (PUD) regulations. However, to provide access, the Applicant has identified the need for several access road variances from the Eagle County Land Use Regulations (ECLUR). The Applicant submitted an application for Variance from Improvement Standards to Eagle County to establish road access to the property. Eagle County has requested an Environmental Impact Report (EIR) from the Applicant. This Biotic Assessment, which addresses plant, aquatics, and wildlife issues, will be part of the EIR. While the Applicant's submittal to the County is only to establish singular roadway access to the property and does not address any additional roadways or driveways that would be necessary to serve future residential lots within the private parcel that may be subject to additional design and planning requirements of the Eagle County Land Use Regulations (ECLUR), this report also assesses impacts associated with full development and use of the road and private parcel. Furthermore, the USFS asked the Applicant to resolve access to the private parcel with the County prior to continuation of the project's review under the National Environmental Policy Act (NEPA). Additional road design and minimization measures may also be a required part of the USFS's NEPA decision, which would include additional Colorado Division of Wildlife (CDOW) and County input.

As part of the current NEPA process, and two former access and development proposals, the Berlaimont Estates project has been through public scoping and preliminary USFS analysis of potential impacts to biotic resources. This report focuses on those resources of principal concern to the County and summarizes effects to those resources that have dropped out of detailed analyses. Because the Proposed Action focuses on NFS lands, this document addresses USFS conventions and species lists, which also include all species of concern to the County on private lands.

Background information on the species addressed herein is contained in WRNF Forest Plan documents (USFS 2002a,b,c,d,e,f,g as amended [USFS 2005a,b,c,d 2006a,b,c,d, 2008a,b]). Those USFS documents were supplemented with information on species status, distribution, and ecology derived from Colorado Natural Heritage Program (CNHP) data base maps and reports, Colorado Division of Wildlife (CDOW) Wildlife Resource Information System and Natural Diversity Information System

(NDIS) mapping, USFS data, personal knowledge of the local CDOW District Wildlife Manager, USFS wildlife biologists, applicable scientific studies and reports, and field surveys. Field surveys were conducted along potential access road corridors and on the private parcel in 2001 (Thompson 2001a,b), 2002, 2006, and June 5, 11, 17, and 19, 2008 specifically for this project. Project descriptions and maps are contained in the project file. Collectively, the plant and animal database used for the present analysis represents the best scientific information currently available.

2.0 PROPOSED ACTION

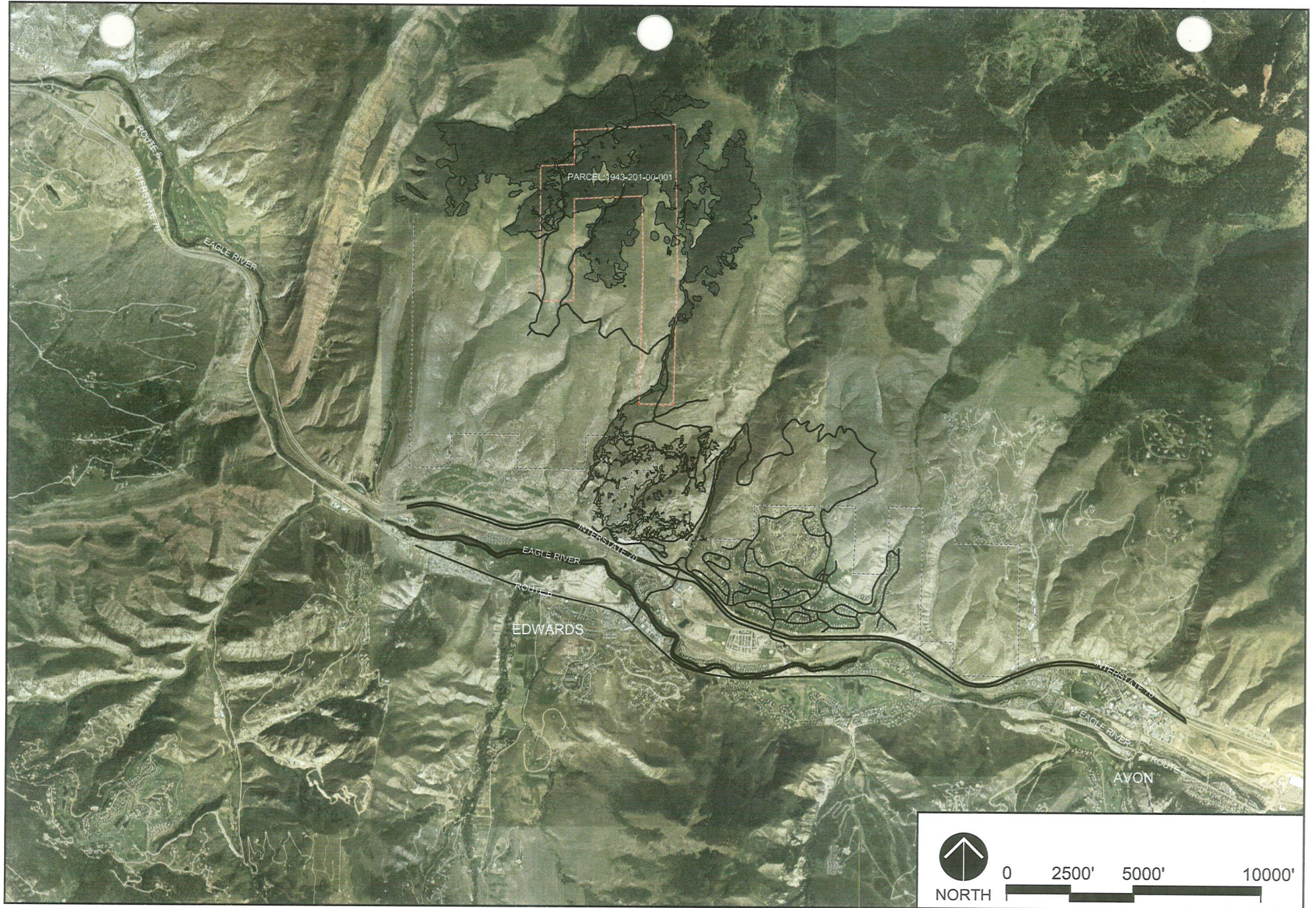
2.1 ACCESS ROAD DESIGN

Figure 1 is a vicinity map showing lands associated with the Proposed Action. Alpine Engineering, working on behalf of the Applicant, prepared a detailed preliminary road design to serve the proposed residential development. Identified as Berlaimont Road, the road would be 5.32 miles in length and would largely follow existing Forest Service Roads (FSR) 774 and FSR 780 (Fig. 2, Fig. 3 of the Application). The access road would terminate in a cul-de-sac at a point north of the private property line. Detailed and complete Berlaimont Road design specifications for are provided along with the Application. Key road design parameters that are relevant to this analysis, which have incorporated (to the extent practicable) wildlife-related design criteria that were discussed as part of the preliminary NEPA analysis, include:

1. When possible, the access road should use the existing FSR 774 and FSR 780 platforms.
2. Based on the 19, single family lots allowed by right and using the Average Daily Traffic (ADT¹) volume of 10.1 vehicles per day (VPD²) for weekends (land use code 210, ITE 7th Edition) the maximum ADT would be 191.9 VPD. The resulting appropriate design standard for such a roadway is a Type V Rural Minor Collector within a terrain classification of mountainous, whose basic standards include:
 - 10-foot-wide travel lanes
 - 3-foot-wide shoulders
 - 20 mph design speed
 - 10% maximum grade
 - 80-foot-wide minimum switchback radius
3. The roadway should have a paved (asphalt) surface.
4. The roadway should have intermittent turnouts for emergency vehicles that meet with approval from the Eagle River Fire Protection District.
5. All utilities (power, telephone and cable) associated with any future development should be buried within the proposed road easement.
6. The road should be privately maintained for year-round access by a homeowners association for Berlaimont Estates.

¹ "ADT" means the average daily two-way traffic volume. ADT represents the total traffic on a section of roadway for a given day or sampling period, but not necessarily for a given year. It is equivalent to vehicles per day (VPD), defined below.

² "VPD" means vehicles per day, the total two-way daily traffic volume on a section of roadway.



BERLAIMONT ESTATES
Edwards, Colorado

VICINITY MAP
FIGURE 1

A1

March 2010

TURNAROUNDS

NO.	TYPE	MILEAGE	LINEAL FEET
1	Bubble	0.16	830
2	Bubble	0.40	2,100
3	Hammerhead	1.04	5,475
4	Bubble	1.51	7,982
5	Bubble	1.73	9,147
6	Hammerhead	1.91	10,092
7	Hammerhead	2.45	12,922
8	Bubble	2.69	14,229
9	Bubble	2.99	15,809
10	Hammerhead	3.49	18,419
11	Hammerhead	3.92	20,704
12	Bubble	4.16	21,995
13	Hammerhead	4.93	26,045
14	Cul-de-sac	5.32	28,095

Berlaimont Estates

Variance From Improvement Standards
March 2010
Figure 2 - Berlaimont Road Design

LEGEND

- USFS Land Boundary
- Inholding Boundary
- Gravel Road
- Existing Paved Road
- Proposed Road
- Emergency Turn-Around

PROJECT DETAILS

ROAD LENGTH: 5.3 MILES



Scale: 1"=1500'

ALPINE
AEI
ENGINEERING INC

EDWARDS BUSINESS CENTER • P.O. BOX 97
EDWARDS, COLORADO 81632
• 970 926-3373 • FAX 926-3390 •

Figure 3 - Berlaimont Road Design

7. Public access to NFS roads through private lands of Berlaimont Estates would be retained through a reciprocal agreement between Berlaimont Estates, LLC and the USFS.
8. The general public would retain access to FSR 774 and FSR 780 for seasonal motorized (consistent with the current seasonal closures) and year round non-motorized use on NFS lands. Gates would be provided where necessary to seasonally limit public motorized access consistent with current closures.
9. The road should facilitate access to the northern most developable portion of the property where building envelopes would be confined due to grade conditions on the lower elevation portions of the parcel's eastern and western "legs." The lower elevation portions of the property are not suitable for development of residential structures.
10. The preliminary road design would largely avoid the most excessive gradients to minimize cuts and fills. When necessary, cut walls and fill slopes would be provided to minimize the area of disturbance for the road.

Additional measures to avoid, minimize, and compensate for adverse wildlife effects on NFS lands associated with the access road will be a required part of the USFS's NEPA decision, which would include additional CDOW and County input.

2.2 REQUESTED ACCESS ROAD VARIANCES

Based on the preliminary road design and site specific topographic constraints, the Applicant requested (in an Application dated April 6, 2010) three variances from Improvement Standards governed under ELCUR Article 4, Division 6, including (1) single (vs. dual road access), (2) emergency vehicle turnarounds that depart from those required to be regularly spaced at 1,000 foot intervals along the road, and (3) a set of variances related to specific dimensional requirements within the Road Design Standards of the ELCUR (listed in the Table on Pp. 10-12 of the Application and in the text). Dual access would be precluded by any USFS approval of access across NFS lands to minimize resource impacts. As a summary of the requested variances from the Road Design Standards, 12 of 13 requested variances relate to the minimum centerline radius of the road. As the terrain is challenging, the road engineers sought to minimize disturbance (generally resulting in smaller cut and fill slopes and longer retaining walls), while providing safe vehicular movement through areas of switchback. The last of the requested Road Design Standards variances is a variance from the maximum vehicle speed for certain segments along the road. While the County standard design speed is 20 mph, there are segments along the proposed road where the Applicant believes a 30 mph speed limit is supported by the planned road design. These areas are generally confined to locations with high visibilities that do not include switchbacks.

2.3 FUTURE BERLAIMONT RESIDENTIAL DEVELOPMENT

The Applicant's ultimate goal of road access to the private parcel is to build 19, single-family homes on the parcel. As a use by right pursuant to C.R.S., the lots on the private parcel would be exempt from subdivision and/or PUD regulations. At this time, the residential development is conceptual, and the Applicant's submittal to the County does not address any additional roadways or driveways that would be necessary to serve future residential lots that may be subject to additional design and planning requirements of the ELCUR. However, some general characteristics of the private parcel are provided

as a partial basis for impact assessment. *Conceptually*, an additional 5.4 miles of road would be constructed throughout the eastern and northern portions of the inholding to accommodate access to each of the 19 lots clustered in that general area. Driveway mileage to homesites would require additional, narrower “roads.” It is the intention of the Applicant that potable water would be trucked in to each residence from a local commercial contractor. Each of the lots would be served by individual wastewater (septic) systems. Non-potable water would be provided from an existing spring located within the property and stored in below grade tanks. Development of a wildlife mitigation plan for the private parcel to insure that development follows a design minimizing habitat losses and facilitating continued wildlife movements through, and use of, the property will be a consideration. Such a plan could include the same types of minimization and compensation measures contained in other wildlife mitigation plans that have been developed for properties containing similar wildlife issues in the County.

3.0 DESCRIPTION OF THE ANALYSIS AREA

The 680.6-acre Berlaimont Estates parcel is located approximately 1.25 miles north of the I-70 Edwards Interchange in Eagle County, Colorado (Sec. 20 and 29, T4S, R82W; Fig. 1). Intervening NFS land between the Town of Edwards and the private inholding that would be crossed by access road segments under consideration is on the Holy Cross Ranger District of the WRNF (Sec. 20, 29, 32, & 33, T4S, R82W; Fig. 1). The Forest is located entirely within the upper Colorado River basin on the western slope of the Rocky Mountains.

The project area contains the distal portions of several ridges extending southwest off Red and White Mountain that terminate in the Eagle River Valley. Elevations range between approximately 7,440-9,270 feet on affected NFS lands and 8,040-9,640 feet on the private parcel. The generally south-facing project area supports undeveloped mountain shrub, big sagebrush (*Seriphidium tridentata*), and juniper (*Sabina scopulorum*) woodlands along the lower 80% of the road alignment. The upper section of the alignment traverses through aspen forest, before entering a sagebrush-tufted hairgrass (*Deschampsia caespitosa*) community on the private parcel. Berry and Beard Creeks are the only perennial creeks in the vicinity of the project area and both support riparian corridors in the vicinity of existing and proposed road alignments. Tames Creek and other tributaries are intermittent in the vicinity of the access road and private parcel.

A mixture of shrubs composes the mountain shrub community. Mountain mahogany (*Cercocarpus montanus*) is the dominant shrub, however big sagebrush, serviceberry (*Amelanchier alnifolia*), and chokecherry are locally abundant. Less common shrubs include rubber rabbitbrush (*Chrysothamnus nauseosus*), low rabbitbrush (*Chrysothamnus viscidiflorus*), bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos oreophilus*), and horsebush (*Tetradymia canescens*). Scattered subshrubs present include fringed sage (*Artemisia frigida*), Oregon grape (*Mahonia repens*), Wood’s rose (*Rosa woodsii*) and sulphur flower (*Erigonum umbellatum*). Grasses and a few scattered forbs dominate a sparse herbaceous layer. Common grasses include bluebunch wheatgrass (*Agropyron smithii*), western wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Junegrass (*Koeleria macrantha*), and needle-and-thread (*Stipa comata*). Cheatgrass (*Bromus tectorum*), a weedy annual grass, is also present. Characteristic forbs present include yarrow, balsamroot (*Balsamorhiza sagittata*), yellow paintbrush (*Castilleja flava*), hoary aster

(*Machaeranthera canescens*), Watson penstemon (*P. watsonii*), Penstemon *strictus*, scarlet globemallow (*Sphaeralcea coccinea*), and American vetch. Introduced weedy forbs present include, ragweed (*Ambrosia trifida*), musk thistle (*Carduus nutans* ssp. *macrolepis*), and yellow sweetclover (*Melilotus officinalis*).

Big sagebrush shrubland is dominated by mountain big sagebrush. The shrub canopy formed by big sagebrush ranges from open to moderately closed, varying with slope, aspect, soil depth, and moisture. Other shrubs present include serviceberry, mountain mahogany, rubber rabbitbrush, low rabbitbrush, bitterbrush, snowberry, and horsebrush. Subshrubs present include fringed sage, winterfat (*Eurotia lanata*), snakeweed (*Gutierrezia sarothrae*), Oregon grape, and sulphur flower. The herbaceous understory is sparse to dense, depending on soil moisture. The understory is dominated by grasses, but has a rich and diverse forb component. Common grasses include western wheatgrass, bluebunch wheatgrass, Junegrass, Indian ricegrass, basin wildrye, needle-and-thread, Letterman needlegrass, and Thurber fescue. Introduced grasses present are orchardgrass (*Dactylis glomerata*), Kentucky bluegrass, smooth brome (*Bromus inermis*), and cheatgrass. Forbs in this community include Harrington penstemon (*P. harringtonii*), Watson penstemon, Osterhout penstemon (*P. osterhoutii*), yarrow, pussytoes (*Antennaria rosea*), balsamroot, mariposa lily (*Calochortus gunnisonii*), yellow paintbrush, bastard toadflax (*Commandra umbellata*), low daisy, scarlet gilia (*Ipomopsis aggregata* ssp. *aggregata*), blue flax (*Linum lewisii*), locoweed (*Oxytropis lambertii*), scarlet globemallow, and American vetch. Weedy forbs present include, musk thistle, dandelion (*Taraxacum officinale*), tansy mustard (*Descurainia richardsonii*), pennycress (*Thlaspi arvense*), and yellow sweet clover.

Juniper woodlands occur in low to moderate densities along the lower one-half of the road alignment and support relatively sparse understories. Canopy coverage of the vegetative understory is generally in the range of 10-30%. Species composition is similar to that of low density sagebrush stands.

The distal (upper) 13.8 % of the proposed road would cross through 4B (mature, 41-70% crown cover) and 3C (sapling-pole, >71% crown cover) aspen (*Populus tremuloides*) stands. This forest on the east side of Tames Creek is at the lower elevational end of its ecological tolerance in this setting. The 4B stand supports a moderate density, four-foot tall snowberry stand, a low density of coarse woody debris (CWD), and a lush herbaceous understory. The 3C stand, along the more xeric ridgeline, contains no CWD and an understory dominated by tufted hairgrass.

The private parcel supports a continuation of the big sagebrush, mountain shrub, and aspen communities found on lower NFS lands. Aspen stands are generally healthier and more extensive at this higher elevation. Stand conditions are generally closed canopy and mature, with some areas of dense, pole-stage trees and other areas of open canopy, decadent trees that have been blown down. A tufted hairgrass (*Deschampsia caespitosa*) stand is present on the parcel's upper eastern leg.

4.0 THREATENED AND ENDANGERED SPECIES

Listed, proposed, and candidate plant and animal species that were initially considered for the Proposed Action included those identified by the USFWS and USFS as potentially present on the WRNF, potentially present in the project area, or potentially affected by the Proposed Action. Table 4-1 identifies those species that may occur in Eagle County that could potentially be affected by the

Proposed Action as identified by the USFS (20010). The USFS (2010) identified Penland alpine fen mustard (*Eutrema penlandii*), Uncompahgre fritillary butterfly (*Boloria acrocneuma*), humpback chub (*G. cypha*), bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), greenback cutthroat trout (*Oncorhynchus clarkii stomias*), and Canada lynx (*Lynx canadensis*). These species are addressed below. Other listed, proposed, and candidate plant and animal species known to occur elsewhere in Colorado were considered, but dropped from detailed analysis because they were not identified by the USFWS or USFS as potentially present on the WRNF, their habitats do not occur in the action area, they have no affinities to project area habitats, the project area is outside of the species' range, and the Proposed Action would have "no effect" on the species or on designated critical habitat.

Table 4-1. Federally listed and proposed plant and animal species that may be affected by the Proposed Action associated with the BSR Peak 6 project.		
Common and Scientific Name	Status	Rationale for Occurrence ^a (Habitat)
Penland alpine fen mustard, <i>Eutrema penlandii</i>	T	No suitable habitat (rocky alpine crevices, streambanks, and wetlands primarily on calcareous-derived soils >12,000 ft.)
Uncompahgre fritillary butterfly, <i>Boloria acrocneuma</i>	E	No habitat (alpine snow willow stands >12,000 ft. on peaks ≥ 12,600 ft.)
Humpback chub, <i>Gila cypha</i>	E	Pot. West Slope water depletions (far downstream in CO River)
Bonytail chub, <i>G. elegans</i>	E	Pot. West Slope water depletions (far downstream in CO River)
Colorado pikeminnow, <i>Ptychocheilus lucius</i>	E	Pot. West Slope water depletions (far downstream in CO River)
Razorback sucker, <i>Xyrauchen texanus</i>	E	Pot. West Slope water depletions (far downstream in CO River)
Greenback cutthroat trout, <i>Oncorhynchus clarkii stomias</i>	T	Not part of historic range (isolated mountain stream headwaters)
Canada lynx, <i>Lynx canadensis</i>	T	Present in AA, potential travel habitat (montane and subalpine forests)
^a In Action Area (AA). Note: Other listed and proposed species are not listed in this table because they have no affinities to action area habitats, the project area is outside of the species' range, and the Proposed Action would have no effect on the species. Species are listed phylogenetically. Federal status, listed after species, is as follows: E = Endangered, T = Threatened, C = Candidate. Potential pre-field survey occurrence on the project area and habitat affinity is summarized for each species. Source: USFS (20010) and Western Ecosystems, Inc.		

After due consideration (Table 4-1), three (Penland alpine fen mustard, Uncompahgre fritillary butterfly, and greenback cutthroat trout) of the eight listed, proposed, and candidate species initially considered herein, were dropped from detailed and further consideration because their range distributions are outside the area of project effects and/or habitats necessary for their life requirements would not be affected by the Proposed Action. The Proposed Action would have no effect on those three species. The five remaining species (Colorado pikeminnow, razorback sucker, humpback chub, bonytail, and Canada lynx), warranting more detailed consideration, are evaluated below.

4.1 COLORADO PIKEMINNOW, BONYTAIL CHUB, HUMPBACK CHUB, AND RAZORBACK SUCKER

None of the four listed, endangered fish (Colorado pikeminnow, bonytail, humpback chub, and razorback sucker, collectively hereinafter, the big river fish) occur any closer to the project area than the main stem of the Colorado River near Rifle (USFWS 1999). The Colorado pikeminnow has been

collected on the main stem of the Colorado River as high as just above Palisade and adults occur in the Gunnison River (USFWS 1991, CDOW WRIS maps). Reproduction is occurring in the Colorado River, but pikeminnows cannot move upstream past the Government Highline and Price-Stub Dams near Palisade. Programs are now under consideration that would allow movements past these structures (P. Gelatt, USFWS, pers. comm.). The razorback sucker is present in the Colorado River well above DeBeque (CDOW WRIS maps). Bonytail and humpback chubs have not been recorded on the main stem of the Colorado River or any of its tributaries higher than the Black Rocks area below Grand Junction. Critical habitat that is part of the action area (USFWS and NMFS 1998) has been designated for these four endangered Colorado River fishes but does not occur any closer to the project area than the main stem of the Colorado River near Rifle (USFWS 1999). Additional biological background information on these fish is contained in Woodling (1985), Osmundson and Kaeding (1989, 1991), USFWS (1990a,b, 1991, 1999) and Phelps (2000).

The above big river fish are not found within the boundaries of the project area. However, they are addressed together because they all occur far downstream from the project area in the upper Colorado River Basin and because water depletions, water quality degradation, and the effects of impoundments have been the major factors adversely affecting these species. The USFWS has determined that activities resulting in water depletion in the Upper Colorado River Basin may jeopardize the continued existence of the four endangered fish. Section 7 mandates that actions authorized, funded, or implemented by a federal agency will not likely jeopardize the continued existence of a listed endangered or threatened species or result in the destruction or adverse modification of critical habitat (Section 7[a][2] of the ESA, Fed. Reg. 51:19926). Federal actions that would result in new depletions of water or degradation of water quality to tributaries of the Colorado River require consultation with the USFWS.

There would be relatively small (<0.5 AF/yr.) consumptive water losses associated with the Proposed Action (i.e., via possible dust suppression during road construction, none associated with any of the requested variances, and residential losses associated with [1] less efficient returns via individual septic systems vs. centralized wastewater treatment facilities and [2] consumptive non-potable water losses). As part of the NEPA process, the Proposed Action would result in a “likely to adversely affect” determination on the big river fish. No compensatory mitigation would be required because consumptive losses would be <100 acre-feet/ year at full buildout.

4.2 CANADA LYNX

Pertinent Canada lynx life history information, including general ecology and their relationship with snowshoe hares, foraging, denning, security, and travel requirements, landscape connectivity and movements, and the effects of recreational activities on lynx may be found in Koehler and Aubry (1994), Nordstrom (1998), Ruggiero et al. (1999), Ruediger et al. (2000), USFWS (2000a), and USFS (2002e).

Lynx habitat mapping on the WRNF was developed by the USFS (2002a, updated Aug. 25, 2009) with USFWS review. This mapping may undergo future modifications as new information develops. Lynx habitat on private lands is not mapped on the WRNF.

Based on field validation the access road corridor crosses through lynx “non-habitat” on NFS lands. While the USFS lynx habitat mapping database shows “other” habitat in the vicinity of the private parcel’s eastern “leg” associated with a mountain shrub stand, that stand is > 500 meters from denning or non-denning winter foraging habitat and, therefore, warrants “non-habitat” status, based on WRNF lynx habitat classification criteria (USFS 2002a).

Based on field validation and WRNF lynx habitat classification criteria (USFS 2002a), the private parcel supports approximately 15-20% “other” habitat and 80-85% “non-habitat”. Because of designated denning and winter foraging habitats that occur on a northwest-facing slope, northwest of the private parcel on NFS land in the east fork of Red Canyon, those aspen stands on the private parcel that are within 500 meters of those stands warrant “other” habitat status. The remaining aspen, mountain shrub, sagebrush, and grasslands on the private parcel warrant “non-habitat” status.

The Berlaimont Estates project area is not located in any designated, lynx linkage area (USFS 2008, I-70 Mountain Corridor PEIS Map 3.3-1, USFS and BLM Lynx Linkages). However, the private parcel is located approximately one-half mile east of a portion of the Castle Peak Lynx Linkage Area (CPLLA). The CPLLA straddles I-70 in the Wolcott area for approximately eight miles between Squaw Creek on the east and the middle of Red Canyon on the west. This linkage was defined by the BLM, although there is currently no written description or management plan for this linkage (D. Ausmus, BLM, pers. comm., June 13, 2008). This linkage generally consists of a matrix of lower elevation (6,800 ft at Red Canyon to 11,275 ft. atop Castle Peak) BLM and private lands connecting NFS lands at the northern end of the Sawatch Range with those in the Red and White Mountain area and Gore Range, to the north and east, and those in the Flat Tops, to the northwest. Four radio-collared lynx are thought to have crossed I-70 within or in the vicinity of this linkage. This linkage is considered in this analysis because a proportion of highway traffic associated with subsequent residential development on the private parcel would travel through this linkage between the development and down valley bedroom communities and because of the private parcel’s proximity to this linkage.

The Proposed Action is “**not likely to adversely affect**” the Canada lynx. Road construction would result in a net loss of “other” habitat on NFS and private lands. Access road use on NFS and private lands would have insignificant and discountable effects on road-kill probabilities because of the relative quality of habitats bisected, the topographic location of habitats bisected (i.e., below higher elevation, primary lynx habitats), and the relatively low speeds (≤ 30 mph) of a maximum of 192 VPD. Similarly, increased road-kill probabilities along regional highways used to access the residential development, including those bisecting designated, lynx linkage areas, would be insignificant and discountable. Proposed road design variances associated with cut and fill slopes and speed limits would have theoretically adverse, but insignificant and discountable practical effects to local habitat connectivity (i.e., by reducing the heights of cut and fill slopes resulting in longer retaining walls that pose restrictions and barriers to potential lynx movements, albeit in “non-habitat” where lynx are unlikely to occur) and road-kill probabilities (i.e., in local areas of posted 30 mph vs. 20 mph vehicle speeds). Other proposed road design variances would have no effect on lynx. Potential adverse effects would also result from residential development on private land, including, but not limited to, the conversion of “other” habitat to “non-habitat”, locally reduced habitat effectiveness, and the introduction of risk factors into the lower fringe of aspen forest that is part of a broad band of continuous forest surrounding the Gore Range.

5.0 USFS REGION TWO SENSITIVE SPECIES

Region Two (R2) of the USFS has designated “sensitive species”, representing species declining in number or occurrence or whose habitat is declining, either of which could lead to federal listing if action is not taken to reverse the trend, and species whose habitat or population is stable but limited. From the updated R2 list, a subset of sensitive species, including 33 plants, one insect, five fish, two amphibians, 17 birds, and eight mammals, was determined to be present or potentially present on the WRNF after an analysis of all sensitive species on the overall updated R2 list (USFS 2010, J. Proctor, USFS, pers. comm., Jan. 28, 2010, Table 5-1 [plants] and Table 5-2 [animals]). These species are considered below in phylogenetically ordered taxa (plants, insects, fish, amphibians, birds, and mammals) and discussed individually where appropriate. The Proposed Action would have **no impact** on any other R2 sensitive species not on the WRNF list.

Table 5-1. USFS R2 sensitive plant species that occur, or that may occur, on the WRNF and their potential occurrence in project disturbance areas associated with the Berlaimont Estates project.	
Common name, <i>Scientific name</i>	Rational for Potential Project Effects (Habitat Affinity)
PLANTS	
Sea pink, <i>Armeria maritima</i> ssp. <i>sibirica</i>	No habitat (Wet sandy alpine slopes 11,900-13,000')
Park milkvetch, <i>Astragalus leptaleus</i>	No habitat (Wet meadows/aspen; Gun. Basin, Middle Park)
Wetherill milkvetch, <i>Astragalus wetherillii</i>	No habitat (Eroding shale bluffs 5,250-7,400')
Trianglelobe moonwort, <i>Botrychium ascendens</i>	No habitat (Montane willow wetlands and ruderal habitats)
Fork leaf moonwort, <i>Botrychium furcatum</i>	No habitat (Upper subalpine ruderal habitats)
Slender moonwort, <i>Botrychium lineare</i>	No habitat (Montane through subalpine ruderal habitats)
Peculiar moonwort, <i>Botrychium paradoxum</i>	No habitat (Montane through subalpine ruderal habitats)
Smooth rockcress, <i>Braya glabella</i>	No habitat (Sparse. calcareous alpine gravels >12,000')
Lesser panicked sedge, <i>Carex diandra</i>	No habitat (Subalpine wetlands, wet meadows, w. carrs)
Livid sedge, <i>Carex livida</i>	No habitat (Fens)
Rocky Mountain thistle, <i>Cirsium perplexans</i>	No habitat (Adobe and barren shale slopes 4,500-7,000')
Yellow lady's slipper, <i>Cypripedium parviflorum</i>	No habitat (variety of forests, incl. S-F & LP, 5,700-12,400')
Clawless draba, <i>Draba exunguiculata</i>	No habitat (Granitic alpine fellfields 12,000-14,000')
Gray's Peak whitlow-grass, <i>Draba grayana</i>	No habitat (Gravelly alpine slopes 11,500-14,000')
Roundleaf sundew, <i>Drosera rotundifolia</i>	No habitat (Continuously moist or saturated fens)
Dropleaf buckwheat , <i>Eriogonum exilifolium</i>	Pot. habitat (Sparsely vegetated, rolling, sedimentary hills <8,500')
Altai cotton-grass, <i>Eriophorum altaicum</i> var. <i>neogaum</i>	No habitat (Peat wetlands 9,500-14,000')
Chamisso's cotton-grass, <i>Eriophorum chamissonis</i>	No habitat (High elevation peaty wetlands)
Slender cotton-grass, <i>Eriophorum gracile</i>	No habitat (Peaty wetlands & saturated soils, 6,900-8,000')
Hall fescue, <i>Festuca hallii</i>	No habitat (Alpine tundra and subalpine grasslands, 11,000-12,000')
Colorado tansy-aster, <i>Machaeranthera coloradoensis</i>	No habitat (Sparsely vegetated sandy soils 8,500-12,500')
Kotzebue's grass-of-Parnassus, <i>Parnassia kotzebuei</i>	No habitat (Edges of standing water bodies 10,000-12,400')
Harrington penstemon , <i>Penstemon harringtonii</i>	Present (Open sagebrush, pinyon-juniper habitats)
De Beque phacelia, <i>Phacelia scopulina</i> var. <i>submontica</i>	No habitat (Clay barrens)
Porter feathergrass, <i>Ptilagrostis porteri</i>	No habitat (Peaty soils in willow-tuft. hairgrass >10,000')
Ice cold buttercup, <i>Ranunculus karelinii</i>	No habitat (Ridge/Mtn. top rock, scree, 12,000-14,100')
Dwarf raspberry, <i>Rubus arcticus</i> ssp. <i>acaulis</i>	No habitat (Moist montane and sub-alpine habitats, 7,000-9,720')
Sageleaf willow, <i>Salix candida</i>	No habitat (Nutrient-rich fens and thickets, 8,800-10,600')

Table 5-1. USFS R2 sensitive plant species that occur, or that may occur, on the WRNF and their potential occurrence in project disturbance areas associated with the Berlaimont Estates project.	
Common name, <i>Scientific name</i>	Rational for Potential Project Effects (Habitat Affinity)
Autumn willow, <i>Salix serissima</i>	No habitat (Calcareous fens, 7,800-9,300')
Narrowleaf peatmoss, <i>Sphagnum angustifolium</i>	No habitat (Fens)
Baltic sphagnum, <i>Sphagnum balticum</i>	No habitat (Fens)
Sun-loving meadowrue, <i>Thalictrum heliophilum</i>	No habitat (Steep oil shale slopes 6,300-8,800')
Lesser bladderwort, <i>Utricularia minor</i>	No habitat (Fens and other calm, shallow, aquatic habitats)
Note: Other R2 plant species are not listed because they have not been found on the WRNF, they have no affinities to project area habitats, the project area is outside of the species' range or elevational distribution. Potential pre-field survey occurrence on the project area and habitat affinity is summarized for each species. Species in bold are potentially present and/or are discussed in the text. Plants are listed alphabetically by scientific name after USFS (2010).	
Source: USFS (2010), J. Proctor, USFS, Jan. 28, 2010 pers. comm., and Western Ecosystems, Inc.	

Table 5-2. USFS R2 sensitive animal species that occur on the WRNF and potential occurrence in impact zones (NFS and private lands) associated with Berlaimont Estates.	
Common name, <i>Scientific name</i>	Rationale for Potential Project Effects (Habitat Affinity)
INSECTS	
Great Basin silverspot, <i>Speyeria nokomis nokomis</i>	No habitat (Wetlands supporting violet populations)
FISH	
Roundtail chub , <i>Gila robusta</i>	Pot. habitat, No hydrologic effects (Far downstream in CO River)
Mountain sucker , <i>Catostomus platyrhynchus</i>	Pot. habitat, No hydrologic effects (Far downstream in CO River)
Bluehead sucker , <i>Catostomus discobolus</i>	Pot. habitat, No hydrologic effects (likely in Eagle River)
Flannelmouth sucker , <i>Catostomus latipinnis</i>	Pot. habitat, No hydrologic effects (likely in Eagle River)
Colorado River cutthroat trout , <i>Oncorhynchus clarkii pleniticus</i>	Present (Isolated high mtn. streams)
AMPHIBIANS	
Boreal western toad , <i>Anaxyrus boreas boreas</i>	Pot. habitat (Montane/ subalpine ponds with willow wetlands)
Northern leopard frog, <i>Lithobates pipiens</i>	Pot. habitat (Permanent wetlands)
BIRDS	
Bald eagle <i>Haliaeetus leucocephalus</i>	Pot. habitat (Rivers, lakes, and uplands)
Northern goshawk , <i>Accipiter gentilis</i>	Pot. habitat (Closed montane forests > 7,500')
Northern harrier, <i>Circus cyaneus</i>	No habitat (Grasslands, agricultural lands, marshes, & alpine)
Ferruginous hawk, <i>Buteo regalis</i>	No habitat (Plains, grasslands)
American peregrine falcon , <i>Falco peregrinus anatum</i>	Pot. habitat (Cliffs, open habitats concentrating/ exposing vulnerable)
White-tailed ptarmigan, <i>Lagopus leucurus</i>	No habitat (Alpine habitat and upper elevation willow stands)
Greater sage grouse , <i>Centrocercus urophasianus</i>	Pot. habitat not present (Sagebrush)
Columbian sharp-tailed grouse, <i>Tympanuchus phasianellus columbianus</i>	Not present (Sagebrush and mountain shrub)
Flammulated owl, <i>Otus flammeolus</i>	No habitat (Old-growth ponderosa pine and aspen)
Boreal owl, <i>Aegolius funereus</i>	No habitat (Mature spruce-fir & mixed conifer)
Black swift, <i>Cypseloides niger</i>	No habitat (Waterfalls, cliffs)
Lewis' woodpecker, <i>Melanerpes lewis</i>	No habitat (Ponderosa pine and cottonwoods)
American three-toed woodpecker, <i>Picoides dorsalis</i>	No habitat (Mature-decadent conifer forests)
Olive-sided flycatcher, <i>Contopus cooperi</i>	No habitat (Open, upper elev. conifer forests)
Loggerhead shrike , <i>Lanius ludovicianus</i>	Pot. habitat (Plains, low valleys, shrublands)
Purple martin, <i>Progne subis</i>	No habitat (Old-growth aspen)
Brewer's sparrow , <i>Spizella breweri</i>	Present (Sagebrush and other structurally similar shrublands)
Sage sparrow, <i>Amphispiza belli</i>	No habitat (Low elevation big sagebrush and sage/greasewood)

Table 5-2. USFS R2 sensitive animal species that occur on the WRNF and potential occurrence in impact zones (NFS and private lands) associated with Berlaimont Estates.

Common name, Scientific name	Rationale for Potential Project Effects (Habitat Affinity)
MAMMALS	
Pygmy shrew, <i>Microsorex hoyi montanus</i>	No habitat (Variety of subalpine habitats)
Fringed myotis, <i>Myotis thysanodes</i>	No habitat (Forests/woodlands to 7,500 ft.; unknown on WRNF)
Spotted bat, <i>Euderma maculatum</i>	No habitat (Cliffs, arid terrain)
Townsend's big-eared bat , <i>Corynorhinus townsendii</i>	Pot. habitat (Structures, tree cavities <9,500 ft.)
American marten, <i>Martes americana</i>	No habitat (Conifer forests)
North American wolverine , <i>Gulo gulo luscus</i>	Pot. travel habitat (Mountains)
River otter , <i>Lontra canadensis</i>	Pot. habitat (Year-round open water and streamflows of ≥ 10 cfs)
Rocky Mountain bighorn sheep, <i>Ovis canadensis canadensis</i>	No habitat (High visibility habitat near escape terrain)
Note: Other R2 species are not listed because they have not been found on the WRNF, they have no affinities to project area habitats, the project area is outside of the species' range or elevational distribution. Potential pre-field survey occurrence on the project area, potential for project effects, and habitat affinity is summarized for each species. Species in bold are potentially present and/or are discussed in the text. Wildlife are listed phylogenetically. Source: USFS (2010), J. Proctor, USFS, Jan. 28, 2010 pers. comm., and Western Ecosystems, Inc.	

The author has reviewed the WRNF R2 sensitive species list (USFS 2010, J. Proctor, USFS, Jan. 28, 2010 pers. comm.) and is familiar with local habitats and plant and animal distributions within and adjacent to the Berlaimont Estates project area based on 1990-2008 field surveys and a review of current Natural Diversity Information Source (NDIS) maps. Project area surveys were conducted to (1) develop an ecological understanding of the resources present on and adjacent to the project area, (2) identify and characterize habitat types and habitat structure classes present relative to the habitat affinities of species considered in this document, and (3) search for evidence of the R2 species considered herein. Structural habitat characterization followed Hoover and Wills (1984), USFS (1993, 1995), and Parks et al. (1997).

Determination of risks to populations of sensitive plants considers the size, density, vigor, habitat requirements, locations of the population, and consequence of adverse effects on the species as a whole within its range and within the WRNF. Determination of risks to populations of sensitive animals (including insects, fish, amphibians, reptiles, birds, and mammals) considers population size and density, occurrence, suitable habitat, location of the population, and consequence of adverse effect on the species as a whole within its range and within the WRNF.

5.1 EVALUATED SPECIES INFORMATION, ENVIRONMENTAL BASELINE FOR THE SPECIES EVALUATED, EFFECTS OF THE PROPOSED MANAGEMENT ACTION ON SPECIES EVALUATED, AND EFFECTS DETERMINATION

5.1.1 PLANTS

Thirty-three species of sensitive plants are known (n=23) or suspected (n=10) to occur on the WRNF (J. Proctor, USFS, pers. comm., Jan. 28, 2010). Required habitats for these species are summarized in Table 5-1. Based on optimally-timed botanical surveys of potential access road disturbance areas and the private parcel, all plant species listed in Table 5-1, with the exception of Harrington penstemon (*Penstemon harringtonii*) and dropleaf buckwheat (*Eriogonum exilifolium*), do not occur in the habitats

present in the project area, do not have elevation and/or distributional ranges that overlap the project area, have not been documented in the general geographic area of the project, would not be affected by the Proposed Action, and do not warrant detailed consideration with respect to the Proposed Action. The Proposed Action would have “**no impact**” on those 31 species and they are dropped from further consideration herein. Harrington penstemon and dropleaf buckwheat are addressed below.

5.1.1.1 Harrington Penstemon

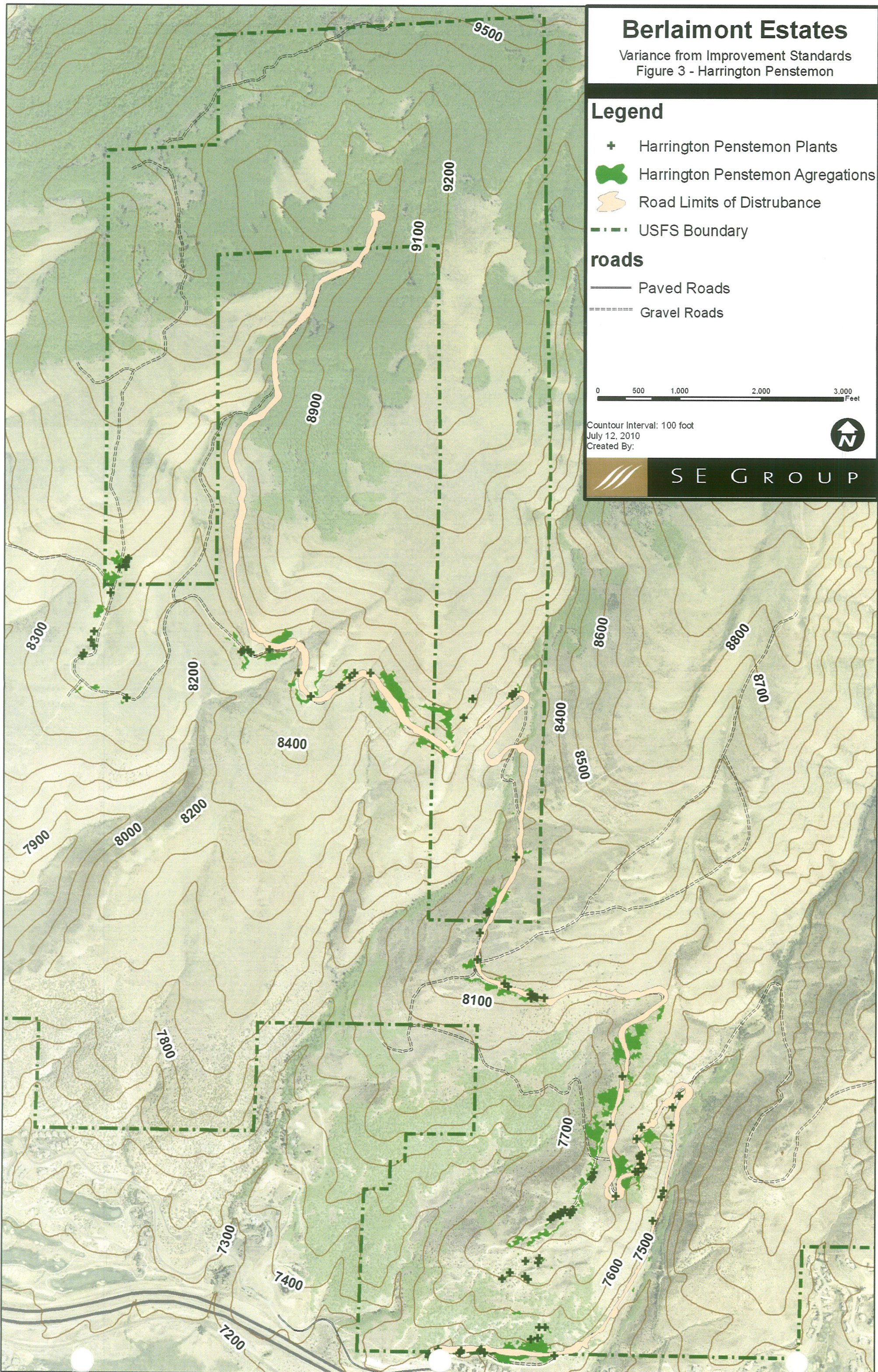
Harrington penstemon (aka Harrington beardtongue, *Penstemon harringtonii*) is a Colorado endemic that grows on pinyon pine, juniper, and sagebrush covered slopes between 6,800 and 9,200 feet in Eagle, Garfield, Grand, Pitkin, Routt, and Summit Counties. Soils are typically rocky loams and rocky clay loams derived from coarse, calcareous parent material (Spackman et al. 1997). This species has been located in the Eagle Valley, including, but not limited to the West Eagle, Cordillera, Cordillera Valley Club, Singletree, Mountain Star, and Avon Village developments. Where this species occurs in sagebrush and mountain shrub habitats, shrub canopy cover is open and the vegetative understory is characteristically sparse.

Harrington penstemon surveys were conducted along all (five) alternative access road alignments on NFS and private lands on June 7 and 19, 2001 Thompson (2001a), June 7, 2002 (Thompson unpubl. data), June 5, 2006 (Thompson unpubl. data), and June 5, 11, 17, and 19, 2008 (see below), when plants were in bloom. The 2001 surveys are described in Thompson (2001a). Occupied and potential habitat delineated during those surveys is shown in Fig. 3.

In 2002, an ANILCA issue arose regarding whether or not the USFS would grant road access to upper portions of the subject property in addition to initial road access to the lower eastern leg of the parcel. If the USFS would not grant the upper road access, access would have to occur switch-backing up the eastern ridge on the private parcel from existing FS Road 780 while remaining within the parcel's eastern arm. The alignment of such a road had not been finalized due to engineering and other considerations. However, Harrington penstemon was known to occur in this area and could be affected by the proposed road. Quantification of potential impacts to this plant was considered necessary to address secondary project effects. Because Harrington penstemon's blooming period would be over by the time the alternative upper access road alignment would be finalized, the entire area of habitat potentially affected by the alternate road was surveyed. On May 31, 2002, an initial survey through the alternative upper eastern access road alignment area (starting at the upper boundary of the road corridor surveyed in 2001 through this portion of the analysis area) was conducted to identify current phenological conditions so that intensive surveys could be timed to coincide with optimal blooming. On June 7 the author and Bret Estep (botanist, SE Group) surveyed the alternative upper eastern access road analysis area using a methodology similar to that implemented in 2001 and described above. Results of the 2002 survey are shown in Fig. 3. Results of the 2006 survey, which reverified 2001 and 2002 aggregations, are not shown in Fig. 3.

Results of the 2001, 2002, and 2006 Harrington penstemon surveys are not considered further herein because of more accurate data collected along more recently engineered potential road alignments in 2008, as described below.

In 2008, Harrington penstemon aggregations were delineated along potential access road corridor alignments using a “Trimble Pro XRS” GPS unit capable of sub-meter accuracy (for aggregation mapping, standard differential correction was applied to the collected data using a CORS base station). As used herein, aggregations were discrete plant groups, somewhat analogous to a population, though not reproductively isolated from each other. Corridors extended out to approximately 200 feet from road centerlines to identify plants that could be affected by cut and fill slopes and potential road alignment shifts. Once an aggregation was intercepted within the road corridor, it was surveyed until



Berlaimont Estates

Variance from Improvement Standards
Figure 3 - Harrington Penstemon

Legend

- + Harrington Penstemon Plants
- Harrington Penstemon Aggregations
- Road Limits of Disturbance
- - - USFS Boundary

roads

- Paved Roads
- - - Gravel Roads

0 500 1,000 2,000 3,000 Feet

Contour Interval: 100 foot
July 12, 2010
Created By:



its boundary had been circumscribed and all plants within counted. The author circumscribed the perimeter of aggregations and the GPS guy followed closely behind in Thompson's tracks. For aggregations composed of a single plant (separated from another aggregation by ≥ 30 ft.), the plant was GPSed as a point and one square foot was used as the aggregation's area. For all other aggregations, the aggregation's area was based on the outer perimeter of plants. Surveys progressed uphill following plant phenology.

Blooming Harrington penstemon was easily differentiated from other penstemons after Weber (1996) and Spackman et al. (1997). However, non-blooming, particularly young, Harrington penstemon and Osterhout penstemon (*P. osterhoutii*) cannot be reliably differentiated from each other by vegetative characteristics (i.e., foliage) alone. Because young plants may not bloom until their second or third years, and because the flower stalks of a relatively large of individuals in some populations (i.e., up to 60%) were bitten off by deer, such non-blooming plants could not be definitively identified to species. Although in several circumstances (8 of 204 aggregations) flowering Harrington and Osterhout penstemon plants were located in the same area (i.e., where individuals from both aggregations overlapped), these species are generally not found together (D. Johnson, Western Ecological Resource, pers. comm., Thompson, add'l. unpubl. data). In exclusive Harrington penstemon aggregations (i.e., where all plants were blooming and had exerted stamens, all penstemons with grey-green foliage were counted as Harrington penstemon, including non-blooming plants composed of basal rosettes. In mixed populations (i.e., those with at least one blooming individual of each species, and in those aggregations identified as mixed based on prior years' surveys), only blooming Harrington penstemon were counted; plants in bud and vegetative plants were not counted. Where only Osterhout penstemon was found, all non-blooming penstemons, which could have been Harrington or Osterhout penstemon, were considered to be Osterhout penstemon. Harrington penstemon plants were counted in each aggregation. In larger aggregations, pin flags were used to divide the aggregation into manageable units where plants could be counted more accurately.

During 2008 surveys, 204 aggregations containing 14,610 plants within 22.16 acres (3.08 acres on NFS land and 0.24 acres on private land) were recorded along ROWs up to 400 feet wide associated within all (five) alternative access road alignments (Fig. 3). Aggregations ranged in size from a single plant to 2.58 acres. Mean aggregation size and area were 72 plants and 0.107 acres, respectively. Aggregations were present along all potential road alignments on NFS land, from the cut slope at the Berry Creek Road entrance to the distal segment of FSR 780 at the private parcel's western "leg". While Harrington penstemon aggregations are present on the private parcel's lower "legs" the vast majority of the potential private road corridors do not contain Harrington penstemon because of unsuitable habitat conditions (i.e., a dense tufted hairgrass understory).

At the request of the USFS (J. Proctor, June, 2010), a botanical survey of the access road was repeated on June 24, 2010 to verify the findings of prior Harrington penstemon surveys. There was no substantive changes to the distribution of aggregations, however Harrington penstemon abundance was appreciably below that identified in 2008 (D. Steinman, botanist, pers. comm., June 25, 2010), most likely attributable to natural, inter-year variations in the size of mature (blooming size) age classes.

Based upon the current road design, actual disturbance areas, and proposed cut and fill slopes and emergency turn-arounds associated with the requested variances, 3.32 acres of occupied Harrington

penstemon habitat would be crossed (impacted) by the proposed ROW, 3.08 acres on NFS lands and 0.240 acres on Private land. All impacts to Harrington penstemon would result from road construction (vs. private residential development). Most impacts would occur on NFS (vs. private) land. Proposed road design variances would have relatively small, uncertain, somewhat offsetting effects, depending on (1) whether proposed emergency turn-arounds would affect more or less occupied habitat than regularly-spaced turn-arounds and (2) whether shorter cut and fill slopes resulting in longer retaining walls would affect more or less occupied habitat. In similar situations within the Mountain Star Subdivision ROW, Harrington penstemon plants have voluntarily recolonized disturbed areas of the ROW. This has also occurred along sections of FS Road 780, which the proposed access road would generally follow.

In addition to the 2001, 2002, 2006, and 2008 surveys conducted along proposed access road alignments, results of Western Ecological Resource's (WER 2006) 2005 Harrington penstemon surveys on an adjacent 348-acre federal parcel (T4S, R82W, Secs. 29-32) to the south and west of the access road alignments are also shown in Figure 3. That parcel of NFS land was being considered as part of a land exchange. The number of Harrington penstemon plants present were not counted because they "were too numerous to inventory, but could number in the thousands" (WER 2006). However, the 22 aggregations delineated totaled 14.44 acres (as transferred from WER's [2006] topographic map).

David Johnson, a plant ecologist with Western Ecological Resource, has worked on this plant, primarily in Eagle County, since 1982. A letter in the project file summarizes his work and findings. On just one 132-acre property in Eagle County (Cordillera), the total number of plants present in 55 populations was conservatively estimated at 300,000-500,000. Extrapolation of sample data resulted in an estimate of 666,000 plants. Based on eight private and federal (BLM) parcels that he worked on in Eagle County, 110 populations were located that covered 572.2 acres, with a conservative total population estimate on those lands alone of approximately 400,000 individuals. Those data do not include the WER (2006) survey. All of his data, primarily from private lands, has previously been provided to the CNHP, but their database does not reflect it. Mr. Johnson has (May 9, 2001, letter in project file) estimated that the number of known Harrington penstemon populations likely exceeds 200, representing $\geq 800,000$ plants, not including the WER (2006) survey or aggregations found as part of the Berlaimont analysis.

The occurrence of Harrington penstemon on private properties proposed for development in Eagle County was a standard review consideration of development applications (i.e., when it was still a federal candidate species, now dropped from that list). Development generally tends to avoid populations and designate such areas as undeveloped open space, but if that is not practicable, plants in impacts areas are transplanted to suitable open space and their survival monitored. Mr. Johnson's experience transplanting hundreds of Harrington penstemon plants has resulted in a 75% survival rate of transplants. Thus, this plant is reasonably assured to be protected on those private lands containing suitable habitat where development has been initiated since approximately 1991. The general consensus among biologists familiar with this plant in and beyond Eagle County is that once the issue is identified and specific surveys are conducted in suitable habitat, the species is often found to be far more common than previously thought.

While the vast majority of surveys for Harrington penstemon have been conducted on private properties and the best habitat for this species occurs on lower elevation private lands, large areas of potential, unsurveyed habitat also exist on federal lands (USFS and BLM) in Eagle County alone. While the USFS determination is only based on affects on the planning area (i.e., WRNF), it is relevant that $\geq 400,000$ plants are present in habitat bordering USFS lands and that the same habitat also extends onto large areas of the Forest in Eagle County alone. Spring 2001 surveys conducted by the USFS on their lands north of Edwards (generally those lands between FSR 780 and Casteel Ridge surveyed by WER [2006]), found moderate numbers of penstemons belonging to the *P. harringtonii*/*P. osterhoutii* group (J. Doerr, USFS, pers. comm., July 3, 2001 letter in project file).

Regarding Harrington penstemon, the proposed action “may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.” PDC that would minimize potential adverse effects to Harrington penstemon could be implemented as a required part of the NEPA decision.

5.1.1.2 Dropleaf Buckwheat

Dropleaf (or slenderleaf) buckwheat (*Eriogonum exilifolium*) was added to the WRNF R2 species list in July, 2009. This species is a regional endemic known only from 26 occurrences in Wyoming and Colorado (Fertig 2000, Anderson 2006, Proctor 2009). In Colorado the plant has been found in North Park and Middle Park of Jackson and Grand counties at elevations ranging from 7,500-9,000 feet. There are currently no documented occurrences of dropleaf buckwheat on the WRNF or in Eagle County (CNHP 2008). *Eriogonum exilifolium* grows in open, sparsely vegetated habitats such as barren hills or sagebrush flats of the mountain parks including semi-bare sandy-clay gumbo flats, white shaley-gypsum ridges, red clay hills, and limestone outcrops in cushion plant-bunchgrass communities with low total groundcover. It has also been found on seleniferous clay-gumbo soils in barrow pits and dirt roadsides. One common associate is desert prince’s plume (*Stanleya pinnata*). Habitat along portions of the access road and at a mid-elevations of the private parcel’s western leg fall outside of this species’ known distribution, but within its elevational range and general habitat continuum. This species was considered as a Species of Local Concern at the time of the 2001-2008 Berlaimont botanical surveys and as an R2 species during a June 24, 2010 survey, conducted specifically for it and Harrington penstemon. While potential habitat for dropleaf buckwheat was located, this species was not detected. Based on surveys conducted to date, the Proposed Action would have “**no impact**” on this species.

5.1.2 ANIMALS

From the overall, updated, R2 species list (USFS 2010), one insect, five fish, two amphibians, 17 birds, and eight mammals are considered to be present or potentially present on the WRNF. Required habitats for these species are summarized in Table 5-2. Life history and occurrence information for these species on the WRNF is contained in USFS (2002d). With the exception of the roundtail chub (*Gila robusta*), mountain sucker (*Catostomus platyrhynchus*), bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), boreal western toad (*Anaxyrus boreas boreas*), northern leopard frog (*Lithobates pipiens*), bald eagle (*Haliaeetus leucocephalus*), northern goshawk (*Accipiter gentilis*), American peregrine falcon (*Falco peregrinus anatum*), greater sage grouse (*Centrocercus urophasianus*), loggerhead shrike (*Lanius ludovicianus*), Brewer’s

sparrow (*Spizella breweri*), Townsend's big-eared bat (*Corynorhinus townsendii townsendii*), North American wolverine (*Gulo gulo luscus*), and river otter (*Lontra canadensis*), none of the species listed in Table 5-2 would be affected by the Proposed Action, the Proposed Action would have "**no impact**" on those other species, and they are dropped from further consideration herein. Potential effects to the species identified in this paragraph that warrant further discussion are summarized below.

5.1.2.1 Roundtail Chub and Mountain Sucker

The roundtail chub and mountain sucker occur far downstream in the Colorado River. Anthropogenic water depletion effects are not one of the principal risk factors affecting these species. While the hydrologic effects of residential water withdrawals from the upper Colorado system could theoretically extend downstream to occupied habitat (i.e., in the same way that the four big river fish could be affected), those potential effects would not be measurable (B. Healy, USFS, pers. comm., Jan 29, 2009). For similar reasons, access road development and the implementation of requested road variances would have no impact on these species even if water was used for dust suppression during road construction. Regarding the roundtail chub and mountain sucker, the proposed action would have "**no impact**" on these species.

5.1.2.2 Bluehead Sucker and Flannelmouth Sucker

Bluehead sucker and flannelmouth suckers are likely present in the Eagle River (B. Healy, USFS, pers. comm., Jan 29, 2009) at least downstream of Alkali Creek. Anthropogenic water depletion effects are not one of the principal risk factors affecting these species. While the hydrologic effects of residential water withdrawals from the upper Colorado system could theoretically extend downstream to occupied habitat (i.e., in the same way that the four big river fish could be affected), those potential effects would not be measurable (B. Healy, USFS, pers. comm., Jan 29, 2009). For similar reasons, access road development and the implementation of requested road variances would have no impact on these species even if water was used for dust suppression during road construction. Regarding bluehead and flannelmouth suckers, the proposed action would have "**no impact**" on these species.

5.1.2.3 Colorado River Cutthroat Trout

A robust conservation population of Colorado River cutthroat trout (CRCT) occurs in Berry Creek, a reach of which closely parallels approximately 3,200 feet of Berry Creek Road (FSR 774, Healy 2008). This population was sampled by electro-fishing on June 9, 2006. Multiple electro-fishing passes were not performed and, therefore, population estimates could not be calculated. The CDOW sampled this population in 2007 and considered it healthy. The location of the isolating barrier on this creek is unknown, but may occur on private land below NFS land (B. Healy, USFS, pers. comm., Jan. 29, 2009). The stream health of Berry Creek is less than robust for macroinvertebrate metrics and physical habitat variables as well (Healy 2008). Berry Creek is a south facing watershed where vegetative cover in the water influence zone is low. It is also located in a naturally erodible geology that naturally has a higher sediment yield. Road design and water quality-related PDC that would minimize and avoid potential adverse effects (sedimentation of spring and early summer spawning areas) to aquatic biota within and below the project area would be implemented as a required part of the NEPA decision. The implementation of requested road variances would have no impact on CRCT. Potential residential

development effects would not extend to drainages containing occupied CRCT habitat. Regarding CRCT, the proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.”**

5.1.2.4 Boreal Toad

Reaches of Berry and Beard Creeks represent potential boreal toad habitat in the vicinity of the proposed access road. Beaver ponds and the reach of Berry Creek on NFS land, from below the first switchback on FSR 778 downstream to the Singletree (private) property boundary, were surveyed to assess aquatic potential on June 7, 2001. A more localized survey, concentrating on the beaver ponds adjacent to the junction of FSRs 774 and 778, was conducted on June 5, 2008. Reaches of Beard Creek, on the private parcel (where it is crossed by FSR 780, June 6, 2006 and June 5, 2008) and on NFS and other private lands below (May 25 and June 6, 2006), were also surveyed to assess aquatic potential. There is no potential boreal toad habitat on or within the influence of private residential development affects. No boreal toads (or other amphibians) were detected along either stream. The Berry Creek beaver ponds represent the most viable potential breeding habitat. While boreal toads are known to breed in streams, outside the reach of Berry Creek containing beaver ponds, other Berry Creek stream reaches have high gradients and are without relatively calm pools or eddies. Both streams are well beyond dispersal distances from surrounding extant populations, near the lower elevational distribution of the species, and neither would be suitable as a reintroduction site. Nevertheless, the Berry Creek beaver ponds will be considered to represent, potential, but unoccupied, boreal toad breeding habitat. There is no potential boreal toad habitat on or within the influence of private residential development affects. Assessment of Berlaimont project effects to boreal toads considers effects to potential, but unoccupied breeding and post-breeding habitats that are unlikely to be naturally (based on distances and intervening terrain from extant populations) or otherwise (i.e., via reintroduction, because of relatively low habitat quality) recolonized. Road design and water quality-related PDC that would minimize and avoid potential adverse effects (sedimentation) to aquatic biota within and below the project area would be implemented as a required part of the NEPA decision. The implementation of requested road variances would have no impact on boreal toads or their habitat. Future residential development would have no impact on boreal toads. Regarding boreal toads, the proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.”**

5.1.2.5 Northern Leopard Frog

No leopard frogs (or other amphibians) were detected in the Berlaimont project area. See the boreal toad discussion, above, for aquatic habitats surveyed for this project. The Berry Creek beaver ponds will be considered to represent, potential, but unoccupied, leopard frog habitat. There are no recent records of this frog's presence in the vicinity of the project area. Leopard frogs have only been collected on the Rifle and Blanco Districts of the WRNF, far from the project area (B. Healy, USFS, pers. com. Nov. 15, 2007). There is no occupied leopard frog breeding habitat that would be affected by road development, the implementation of requested road variances, or future residential development. Road design and water quality-related PDC that would minimize and avoid potential adverse effects (sedimentation) to aquatic biota within and below the project area would be implemented as a required part of the NEPA decision. The implementation of requested road variances would have no impact on leopard frogs or their habitat. For the same reasons described

above for the boreal toad, regarding leopard frogs, the proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.”**

5.1.2.6 Bald Eagle

Bald eagle winter range and foraging habitat extend up the Eagle River through the project area (NDIS mapping accessed Feb. 3, 2009 consistent with Phinney 2008, Fig. 4). Those activity areas include upland habitats north of I-70, approximately up to the 8,200-8,400 foot contour. That area includes all access road segments across NFS land below the private parcel's eastern “leg”, the distal tip of the private parcel's eastern “leg”, and the western loop of FSR 780 immediately below the private parcel's western “leg”. No other seasonal bald eagle habitats are identified in the local area on NDIS maps. Bald eagles likely forage for carrion on the big game winter ranges (see elk and mule deer sections, below) affected by the proposed action. The frequency of such eagle foraging depends on carrion availability. Based on replicated surveys conducted on NFS and undeveloped private lands within the bald eagle polygons between Berry and Spring Creeks, the number deer and elk that may die in that polygon, whose availability could be influenced by access road and residential use, probably³ ranges between 0 and 8 animals annually. Access road development, per se, and the implementation of requested road variances would only affect bald eagles to the extent that the road would reduce big game forage availability and impair habitat effectiveness (via increased barriers and restrictions) resulting in short-term, big game mortality and discountably smaller, long-term big game herd sizes using this and other portions of big game winter ranges north of I-70. Road use and future residential development could result in discernably smaller numbers of big game wintering in the project area that may result in slightly smaller herd numbers (i.e., in the project area and on adjacent winter ranges where project area big game may be displaced). This could result in increased carrion availability (from winter-killed carcasses), possibly occurring towards the end of winters or during severe winters that occur after residential development starts on the private parcel. Affects of the proposed action on carrion availability benefitting bald eagles would depend on the distance of the carcass away from active road segments and human activity areas, whether an adequate topographic and/or spatial (100-200 yards) buffer is present that would allow eagles to comfortably feed on the carcass, and the time of winter that carcasses become available (bald eagle generally leave their winter ranges by March 15). The proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability rangewide”**.

³ Based on the number of carcasses detected during surveys (where animals died over the preceding winter) and accounting for undetected carcasses (@ 2x detected carcasses) within the sample area.

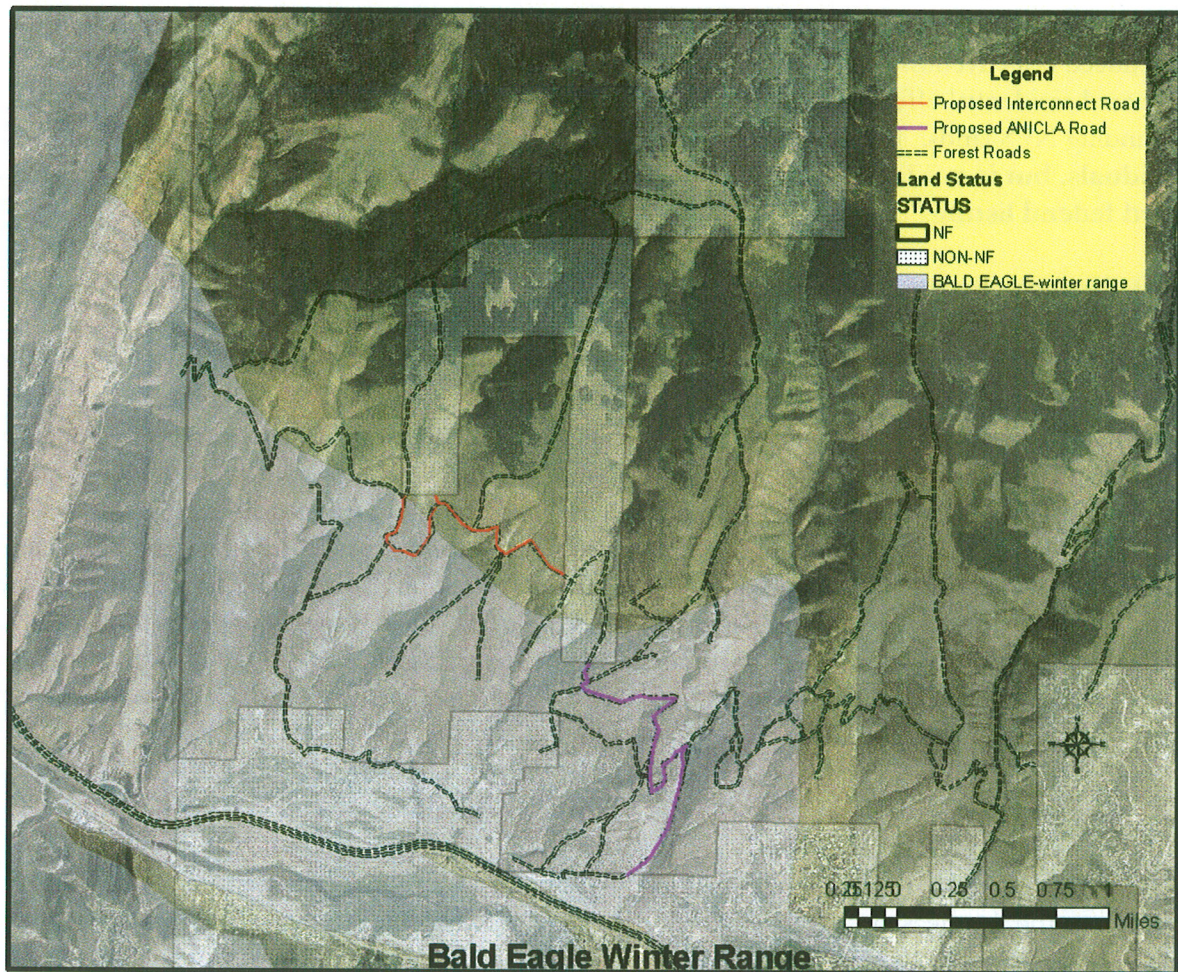


Figure 4. Bald eagle winter range in the vicinity of the Berlaimont project area from Phinney (2008). The private Berlaimont parcel is shaded. The “proposed interconnect road” shown reflects a prior, outdated road proposal.

5.1.2.7 Northern Goshawk

Goshawks are a forest-interior species generally associated with mature aspen and conifer forests between 7,500 and 11,300 feet on the WRNF (Doerr 2004). There are no suitable goshawk nesting or foraging habitats bisected by, or adjacent to, access road segments on NFS lands that would be affected by the proposed action. The linear, discontinuous, isolated narrowleaf cottonwood stand along a portion of the lower Berry Creek access road does not represent goshawk habitat. Most (mature, non-stunted) aspen stands on the private parcel represent potential goshawk foraging habitat and some areas may be physiographically suitable as nesting habitat. No goshawk nests are present on the private parcel. It is unlikely that any nesting would occur on the private parcel, which is located at the lower edge of aspen distribution and, therefore, potential goshawk distribution at this end of the Gore Range.

Goshawks have not been detected on the private parcel. However, suitable goshawk foraging habitat on the parcel is connected with more extensive suitable habitats on NFS lands to the north and northeast. Therefore, it is possible that goshawks could utilize portions of the private parcel as part of a local pair’s large range. Access road development and the implementation of requested road

variances would have no impact on goshawks. Future residential development would result in the loss and reduced effectiveness of goshawk foraging habitat on the private parcel. It is unlikely that anticipated residential effects would extend off the private parcel and affect goshawk habitat on surrounding NFS lands. Regarding goshawks, the proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.”**

5.1.2.8 American Peregrine Falcon

Two active peregrine falcon eyries are present in the Minturn and Vail areas. Both are further than 10 miles from the closest disturbance areas associated with the access road. With the exception of the Berry Creek riparian corridor, which would be unaffected by the proposal, there are no habitats within the project area that concentrate prey, support higher prey densities, or that expose the moderate prey base to peregrine attack any more so than other habitats common in the surrounding area. Road upgrading and use, the implementation of requested road variances, and future residential development on the private parcel should have no discernable adverse effect on the available prey base. Peregrines are not particularly bothered by humans per se (G. Craig, CDOW Raptor Biologist, retired, pers. comm., Oct. 3, 2007), so the increased summer human activity along access road corridors and around homesites should have little adverse effect on prey acquisition. The proposed action would have **“no impact”** on the peregrine falcon.

5.1.2.9 Greater Sage Grouse

Greater sage grouse are resident, sagebrush obligates throughout the western United States, with Colorado in the southeastern periphery of the species' distribution. No sage grouse have been reported in the Berlaimont project area for the last 20 years (approx.). There are no documented leks within the project area. The nearest active leks are west of Highway 131, about eight miles west of the project area. However, the project area is part of a large block of historic habitat (NDIS mapping accessed Feb. 3, 2009). The CDOW (B. Andree, DWM, pers. comm., 1999) indicated that most grouse breeding in this portion of Eagle County does not occur in traditional, multi-male lek contexts, but is better characterized by individual males displaying in relatively closed sagebrush habitats. This may be a result of a nearly extirpated population. Habitats along much of the access road corridors and lower “legs” of the private parcel are not ideal sage grouse habitat. The expansion of juniper trees into the sagebrush, resulting from historic fire suppression, provides raptor perches (real and imagined). Some raptors, such as golden eagles (*Aquila chrysaetos*), are sage grouse predators. Although eagles don't need perches to successfully hunt sage grouse, perches are thought to increase predation rates. In any event, grouse are known to avoid areas containing such raptor perches. Because local habitat conditions and female nesting distributions, it is unlikely that habitat bisected by the access road segments currently represents suitable, effective habitat, although it would represent potential habitat if juniper trees were removed. Road upgrading and use, the implementation of requested road variances, and future residential development on the private parcel should have **“no impact”** on sage grouse.

5.1.2.10 Loggerhead Shrike

Loggerhead shrikes (*Lanius ludovicianus*) are considered likely breeders (breeding is suspected, but had not been confirmed as of 1982) in the latilong block overlapping the project area (Chase et al. 1982). Bailey and Niedrach (1965) considered this species common on the plains and low valleys of Colorado, occasionally ranging into the mountains to 9,000 feet. Andrews and Righter (1992) indicate the primary range of this species only extends to 6,000 feet. They consider the species to be uncommon in mountain parks and rare in the mountains, with no confirmed breeding records in the mountain parks. These birds, which have the peculiar habit of impaling their prey on thorny bushes or barbed-wire, prefer open country, thinly wooded, or scrubby land with clearings, meadows, and pastures. The mountain shrub and juniper woodland habitat along portions of the access road and lower arms of the private parcel is generally suitable shrike habitat, however, shrikes have not been observed in this upper portion of the Eagle Valley (Chase et al. 1982, Thompson and Payton 1994, T. Johnston, USFS, pers. comm. 1994). One or two sightings have recently been reported each year in the Eagle Valley, but none have been above Wolcott, several miles down valley from the project area and in more suitable shrike habitat. Shrikes were not detected in the Berlaimont project area during four years of field surveys that overlapped the breeding season and they have not been observed east of Highway 131 and north of I-70 during field surveys conducted by the author dating back to 1992. Therefore, the “generally suitable shrike habitat” that would be bisected on NFS and private lands is not considered to represent potential habitat. As a result, road upgrading and use, the implementation of requested road variances, and future residential development on the private parcel should have **“no impact”** on loggerhead shrikes.

5.1.2.11 Brewer's Sparrow

Brewer's sparrows are breeding summer residents in portions of the project area. They were most common in the tall, dense sagebrush stand located at the southern end of the private parcel's western “leg”, where a relatively high density of birds overlapped NFS and private lands. They were also present along other portions of FSR 780, between the private parcel's “legs” and along the approximately one-quarter distal end of FSR 774, where the habitat is dominated by mature sagebrush. They were also present, but less common, along mid-portions of the ANILCA along the ridgeline, where the habitat is dominated by mature mountain mahogany. Brewer's sparrows are present and exhibit similar, habitat-related, relative densities at mid-elevations (approx. 8,000-8,400 ft.) between Berry and Spring Creeks. Brewer's sparrows are not present at mid- and upper elevations of the project area that would be affected by residential development even though sagebrush stands are present in some of those areas. Future residential development on the private parcel would have “no impact” on Brewer's sparrows. Road upgrading and use would result in the loss of occupied Brewer's sparrow habitat, possible loss of construction season recruitment, and the harassment of birds nesting within the influence of the access road corridor. Road design and reclamation-related PDC that would minimize potential adverse effects to Brewer's sparrows could be implemented as a required part of the NEPA decision. Regarding Brewer's sparrows, the proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.”**

5.1.2.12 Townsend's Big-eared Bat

Townsend's big-eared bat occurs throughout the western two-thirds of Colorado, roosting in caves, mine shafts, crevices, and, occasionally, buildings to elevations of 9,500 feet. This species has been detected in Eagle County, but not in the vicinity of the project area (Scott et al. 1984). There have been no surveys conducted on or in the vicinity of the project area that were adequate to detect this species. No structures suitable as roost sites are known in the vicinity of the road corridor and private parcel, although it is possible that tree cavities, if present, along the Berry Creek riparian corridor and in aspen on the private parcel could provide summer roost sites. If *Corynorhinus* are present, they could utilize habitats along the road alignments as part of a much larger, summer foraging area. Because of water and a theoretically more abundant prey base, this bat would be more likely to occur in the vicinity of the road segment paralleling Berry Creek. No known roosts or water sources would be affected by the proposal. Road upgrading would result in a net loss of potential foraging habitat on the Forest. Proposed road design variances would have insignificant and discountable effects to potential foraging habitat. Potential foraging habitat on the private parcel would also be lost to road and residential development. As a worst case scenario regarding Townsend's big-eared bat, the proposed action **"may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."**

5.1.2.13 North American Wolverine

Although the Berlaimont project area is located within the wolverine's historic range (Bissell 1978), only two, positive identifications of a wild wolverine (one killed on the Colorado/ Utah border in 1979 and the other, a radio-collared male from Montana that traveled to northern Colorado and was observed in Rocky Mountain National Park in June, 2009) have been documented in Colorado in the last 30 years. The CDOW has been unable to verify that a viable population persists. Current assessments now consider Colorado to be outside of the extant wolverine distribution. Nevertheless, the Gore Range, including the Berlaimont project area, remains functional as a wildlife movement corridor that might encourage more frequent wolverine movements through the local area. No known wolverine foraging, denning, travel, or security habitats would be affected by the Proposed Action. The Proposed Action would not adversely affect habitat connectivity or impair potential wolverine movements. Access road development and use and the implementation of requested road variances could only affect wolverine to the extent that the access road would increase or decrease big game carrion availability (i.e., via increased road mortality, reduced winter and transitional forage availability, and impaired habitat effectiveness, resulting in short-term, big game mortality and long-term big game herd sizes using this and other portions of big game winter ranges north of I-70). Some of these impacts are quantified in the elk and mule deer sections, below. These same big game effects would also result from road and residential development on the private parcel. Year-round paved road use, where no such use presently occurs, would increase big game road-kill probabilities. Proposed road design variances, other than the speed limit variance, would have small, uncertain, somewhat offsetting effects, depending on net habitat impacts associated with (1) proposed emergency turn-arounds and shorter cut and fill slopes. The requested 30 mph vs. 20 mph local speed limit variance could increase big game injury and road-kill probabilities, but only in unusual circumstances. Such discountable carrion benefits/ adverse effects would only be realized by the rare individual moving through the landscape. Wolverines have an extreme aversity to crossing highways (e.g., Copland et al. 2004). Traffic volumes on regional

highways used to access the project area are at least an order of magnitude above levels considered to be barriers to wolverine movements, so it is extremely unlikely that vehicular use of such highways that would be associated with the proposed action would affect wolverine. As a worst case scenario regarding the wolverine, the proposed action **“may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.”**

5.1.2.14 River Otter

Individual otters are occasionally present in mid-reaches of the Eagle River (i.e., below Dowds Junction), where dispersing individuals (summer transients) are thought to move upstream from the Colorado River during summer. Year-round otter habitat is probably limited to the reach of the river below Edwards (B. Andree, CDOW, pers. comm., July 7, 1995), which is at the mouths of the creeks draining the project area. It is unlikely that otters would move out of the river and into project areas creeks, including Berry Creek, because of the limited forage base. Road design and water quality-related PDC that would minimize and avoid potential adverse effects (sedimentation of spring and early summer spawning areas) to aquatic biota in Berry Creek would be implemented as a required part of the NEPA decision. The implementation of requested road variances would have no impact on otters or their habitat. Potential adverse water quality effects would not extend to the Eagle River and occasionally occupied summer otter habitat. Project-related traffic on access roads and regional highways would result in discountable increases in road-kill probabilities. Potential residential development effects would not extend to occupied otter habitat. The proposed action would have **“no impact”** on the river otter.

6.0 OTHER WILDLIFE SPECIES

6.1 AMERICAN ELK

6.1.1 ELK LIFE HISTORY INFORMATION

Elk inhabit higher elevations during spring and summer and migrate to lower elevations for winter range. The length of seasonal migration varies from just a few miles to nearly 50 miles in some cases. When early winter snows begin to accumulate, cows, calves, and younger bulls begin to move down to winter ranges, where they usually remain from December through March (Boyd 1978). During winter, elk form large, mixed herds on favored winter range and more than 1,000 animals may be observed together. Mature bulls typically winter at higher elevations than cows and are found in small bachelor groups. As winter moderates in late March, elk start a gradual movement back up to their summer ranges and the cycle begins again (Boyd 1978). Winter range availability and habitat effectiveness may be the most critical seasonal range for elk survival. The project area is not part of, and is somewhat separated from, the Front Range endemic area where chronic wasting disease has been detected in deer and, to a lesser extent, elk (CDOW 2004).

Elk studies have consistently demonstrated that they avoid roads (Lyon 1979, 1983, Thomas et al. 1979, Christensen et al. 1993, Rowland et al. 2000, and Lyon and Jensen 1980). The amount of vehicular travel on roads appears to be the key factor that causes avoidance. Lyon (1983) demonstrated that elk

habitat effectiveness decreases by approximately 25% with a density of one mile of road per square mile of land, and by at least 50% with a density of two miles of road per square mile. The same research concluded that the best method of maximizing elk habitat effectiveness is by closing and obliterating roads. Road closure needs should be assessed on a site-specific basis to determine the limiting habitat conditions in each area.

The CDOW manages elk to provide healthy populations capable of supporting both significant harvests and opportunities for non-consumptive uses (Freddy et al. 1993, CDOW 2002). Elk license sales account for a large percentage of all license revenue, indicating the importance of elk herd management and population viability in the state.

6.1.2 FOREST AND DISTRICT LEVEL INFORMATION

Elk habitat on the WRNF includes all of the dominant vegetation types, and most of the other types found in the Southern Rocky Mountains. The WRNF provides most of the summer range for the herds resident in the general area. Certain areas in the extreme lower elevations of the Forest are used as winter or transitional range, but the vast majority of the winter range occurs off the Forest. Winter range is considered the most limiting seasonal range for most elk populations on the Forest (CDOW 2002). Approximately 10% of the winter range is found on NFS lands for the populations of elk that spend the summer on the WRNF. The remaining 90% is located on either Bureau of Land Management lands or private lands surrounding the Forest.

The State of Colorado has responsibility for the management of wildlife populations. The CDOW has specific elk management goals and objectives that have been developed in cooperation with landowners, the public, and federal land management agencies. These plans help guide the State's direction in the management of elk. Periodically these plans are updated to cover land management changes, new social perspectives, and changes in elk populations. The CDOW estimates population numbers of elk and sets management objectives for elk in units referred to as Data Analysis Units (DAUs). The Berlaimont project area is located in DAU E-12, which includes those portions of Eagle, Routt, and Grand Counties bounded on the north and west by the Colorado River, on the south by I-70, and on the east by the Gore Range divide (CDOW 1993b). DAU E-12 contains approximately 629 square miles, with approximately 75% of the property public lands (BLM and USFS) and the remainder private (CDOW 1993b). Of the entire DAU, 44% is on the WRNF, including important summer and winter ranges for this herd (Giezentanner 2008). Much of the winter range on private land in the Eagle River Valley is under heavy development pressure. The winter ranges in the northern and western portions of the DAU are largely on BLM lands and private lands managed as working ranches with little development.

The overall population of DAU E-12 increased from an estimate of 500 animals in the mid-1950's to nearly 7,000 in 2000. It is currently estimated at 4,762, above the DAU herd objective of 2,950 (Giezentanner 2008). This herd has been actively managed according to the current DAU plan (1988) through liberal antlerless permits to attempt to reduce the population to the DAU herd objective. The 10 year population estimate is 6,050 and the last five years has averaged 5476, indicating some positive results in reducing the overall population towards the DAU objective. This reduction is not a cause for MIS concern at this time (Giezentanner 2008).