



URSUS Ecosystem Management Ltd.

3426 Lane Crescent S.W.
Calgary, Alberta
T3E 5X2

phone/fax: (403) 246-2697

31 October 2005

Jennifer Symcox
Natural Areas Management Coordinator
Calgary Parks #75
Community Vitality and Protection
P.O. Box 2100 Stn. "M"
Calgary, Alberta, T2P 2M5

Dear Ms. Symcox,

RE: Mitigation Plan/Ecological Impact Assessment – Nose Hill Pathway-Segment 1

This letter report provides a mitigation plan and assessment of impacts for a 140 meter-long paved pathway on Nose Hill Park from the Pedestrian Overpass to the existing road. The results of this interim assessment will be incorporated into a Biophysical Impact Assessment (BIA) for the entire N/S pathway connection from Edgemont to Brisebois – as per your 7 September Letter of Acceptance.

Should you have any questions or concerns regarding this report please contact the undersigned at 403-282-1194 or by e-mail at john.kansas@ursusecosystem.com.

Sincerely,

John L. Kansas, *M.Sc., P.Biol.*
Senior Ecologist





URSUS Ecosystem Management Ltd.

3426 Lane Crescent S.W.
Calgary, Alberta
T3E 5X2

phone/fax: (403) 246-2697

31 October 2005

Jennifer Symcox
Natural Areas Management Coordinator
Calgary Parks #75
Community Vitality and Protection
P.O. Box 2100 Stn. "M"
Calgary, Alberta, T2P 2M5

Dear Ms. Symcox,

RE: Mitigation Plan/Ecological Impact Assessment – Nose Hill Pathway-Segment 1

This letter report provides a mitigation plan and assessment of impacts for a 140 meter-long paved pathway on Nose Hill Park from the Pedestrian Overpass to the existing road. The results of this interim assessment will be incorporated into a Biophysical Impact Assessment (BIA) for the entire N/S pathway connection from Edgemont to Brisebois – as per your 7 September Letter of Acceptance.

Should you have any questions or concerns regarding this report please contact the undersigned at 403-282-1194 or by e-mail at john.kansas@ursusecosystem.com.

Sincerely,

John L. Kansas, *M.Sc., P.Biol.*
Senior Ecologist

BACKGROUND

URSUS Ecosystem Management Ltd. was retained on 7 September 2005 by the City of Calgary to complete a Mitigation Plan and Biophysical Impact Assessment for the construction and operation of a paved pathway on Nose Hill Park from the Pedestrian Overpass at Brisebois to the Edgemont Parking lot area (hereafter referred to as the “N/S Pathway”). Due to budget and time constraints the N/S pathway construction was divided into two segments:

1. Segment 1 (2005) – Pedestrian Overpass to Existing Road; and,
2. Segment 2 (2006) – Remainder of N/S Pathway

This letter report provides a Mitigation Plan and ecological impact assessment for Segment 1. An overall BIA for both Segments 1 and 2 will be completed later in October 2005.

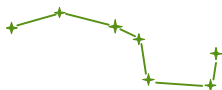
APPROACH

The following tasks were conducted in order to complete this project:

- Literature review concerning ecological impacts of pathways on prairie environments;
- A reconnaissance site visit (19 September) including on-site discussions with O2 Planning and Design – the landscape architecture firm retained for the project;
- Detailed site investigations on 20 and 21 September to inventory and map plant associations at a scale of 1:1,500 in the immediate vicinity of the planned pathway;
- Preparation of a Mitigation Plan for Segment 1
- Assessment of post-mitigation (residual) impacts of the planned Segment 1 pathway on wildlife and vegetation resources of Nose Hill Park.

PROJECT DESCRIPTION

The Segment 1 pathway measures approximately 140 meters in length. Construction will result in a three-meter wide disturbance footprint including a two-meter wide finished pathway. Included in the footprint will be a wider area at the overpass that will be re-contoured to allow for an acceptable pathway grade. The pathway surface will be comprised of a base of standard asphalt (as identified in Parks Development Guidelines and Standard Specifications Manual - 2004) covered with a top layer of natural fine aggregate stone, which will be hot rolled into the asphalt to form a textured surface. Parks is currently looking at the feasibility of using a new clear asphalt product. Construction will occur during a 6-day period in late October. Less than 10 persons will be working on site. Mechanized equipment will include one bobcat and one compactor. All mechanized equipment will be stored off-site.



ENVIRONMENTAL SETTING

NOSE HILL PARK – REGIONAL STUDY AREA

A Regional Study Area (RSA) was delineated to provide a context within which to assess local project impacts. The RSA for this project is all of Nose Hill Park (1123-ha). This area was chosen because of: 1) the availability of large scale ecological mapping and assessment; 2) similarities between affected areas and ecological conditions in the remainder of the Park; and, 3) the isolated nature and clear ecological boundaries of Nose Hill Park.

Nose Hill Park occurs very near the boundary of the Foothills Parkland Subregion of the Parkland Natural Region (to the west) and the Foothills Fescue Subregion of the Grassland Natural Region (to the east) (Achuff 1994, Strong and Thompson 1995). As such the Park contains ecological elements of both Subregions. According to Kansas et al. (1993) the boundary between these two Subregions is approximated by Crowchild Trail - leading the authors to state that the Park is best characterized as occurring in the Foothills Fescue Subregion.

Strong and Thompson (1995) mapped Ecodistricts in Alberta, which are defined as subdivisions of Natural Subregions based on distinctive Physiographic and/or geological patterns. According to their mapping Nose Hill Park occurs in the Delacour Plain Ecodistrict of the Foothills Fescue Subregion. This Ecodistrict is characterized by:

- 70% grassland (includes cultivated and pasture) vegetation on undulating (0% to 0.5%) morainal plain with moderately well drained, loam-textured black chernozem soils;
- 20% grassland (includes cultivated and pasture) on undulating (0.5% to 2.5%) morainal plain with moderately well drained, silty loam-textured black chernozem soils; and
- 10% grassland (includes cultivated and pasture) vegetation on rolling (6.0% to 9.0%), morainal deposits with well-drained, sandy loam-textured dark brown chernozem soils.

As of the mid-1990s approximately 90% of the Delacour Ecodistrict had been cleared for agriculture (Strong and Thompson 1995).

Kansas et al. (1993) mapped Ecosites on Nose Hill Park at a scale of 1:5,000. Ecosites are defined as areas with a unique recurring combination of vegetation, soil, landform and other environmental characteristics. A total of 81 different Ecosites were mapped on Nose Hill Park with distinct Ecosites recurring as map polygons from 1 to 46 (mean = 6.9) times. The average size of mapped Ecosite polygons in Nose Hill Park was 2.0 hectares.



SEGMENT 1 PROJECT SITE – LOCAL STUDY AREA

The Local Study Area (LSA) for this project is 4.6 hectares in land area and occurs in the immediate vicinity of the planned pathway (Figure 1). Generally, the LSA is characterized by a mix of low shrub (Snowberry, Rose, Shrubby cinquefoil), grassland (Rough fescue, Bluegrass, Wheatgrass) and disturbance species (Smooth brome, Canada Thistle) on gentle west facing morainal slopes.

The boundary of the LSA in Figure 1 is defined by two mapped Ecosites (Kansas et al. 1993), which are transected by the planned Segment 1 pathway. The two mapped Ecosites affected by the pathway are described below and their location shown in Figure 1:

- **3M1.24/3** (3.3-ha)- a shallow morainal slope of Orthic black chernozem soil and a vegetation composition of 40% Bluegrasses, 30% Smooth brome and Quack grass (*Agropyron repens*) and 20% Snowberry;
- **3M1.13/1** (1.3-ha) - hummocky moraine overlain with Orthic black chernozem and a Rough fescue/Parry Oatgrass (*Danthonia parryi*) vegetation community.

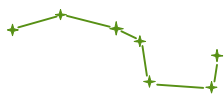
The above Ecosite descriptions are from ecological land mapping completed well over a decade ago (Kansas et al. 1993). Because of possible vegetation [natural succession] changes in the last decade and the small size of the study area, we mapped plant associations occurring within the two mapped Ecosites (LSA) at a finer level of detail (Figure 2). Table 1 summarizes the land areas of groupings of these plant associations in the LSA. Approximately 3.8-ha (82.5%) of the LSA consists of plant associations that are dominantly native. The remaining area (0.8-ha or 17.5%) is occupied by plant associations dominated by introduced plants such as Smooth brome (*Bromus inermis*) and Canada Thistle (*Cirsium arvense*). Of the native-dominated plant associations 31.8% (1.2-ha) contained significant amounts of Smooth brome and Canada Thistle – both invasive, non-native plant species.

The vast majority (76.5%) of vegetation in the LSA is comprised of low shrub communities dominated by Wood's rose (*Rosa woodsii*) (2.19-ha) and snowberry (*Symphoricarpos occidentalis*) (1.11-ha). Other less common shrub types include Buffaloberry (*Shepherdia canadensis*), Gooseberry (*Ribes* spp.), Pin/Choke Cherry (*Prunus* spp.), Shrubby cinquefoil (*Potentilla fruticosa*), Saskatoon (*Amalanchier alnifolia*), and Wolfwillow (*Elaeagnus commutata*). Native grassland plant communities –dominated by Rough Fescue - occupied only 0.08-ha or 1.7% of the LSA. Rough fescue was also found as a significant component in the understory of four Wood's rose (3) and Shrubby cinquefoil (1) dominated plant associations totaling 1.04-ha (22.6% of the LSA). Rough Fescue grassland is a rare plant community provincially and nationally that supports a high level of vegetative diversity. Generally, less Rough fescue grassland stands occurred in the study area than was indicated in the biophysical inventory from the early 1990's Kansas et al. (1993). We suspect that natural encroachment of Rough Fescue grasslands by low shrubs has occurred in this and other portions of Nose Hill Park.



Table 1. Vegetation groupings and Plant associations – Segment 1 Local Study Area.						
<i>Vegetation Type</i>	<i>Plant Associations¹</i>	<i># Map Polygons</i>	<i>Mean Polygon Size</i>	<i>Land Area (ha)</i>	<i>% of LSA</i>	
Anthropogenic	Trail	1	0.11	0.11	2.4	
Aspen Forest/Tall Shrub	Aw-W-WW Aw/Ro Aw/Sn/Br	6	.04	0.21	4.6	
Buffaloberry Shrub	Bb	2	<0.01	<0.01	<0.1	
Canada Thistle	Ca Ca/Br	3	0.02	0.05	1.1	
Gooseberry Shrub	Ri	1	0.05	0.05	1.1	
Maple Shrub	Ac	3	0.01	0.02	0.4	
Pin/Choke Cherry Shrub	Pr Pr-Bb	3	0.03	0.09	2.0	
Rose Shrub	Ro Ro-Aa-Sc/Po-Rf Ro-Sc/Rf Ro-Sn Ro-Sn-Sc/Rf Ro-Sn/Po-Rf Ro-Br Ro-Br	11	0.20	2.18	47.4	
Rough Fescue Grassland	Rf/Sc	1	0.08	0.08	1.7	
Saskatoon Shrub	Aa	1	<0.01	<0.01	<0.1	
Shrubby Cinquefoil Shrub	Sc	1	0.01	0.01	0.2	
Smooth Brome Grassland	Br Br/Ro Br/Ro/W Br/Sn-Ro	7	0.09	0.63	13.7	
Snowberry Shrub	Sn Sn-Br Sn-Ro Sn-Ro/Br Sn-Ro/Po Sn/Ca Sn/Ca-Br Sn/Po	13	0.09	1.11	24.1	
Wolfwillow Shrub	Ww	2	0.02	.05	1.1	

¹ See Figure 2 for code descriptions



DISTURBANCE FOOTPRINT

URSUS received a GIS file of the planned Segment 1 Pathway route from the City of Calgary. The centerline of this route was buffered by 1.5-m on each side to delineate the disturbance footprint. The three-meter wide physical disturbance footprint included a two meter wide finished pathway and construction workspace. Also included in the disturbance footprint was a wider area at the overpass that will be re-contoured to allow for an acceptable pathway grade. The total footprint associated with the planned construction of the pathway is 0.056-ha, which comprises 1.2% of the LSA.

The proposed route for the Segment 1 portion of the pathway crosses 3 distinct vegetation communities:

- An old road bed covered with a high proportion of bare ground and introduced grasses: e.g. Smooth brome (*Bromus inermis*) (Photo 1);
- An area of Rough fescue (*Festuca campestris*) and native shrubs such as Wood's rose (*Rosa woodsii*), shrubby cinquefoil (*Potentilla fruticosa*) and snowberry (*Symphoricarpos occidentalis*) (Photo 2); and
- An area covered predominantly by snowberry (Photo 3).

MITIGATION PLAN

The main approach to mitigation focuses on vegetation restoration and management including the replacement and establishment of as much native plant material as possible following trail construction.

PURPOSE OF NATIVE RESTORATION

As native plant communities and wildlife habitats are becoming increasingly rare, more societal pressures are placed on regulatory authorities and development proponents to avoid installing conventional, expensive high maintenance and energy intensive ground covers. Re-vegetating disturbed lands with native species is becoming common practice as a way to recover some of the original community diversity, structure and function, as well as to reduce long term maintenance costs. Benefits for native wildlife also accrue from this approach.

PLAN OBJECTIVES

The broad objective of this Mitigation Plan is to restore a vegetation composition resembling the native plant communities present on the site. As the site will be stripped of vegetation and soil along the pathway route, plant material with a high percent cover of native species will be used to restore the remaining portion of the project footprint damaged by pathway construction. This plan consists of a protocol and schedule, with options, for initial soil preparation and weed control, erosion control, seeding and/or planting, monitoring and follow-up maintenance. The target for completion of the restoration to an acceptable



condition is fall 2006. This timing may need to be adjusted if the construction schedule changes substantially.

MITIGATION OVERVIEW

Field investigations and site-specific mapping (LSA) highlight the following points that will influence mitigation planning:

- the north half of the proposed pathway follows an old road bed and consists of a high percent cover of introduced species and bare ground;
- the south half of the route is covered with native shrub and grassland communities of variable quality;
- the majority of the native vegetation along the south half of the route is of sufficient quality to use as transplant material;
- the remaining portions of the south half contain Canada thistle (*Cirsium arvense*), smooth brome and Kentucky bluegrass (*Poa pratense*).

The two sites present the following challenges and opportunities:

- approximately ½ of the proposed route crosses previously disturbed land that has been compacted and/or comprises introduced species of vegetation;
- approximately ½ of the proposed route crosses native plant communities;
- the native plant communities and soils are suitable for transplanting onto the disturbance footprint;
- native topsoil contains beneficial bacteria, seeds and other propagules. Topsoil from the site is suitable for use as a seedbed in restoring the project footprint;
- noxious weeds common in the surrounding area include Canada thistle (*Cirsium arvense*), toadflax (*Linaria vulgaris*), perennial sow thistle (*Sonchus arvensis*);
- other introduced invasive agronomic and weedy species in the area include brome grass (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*) and dandelion (*Taraxacum officinalis*).

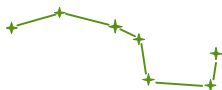
VEGETATION ESTABLISHMENT TASKS

The availability of seed and plant material of native species is limited relative to the original species composition. Thus, the following tasks are recommended to conduct a restoration of the project footprint and retain as much species diversity as possible.

1. Native Sod Transplant

Transplanting patches of native sod provides the best potential for maintaining diversity of native species and reduce the severity of weed invasion. The objectives for this project are to:

- Place Snowberry sod within the original Snowberry community
- Place Rough fescue sod in the original Fescue community.
- Dig up the large Saskatoon and Buffaloberry shrubs from the construction footprint. Replace them beside the pathway after construction is complete.



Equipment Needs for Transplanting Native Sod

- Spray paint or flagging
- Vertical rotary blade or square spades
- 40 pallets
- Bobcat with spatula or flat-lipped bucket and loader forks

Removal of Transplant Material

- Clearly mark area to be cut for transplant. Avoid areas with Canada thistle, Smooth brome and other weedy species
- Use rotary blade or spades to score out blocks slightly narrower than Bobcat bucket
- Lift out blocks with 6-8" (15-20cm) of soil and place on pallet
- Store pallets out of way with loader forks.
- Pallets can be stacked 3-4 high if space is a factor.

Laying Transplant Material

- Move palleted sod with loader forks
- With loader, position palleted sod and tilt pallet
- Slide sod into place with spades
- Cut to fit with spades

Potential Storage Areas

To minimize disturbance, store palleted sod in area where access and movement is along the proposed pathway (i.e. so additional trails are not created). For example:

- Outside fence at overpass
- Along old road bed at north end of proposed pathway

Task Sequence

The order that tasks occur in and the exact location of the sod storage area(s) will have to be flexible. These issues will be finalized onsite by transplant project manager and construction project manager.



2. Topsoil Salvage

Topsoil will be collected from areas after transplant material is removed and where appropriate from the rest of the project footprint. If an area contains perennial and/or noxious weeds, the vegetation and top few cm of topsoil should be collected and disposed of. The vegetation will be burned or mulched with the soil and buried deep enough to prevent weed seed germination (i.e. used as fill). This native topsoil will be used to fill gaps in transplant sod and as a seedbed for the rest of the construction footprint. Topsoil will be stored as above (Potential Storage Areas).

3. Soil Preparation and Seeding

Spring seeding (as soon after snowmelt as possible) is recommended over fall seeding to minimize seed predation by birds, insects and rodents. The seed mix should be ordered the year prior to seeding and stored in cold, dry conditions (stratification) and where rodents cannot get into it.

Alternatively, seeding can be performed in the fall, allowing the seed to over-winter in situ. There is always some degree of seed predation by rodents and birds using this method.

The seed mix recommended is:

- | | |
|--|------------|
| • Rough fescue (<i>Festuca campestris</i>) | 30% of mix |
| • Green needle grass (<i>Stipa viridula</i>) | 30% of mix |
| • Slender wheatgrass (<i>Agropyron trachycaulum</i>) | 15% of mix |
| • Western wheatgrass (<i>Agropyron smithii</i>) | 15% of mix |
| • June grass (<i>Koeleria macrantha</i>) | 10% of mix |

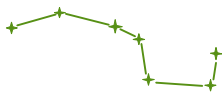
Seed will be sown at a rate of 40 kilograms per hectare.

Hand/broadcast seeding will be necessary due to the small area involved

- place topsoil where seeding will occur
- if seeding in the spring, pack firmly and cover for the winter
- if seeding in the fall, pack seed bed lightly, seed and pack firmly to attain good seed-soil contact

Additional Planting Techniques

If deemed necessary, plant material can be collected from nearby native areas that are being developed (seed, transplants or sprigs) and planted throughout the restoration sites. Such material will add a diversity of plant species, fungi, moss, seeds and soil bacteria and will spread throughout the sites over time.



Apply mulch to the newly seeded area to lessen the effects of wind on the soil and seed bank and to hold snow in the winter if the sites are seeded in the fall. Mulching will assist in soil moisture retention and add organic matter to the soil.

A cover crop of a non-allelopathic grass such as annual oat or a short-lived perennial like Canada wild rye can be sown on slopes to stabilize the soil and prevent erosion. Annual weeds may serve this function in most sites. They will be cut prior to seed set.

4. Maintenance

Initial Weed Control

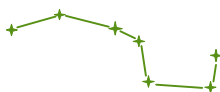
Some weed species can produce thousands of seeds per plant and others develop deep root systems that spread extensively precluding easy eradication. As construction is scheduled for late September, there are two options for dealing with the inevitable weed problem on the restored site.

Option 1 entails either burning the area containing the Canada thistle or hand-pulling and bagging the plants and seeds, as soon as possible prior to construction. This will be followed up by spot spraying any rosettes or new growth that occurs in the fall. This will prevent the spread of seeds onto the restoration site (especially the seeded portions with an exposed soil surface), less site maintenance (weed control) in future years and better overall results.

Option 2 eliminates the weed eradication program. This may lead to more labor and cost intensive weed maintenance in future years. See below for follow up maintenance procedures.

Spring Maintenance and Monitoring

The restoration will be monitored every two weeks to identify problems with invasive species, erosion, poor establishment of seeded/planted material, and to immediately implement measures to counter any identified problems. On such a small site, mechanical removal (hand pulling) of noxious weeds will give the best results while not disturbing the establishment of desirable species. Two or three treatments through the first year will effectively reduce the desired establishment time of the seeded material.



Year 1

- Seeded sites will be watered every few days for the first month and weekly during the second month if rainfall is insufficient to keep the soil moist. Watering will not be required after the first year.
- Weekly inventories of species germinating will be collected and immediate pulling of identified noxious and perennial weeds will be undertaken throughout the first summer.
- Mowing of the seeded sites will occur 2 or 3 times over the first summer before weed species set seed. Canada thistle will be avoided by the mowers.
- Noxious and perennial weeds will be hand-pulled as they appear. If they become established they will be spot sprayed in the fall by certified applicators with appropriate herbicides.

Subsequent Years

Mowing will be performed during subsequent summers to prevent annual and perennial weeds from self-seeding. Perennial noxious weeds will be hand-pulled as discovered and prior to flowering. If necessary, following a last cut in the fall, appropriate herbicides will be applied selectively to individual persistent perennial weed species.

Establishment rates for native grasses should reach approximately 60 seedlings/m² during the first year. If establishment is poor in any areas during year one or two, reseedling will be performed as soon as possible to counter invasion by weeds.

IMPACT ASSESSMENT

The planned project has the potential for the following classes of impact on ecological resources of Nose Hill Park:

- Alteration of native vegetation
- Loss of rare plants and plant communities
- Alteration of wildlife habitat
- Alienation of wildlife habitat
- Obstruction of wildlife movement

Potential effects and mitigation measures for each of the above impact classes are discussed below.



ALTERATION OF NATIVE VEGETATION

Construction of the Segment 1 pathway will result in the clearing of 0.056-ha (560 m²) of natural vegetation. Approximately 60.7% (0.034-ha) of total land clearing will affect predominantly native plant associations. The amount of native vegetation cleared as a proportion of the locally available supply (Figure 2) by vegetation grouping ranges from 0.5% to 3.5% (Table 2). Based on the supply of plant community types mapped by Kansas et al. (1993) for all of Nose Hill Park (regional supply) the percentage of native habitat altered by the pathway will be negligible, ranging from <0.001% for Rough Fescue Grassland to 0.1% for low shrub communities such as Rose/Snowberry and Snowberry (Table 2). The relatively low levels of native vegetation loss will be ameliorated by the planting of native grassland species in areas that were formerly dominated by introduced grasses. This could result in the gain of approximately 0.01-ha of [near-] native grassland.

The two Ecosites affected by construction of the Segment 1 pathway occur elsewhere in Nose Hill Park. The 3M1.24/3 type occurs in 2 additional areas comprising another 23.2-ha. The 3M1.13/1 occurs in 8 other areas comprising another 9.1-ha. In terms of the effect of habitat alteration on Ecosite-level supply, the construction will affect less than 0.5% of either Ecosite.

Based on the minor proportion of local vegetation supply affected and the negligible proportion of regional supply affected we conclude that impacts of the project relating to the alteration of native vegetation are of minor magnitude and are local in scope.

LOSS OF RARE PLANTS/PLANT COMMUNITIES

The timing of this assessment precluded a comprehensive rare plant field search. The following is a list of priority rare plants potentially occurring in habitats found in the study area. This list is based on reports by Moss (1983), Wallis (2001) and Kershaw et al. (2001). Plants on this list do not necessarily occur in the study area. Rather, the known distribution and habitat affiliations of these plants suggest potential occurrence.

- *Aster eatonii* (Eaton's Aster) – grassland, S2
- *Castilleja lutescens* (Stiff Yellow Paintbrush) – grassland, S2S3
- *Gratiola neglecta* (clammy hedge-hyssop), wet muddy places, S2S3
- *Potentilla finitima* (sandhills cinquefoil) - disturbances in native grassland, especially sandier sites, S1
- *Ranunculus glaberrimus* (early buttercup) - grassland, S2
- *Rorippa tenerrima* (slender yellow-cress) - moist open areas, generally on recently exposed mud, S1
- *Sisyrinchium septentrionale* (pale blue-eyed grass) - moist meadows, S2S3
- *Townsendia exscapa* (low townsendia), dry hillsides and prairies, especially exposed valley slopes or ridge, S2
- *Viola pedatifida* (crowfoot violet) - grassland, especially sandy types, S2



Table 2. Amount and % of Vegetation Types affected by Land Clearing –Segment 1 LSA				
<i>Vegetation Type</i>	<i>Plant Associations¹</i>	<i>Supply in LSA (ha)</i>	<i>Affected by Clearing (ha)</i>	<i>% of Type Affected (ha)</i>
Anthropogenic	Trail	0.11	<0.01	0.5%
Aspen Forest/Tall Shrub	Aw-W-WW Aw/Ro Aw/Sn/Br	0.21	Nil	Nil
Buffaloberry Shrub	Bb	<0.01	Nil	Nil
Canada Thistle	Ca Ca/Br	0.05	Nil	Nil
Gooseberry Shrub	Ri	0.05	Nil	Nil
Maple Shrub	Ac	0.02	Nil	Nil
Pin/Choke Cherry Shrub	Pr Pr-Bb	0.09	Nil	Nil
Rose Shrub	Ro Ro-Aa-Sc/Po-Rf Ro-Sc/Rf Ro-Sn Ro-Sn-Sc/Rf Ro-Sn/Po-Rf Ro-Br Ro-Br	2.18	0.016	0.7%
Rough Fescue Grassland	Rf/Sc	0.08	0.001	1.3%
Saskatoon Shrub	Aa	<0.01	Nil	Nil
Shrubby Cinquefoil Shrub	Sc	0.01	Nil	Nil
Smooth Brome Grassland	Br Br/Ro Br/Ro/W Br/Sn-Ro	0.63	0.022	3.5%
Snowberry Shrub	Sn Sn-Br Sn-Ro Sn-Ro/Br Sn-Ro/Po Sn/Ca Sn/Ca-Br Sn/Po	1.11	0.017	1.5%
Wolfwillow Shrub	Ww	.05	Nil	Nil

¹ See Figure 2 for code descriptions



In grassland regions rare plants are most commonly found in association with relatively rare plant communities that are usually uncommonly wet (e.g. riparian sites, wetland fringes) or uncommonly dry (sandstone bluffs, blowout areas). The lands affected by the Segment 1 pathway are common vegetation types (low shrub, native grassland) that are neither excessively dry nor wet. Based on the relatively small disturbance footprint and the habitat types present we conclude that impacts on rare plants are of low probability and magnitude.

No provincially listed rare plant communities are affected by the planned pathway based on our field reconnaissance and review of Allen (2005).

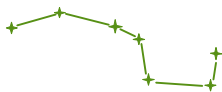
ALTERATION OF WILDLIFE HABITAT

The magnitude of alteration of native vegetation is minor to negligible as described previously. Therefore the effect on wildlife habitat should be of similar magnitude. The habitats affected are in abundant supply on Nose Hill Park and no dens or other featured habitats were observed on the site. None of the wildlife attributes or species identified by Kansas et al. (1993) (Baird's Sparrow, Sharp-tailed Grouse, Mule Deer, White-tailed Deer, Badger, closed-canopy deciduous forest, tall willow plant communities) strongly affiliated with the study area. The exception is Rough Fescue grassland, which currently occurs in small patches and will be replaced in part by planned native vegetation restoration.

ALIENATION OF WILDLIFE HABITAT

Wildlife may avoid using habitat that is floristically and structurally intact because of the presence of human activity and associated sensory disturbance. This has been termed habitat avoidance and can result in "effective habitat loss" (Weaver et al. 1986). The duration and magnitude of the human use and the behavioral response of the species in question determine whether the extent of the habitat loss will be complete, partial, temporary or permanent (Bromley 1985). The duration and extent of habitat avoidance resulting from sensory disturbance depends on a number of factors including: 1) type of human use; 2) the duration and intensity of human use; 3) the sensitivity of the species in question; and, 4) habitat characteristics (extent of hiding cover). The implications of effective habitat loss are greatest in the following situations:

- In areas of very high habitat quality or in "critical" reproductive habitat such as nest/den sites or courtship areas;
- In areas of traditional concentration of colonial or gregarious species (e.g. ungulate winter range);
- When the timing of development interrupts breeding, nesting or rearing of young;
- When the disturbance leads to effective loss of all or a high percentage of a particular high quality habitat type;
- When the population of a sensitive species is low or decreasing; and,
- When effective habitat loss occurs as linear disturbances create barriers to movement, which serve to fragment or isolate large areas of habitat.



Construction of the pathway will occur in the fall period when bird and mammal nesting and rearing do not occur. As mentioned above, “critical” reproductive habitat does not appear to occur in the study area. The pedestrian overpass will focus intensive human use along the Segment 1 pathway (Photo 4). This will lead to increased levels of sensory disturbance. This effect will be reduced because of the occurrence of relatively common vegetation types in the local study area and because of the close proximity of the site to John Laurie Boulevard and already high levels of traffic noise. Overall we conclude that effects of the project relating to wildlife habitat alienation are minor.

OBSTRUCTION OF WILDLIFE MOVEMENT

No significant wildlife trails were observed during field visits and neither the vegetation nor the topography at the site encourages movement of medium to large mammals. The close proximity of the site to John Laurie Boulevard also reduces the current quality of this area for animal security and movement. As such we conclude that the effects of the project relating to movement obstruction of wildlife will be minor.

LITERATURE CITED

Achuff, P.L. 1994. Natural regions, subregions and natural history themes of Alberta. A classification for protected areas management. Prepared for Parks Services. Alberta Environmental Protection. Edmonton, Alberta.

Allen, L. 2005. Alberta Natural Heritage Information Centre Preliminary Plant Community Tracking List. Alberta Community Development, Edmonton, Alberta.

Bromley, M. 1985. Wildlife management implications of petroleum exploration and development in wildland environments. USDA For. Serv. Gen. Tech. Rep. INT-191. Intermountain Research Station, Ogden, Utah. 42 pp.

Kansas, J.L., R.G. Usher, and W.L. Strong. 1993. Biophysical and Land Use Inventory and Analysis of Nose Hill Park. Prepared for the City of Calgary Parks and Recreation by Sentar Consultants Ltd., GAIA Consulting Inc. and Ecological Land Surveys Ltd. 161 pp. + 12 Appendices.

Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001 Rare vascular plants of Alberta. University of Alberta Press. 484 pp.

Moss, E.H. 1983. Flora of Alberta (Second Edition). University of Toronto Press. 687 pp.

Strong, W.L. and J.M. Thompson. 1995. Ecodistricts of Alberta, summary of biophysical attributes. Alberta Environmental Protection Publication No. T/319. Edmonton, AB.



Wallis, C. 2001. Proposed protocols for inventories of rare plants of the Grassland Natural Region. Alberta Species at Risk Report No. 21. Fish and Wildlife Division, Resource Status and Assessment Branch, Alberta Sustainable Resource Development.

Weaver, J., R. Escano, D. Mattson, T. Puchlerz, and D. Despain. 1986. A cumulative effects model for grizzly bear management in the Yellowstone Ecosystem. Pages 234-246 IN: Contreras, G.P. and Evans, K.E. eds. Proceedings-Grizzly bear habitat symposium. Intermountain Res. Station. Gen. Tech. Rep. INT-207. 252 pp.





Figure 1
Locations of Nose Hill Pathway Segments
1 and 2 - N/S Connection
(Edgemont to Brisebois)

Legend

— Segment 1 Pathway

— Segment 2 Pathway



Local Study Area (Ecosites)

Scale = 1 : 1,500

Projection: 3TM, NAD83
Ortho Flown: 2003



URSUS Ecosystem Management Ltd.

Produced by Rich Ashton: Sept, 28

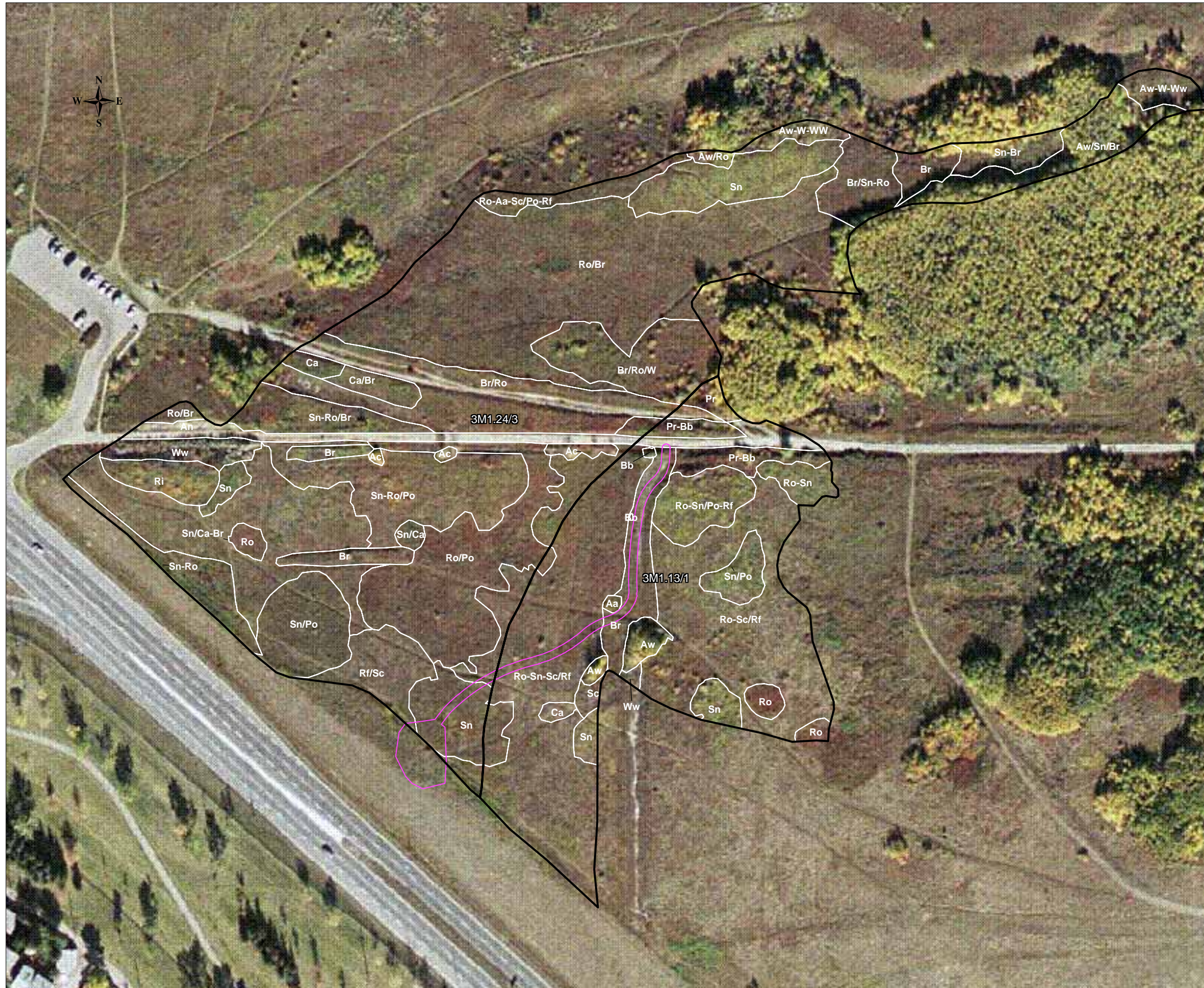





Figure 2
 Plant Associations in the Local Study Area
 - Nose Hill Pathway Segment 1 - N/S
 Connection (Edgemont to Brisebois)

Legend

- | | |
|-------------------------|--|
| Trees | Aw - Aspen
Pb - Balsam Poplar |
| Shrubs | Sn - Snowberry
Ro - Rose
Sc - Shrubby Cinquefoil
W - Willow
WW - Wolfwillow
Bb - Buffaloberry
Aa - Saskatoon
Ri - Gooseberry
Pr - Pin/Choke Cherry
Ac - Maple |
| Grasses
and
Forbs | Br - Brome
Po - Poa
Rf - Rough Fescue
Ca - Canada Thistle
Sg - Goldenrod |

-  Study Area (Ecosites)
-  Pedestrian Overpass Base Area
-  Segment 1 Pathway

Scale = 1 : 1,500

Projection: 3TM, NAD83
 Ortho Flown: 2003





Photo #1. Old road bed with introduced Smooth Brome grassland (*Bromus inermis*).



Photo #2. Snowberry (*Symphoricarpos occidentalis*) stand and Segment 1 Pathway route.



Photo #3. Native Rough Fescue (*Festuca campestris*) grassland near Segment 1 Pathway.

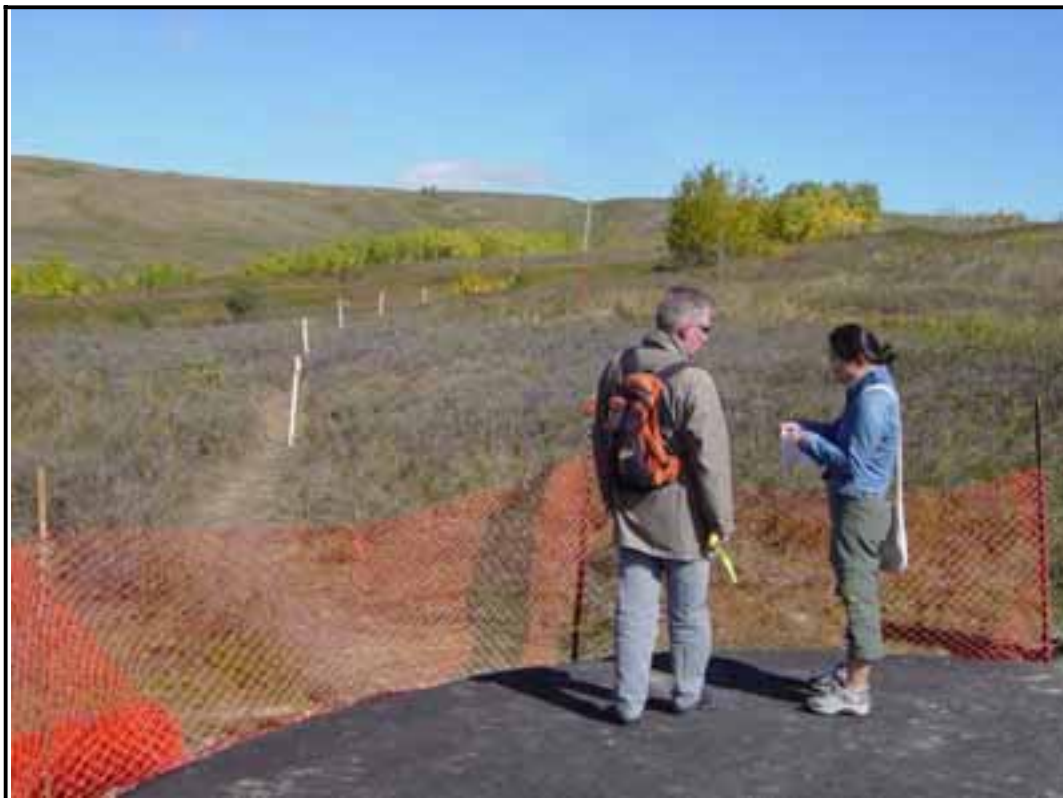


Photo #4. View of Segment 1 Pathway route from north end of pedestrian overpass.