REPORT

Assessment of Grizzly Bear Distribution, Habitat Use, and Human / Bear Conflict Management Recommendations

IN SUPPORT OF THE MINETTE BAY WEST CONCEPT PLAN

Submitted to:
District of Kitimat
270 City Centre
Kitimat, BC, V8C 2H7



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Table of Contents

1.0 Introduction 2
2.0 Phase I Desktop Review 3
2.1 Methodology 3
2.2 Results 4
2.3 Seasonal Foraging Habitat 6
2.4 Cover Habitat 8
3.0 Phase II Field Investigation 9
3.1 Methodology 9
3.2 Results 10
4.0 Phase I and Phase II Discussion 14
5.0 Conclusion and Recommendations 17
6.0 References 19
7.0 Attachments 20

1.0 Introduction

The District of Kitimat (DOK) is exploring options to develop 191 ha on the west side of Minette Bay in two District Lots (DL 471 and DL 95). This area is officially designated as Park within the *Official Community Plan* and is zoned for greenbelt uses, including forestry and environmental preservation. Initial site investigations, including a Bio-Inventory and an Archaeological Overview Assessment, were completed in the 2016 field season. This work was followed by public engagement and concept planning which culminated in three park amenity options (Concept Plan Options) focusing primarily on the level of environmental protection. Concept Plan Option 1 proposes the least amenities and preserves the greatest proportion of the site and Concept Plan Option 3 proposes the most amenities; Option 2 proposes a balance. The three Concept Plan options and other materials related to this project are available for review at www.kitimat.ca/mbw and the maps of each Concept Plan Option have been presented in the attachments.

From the complete Bio-Inventory (Silverwood 2016) and during discussion with the public, it was expressed that Minette Bay West (MBW) is regularly frequented by grizzly bears (*Ursus arctos*). Recommendations in the Bio-Inventory suggested that once Concept Plan Options for Minette Bay West were further developed that a detailed analysis of grizzly bear distribution and habitat use would be warranted to both maintain the environmental values of the area, but also to design facilities and infrastructure such that the public is not put at undue risk. Through the Concept Planning engagement process several key questions were posed by both the community and the DOK about grizzly bears in attempt to better understand their use and the risks for human /bear conflict including, but not limited to:

- What is the number of grizzlies in the area?
- What are their travel patterns?
- What is the relative risk to human safety of the three options, are there locations with greater or lesser risk, what is the likelihood of bear-human encounters in the study area versus other parks in the area, and are there methods to reduce risk?
- What recommendations could be employed to reduce potential conflicts?
- What would be the impact of the development of LNG Canada on bear movement and foraging in the MBW area?

To answer these questions, a two-part assessment approach was used. Phase I of the assessment consisted of a preliminary desktop review which focused on existing vegetation information and expert knowledge. Phase II of the assessment included a thorough on-site field investigation.

The following sections of this report provide:

- an overview of the methodology and results of Phases I and II;
- responses to the questions posed above; and
- summary conclusions and recommendations.

2.0 Phase I Desktop Review

2.1 Methodology

The initial stage of this assessment was a desktop exercise. It relied heavily on four primary sources, described below.

- **Bio-Inventory report.** This document, produced by Silverwood in 2016, provides a broad overview of the site values including terrestrial ecosystem mapping and descriptions of plant communities.

- **Detailed aerial photography of the study area.** Detailed aerial photography of Minette Bay West was captured by drone in July 2016 (specifically for the concept planning process) by LM Forest Resource Solutions Ltd. With a 2.5 cm pixel size, details of vegetation communities and visual records of past animal movements were readily apparent.

- **Conversations with local residents with extensive knowledge of and experience with wildlife in the Kitimat area.** Mike Langegger, a Director with the BC Wildlife Federation out of Kitimat provided some of his local experiences in a brief phone interview, and Doug Read, photographer, provided videos and provided observations in a phone interview.

- **Expert opinion.** Expert opinion was provided by Brad Pollard (R.P. Bio., R.P.F. and co-author of this report) based on extensive grizzly bear habitat mapping, including over 150,000 km^2 of grizzly bear capability suitability mapping in the northwest. This mapping included over 500 on-site forage evaluations so that the relative value and use of the ecosystems and vegetative communities in the area is well understood. In addition, extensive work on the Kitimat River estuary for industrial clients has rounded out the knowledge of local fisheries values and wildlife use.

The first step in Phase 1 was to examine the two lots and their immediate context in detail to identify their relative foraging and security values for grizzly bears. This was completed by developing habitat suitability mapping. Initial vegetation classification by Silverwood in the Bio-Inventory (2016) was relied on for terrestrial sites with only one change to accommodate a complex ecosystem. In the estuarine and marine interfaces, the high density drone photography was used to classify the vegetative communities as identified in the *Wetlands of British Columbia Guidebook* (2004). Note that the detailed vegetation evaluation was limited to the area photographed by the drone (i.e. both within and outside the District lots boundary but did not include the entire southern portion of the Minette Bay / Kitimat River / estuary interface).

Once the vegetative composition of the study area was delineated (in terms of grizzly bear forage and security cover), a ratings table was developed for grizzly bear forage values specific to the biogeoclimatic subzone and ecology of the site. Note that the suitability follows the recommendations of the Resource Inventory Committee for seasonality, ratings, and scale for this project (RIC, 1999). For this project, each ecosystem is rated by growing season subsets (early spring, late spring, summer, and fall) and ratings fall between 1 (Very High) and 6 (Nil). These values are measured against the Provincial benchmark for coastal grizzly bears (Khutzemateen).

Ratings were then colour coded and mapped to provide a visual representation of the varying habitat values through the year. The four seasonal foraging value maps have been included as attachments 1-4. The habitat suitability maps also overlay the potential trails from the three options for the MBW Concept Plan.

Once the detailed vegetative forage values were established for the two district lots, the larger habitat context of the surrounding area was reviewed using Google Earth and Bing mapping. This assessment generally focused on likely movement routes of animals coming into the study area and relied heavily on historic suitability mapping in the surrounding area. However, it also looked at the distribution of other high value estuarine sites in areas outside of the study area.

Finally, these two developed data sources, in combination with local input, were used to inform expert opinion. The scope of this project does not allow for a highly referenced exploration of grizzly foraging, intra-sexual behaviour, seasonal movement or local demographic although many of these have effects on bear activity in the area. For a succinct report of grizzly bear life history directly relevant to the study area, MacHutchon's 2007 *Grizzly Life Bear Life History* is recommended.

2.2 Results

Analysis of the vegetation communities (described in the Bio-Inventory) identified 16 different vegetative communities within the study area and an additional non-vegetative polygon (Kitimat River Off-Channels) that have seasonally high forging values for grizzly bears. In addition to the vegetation classification, the drone images were clear enough that spawning chum (Oncorhynchus. keta) were identified and moose (Alces alces) tracks and bear (Ursus sp.) tracks could be differentiated on exposed substrate. In gramminoid (sedges and grasses) dominated areas, trails could be seen but their source could not be identified. However, given the available habitat values, it is highly likely these are the result of bears. Over 30 individual trails were identified in non-forested ecosystems where they could be seen. See Figure 1 for the Plant Communities map with the track and trail locations noted. As indicated, each of these communities was rated for grizzly forage production in the four seasons. The seasonal maps (habitat suitability maps) are provided as attachments 1-4.

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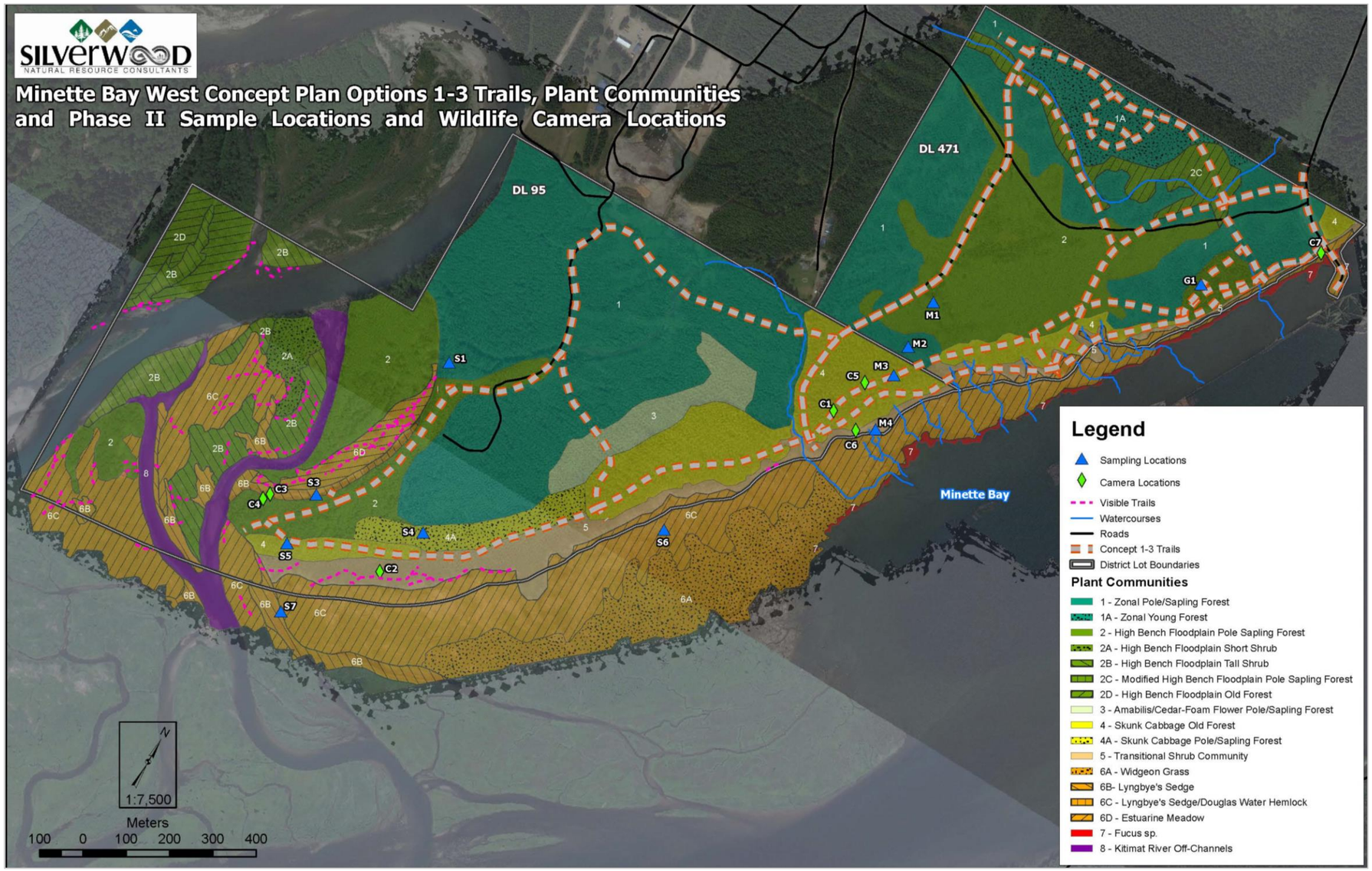


Figure 1 Plant communities in the study area in context of grizzly bear forage production (wildlife trails noted for open cover areas only as determined from aerial photography)(Phase I); May 11, 2017 plot assessments (S1-S7, M1-M4, and G1) and infrared trail camera placements (C1-C7)(Phase II); and MBW Concept Plan Options 1-3.

It is apparent from a quick review of the habitat suitability maps that the estuary has extensive forage values in most seasons. This is consistent with other large estuarine ecosystems in the northwest such as the Dala-Kildala estuary in the Douglas Channel, the Ecstall estuary near the Skeena River, and the Kwinamass estuary, adjacent to the Khutzeymateen Conservancy. The only variation is the high intensity of human activity in the area, particularly in the western edge and upstream on the mainstem of the Kitimat River. Areas in the northeastern portions of Minette Bay are less influenced by the fresh water input by the Kitimat River and show the vegetative communities more common in sheltered marine bays.

2.3 Seasonal Foraging Habitat

While all seasons are important to grizzly bears, early spring is often given higher importance as it represents the recovery period from winter or hibernation and can be particularly important to females with new cubs as they tend to leave the den in a more nutrient stressed condition. For bears, early spring is defined as the time from hibernation until fresh forbs are widely available in lower elevations and in the study area would likely run from mid-April until mid-May. The estuary provides important high value food sources in early spring with the emergence of several important gramminoid (grasses and sedges) species, such as Lyngby's sedge (*Carex lyngbyei*), that provide highly digestible protein. This is also true of skunk cabbage (*Lysichiton americanus*) in adjacent swamp forests and shoots of herbaceous plants in the old floodplain sites. As omnivores, grizzlies will opportunistically scavenge and estuaries are places where both marine and upland carcasses collect. In early spring there are often late spawned out salmon carcasses as well.

The early spring suitability map identified Lyngby's sedge meadows, swamp forests and old floodplain forests in the study area as having Very High foraging values in early spring. Much of the mapped vegetation has Moderate and High values at this time of year with only the open water, marine transition shrub community and pole/sapling zonal forest having Low or Very Low values. However, while foraging values may be lower, both the shrub transition and the zonal forest directly adjacent to the Kitimat River likely see a fair amount of use for movement. While not assessed in the same detail, areas west of the Kitimat River mainstem appear to have much the same quality of early spring forage.

Late spring, defined locally from mid-May until mid-June, includes that period where forbs are widely available until most mid to lower elevations are snow free and most shrubs have leaved out. With these types of conditions, there are more options available for foraging bears and the density of use on the prime landscape sites such as the estuary starts to decrease. However, while there are alternative sites available, the estuary still represents a concentration of quality foraging in the landscape. In addition to the increase in vegetation, this season also includes moose calving. In many ecosystems, calving moose on low elevation floodplains represent a significant foraging opportunity for grizzly bears. While it has been noted in the northwest region, the rapid progression of snow retreat during this time of year in coastal areas often means that calving moose are more widely dispersed than would be in interior and more northerly ecosystems. However, given that moose tracks are evident in the July 2016 drone photograph, the possibility that moose are calving in this area cannot be ruled out.

The late spring suitability map identified only one Very High value site and that was associated with the old growth, high bench floodplain site on the west side of the Kitimat River still within DL

95. However, as indicated, much of the remaining estuarine shrub and grassland habitats, as well as the intertidal and swamp forest remain as either Moderate or High value. Areas west of the Kitimat River outside of the study area appear to have slightly higher forage values due to the presence of more mature and old serial stage floodplain communities.

Summer includes the peak of the growing period where all but the north facing alpine areas are snow free and providing forage. Berries are available in most areas and the pink salmon (*Oncorhrynchus gorbuscha*), chinook (*O. tshawytscha*), sockeye (*O. nerka*) and chum are in the rivers. Locally this is generally between mid-June and early September. Bear forage is plentiful throughout the landscape especially in areas that previously provided little sustenance. Berry production generally peaks at a shrub seral stage and then later at a mature and old seral stage. Given that much of the two lots have been harvested in the last 60 years, there are few upland terrestrial areas in these seral stages so it is anticipated that berries will not be a driving force in grizzly distribution in the area. Berries should be plentiful however in many of the floodplain areas where even at intermediate seral stages, the deciduous canopy allows adequate light for salmonberry (*Rubus spectabilis*), devil's club (*Oplopanax horridus*) and elderberries (*Sambucus racemose*) to flourish. Other vegetative food sources likely utilized include Pacific crabapple (*Malus fusca*), corms of hellebore (*Veratrum viride*) and rice root (*Fritillaria camschatcensis*) in the estuarine meadow, and sedges and grasses in the foreshore.

The optimal summer food source is salmon due to their rich and plentiful nature. Grizzly bears generally fish for live salmon in smaller slower systems where fish mobility is limited, or post spawning, when fish energy expenditures are declining. Observations of the drone images indicated several of the off-channel branches have the right type of confinement that fishing for the less active salmon could take place. While difficult to confirm, it appears a small school of chums might be holding in one of these channels in the photograph. There is also a large dead fish in the main Kitimat channel that is likely a chinook accidently killed by fisherman upstream. Within the study area, these channels likely have the highest summer value for fish, but in other areas of the estuary, along the western edge, summer fisheries values are much higher. Beaver, Anderson, and Moore Creek are all known to have significant pink runs available during this season and the multitude of small channels in this area suggest it would receive much higher fishing pressure from grizzlies in the summer.

Only the off-channel sites in the study area were rated as Very High with much of the rest of the floodplain sites rated as either High or Moderate. The transitional shrub community was also rated as Moderate due to the high forb and sedge production. Zonal forests were rated as Very Low although isolated sites adjacent to the Kitimat River or other canopy openings likely have higher values.

The fall season represents that time of year when vegetative sources of forage starts to decline. Foraging continues on some of the live salmon including coho (*O. kisutch*), but includes most of the dead and declining summer stocks. In the study area this would generally relate to the period between mid-September and late November. They continue to forage on late berries such as high bush cranberry (*Viburnum edule*) as well as any other fruits that are available. Skunk cabbage corms and tubers are also excavated in lower elevation sites. Some bears will depart from low elevation areas and move upslope to alpine areas to capture the last of the high elevation berries as well as prepare a hibernation site.

Within the study area, the areas with the highest fall values are those associated with floodplain ecosystems and swamp forests. While some dead fish are likely to collect in this area, the

highest carcass foraging opportunities are likely upstream nearer the actual spawning areas. The exception may be in the western side of the estuary where smaller streams generally have spawning occurring just upstream from the estuary. In addition, with the potential for a high rainfall event, decaying carcasses are not a particularly reliable food source. No Very High value habitats were identified in this assessment, but all of the swamp forests, estuarine sedge meadows and intertidal areas were rated High.

2.4 Cover Habitat

While the location and site use by grizzly bears is largely driven by the available food, grizzly bears will also use those areas that provide cover. This cover can include either thermal cover, or environments that help them regulate their temperature, or security cover, or cover that offers them protection from perceived or potential conflict. Thermal cover generally includes areas that provide some protection from the elements such as rain or heat. Grizzlies are known to seek out rock overhangs and large open grown trees to avoid heavy precipitation. However, of more significance is their behaviour with regards to hot weather. Grizzly bears will often find dense thickets, open water or dense forests to cool off in the shade. One novel approach was noted on the Kitimat River where a boar had climbed inside of a log jam at the waters' edge to keep cool during 35^{o} C weather. While denning habitat is generally considered part of the thermal cover, given that most local grizzly denning occurs in the subalpine, it is not considered in this assessment.

The distribution of security cover also dictates the use of available foraging habitats. Security cover is used to avoid intraspecific (grizzly to grizzly) and interspecific (grizzly to other species including humans) conflicts. For intraspecific conflicts, young bears and females with cubs have to be very attentive to the location of adult males as they represent a significant threat. Often they will use sub-optimal or marginal habitats, or good quality habitats closer to human use, to avoid dominant boars. To provide visual cover these sites are generally past the short shrub seral stage but mature and old forests are preferred.

Within the study area, thermal cover would likely be limited to wet wallows in the estuarine mud or in adjacent wetted areas. Log jams would also likely be used adjacent to the river as would alder thicket directly adjacent to the estuarine sedge and grass areas. Old floodplain forests would also likely have large stems and would be selected for relief both from heavy rain as well as shade in the summer. Security cover is primarily provided by a visual screen and this occurs primarily on stand edges where forest crowns can reach from the ground to the canopy. These occur throughout the study area at the estuarine edge, but also occurs in isolate stands to trees within the floodplain and estuary itself.

3.0 Phase II Field Investigation

3.1 Methodology

Field assessment of grizzly bear habitat within the MBW Concept Plan study area was performed by four biologists on May 11, 2017. The field investigation involved visiting several vegetation polygons in and around the proposed MBW concept plan trail networks, and completing field plots to assess ecosystem values and confirm grizzly bear habitat suitability mapped during the Phase I desktop assessment. Several factors were considered in targeting field investigations in and around the proposed development area, including likely movement corridors for grizzly bears, the location of proposed development components, and coverage of a variety of ecosystem types with potential value to grizzly bears. A number of potential grizzly bear migration routes were hypothesized based on likely movement through high value foraging polygons and available security cover. These hypothesized migration routes were then overlapped with the proposed development options to help gauge the potential for human-wildlife conflict.

Field crews assessed the shoreline areas and adjacent forests along the west shore of Minette Bay from a deactivated log dump / causeway at the northern most point of DL 471 to the southernmost tip of forested cover just outside of DL 95 (Figure 1). This area included peripheral forest around trail networks proposed for all three MBW concept plan amenity options. Field plots assessed the terrestrial ecosystem type, potential use by grizzly bears, evidence of use, and habitat suitability. Field cards followed the *Resource Inventory Committee standards for Wildlife Habitat Ratings* (RIC 1999) and the *Land Management Handbook for Describing Terrestrial Ecosystems in the Field* (MoFR and MoE 2010). Ratings were adapted to be consistent with suitability rating methods used in Phase 1 of the assessment. Potential use included daily and seasonal movement, security and thermal cover, general foraging and foraging for salmon. Evidence of use included sightings, tracks and trails, day beds, body parts (e.g. fur), evidence of foraging activity (e.g. diggings, browse, carcasses), scat, and territorial displays (e.g. marked trees). Habitat suitability of each plot was rated by growing season subsets (early spring, late spring, summer, and fall), with ratings ranging from 1 (Nil) to 10 (Very High); these ratings were converted to a scale from 1 (Very High) to 6 (Nil) to be consistent with the rating scheme utilized in Phase 1. Field photographs were taken at each plot to demonstrate general ecosystem characteristics, and highlight evidence of use and features with specific foraging or habitat values.

Bushnell Trophy infrared trail cameras were placed in areas where grizzly bear presence and movement was evident or expected, based on habitat suitability in early and late spring. Camera placement was also focused on proposed Concept Plan Option trails, considering highest potential of human-wildlife conflict. Cameras were set to collect bursts of three still photographs whenever triggered by infrared motion, with a 30-second inactive period following each burst. The cameras were installed on May 11 and collected on May 29, 2017.

3.2 Results

A total of 11 field plots were completed: S1, S3, S4, S5, S6, S7, M1, M2, M3, M4 and G1. All plots, except for G1, confirmed the initial ecosystem classifications assigned in Phase 1. G1 was identified during the desktop assessment as an old growth swamp forest (CWHvm1/14); however, field investigations identified a mature, zonal forest (CWHvm1/01) with an understory dominated by *Vaccinium* sp. rather than skunk cabbage (*Lysichiton americanus*). This change in ecosystem classification results in a lowering of the habitat suitability for grizzly bear forage value in the early spring context (Phase I characterized as very high value and Phase II made change to high value in early spring). Plot S5, identified remotely as a swamp forest ecosystem, had variable density of skunk cabbage cover at the plot site; however, high skunk cabbage densities in other areas within this vegetation polygon confirmed its high forage values and suitability. Table 1 contains ecosystem typing results and grizzly bear habitat suitability from the 11 plots, while Figure 1 shows plot locations as well as the locations of infrared trail cameras.

Table 1. Field assessment confirmations of Minette Bay West Biogeoclimatic Ecosystem Classification (BEC) zones, subzones, site series and structural stage along with grizzly suitability ratings and evidence of use.

Plot	BEC subzone/ site series	Structural Stage[1] (1-7)	Field Findings	Evidence of Use[2]	Suitability[3] (1-6) PE/LS/S/F	
					Desktop	Field
G1	CWHvm1/01	5	Downgrade suitability	None	1/3/3/2	4/4/3/3
M2	CWHvm1/01	4	Confirmed	None	5/5/5/6	5/5/5/5
M3	CWHvm1/14	7	Confirmed	S	1/3/3/2	1/1/3/3
M4	CWHvm1/Em06	2	Confirmed	Ex	2/3/3/2	2/2/4/4
S1	CWHvm1/01	4	Confirmed	None	5/5/5/6	5/5/5/5
S2	CWHvm1/Ed02	2	Confirmed	None	2/2/2/4	2/2/4/4
S3	CWHvm1/Em05	2	Confirmed	Ex, Tw	1/3/3/2	1/1/4/4
S4	CWH vm1/14	5	Confirmed	None	2/4/4/3	2/2/4/4
S5	CWHvm1/14	6	Confirmed	None	1/5/5/2	2/2/4/4
S6	CWH vm1/Em 06	2	Confirmed	None	2/3/3/2	2/2/4/4
S7	CWHvm1/Em05	2	Confirmed	None	1/3/3/2	1/1/3/2

[1] Structural stage: 1 (non-vegetated) – 7 (old growth);
[2] Evidence of Use: S: sighting, Ex: scat, Tw: tracks;
[3] Habitat Suitability: 1 (very high) – 6 (nil); PE: Early Spring, PL: Late Spring, S: Summer, F: Fall

Evidence of use noted during field investigations included scat, trails, tracks, vegetation excavations and photographs collected by the trail cameras. Evidence of use was strongest along an existing footpath near plot S3. Scat from a bear cub was found here on multiple occasions, both during the main field investigation and upon return to the site to retrieve the trail cameras (Photo 1). In addition, vegetation excavations were noted here. The south end of this trail appears to see use by bear, wildlife and humans, while an ATV trail further north may see year-round use; both trails fall within the planned nature trail in Concept Plan Option 3. High suitability was confirmed for vegetation polygons along this trail, with very high suitability found in adjacent estuarine marshes.



Photo 1 Bear cub scat found on May 11, 2017 (A) and again on May 29, 2017 (B) near plot S3 along a game trail.

Additional evidence of grizzly bear use was noted in areas of very high grizzly bear suitability near plot M3. Extensive areas of skunk cabbage within the swamp forest here had been excavated, bear scat was observed, and photographs from trail cameras confirmed grizzly bear presence. An existing trail runs between camera locations C1 and C6, beside and along a historic corduroy boardwalk at the edge of the estuarine marsh / meadow zone, while a game trail runs from C5 northeast to M3. Both paths are components of the nature trail proposed for Concept Plan option 1. Bear scat was also noted along the access road to the old barge ramp, near the compact gravel trails proposed in Concept Plan Option 1, while grizzly bear tracks were seen along the shore near the Concept Plan Option 3 compact gravel trail.

Game trails were also identified during Phase 1 along the area described as a Transitional Shrub Community along the west shore of Minette Bay; heavy use by moose (*Alces alces*) was evident in the field, though no evidence of grizzly bear use was noted. Moose use was evident from the presence of moose pellets and tracks, and browsing on sweet gale (*Myrica gale*). Limited evidence of use by grizzly bears was recorded in the estuarine marsh and meadow ecosystems along Minette Bay's west shore, though grizzly bear use has been observed here anecdotally (Read 2015 and 2017). No other trails were located during the field investigation.

Seven infrared trail cameras were placed in strategic locations along the assessment track. Setup of these wildlife cameras was focused on game trails, human foot paths and areas of high spring forage values for grizzly bears. Table 2 summarizes captured footage and Photos 2-4 represent examples of captured footage. Photos of at least one adult grizzly bear were captured by cameras C1 and C5, near an existing footpath.

Table 2. May 11, 2017 to May 29, 2017 remote sensing results and wildlife footage.

Camera	Wildlife Captured
C1	Adult male grizzly bear, adult male moose, adult deer
C2	Adult male moose
C3	Adult male moose, fox
C4	None
C5	Adult male grizzly, adult male moose, wolves, deer
C6	None
C7	Missing[1]

[1] Camera C7, placed in proximity to the deactivated log dump / causeway at the northern most point of DL 471 was reported stolen to the Kitimat RCMP when not found upon camera retrieval.



Photo 2 Adult grizzly bear captured by camera C5 traveling south along an established game trail in proximity to the historic corduroy trail; very high forage values are evidenced by extensive skunk cabbage in the understory



Photo 3 Adult male moose captured by camera C5 traveling south along an established game trail in proximity to the historic corduroy trail; same trail used by grizzly bear in Photo 2 (one day earlier)



Photo 4 Wolves in pursuit of moose captured by camera C5 traveling north along an established game trail in proximity to the historic corduroy trail (moose not seen in this photo); same trail used by grizzly bear and moose in Photos 2 and 3.

4.0 Phase I and Phase II Discussion

Apart from one plot at G1, the habitat suitability ratings established in Phase I were confirmed during field investigations (Phase II). The G1 plot had lower suitability than had been previously assessed, due to a zonal forest ecosystem with limited skunk cabbage cover. Overall, much of the MBW area boasts high and very high value spring habitat for grizzly bears. Furthermore, while no major seasonal migration corridors were identified during the field investigation, many components of the proposed trail development would overlap existing game trails. It is understood that the overlap was purposely explored in order to limit clearing of existing vegetation should those trails become part of the final Concept Plan. It is also understood that wildlife, such as bears, will choose to follow a path of least resistance (i.e. established trails); therefore, trails in a different locations may not necessarily mean that they will be avoided by bears if they remain within a highly suitable forage / cover habitat area.

Mature skunk cabbage forests and estuarine marshes and meadows provide high spring forage values, while the mouth of the Kitimat River and its side channels likely see high densities of spawning salmon in the fall. Skunk cabbage forests with high value grizzly bear habitat were identified along much of Minette Bay's west shore, approximately 50 to 80 meters from the shoreline interface, coinciding with the trails proposed in all three Concept Plan options. Grizzly bear movement was evident along game trails and footpaths within and between these skunk cabbage forests.

Additional high value grizzly bear habitat was found in estuarine marshes and meadows along and adjacent to the trails proposed in Concept Plan option 3, at the southwest end of the proposed development area. Grizzly bear movement was also evident along ATV trails, footpaths and game trails in this area.

As proposed initially, the following addresses the specific question posed by community members engaged in the MBW Concept Planning process.

1. What are the number of grizzlies in the area?

The scope of the assessment, documented herein, did not include an estimate or a detailed survey to estimate the number of bears in the Kitimat River estuary area. Given that there was significant evidence of bear use of the DL 471 and DL 95 study area, the scope was focused on the assessment of bear habitat suitability (and seasonal use of that habitat) and the risks associated with the interaction of the Concept Plan Options and bear habitat.

It is likely that the number of bears utilizing the area varies by season with the spring seeing the highest density. It has been suggested by local residents that the Environmental Assessment Application for the LNG Canada project reported 21 different grizzly bears and their cubs utilize the Kitimat River estuary. This has not been confirmed, but could very well be true as the tendency for intraspecific conflicts is reduced significantly if food is plentiful. Based on the distribution of forage throughout the year, it's very likely that grizzly use and density is higher in areas at, and west of the mouth of the Kitimat River.

Doug Read has spent many hours over many years taking photographs and taking videos of wildlife within the Kitimat River estuary and suggest that previous to 2016 he has observed approximately 20-25 individual grizzly bears, per year (approx. spring through fall). In 2016 he

observed a significant drop in this number, where he only observed approximately 3 different individual bears. Currently in 2017 Doug has observed and video recorded at minimum 8 different individual grizzly bears. These were seen in four locations including; west of the Kitimat River mainstem; east of the Kitimat River mainstem (and south of the secondary channel that runs northwest to southeast through the bottom of DL 95); along the south end of Strawberry Meadows, and along the western shore of Minette Bay at DL 471 (Read, pers. comm. 2017).

The DOK and the community also asked the following questions.

2. What are their travel patterns?

It is noted that there is a level of uncertainty to the following response given the scope of the assessment, as discussed in question 1.

While not exclusively, many seasonal grizzly trails are located in parallel with landscape features such as drainages, ridges or slope breaks, or along an ecotome (vegetative boundary) and almost always represent the path of least resistance. The location they select for movement will also depend on their sex, age and if they have cubs as intraspecific conflicts may lead the younger bears and females with cubs to select a non-optimal travel corridor to avoid dominant boars.

Within the study area there is no significant topographic variation to suggest ridges or slope breaks might influence movement, but several apparent optimal locations are hypothesized. The most likely path would be along the Kitimat River. Even though there is industrial development in several places, and during the fishing season there can be high densities of humans, there is ample areas adjacent to the river and times of the day when grizzlies can continue to follow the river from above Kitimat town site down to the estuary. Several bear tracks on the 2016 drone aerial photography can be seen moving in the mud and sand beside the Kitimat River.

The second most likely route, and one that personal experience supports, is from the northwest down through the old Methanex property (now LNG Canada property) (Brad Pollard, pers. observ.). Grizzlies have been seen moving south on Beaver Creek and the route follows it downstream to Anderson Creek before moving east into the estuary. Work in Beaver Creek and in the western estuary has identified several mark and rub trees in this vicinity.

The final hypothesized travel route would be parallel to the western edge of Minette Bay. Although video footage of a female and cubs along the western edge of Minette Bay at DL 471 has been noted (Read 2017), the field investigation crew did not observe any significant signs of bear use along the estuarine meadow / marsh in this section of the study area (e.g. no scat or trails). Note that bears are excellent swimmers so that there is a possibility that they arrive in the study area by swimming across Minette Bay. However, how often this occurs, or if it occurs at all, would be very difficult to establish without multiple supporting witnesses.

No major seasonal movement corridors were identified within the MBW area during the field investigations, and it is likely that other movement corridors along the Kitimat Valley are the main migration routes for grizzly bears moving to and from the estuary. However, several game trails were identified within and between suitable habitat areas, and grizzly bear use was documented. These routes may act as secondary seasonal migration routes for some grizzly bears, and likely see daily movement of bears in the spring. Evidence of use also suggests that bears are utilizing existing human footpaths to move through the area.

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3. What is the relative risk to human safety of the three Concept Plan options, is there locations with greater or lesser risk, and what is the likelihood of bear-human encounters in the study area versus other parks in the area, are there methods to reduce risk?

Grizzly bears occur throughout the Kitimat area and can be encountered in all situations including urban areas. Managing human-grizzly encounters is based primarily on keeping humans and grizzlies separated. In an area such as the Kitimat River estuary, this involves keeping humans away from highly valued food sources as well as keeping them away from well-established routes of travel. As indicated, the highest density of high value habitat varies from season to season but tends to focus largely on the area near the mouth of the river and areas in the western estuary. During early spring, other areas associated with the swamp forests can also have heavy use. Travel routes are less well understood but would likely occur within 30 to 50 m of the marine-terrestrial interface and along the Kitimat River.

Considering these factors, it's likely that the trail network proposed in Concept Plan Option 1 has the lowest risk of the three options primarily because it tends to keep as much development and human activity away from areas known for high foraging value. In addition, this area already has the higher human use with industrial activity directly across the bay and access roads to the site. The trail network proposed in Concept Plan Option 2 would have the second highest risk and the trails in Option 3 would have the highest risk.

The likelihood of a bear human encounter is based on several factors including the season, location, activity of the humans, social and emotional status of the bear, activity of the bear, the way the encounter is initiated, and the reaction of the human to the encounter. Concentrated, high density human activity in a single area that can be easily avoided by bears likely provides the lowest risk of a negative outcome. Low density rapid human behaviour in high value foraging areas, such as individuals or couples quietly running a trail with a poor line of sight in early spring near the Kitimat River likely has the highest risk of a negative outcome.

Risks can be managed by ensuring good line of sight on the trails, avoiding high valued foraging habitats and adjacent security areas, having an impeccable and well-managed waste removal program, and potentially closing portions of the area during specific seasons or when bears are known to be present. Dogs should only be allowed off leash in highly developed areas and dogs should be either banned or limited to harness and leash on trails. Multiple warning and other communication schemes should also be considered to ensure that people remain noisy and aware that they are encroaching on high value and high density grizzly bear habitat.

Comparisons with other parks in the area are difficult as these areas have not been thoroughly researched. However, the density of important food sources at an estuary is generally unparalleled in the landscapes of the northwest so that while parks on the Wedeene River or Hirsh Creek likely have grizzlies present during salmon runs, the densities of bears visiting the sites is likely far lower that the Kitimat estuary. The only possible park that may be comparable is Radley Park given that it is low on the Kitimat River. However, this area is so heavily used by fishermen during fishing season that it's likely the area is already avoided. Given that there is a fairly limited access to the adjacent forest, the bears can easily avoid humans.

In general, the field investigation in Phase II of the assessment did not add new information to the inferences from Phase 1 of the assessment discussed above. Changes to habitat suitability

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ratings were minor following field verifications, except for one site, and movement corridors were identified along several of the proposed Concept Plan trail alignments as were expected.

4. What would be the impact of the development of LNG Canada on bear movement and foraging in the MBW area?

Potential for impacts of LNG Canada's development on grizzly bear movement and habitat use are difficult to assess, and would depend on a wide variety of factors. Details about the scale of development, and the pace of development, and the daily operational activities would factor into any analysis, and none of the original work associated with grizzly bears done in conjunction with the LNG Canada Environmental Assessment Application has been analyzed. Given that the impact of Rio Tinto, Methanex (now LNG Canada property), and Eurocan sites does appear to have historically limited grizzly bear access and use, initial impressions suggest that impacts would be limited.

However, if areas proposed for LNG Canada's development coincide with existing forage areas and major seasonal migration routes for grizzly bears, it is possible that construction may displace grizzly bears from these sites. This could result in increased grizzly bear densities in surrounding areas, including the MBW area. Development of trail networks within the MBW area may further increase the potential for use as migration routes if bears are displaced from the LNG site.

5.0 Conclusion and Recommendations

The two DLs being considered for the Minette Bay West Concept Plans and their immediate vicinity both contain significant grizzly bear foraging values and a well-established history of use. Recreational developments in high density grizzly areas are inherently a high risk to both humans and grizzlies unless managed appropriately. Appropriate management is defined as creating situations where the human use of the area does not conflict with grizzly bear use (forage, movement, or cover) and does not create situations where isolated individuals or small groups of people surprise bears.

The following is a summary of the key recommendations in order to avoid or minimize human and bear conflict through Concept Options planning and through management strategies.

Through Concept Plan Options consider:

- **Limiting the extent of proposed trails**. Trails, if any, that are included in the final concept plan for MBW should avoid areas of very high bear habitat suitability. As previously stated, Option 1 trails and amenities presents the lowest risk of the three Concept Plan options, and Option 3 trails the highest risk;

- **Concentrating uses**. Concentrating high density human activity in a single area that can be easily avoided by bears likely provides the lowest risk of conflict and risk of bear displacement from important forage areas;

- **Restricting pet access**. It is recommended that there be no dog off-leash trails in the final Concept Plan. Dogs should be either banned or limited to harness and on-leash

trails, and dogs should only be allowed off leash in highly developed areas of the final Concept Plan; and,

- **Line of sight**. Trails, if any, that are included in the final concept plan for MBW should incorporate good line of sight such that neither bears nor human will be surprised by an encounter. Maintenance of this line of sight will likely require initial vegetation management as well as yearly management in areas dominated by shrubs.

Through management strategies such as:

- **Seasonal closures**. Seasonal closures should be considered for any proposed trail(s) which intersect with high seasonal grizzly bear habitat suitability.

- **Carefully manage refuse**. It is important that a robust and well-managed waste removal program is in place for any of the Concept Plan Options, such that bears will not be attracted to the Concept Plan trails and/or amenities;

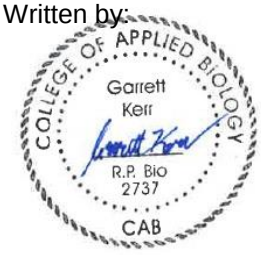
- **Multiple warning and other communication schemes**. Educational signage / programs and warning signage at multiple locations should be considered in any Concept Plan Option to help avoid encounter situations (e.g. bear behaviour information and potentially a sightings reporting and tracking system, and warning signs that remind users of "bears in the area", to remain noisy and that they are encroaching on high value and high density grizzly bear habitat).

In closing, all three proposed concepts for the MBW development area coincide with grizzly bear habitat of high seasonal suitability. Development of recreational components with the lowest footprint situated in and around high value grizzly bear habitat and movement corridors presents the lowest risk of human-wildlife conflict. Limiting potential for human-wildlife conflict may be possible, but will require strict implementation of several mitigation measures as suggested above.

We hope that this report supports the immediate requirements of the District of Kitimat to inform decision making regarding the implementation of the proposed Minette Bay West Concept Plans. Should there be any clarification required please contact the undersigned.

Sincerely,

Written by:



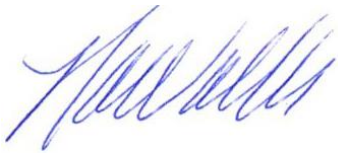
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Reviewed by:



Brad Pollard, R.P.Bio., R.P.F.
Senior Biologist

Reviewed by:



Nicole Wallace, R.P.Bio
Operations Manager

6.0 References

Banner, A., W.H. Mackenzie, S. Haeussler, S. Thomson, J. Pojar and R.L. Trowbridge. 1993. A Field Guide to Site Identification for the Prince Rupert Forest Region. Land Management Handbook No. 26. Ministry of Forests, Research Program. Victoria, BC.

MacHutchon, G. 2007. Mapping Methods for Important Coastal Grizzly Bear Habitat – Draft 2. Contracted report to the Ministry of Environment Lands and Parks, Victoria, BC.

MacKenzie, W.H. and J.R. Moran. 2004. Wetlands of British Columbia a Guide to Identification. Forest Science Program Ministry of Forests British Columbia.

McElhanney Consulting Services Ltd (McElhanney). 2017. Minette Bay West Grizzly Bear Preliminary Investigations and Management Recommendations Associated with the District of Kitimat Minette Bay West Concept Plan. Terrace, BC. 14 pp.

Ministry of Forests and Range (MoFR) and Ministry of Environment (MoE). 2010. Field Manual for Describing Terrestrial Ecosystems, 2nd Edition. Land Management Handbook No. 25. Ministry of Forests and Range, Research Branch and Ministry of Environment, Resources Inventory Branch. Victoria, BC.

Read, Doug. 2015. *Personal video footage of wildlife around Minette Bay*. Recorded July 2015 and 2017.

Read, Doug. June 2017. *Personal Communication*.

RIC (Resource Inventory Committee). 1999. British Columbia Wildlife Habitat Rating Standards. Ministry of Environment Lands and Parks, Resource Inventory Branch for the Terrestrial Ecosystems Task Force. 97pg.

Silverwood (Silverwood Natural Resource Consultants). 2016. Bio-Inventory of District Lot 471 and District Lot 95, Kitimat, BC. In support of Phase 1 of the Minette Bay West Concept Plan. Contracted report to Urban Systems. Vancouver, BC. Pg. 40.

7.0 Attachments

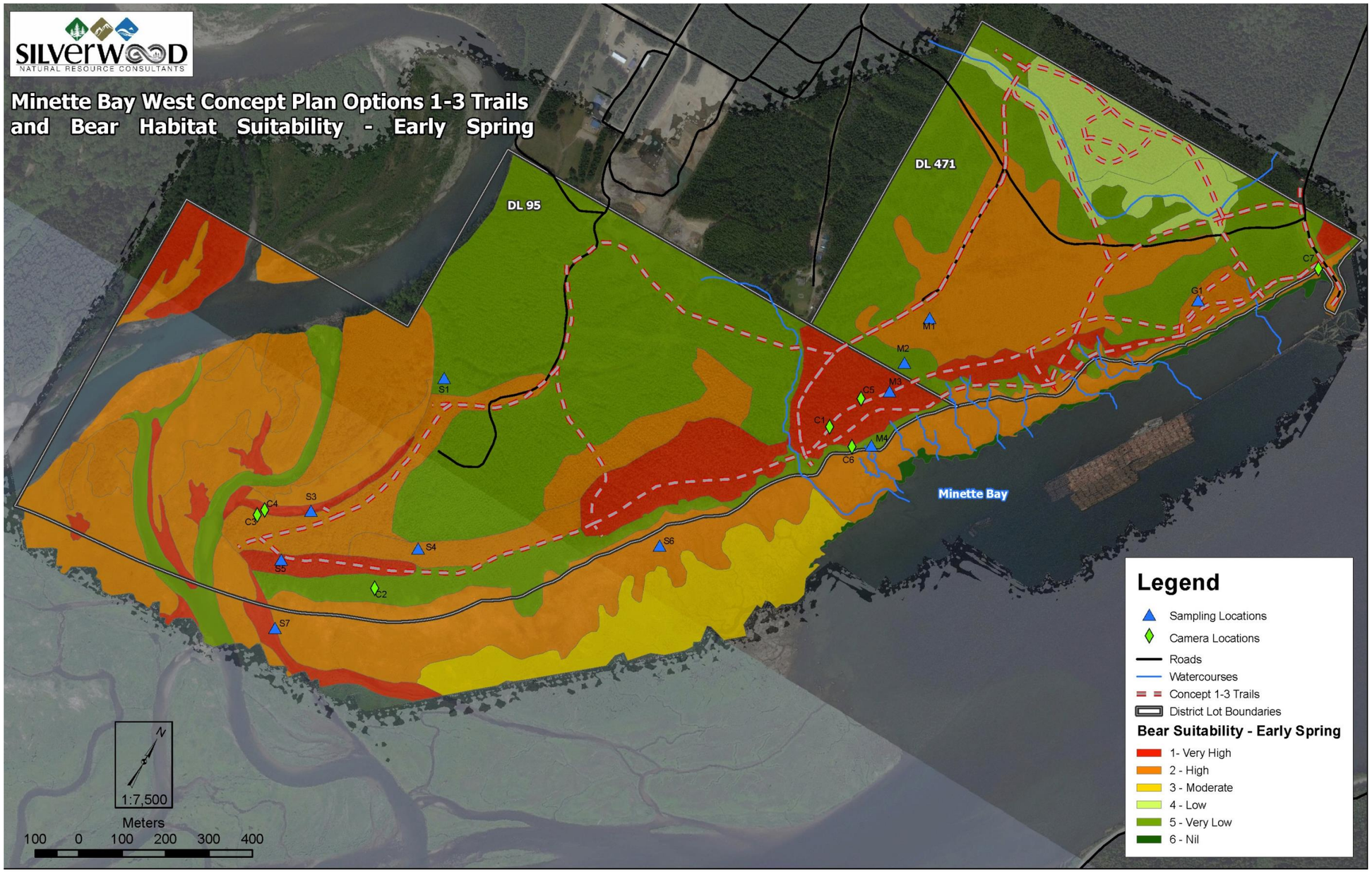
Seasonal Forage (Habitat) Suitability Maps and Concept Plan Options Maps

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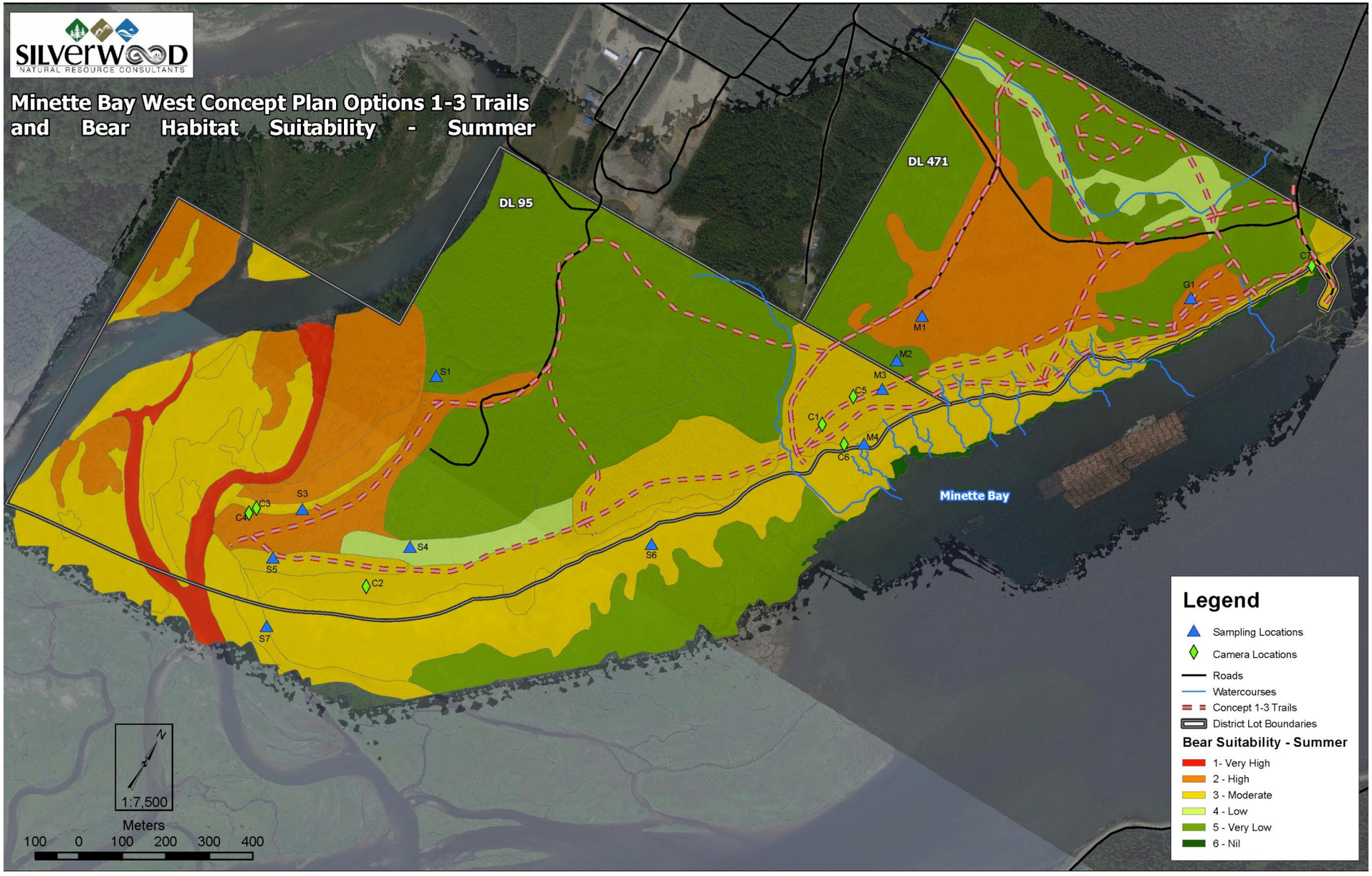
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Minette Bay West Concept Plan Options 1-3 Trails and Bear Habitat Suitability - Early Spring
DL 95
DL 471
Minette Bay
S1
S2
S3
S4
S5
S6
S7
C1
C2
C3
C4
C5
C6
C7
M1
M2
M3
M4
G1
N
1:7,500
Meters
100 0 100 200 300 400
Legend
Sampling Locations
Camera Locations
Roads
Watercourses
Concept 1-3 Trails
District Lot Boundaries
Bear Suitability - Early Spring
1- Very High
2 - High
3 - Moderate
4 - Low
5 - Very Low
6 - Nil



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Minette Bay West Concept Plan Options 1-3 Trails and Bear Habitat Suitability - Summer
DL 95
DL 471
Minette Bay
S1
S2
S3
S4
S5
S6
S7
C1
C2
C3
C4
C5
C6
M1
M2
M3
M4
G1
1:7,500
Meters
100 0 100 200 300 400
Legend
Sampling Locations
Camera Locations
Roads
Watercourses
Concept 1-3 Trails
District Lot Boundaries
Bear Suitability - Summer
1- Very High
2 - High
3 - Moderate
4 - Low
5 - Very Low
6 - Nil

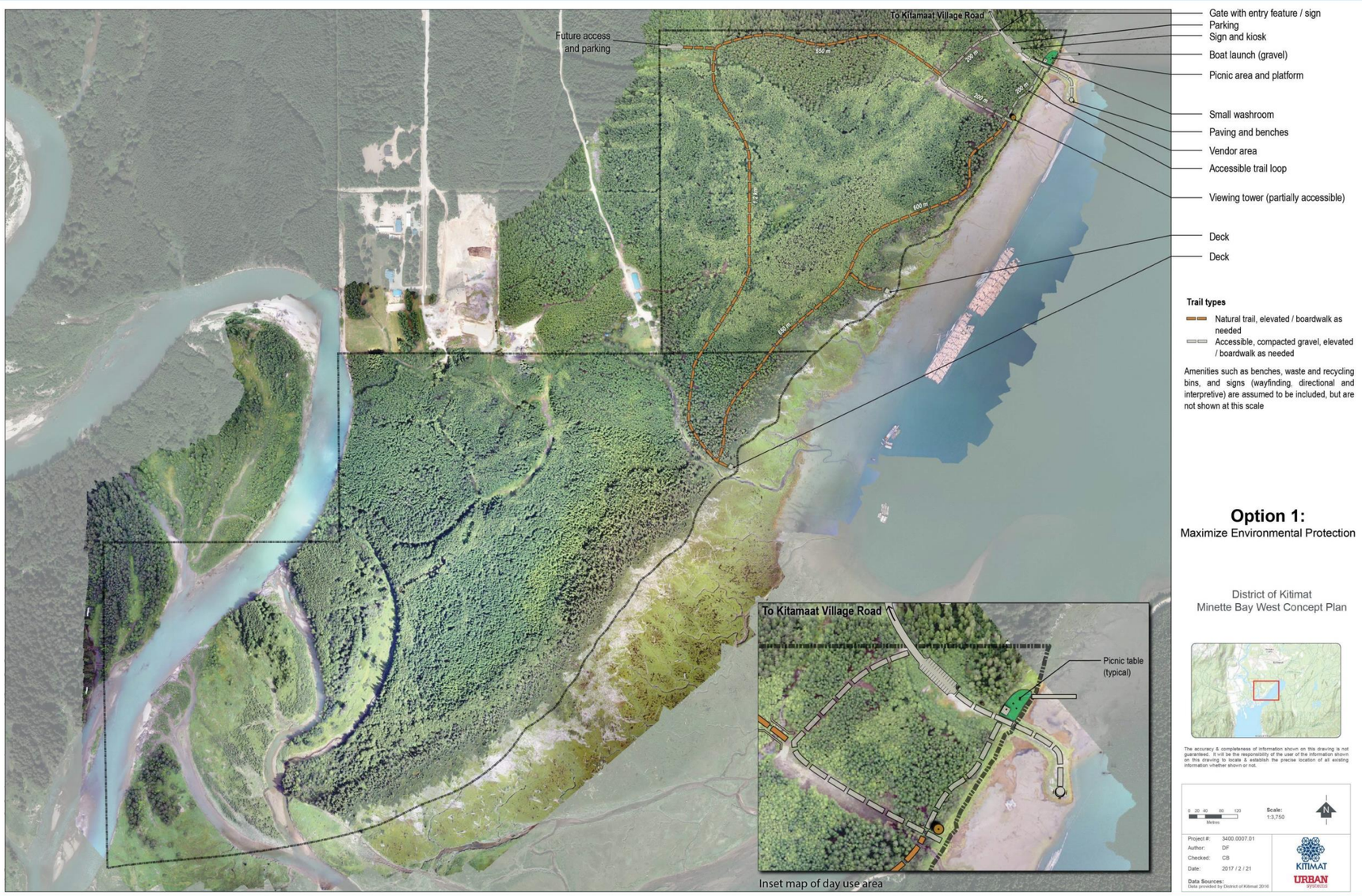


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Minette Bay West Concept Plan Option 1 amenities

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Minette Bay West Concept Plan Option 3 amenities

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