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REPORT ON

ARCHAEOLOGICAL OVERVIEW ASSESSMENT OF TFL 25

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MANAGEMENT SUMMARY

This report describes the results of an archaeological overview assessment (AOA) of Western Forest Products (WFP) Timber Forest License 25 (TFL 25). The study was undertaken by Golder Associates Ltd. on behalf of the Western Forest Products. The project combined the results of two separate AOA studies previously completed by Golder Associates: one for the Central Coast LRMP area, and one for the northern portion of TFL 25. Each of those studies encompassed parts of TFL 25. The present study provides a stand-alone overview and archaeological resource management recommendations for all of TFL 25.

The objectives of the study are to summarize and evaluate existing information on archaeological resources in the study area and to apply a series of predictive models to assist in planning forestry operations such that impacts to archaeological sites are minimized. Since Golder has recently completed an archaeological overview assessment (AOA) of the adjacent Central Coast Land and Resource Management Plan (LRMP) area (which encompasses the southern part of TFL 25) and the North Coast TSA, models created for those projects were reviewed and applied to the TFL 25 study area. Predictive models were developed for coastal and inland habitation sites, and for culturally modified trees (CMTs). The Central Coast models for subalpine camps, trails, pictographs, and petroglyphs were not effective, due to data limitations, and consequently they were not implemented for TFL 25.

Model results were tested by evaluating the degree to which they correctly predicted the locations of the recorded archaeological sites. Since the previous Central Coast and North Coast models were being used, model performance for the TFL was compared against results for the Central Coast LRMP area and the North Coast TSA. The models classified all lands according to a three-part scheme, in which Class I lands are expected to have the greatest archaeological site potential (or highest predicted density and variety of sites) and Class III lauds the lowest. Given the severe terrain of much of study area, it was expected that most areas with moderate to high site potential would be limited to a small portion of the study area land mass.

The models predict that 4.3% of the study area (12,426 hectares) falls within the Class I category (highest site potential), while 23% (62,683 hectares) fall within Class II lands.

This suggests that the vast majority of archaeological sites in the northern TFL 25 area will occur in about 27% of the land mass. Lands predicted to have moderate (Class II) potential for CMT sites are by far the most extensive category of predicted site potential (21.6% of the TFL), and archaeological resource management planning for this land class presents the greatest challenges for forestry operations.

It is recommended that archaeological impact assessments be undertaken in all Class I lands (highest risk areas) prior to any land-altering developments, unless scheduling precludes archaeological work under permit. In those cases, a non-permit reconnaissance could be conducted, although it is cautioned that there is a relatively high probability that the reconnaissance would result in a recommendation for an impact assessment. This would require a return trip and may delay development.

For Class II lands, including those predicted to have only CMT potential, preliminary reconnaissance is recommended to verify the data used in the model and to assess the site potential in the field. Where possible, it is recommended that the reconnaissance be completed under permit, to allow an impact assessment to be undertaken if warranted. Reconnaissance may result in a recommendation for an impact assessment, or no further work may be required.

No archaeological field work is recommended for Class III lands, although it is cautioned that occasional, and possibly significant, sites may be present in those areas. Consistent with the Heritage Conservation Act and Section 51 of the Forest Practices Code, if an archaeological site is encountered during development, it is recommended that all land-altering activity in the immediate vicinity of the site until the Ministry of Forests District Manager, the Archaeology Branch, and local First Nations are contacted to develop a site management plan.

This GIS-based project produced coverages and maps showing areas of predicted archaeological concern at a 1:20,000 scale. Information derived from the study will help Western Forest Products Ltd. to integrate archaeological resource management with other land-use planning decisions so that heritage sites may be preserved or otherwise managed in appropriate ways. The project maps and this report can be used as a foundation for consultation with First Nations and regulatory agencies, with the aim of developing a long-term cultural resource management plan for TFL 25.

CREDITS

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1.0 INTRODUCTION

This archaeological overview assessment (AOA) was commissioned by Western Forest Products Ltd., with funding provided by Forest Renewal B.C., under Ministry of Forests Standards Agreement SBM98711, Activity Number 10493. The objectives of the study were to summarize existing archaeological information for TFL 25 (Figure 1), to assess the archaeological site potential of the TFL, and to provide direction for the management of archaeological resources in the TFL. Information derived from the study will help Western Forest Products Ltd. to work with the Ministry of Forests and First Nations to integrate archaeological resource management into operational planning so that heritage sites may be properly preserved or managed, in accordance with the British Columbia *Heritage Conservation* Act, the *Forest* Act and the Forest Practices Code, and other relevant legislation and protocol agreements.

1.1 Background

In 1999, Golder Associates completed an archaeological overview assessment of the Central Coast LRMP (Golder Associates 1999a). That study encompassed the southern portion of TFL 25 (Figure 2), but did not include modelling of culturally modified trees (CMTs) for the TFL because forest cover data were not provided. A subsequent overview (Golder Associates 1999b) applied predictive models developed in the Central Coast study to the northern portion of TFL 25 (Figure 2). The present study combines the results of the Central Coast and northern TFL 25 overviews, applies the CMT model to the previously un-modelled southern part of the TFL, and provides a foundation for a cultural resource management plan for all of TFL 25.

1.2 Use of Archaeological Overview Assessments (AOAs)

Archaeological overview assessments are planning tools that are designed to help resource managers to account for archaeological sites when making land-use decisions. Through the use of archaeological site potential maps, an AOA attempts to identify locations where archaeological sites are most likely to occur. Overlaying development plans on the site potential maps highlights locations where conflicts with archaeological sites are most probable. The site potential ratings are based on predictive models that are derived from information about aboriginal use of the landscape and the characteristics of documented archaeological sites. The predictive models are not designed to pinpoint

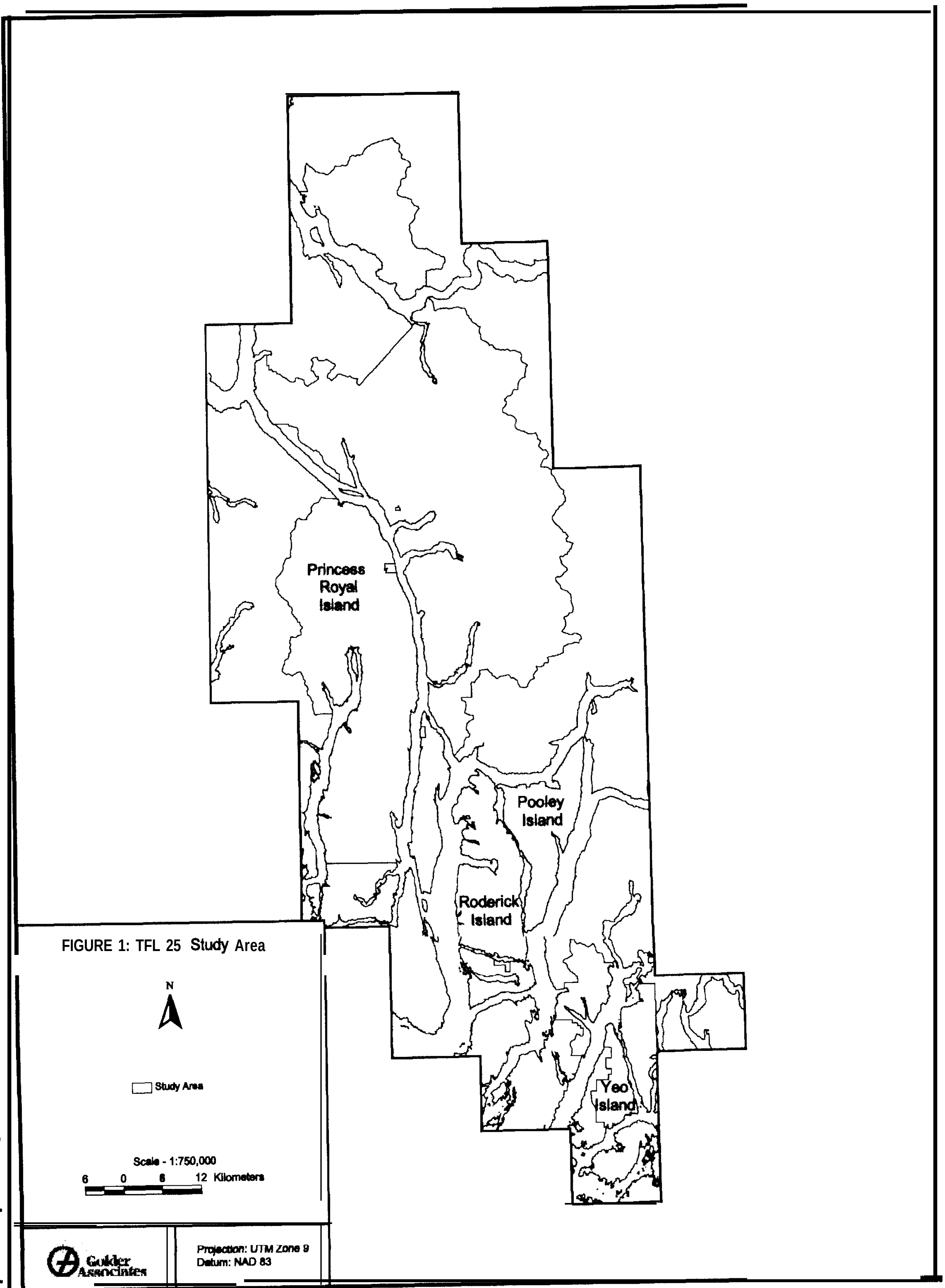


FIGURE 1: TFL 25 Study Area

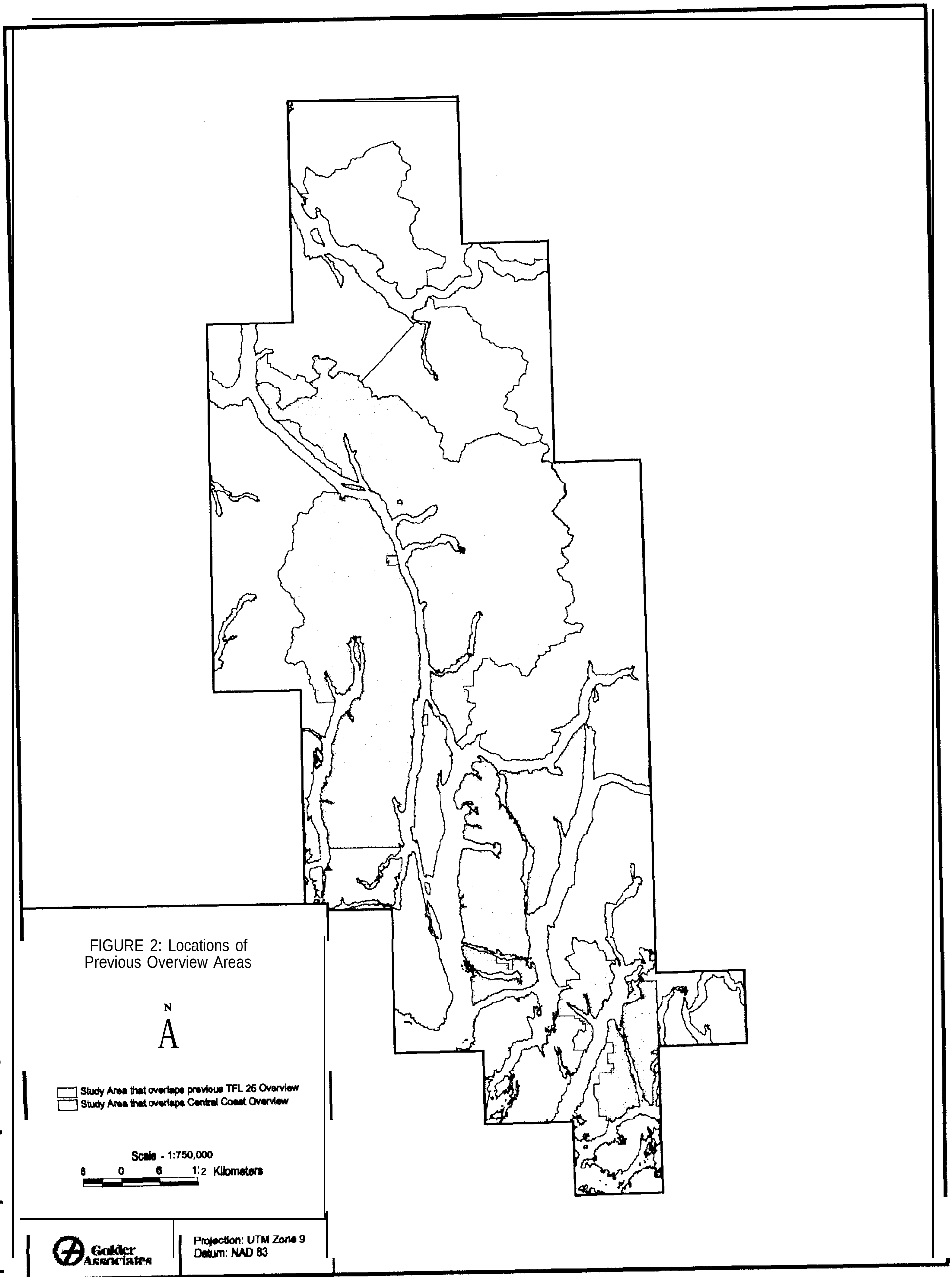


FIGURE 2: Locations of Previous Overview Areas

specific archaeological site locations, but rather to delineate areas where archaeological sites are most likely to be present, preserved, and identifiable, and where field work should be undertaken to locate, record, and evaluate archaeological sites.

An AOA is a useful management tool, but its use should not preclude other information sources (whether supportive or contradictory), including direct consultation with First Nations and the field observations of non-archaeological personnel (e.g., engineers and timber cruisers). This study differs from most broad-scale AOAs in that it did not involve a detailed literature review or community consultation, because these tasks had been undertaken or initiated in previous studies (Golder 1999a, 1999b).

1.3 Study Objectives

The primary objectives of the TFL 25 Archaeological Overview Assessment are:

1. to apply the previously developed CMT model to the entire TFL 25 area;

2. to integrate the GIS predictive modelling results from previous studies pertaining to TFL 25;

3. to produce GIS coverages indicating areas of relative predicted archaeological site potential; and

4. to provide management recommendations for areas of predicted archaeological sensitivity with respect to potential land-altering operations in TFL 25.

2.0 POTENTIAL IMPACTS TO ARCHAEOLOGICAL SITES

A range of forestry-related activities have the potential to damage archaeological sites, and particularly culturally modified trees (CMTs). Direct impacts may include, but are not necessarily limited to, artifact breakage or displacement, destruction of features (including CMTs), and disturbance of stratified deposits. Examples of indirect impacts include increased public access (which may lead to site looting or vandalism, or more gradual impacts from heavy use of an area) and possible increased rate of natural degradation (e.g., increased erosion following vegetation removal). The following sections summarize some of the forest development activities that may affect the integrity of archaeological sites, based in part on discussions by Eldridge (1990) and Mackie and Eldridge (1992).

2.1 Falling

Different logging methods can create varying levels of disturbance to archaeological sites, Since all logging methods will destroy culturally modified trees, this discussion is most pertinent to buried or surficial archaeological deposits and features. Hand falling has relatively little effect on deeply buried archaeological deposits, since subsurface disturbance is limited, but sites with surface components (such as house depressions and artifact scatters) may be damaged. Heavy equipment used in mechanical falling may severely impact archaeological sites or features lying on or near the surface.

2.2 Yarding

With the exception of helicopter logging, yarding activities have greater potential to impact archaeological sites than does falling. A skyline system or standard high-lead yarding may reduce the potential for damage to archaeological sites by lifting logs partially clear of the ground, and a high-lead system is generally preferable to a low-lead. However, the use of heavy equipment at landings associated with this yarding technique can significantly disturb archaeological sites. Grapple yarding with a backspar can further disturb site deposits.

Skidders can cause severe ground disturbance, and even horse skidding can cause some damage to archaeological sites, especially if surficial or above-ground features are present. In general, yarding impacts can be mitigated by operating in archaeologically-sensitive areas when the ground is frozen and (preferably) covered with snow. Horse skidding may offer more flexibility in avoiding visible archaeological features.

2.3 Access Roads

Logging roads, and particularly mainlines, pose one of the most serious threats to archaeological sites because they often cover large areas, and they tend to follow gentle terrain, which often has archaeological site potential (particularly in areas of rugged terrain, such as the north and central coasts of B.C.). Road building severely disturbs the ground, and can completely destroy archaeological sites. In some locations, logging roads have been built over aboriginal trails, and some have destroyed archaeological sites along those trails (Bailey 1995).

Eldridge (1989) showed that road locations tend to correspond more closely with CMT locations than a random sample from nearby areas, and field assessments in the Fraser Canyon support this assertion (Golder Associates 1998). This suggests that ease of access may have been an important factor in aboriginal forest utilization.

A potential indirect impact of road construction is increased public access to archaeological sites. Site vandalism is a serious concern in many regions of British Columbia, and it is an issue of great importance to many First Nations.

2.4 Associated Developments

Ancillary developments, such as log landings and sorting grounds can impact archaeological sites through terrain levelling and heavy equipment traffic. Artifact displacement and breakage are common types of damage associated with these developments Coastal log dumps are usually located on beaches, which often coincide with shell middens, aboriginal villages, or CMT sites. Associated ground disturbance can impact the upper levels of cultural deposits.

2.5 Silviculture

Certain reforestation techniques can be extremely damaging to archaeological deposits. Slash piling using bulldozers and skidders, stump removal, and scarification can severely disturb the ground. Tree planting, thinning, and pruning, in contrast, should have relatively little effect on archaeological sites, as long as invasive site preparation is not involved.

3.0 NATURAL SETTING

3.1 Introduction

A general understanding of the natural setting of TFL 25 is important to archaeological research because cultural adaptations to the environment are reflected in the archaeological record. The location, preservation and visibility of archaeological sites is often directly linked to physical factors such as terrain, climate, proximity to water, and vegetation. The following sections summarize the physical setting of the study area, including descriptions of the location, terrain, climate, sea-level history, and vegetation.

3.2 Location of the Study Area

TFL 25 encompasses approximately 290,370 ha. of land in the Mid-Coast and North Coast Forest Districts, and is located primarily on Princess Royal, Roderick, Pooley, and Yeo Islands, and adjacent areas of the mainland (Figure 1). Portions of the TFL fall within the ancestral territories of the Heiltsuk, Kitasoo, Haisla, and Gitga'at (Hartley Bay) First Nations. There are only fifty-five recorded archaeological sites within the TFL, but significantly larger datasets exist for the broader Central and North Coast areas (Figure 3), and many more sites undoubtedly remain to be recorded in TFL 25.

3.3 Modern Environment

3.3.1 Physiography

Certain archaeological site types, notably occupation sites, are constrained by topography. For example, archaeological and ethnographic evidence indicates that villages tend to be located on well-drained, relatively flat landforms near the coastal shoreline, with easy access by canoe, and often near a source of fresh water. These variables can be used to develop models to predict unrecorded village site locations. However, exceptions are known, and these cases can affect modelling efforts. For example, defensive sites usually have difficult access from the ocean, with a single, easily guarded point of entry. These locations often lack a ready source of fresh water, and drinking water would have been carried in from elsewhere, or collected during rain storms.

Geological processes can also affect site preservation. Certain factors, such as unusually dry or wet soil conditions, can enhance preservation (particularly of organic materials) while other processes such as flooding, erosion, acidic soils, and avalanching can destroy archaeological evidence.

The study area lies within the Hecate Lowland of the Coastal Trough physiographic subdivision, and the Kitimat Range of the Coast Mountain physiographic subdivision (Holland 1976). The Coast Mountains are a rugged, nearly continuous inland range running roughly parallel to the Pacific coast and forming the boundary between the wet coastal zone and drier regions to the east.

One of the most notable geographic features of the Central and North Coast area is its complex system of fjords, some of which are exceptionally long and offer protection from storms and winter outflow winds. On the northwest coast, archaeological remains of village sites and rniddens are common at the sheltered heads of fjords.

Valleys on the western side of the Coast Mountains were occupied by Pleistocene glaciers in excess of 2,000 m thick (Tipper 1971). As the ice moved through existing valleys, it excavated troughs now occupied by rivers, resulting in the present topography of steep mountains with rounded summits, U-shaped valleys, and fjords (Ryder 1978). Many rivers offer abundant fish resources, and archaeological sites associated with fishing, camping, and food preservation may be expected along the rivers.

Extensive icefields and glaciers still remain at high elevations in the Coast Mountains. The major rivers draining these areas have broad gravel floodplains crossed by shifting, braided channels (Ryder 1978). Erosion of river bank archaeological sites may be a problem in these locations.

Within the mountains, thick drift deposits are restricted to the margins of major valley floors and adjacent hillsides (Ryder 1978). On most slopes there are extensive bedrock outcrops and accumulations of colluvium, while gentler slopes may have a thin till mantle. Archaeological sites in these areas, if present, would tend to have shallow deposits. Avalanching is one of the principal geomorphic processes active today on steep slopes at intermediate and high elevations (Ryder 1978). These conditions limit the potential for the presence and preservation of archaeological sites.

3.4 Palaeoenvironment

The natural environment of the northwest coast has changed significantly since the last ice age. Four aspects of the palaeoenvironment are particularly relevant to archaeological site distribution: (1) deglaciation, which dictated when the environment was capable of sustaining human settlement; (2) sea-level changes after deglaciation, which influenced the locations of ancient shoreline sites; (3) changes in the tree line and associated resources, which would have affected high elevation site locations; and (4) the establishment of cedar forests, which contributed to the development of the sophisticated wood working tradition of Northwest Coast First Nations. Each of these factors is discussed below in terms of its potential influence on archaeological site distribution.

3.4.1 Deglaciation

Like most of British Columbia, the northwest coast was covered by ice during the glacial maximum of the Pleistocene approximately 16,000 years ago. According to Clague et al. (1982), the parts of the coastline were buried beneath as much as 2000 m of ice, but glaciers on the outer coast were not as thick (Clague 1985). The retreat of glacial ice began by at least 13,500 years B.P. (Josenhans et al. 1995) and was well underway along the outer islands of the Central and North Coast by about 13,000 to 12,500 years ago (Blaise et. al 1990, Andrews and Retherford 1976). Based on these data, it can be inferred that portions of the coastal fringe and marine islands could have been occupied as early as 13,000 B.P. Localized ice remained, primarily in fjords and valleys, until approximately 10,000 to 11,000 years ago (Clague et al. 1982).

3.4.2 Relative Sea-level

An understanding of changes in relative sea-level over time is important for interpreting early human occupation of the coast. The initial settlement of the New World may have followed a southward route along the edge of the northwest coast, and there is potential for very early sites in this region. Assuming that early coastal cultures relied on the sea for subsistence and transportation, settlement locations would be concentrated along the shoreline (Easton and Moore 1991). The following discussion examines relative sea-levels since the end of the Pleistocene, and the implications for archaeological site distribution,

The term “relative sea-level” is used to distinguish between localized shoreline conditions and global eustatic sea-levels. Relative sea-level reflects a combination of actual sea-level changes and the effect of isostatic rebound (the rising of land that was previously depressed by the weight of ice). Tectonic plate movement is also a minor factor, but it is not considered significant within the time frame discussed here. Because ice build-up was not uniform along the coast, isostatic rebound may have been the primary cause of regional variations in relative sea-level. The magnitude of rebound was greater in the fjords and valleys, where glacial ice was thickest. This means that archaeological sites on ancient beaches or sea terraces generally would be found at higher elevations in the fjords than on the coast, assuming similar site ages.

Relative sea-levels have varied significantly since deglaciation at the end of the Pleistocene (ca. 14,000-10,000 B.P. [before present]), but data specific to the North and Central Coast areas are sparse and localized (Fedje 1997 pers. comm.; Archer 1998). In general, relative sea-levels were lower than today during the late Pleistocene, due to the capture of water in glaciers, and some coastal areas that are currently submerged would have been exposed at that time (Josenhans et al. 1995). Relative sea-levels were significantly higher during the period of deglaciation between about 14,000 and 10,000 years ago (Blaise et al. 1990). The maximum level reached during this time is not known, but marine waters extended much farther inland than today.

On parts of the Central Coast, relative sea-levels dropped dramatically at the onset of the Holocene, and by about 8,000 years ago they had reached a point about 12 m below the present sea-level. Due to isostatic uplift, shorelines along the inland fjord-heads fell rapidly throughout the period (Luternauer et al. 1989). Raised marine features in the study area suggest that this fall in sea-level was not constant, but occurred as a series of alternating periods of relative sea-level stability and rapid isostatic rebound (Retherford 1972:90). According to Andrews and Retherford (1976:349), the present sea-level was established on the North Coast between 8,000 and 7,000 years ago. Between 7,500 and 7,000 years ago, sea-levels rose again — a trend that continued until about 5,500 to 5,000 B.P. Clague et al. (1982) suggest the sea was within 2 m of its present level by 5,000 B.P., and that sea-levels have remained relatively stable since that time with local fluctuations of no more than 1 or 2 m.

Archer (1998) has proposed a sea-level curve for the Prince Rupert area, based on a small sample of dated raised beach deposits and archaeological evidence. A dated beach deposit at Port Simpson shows that 12,400 years ago the sea-level was 50 m higher than today. Between 12,400 and 12,100, the sea-level dropped rapidly to about 13 m above present (a drop of 37 m in only about 300 years). Over the next 3,000 years or so, sea-levels dropped slowly, to a level about 5 m above present by 8,000 years ago. No data are available for the North Coast between about 8,000 and 5,000 years ago, but elsewhere on the coast, the sea-level dropped to slightly below modem levels (Archer 1998). If

Archer's interpretations are correct, then early sites in the Prince Rupert area could be found on sea terraces or raised beaches up to about 50 m above current sea-level.

In contrast, marine deposits radiocarbon dated to about 10,500 B.P. at the heads of fjords in the Kitimat Trough are 200 metres above present sea-level (Clague 1985). This probably indicates significantly greater isostatic rebound in the Kitimat area than in Port Simpson, due to heavier Pleistocene ice loading. Presumably, post-glacial beaches and terraces older than 610,500 years in the Kitimat Trough would be at even higher elevations. These data suggest that late-Pleistocene and early-Holocene archaeological sites, if present, will tend to be at higher elevations in coastal river valleys and fjords than on the coast. For TFL 25, palaeoshorelines may be submerged, or they may exist from just above the present sea-level up to about 200 metres a.s.l.

The high degree of regional variation in sea-level fluctuations creates challenges for archaeological predictive modelling. Based on current data, it is not possible to accurately model palaeoshorelines, and field observation remains the preferred method of identifying these potentially important landforms.

3.4.3 Tree Line

Similar to relative sea-level, vegetation communities have changed significantly since deglaciation in response to climate shifts. Throughout the Holocene, forests have expanded and contracted in response to climate shifts. During cooler periods, the tree line was lower than today, and during wanner climatic episodes the tree line would have been higher than today. Archaeological sites associated with subalpine parklands at the upper forest fringe, if present, may now be in the forest or in the alpine.

Hebda (1995) has used pollen data from sediment cores to reconstruct palaeoclimatic trends for several regions of British Columbia. Although information for the North Coast is limited, data from a core taken from a bog woodland near Mount Hayes near Prince Rupert can be used to extrapolate general palaeoenvironmental trends.

Hebda (1995) suggests that the earliest tree populations on the coast were comprised of an assemblage of pine and alder, which likely colonized alluvial surfaces left by retreating glaciers by about 8,700 B.P. By approximately 8,000 B.P., a moist forest characterized by Sitka spruce and western hemlock was established along the coast. Around 7,000 to 6,000 B.P., peat began to develop on the forest floor and a scrub forest of pine and hemlock began to dominate. By approximately 3,200 B.P., a bog woodland had developed. Hebda (1995) suggests that the dramatic change in vegetation is due to the combined effect of climate and changes in soil conditions.

In summary, Hebda (1995) suggests that the climate on the North Coast between 10,000 to 7,000 B.P. was warmer and drier than current conditions. From between 7,000 to 4,500 B.P., the climate was both wetter and warmer than contemporary conditions and by 4,500 B.P. it was generally cooler. By 3,500 B.P. the climate was similar to modern conditions. Given the limited data used to create this characterization, Hebda (1995) suggests it should be used with caution, However, it highlights some of the limitations in predicting archaeological site types and locations solely on the basis of modem conditions.

3.4.4 Establishment of Cedar Forests

Western redcedar and, to a lesser extent, yellow cedar, have long been the primary materials used by the aboriginal people of the Northwest Coast to build houses and to make canoes, boxes, basketry, clothing and a host of other utilitarian and ceremonial items. However, the establishment of western redcedar and yellow cedar on the North Coast appears to be relatively recent, in archaeological terms.

Hebda and Mathewes (1984) used palaeobotanical data to document the expansion of western redcedar in coastal forests between 6,000 and 2,500 B.P. Their data indicate that cedar found refuge in California during the Pleistocene, and expanded northward during the late Holocene (Hebda 1995; Hebda and Mathewes 1984), but it did not become a major species in the Prince Rupert region until about after 4,000 years ago.

These findings correspond with early archaeological evidence for the development of woodworking technology among aboriginal cultures, which suggests that specialized woodworking tools, such as adzes, were not common until about 3,500 years B.P. on the North Coast (Matson and Coupland. This also corresponds with evidence of the earliest structures found in the province. One of these structures is found at the X̲á:ytem site (DgRn-23), near Mission, B.C. and dates to about 4,700 B.P. (Mason 1994). The oldest plank house documented on the Central Coast is from Milbanke Sound, dating to approximately 2,000 B.P. (Simonsen 1973). Changes in the archaeological record should be recognizable as cedar became central to aboriginal cultures.

3.5 Modern Climate

Climate strongly influences the distribution of plant and animal resources, which in turn affect human subsistence strategies and settlement patterns. These factors should be reflected in the archaeological record in generally predictable ways, at least to the extent that modern resource distributions can be extrapolated into the past.

In general, region is characterized by moderate temperatures, high levels of precipitation and limited sunlight. Temperatures throughout the study area range from moderate to cool, and the mean annual range along the outer coastal zone is the narrowest in Canada at 10" C (Schaefer 1978:6). The Pacific Ocean acts as a reservoir of heat and moisture, cooling air in the summer and warming it during the winter. The study area has high precipitation rates — in excess of 2,500 mm in some areas (Schaefer 1978). Snowfall constitutes a small fraction of annual precipitation at sea-level, but is significant at higher elevations. These conditions are conducive to shoreline habitation, and would restrict the resource capacity of upland areas. Consequently, human use of high elevation locales would tend to be limited and seasonal.

3.6 Modern Biogeoclimatic Zones

Most of the study area falls within the Coastal Western Hemlock (CWH) biogeoclimatic zone, with the Mountain Hemlock (MH) biogeoclimatic zone occurring at higher elevations, and the Alpine Tundra (AT) biogeoclimatic prevailing above the tree line. These biogeoclimatic zones are briefly summarized as follows.

3.6.1 Coastal Western Hemlock (CWH) Zone

The CWH zone covers low to middle elevations throughout the coast, extending from sea-level to about 900 m a.s.l. on windward slopes and slightly higher on leeward slopes (Pojar et al. 1991). This is the wettest and most productive zone in British Columbia in terms of overall biomass (Jones and Annas 1978).

The forests of the CWH zone are dominated by western hemlock and Pacific silver (or amabilis) fir. Other tree species that are commonly found in this biogeoclimatic zone include western redcedar and Sitka spruce. The understory of the CWH zone is generally lush, and contains a number of food species important in traditional First Nations' subsistence, including blueberry, salmonberry, bunchberry, soopollalie (soapberry), wood fern and lady fern. Red huckleberry, stink currant, Nootka rose and prickly rose are also characteristic of CWH.

Aboriginally important mammal species include marten, mule deer, black bear, grouse, mountain goat, and various species of waterfowl. Low-lying areas near tidal inlets are inhabited by sea mammals such as harbour seals and Steller sea lions. Throughout the CWH zone, streams and rivers provide spawning habitat for salmon and other fish, such as eulachon. Intertidal invertebrates are diverse, and include economically significant species such as mussel, cockle, abalone, butterclam and littleneck clam,

3.6.2 Mountain Hemlock (MH) Zone

The Mountain Hemlock (MH) biogeoclimatic zone is characteristic of subalpine areas of the Coast Mountains above the CWH zone, at elevations between about 900 m and 1,800 m in the south, and 400 m to 1,000 m in the north. In general, the coastal subalpine climate of the MH zone features relatively dry, short, cool summers, and very wet, long, cool winters, with heavy snow cover for several months. The deep winter snowpack is slow to disappear, resulting in a short growing season.

Dominant tree species in the MH zone include mountain hemlock, western hemlock and amabilis fir, with western redcedar, yellow cedar and subalpine fir found in smaller proportions. Common shrubs in the MH zone include Alaskan and oval-leafed blueberry, black huckleberry, salmonberry, bunchberry and lady fem. Due to the long period of snowpack, the diversity of animal species is low. Notable mammals include snowshoe hare, black bear, mule deer, Roosevelt elk and mountain goat.

Much of the MH zone consists of steep mountain slopes that place considerable constraints on human occupation. Use of this zone s expected to be short term, focusing on the collection of specific resources.

3.6.3 Alpine Tundra (AT) Zone

The Alpine Tundra (AT) biogeoclimatic zone, which characterizes the highest elevations of the Coast Mountains, consists of treeless meadows, windswept ridges, snowfields and icefields in high elevation mountainous terrain (Pojar and Stewart 1991). The AT zone starts at elevations as low as 900 m a.s.l. along the Central Coast and extends to the highest peaks (Jones and Annas 1978). Harsh conditions prevail in the alpine tundra, and much of this zone lacks vegetation, being typically covered with rock, ice and snow.

The AT zone is by definition treeless, although some species are found at lower elevations in stunted form, the most common being subalpine fir, Engelmann spruce, white spruce, mountain hemlock and whitebark pine. Due to a very short frost-free growing season, lower alpine vegetation is typically characterized by dwarf species such as willow and scrub birch. Mountain heathers, kinnikinnick, lingonberry and bog blueberry grow in moister, snowier regions, and herb meadows are found in drier regions of the lower alpine elevations, where soil depth is sufficient.

Despite the harsh climate and rugged topography, the AT zone provides habitat for several economically important mammal species, though overall species density and diversity is low. Ungulates, including Roosevelt elk, black-tailed deer and mule deer, forage at lower elevations of the Alpine Tundra zone adjacent to Engelmann spruce - subalpine fir zones, and they were traditionally hunted by First Nations in the alpine during the summer. In the driest regions, bighorn sheep and caribou winter on steep south-facing slopes, and some of the densest populations of mountain goat in North America are found in these areas. Other animal species found seasonally in the AT zone include grizzly bear, black bear, golden-mantled ground squirrel, hoary marmot, wolverine, golden eagle and common pika.

4.0 ETHNOGRAPHIC SUMMARY

According to First Nations' Statements of Intent submitted to the B.C. Treaty Commission and additional information provided by Western Forest Products, TFL 25 falls within the traditional lands of the Haisla, Heiltsuk, Gitga'at, and Kitasoo First Nations. The main Gitga'at community is at Hartley Bay, the Kitasoo live at Klemtu, the Haisla are at Kitamaat Village, and the Heiltsuk are in Bella Bella. The Gitga'at and Kitasoo are part of the Southern Tsimshian language group and are politically affiliated with the Tsimshian Tribal Council. The Haisla and Heiltsuk Nations are Wakashan speakers.

While there is considerable cultural variation among northwest coast First Nations, there are many similarities in terms of socioeconomic organization and material culture. Traditional subsistence economies centered on marine resources, such as shellfish, ocean fish, and sea mammals, and on and salmon and eulachon that spawn in coastal rivers. Terrestrial mammals, such as deer, mountain goat, elk, and smaller mammals were also important to the traditional diet, as were terrestrial and marine plants. Hunting tended to be more prevalent among Inner Coast groups, including the Haisla. The dense coastal rain forests have long provided the raw materials for houses, canoes, implements and utensils. Probably the most extensively used traditional plant resource for Northwest Coast First Nations is the western redcedar, its wood being used for house construction and for carving masks and ceremonial regalia, and its bark for making clothing, basketry, rope and other items.

The aboriginal settlement patterns on the central and north coasts revolved around the main villages, which were generally sheltered from strong winter winds and somewhat protected from attack. Village sites were also usually near a source of fresh water and had plant and food resources nearby (Halpin and Seguin 1990).

Throughout the year, small groups of villagers would move to temporary or semi-permanent camps to collect seasonal resources, such as seaweed, eulachon, salmon, roots, and berries. For example, the Southern Tsimshian took part in the annual eulachon fishery on the Nass River between February and April. In the early spring, they gathered and dried seaweed at special seaweed camps along the coast. The Heiltsuk and Haisla had similar seasonal patterns of resource collection. The socioeconomic system was maintained through the potlatch, intermarriage, trade and other means,

Additional anthropological summaries are provided in Golder Associates (1999b, 2000). More detailed descriptions of the Tsimshian can be found in Halpin and Seguin (1990) and the Kitasoo/Xaixais First Nations Resource Mapping Project (1995), the Marius Bar-beau and William Beynon collections (British Columbia Archives and Records Service), and Garfield (1939, 1966, 1984). Ethnographic information about the Heiltsuk is summarized in an archaeological overview of Heiltsuk traditional territory (Millennia

Research 1997), and also in Hilton (1990). Other ethnographic sources include Boas (1928, 1932), Olson (1955) and Storie and Gould (1973). Information on the Haisla can be found in Hamori-Torok (1990), Olson (1940), Drucker (1940, 1950), Lopatin (1945), Robinson (1962), and Pritchard (1977).

5.0 REVIEW OF PREVIOUS ARCHAEOLOGICAL WORK

A review of previous archaeological work in the study area was conducted as background to this overview. The purpose of the review was to identify which portions of the study area have received archaeological attention, and which have not. This information contributes to a preliminary gap analysis - an assessment of how well the existing archaeological inventory represents the entire range of sites that may be present in the study area.

The annotated bibliography of archaeological field research produced by the Archaeology Branch (1995) was consulted to identify overview, inventory, impact assessment and excavation reports conducted by academic researchers and cultural resource management consultants. Archival research undertaken for the previous AOA of the north portion of TFL 25 was incorporated, and consultants reports and published and unpublished manuscripts and articles were also reviewed.

5.1 Review of Archaeological Data

5.1.1 Culture History Sequence

To date there is no well-defined culture history sequence for the North Coast (Fladmark et al. 1990). Archaeological studies that have been conducted in the area have been fairly restricted in scope, with most focusing on Prince Rupert Harbour and the Skeena River. Between 1966 and 1978, 200 archaeological sites were recorded and 11 sites were excavated in the vicinity of Prince Rupert Harbour (Fladmark et al. 1990). Excavations and site investigations on the Skeena have focused primarily on historic occupations, however, two pre-contact sites in the Kitselas Canyon (Gitaus and Paul Mason) have been excavated.

There is some debate as to the earliest human occupation of the Prince Rupert Harbour area. McDonald and Inglis (as cited by Matson and Coupland 1995) suggest a date just

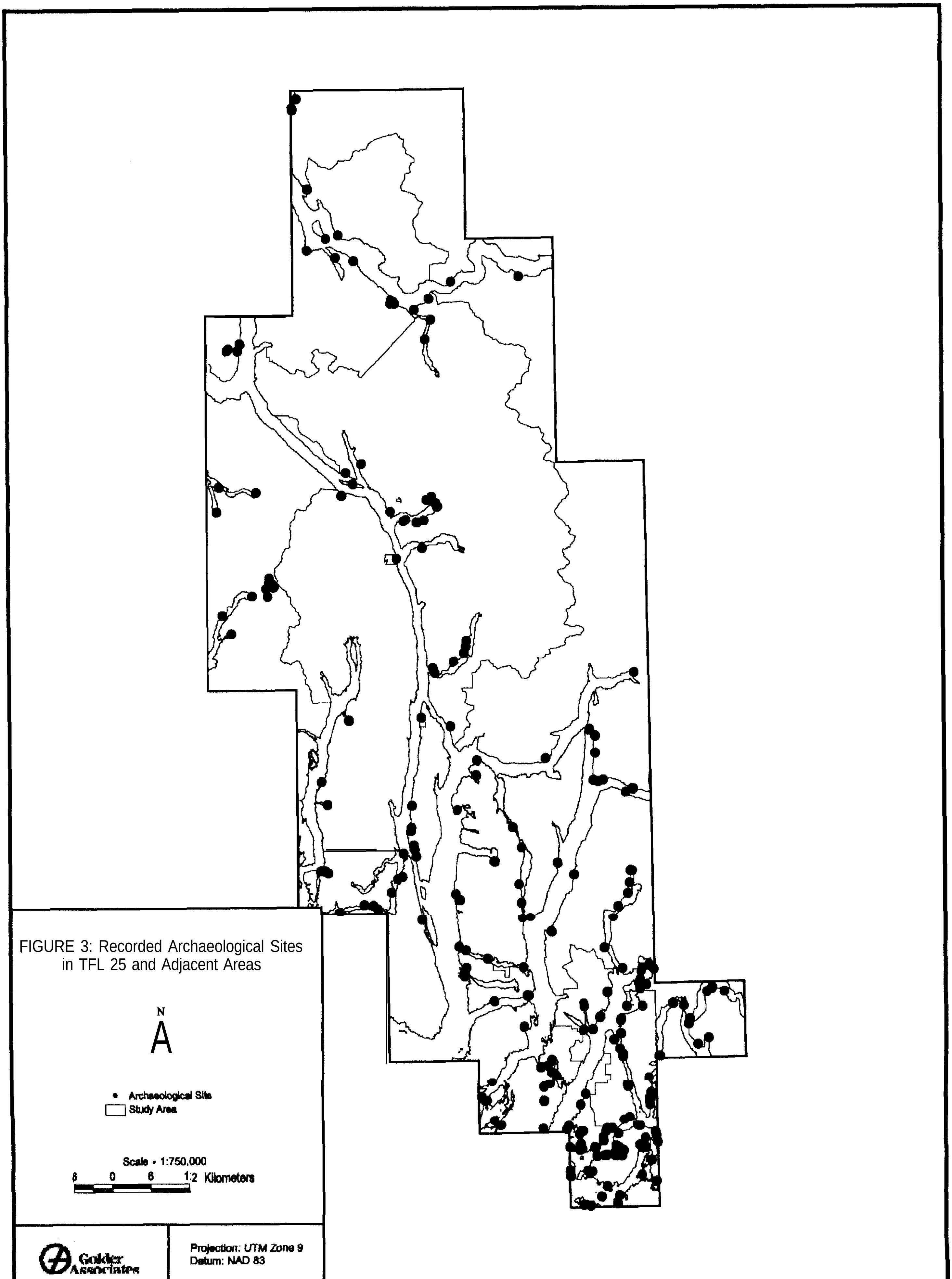


FIGURE 3: Recorded Archaeological Sites in TFL 25 and Adjacent Areas

prior to 5000 B.P., Fladmark (1990:231) states that no archaeological materials that predate 5,000 years B.P. have been recorded on the mainland North Coast, and Ames (1998:686) proposes that some sites may have been occupied before 5,000 B.P. since several have water-logged basal deposits, suggesting that they were initially occupied during a period of lower sea-levels (possibly between 8,000 and 5,000 B.P. in the Prince Rupert Harbour area). However, Ames (1998) noted that possible pre-5,000 B.P. sites have few artifacts or fauna1 remains to support this hypothesis. Fladmark (1990) postulates that the lack of archaeological materials from the area which predate 5,000 B.P. may be due to sea-level changes (i.e. many sites may be either under water or on high terraces now obscured by thick vegetation) or a lack of systematic archaeological research.

Prince Runert Harbour Period III (5000-3500 B.P.)

Deposits dating to Prince Rupert Harbour Period III have been identified at only four of the 200 sites recorded around Prince Rupert Harbour (Fladmark 1990). Shell middens from this period are thin and diffuse. Some fauna1 remains have been recovered from the excavated sites, possibly because middens aid preservation by keeping the soil acidity near neutral. The fauna1 assemblages contain a high proportion of land mammal remains, although fish and sea mammals were also utilized. There is no evidence of house depressions or structures, or of intensive processing or storage of salmon during this period. This, coupled with the absence of midden accumulation, has been taken to suggest a small and mobile population with a "broad-based hunting-gathering-fishing economy" (Fladmark 1990:222).

Prince Rupert Harbour Period II (3500-1500 B.P.)

Prince Rupert Harbour Period II has been split into two sub-phases, the first half dating from ca. 3500 to 2500 B.P., and the second from ca. 2500 to 1500 B.P. Sites that date to the first half of the phase indicate a larger population base and use of a wider variety of local resources. New fishing technology, such as the introduction of net sinkers, suggests an increased importance of marine resources and may reflect exploitation of new marine habitats (Matson and Coupland 1995). Deep, concentrated shell middens appear during this phase, and they contain a greater variety of shellfish and fewer land mammals than those documented for Period I. A seasonal shift, from the diverse resource base at the coast during the winter and spring to the specialized riverine exploitation of salmon in summer and fall, is also apparent during the first half of this phase (Matson and Coupland 1995).

There is considerable evidence of social change during the second half of Prince Rupert Harbour Period II. Indicators of status and increased social organization, including objects of personal adornment and evidence of warfare, first appeared during this phase (Ames 1998; Matson and Coupland 1995). Ornamentation and decoration of utilitarian items in the emerging Northwest Coast art style suggest a structured society which, according to Ames (1998), may have included slaves. The presence of exotic raw materials such as copper and amber indicates a broad trade network was in place at this time. This period is also characterized by the tremendous variety of food resources used; the presence of eulachon at one site indicates that it may have been during this period that the people first began the annual migration to the Nass River to take advantage of the eulachon run (Fladmark 1990:233).

Archaeological evidence indicates that the Prince Rupert Harbour area was occupied year-round, though winter and spring were the major occupation periods. Wood-working tools, such as abrasive stone artifacts used to smooth planks, indicate an ability to build large cedar plank houses similar to those known from the 19th century. Although no direct evidence of large structures has been found (Fladmark 1990:234), the presence of large, deep shell middens and house depressions at some sites, and two small house floors at the Boardwalk site, suggest the use of winter villages during this phase (Matson and Coupland 1995).

Prince Rupert Harbour Period I (1500-150 B.P.)

The most recent pre-contact period, designated the Prince Rupert Harbour Period I, extended from 1,500 years B.P. to European contact in the mid-1800s. While there is general continuity between Prince Rupert Harbour II and I archaeological assemblages, some differences exist. Fladmark et al (1990:234) suggest that an apparent decrease in the rate of midden accumulation during the Prince Rupert I phase may indicate that population levels were stabilizing; another explanation for the slower midden accumulation rate may be a decreased emphasis on sea mammal hunting, as evidenced by a change in sea mammal hunting tackle during this phase (Fladmark 1990:234). The fact that salmon is represented almost entirely by post-cranial elements suggests that they were caught and processed at fish camps and transported back to village for storage and eventual consumption (Matson and Coupland 1995). Matson and Coupland suggest that a dramatic increase in dwelling and household size occurred some time after 1500 B.P. and that large houses belonging to people of high status were present at some locations (1995:280).

5.1.2 Previous Research

Several small-scale archaeological impact assessments have been completed in TFL 25, but most have been located fairly near the coastline. Relatively little is known about inland use, and no detailed excavations or research projects have taken place in the TFL.

Three recent archaeological overview studies have been undertaken in the general vicinity of TFL 25. Golder Associates' (1999a) overview of the Central Coast LRMP area included much of Princess Royal Island, but excluded TFL 25. Commonwealth Historic Resource Management Ltd. and Millennia Research (1996) prepared an overview mapping report on archaeological resource potential in portions of the North Coast Forest District, which included portions of TFL 25, and Golder Associates (2000) updated and enhanced that study, producing an overview and GIS-based predictive model for the entire North Coast TSA. Golder Associates (1999b) produced GIS maps of archaeological potential for the northern portion of TFL 25, Block 5. The Kitasoo/Xaixais First Nations Resource Mapping Project (1995) also produced maps and related information on 96 archaeological sites in Kitasoo/Xaixais traditional territory, to facilitate community and government consultation on archaeological resource management. This study also mapped Kitasoo/Xaixais resource use areas that have not been inspected to determine whether archaeological remains are present.

In 1984, Leen conducted a shoreline survey of Haisla and Gitga'at territory designed to locate petroglyphs and pictographs. The inventory was initiated in response to concern over the reported disappearance of several petroglyph boulders in the Kitkiata Inlet site (FjTh-1). Study objectives were to record and map the Kitkiata Inlet petroglyphs; to locate and record any additional rock art in the area; to consult with the Gitga'at and Haisla to document their concerns regarding rock art in their respective territories; to collect materials suitable for interpretive displays; and to establish priority areas for future work.

The field survey involved judgmental inspection of approximately 619 km of shoreline with the express intention of locating as many sites as possible. The methodology consisted of a boat survey during which one crew member examined the passing rock faces with binoculars. Three previously unrecorded petroglyph sites, one combination petroglyph-pictograph site, and 23 pictograph sites were recorded, bringing the total number of recorded sites to 46 (Leen 1985:8). In addition, the crew spent two weeks at the Kitkiata Inlet site (FjTh-1) where 208 petroglyphs were recorded.

Leen (1985:6) states that inland, sheltered granitic cliffs were prime rock-art locales while the rougher, more exposed rock outcroppings on the outer coast were apparently less favourable. Quentin Mackie (personal communication 1999), a member of the 1985 field crew, also noted that most pictographs were situated in visible locations, on prominent or "cathedral like" rock faces, with rock overhangs and/or light coloured granite faces. According to Leen (1985:6), "pictograph sites appear to be concentrated in the inner coastal areas, with none reported on the outer coast within the project area". However, he cautions against taking this site distribution model too literally and recommends further work to verify pictograph distribution patterning. Leen also notes that a large number of Northwest Coast rock-art sites probably remain unrecorded. Petroglyphs were located primarily via First Nations descriptions and, because they are not readily observable from off-shore, they were not the focus of the survey.

Mackie and Eldridge (1988) undertook a survey of part of Kiltuish Inlet on behalf of Kiltuish Forest Products Ltd. The study area encompassed the shoreline east and west of the mouth of the inlet and both shorelines of the inlet itself, but it did not include the head of the inlet. A high archaeological site potential rating was assigned to those areas that were well-drained, gently sloped and near the shoreline and "as fewer of these characteristics were present, the rated potential was diminished accordingly" (Mackie and Eldridge 1988:4). High potential areas in direct conflict with existing or proposed logging activities received the most intensive field assessment, while high potential areas not in conflict with logging were surveyed as time allowed. Moderate potential areas in conflict with logging were also inspected, though less intensively. Spot checks of moderate potential areas did not extend more than 100 m inland from the shoreline (Mackie and Eldridge 1988:6).

Four previously unrecorded sites were located during the study, including one large and one small shell midden (FiTc-3 and FiTc-2), one petroglyph/historic site (FiTd-1), and a large network of fish traps and weirs (FiTc-4). Both FiTc-3 and FiTd-1 had associated CMT clusters (Mackie personal communication 1999). Mackie and Eldridge (1988: 10) state that FiTc-1 is highly significant because it has deep, largely undisturbed, stratified deposits. The petroglyph at FiTd-1 was also rated as highly significant. Sites FiTc-2 and FiTc-4 were rated as moderately significant.

Recent archaeological impact assessments in TFL 25 have been associated with Western Forest Products' operations. The Bastion Group (1995) inspected four timber harvesting blocks and associated access roads near Watson Bay and Roderick Cove on Roderick Island. The development areas required inspections because they were rated as having high archaeological site potential in an earlier archaeological and traditional use overview assessment (Bastion Group 1994). No archaeological sites were found in the assessed areas.

Impact assessments of 13 proposed cutblocks on Roderick and Pooley Islands identified 45 CMTs that were recorded as 13 separate CMT sites (Millennia Research 1996). The CMT features included taper- and rectangular-stripped cedars, possible stripped hemlocks, and trees with marten trap holes.

Additional impact assessments were completed 1997 and 1998 on Roderick and Pooley Islands (Millennia Research 1998a), in Green Inlet (Millennia Research 1998b) and in Aaltanhash and Klekane Inlets (Millennia Research 1998c). The assessments on Roderick and Pooley islands included 12 proposed cutblocks, two dryland sort areas, three log storage areas, and three segments of access road. Fourteen CMT sites were recorded, consisting of 185 CMTs; one site also contained two canoe runs. CMTs included taper- and rectangular-stripped cedars, planked trees, stump features, and tested trees (Millennia Research 1998a).

In Green Inlet, 14 cutblocks and one log storage area were assessed in 1997 (Millennia Research 1998b), resulting in the documentation of 7 CMT sites and one lithic scatter, which is located on a palaoeshoreline outside TFL 25. In Aaltanhash and Klekane Inlets, 9 proposed helicopter logging blocks were assessed. Eleven CMT sites were recorded, represented by 171 CMTs.

Reports on more recent archaeological assessments in TFL 25 are not yet available from the Archaeology Branch.

5.2 Archaeological Site Types and Distribution

Fifty five archaeological sites have been recorded within the TFL 25 study area. Since so few sites have been recorded in the TFL, site locations and types from the adjacent Central Coast LRMP and North Coast TSA overviews (Golder Associates 1999a, 2000) were used to assist with modelling.

The vast majority of sites recorded on the coast are of aboriginal origin, and they may be of pre-contact or post-contact age. However, it should not be assumed that the existing inventory of archaeological sites accurately represents the entire range of aboriginal uses or archaeological sites of the area throughout history. It is clear from ethnographic reports that many aboriginal cultural practices, for example berry picking and certain ceremonial activities, may not have left material remains that can be identified archaeologically. Moreover, wood, bone, antler and other perishable materials were very important in the traditional cultures of coastal First Nations and, under most soil conditions, these materials are not preserved. Consequently, archaeological sites usually contain only a sample of the materials that were originally deposited. Finally, previous archaeological research has tended to focus on shoreline zones where sites are often highly visible, large, and rich in artifacts. This bias in research design has produced a skewed view of the pre-contact history of the North and Central Coast.

5.2.1 Site Types

A wide variety of pre-contact site types has been recorded on the north and central coasts, the most common being shell middens, habitation sites (including village sites and seasonal camps), rock art (pictographs and petroglyphs), burials, culturally modified trees, fish traps, and canoe runs. Even the limited database of recorded sites in TFL 25 exhibits this variation, albeit in low frequencies. Further systematic archaeological investigation would undoubtedly locate more sites in the TFL.

Table 1 and Figure 4 summarize the existing inventory of archaeological site components on the Central Coast LRMP area, North Coast Forest District, and TFL 25 study area, based on information in PHRD. Figure 5 shows the breakdown of recorded site types in

TFL 25. Some sites have multiple components, so the total number of site components listed in the table is greater than the number of discrete recorded archaeological sites. For example, a large village site could contain a shell midden, CMTs, canoe runs and other site components. It should also be noted that these summaries refer to recorded sites only and, as discussed above, they should not necessarily be taken as a literal interpretation of true relative site frequency.

Table 1 - Summary of the Existing Archaeological Inventory for the Central Coast, North Coast and TFL 25, Showing Site Type Frequency.

Site Type	Central Coast	North Coast	TFL 25
Coastal and Riverine Habitation	1144	273	7
Rock Art (petroglyphs and pictographs)	322	294	9
Culturally Modified Trees	88	30	33
Fish Traps and Weirs	194	78	4
Canoe Runs	24	17	5
Lithic Sites (scatters, quarries)	139	49	0
Historic Sites	127	0	0
Burials	119	0	1

Figure 4 - Relative Frequency of Recorded Archaeological Site Components in the Central Coast LRMP Area, North Coast Forest District, and TFL 25

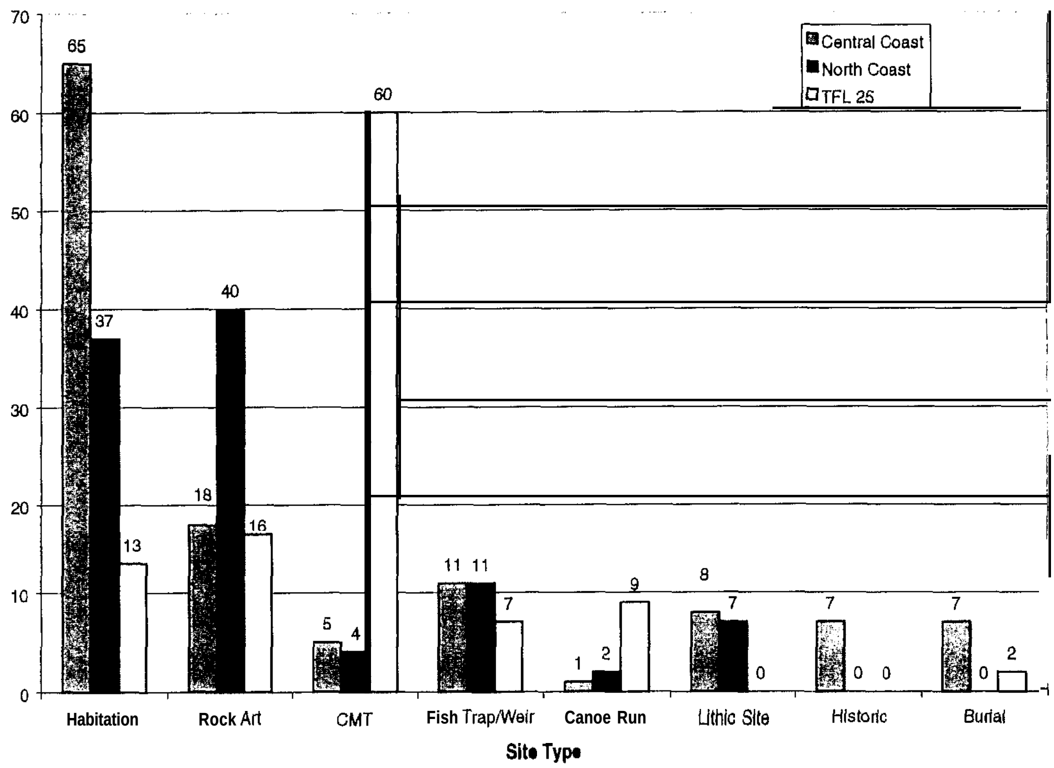
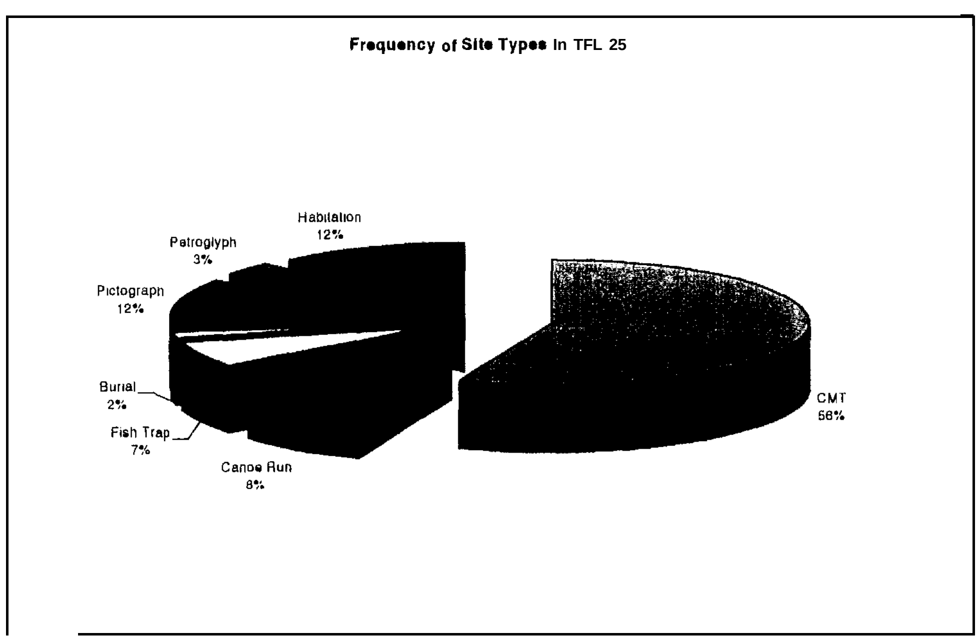


Figure 5. Relative Frequency of Recorded Archaeological Site Components in TFL 25



5.2.2 Habitation Sites

Habitation sites are relatively common on the Central and North Coasts, and a number of distinct sub-types are recognized, based on ethnographic and archaeological information (Chatan et al. 1996). The use of the term "habitation" in recording site types has been somewhat problematic, as habitation sites have been identified on the basis of various types of evidence, (including shell midden deposits, depressions, house platforms, and structural remains) which are not always made explicit. For the purposes of this discussion, the term habitation refers primarily to structural remains, house depressions or platforms and rockshelters associated with village sites and seasonal camps; shell middens are discussed separately below. However, all habitation types (including shell middens) were considered together during modelling, as their general distribution on the landscape tends to be similar.

Habitation styles varied across cultures and over time. Based on ethnographic data on the Tsimshian, Halpin and Seguin (1990) identified a number of structure types reflecting the known pattern of permanent winter villages and seasonal resource camps. Low gabled, cedar plank houses were the most common type of Tsimshian winter dwelling, but various temporary light-framed house types and smoke houses were also commonly used. These temporary dwellings were constructed at both fishing and hunting camps (Commonwealth Historic Resource Management Ltd. and Millennia Research 1996).

Some groups used dry rock shelters as temporary camps and for drying mountain goat meat. Food storage (cache) pits are occasionally found in the vicinity of habitation sites, and some historic era aboriginal sites are associated with root cellars (Hobler 1990).

Few house depressions have been recorded on the North Coast, but small, square houses in the Kitselas Canyon area date to the Prince Rupert Harbour II Period (ca. 3500-1500 B.P.), and similar houses were being constructed in the Prince Rupert Harbour region (Fladmark et. al 1990). Robust woodworking tools typical of those used for the construction of large cedar plank houses have been recovered from Prince Rupert Harbour sites, providing additional evidence for this hypothesis.

Defensive sites are specific types of habitations that are usually located on small islands or peninsulas with steep cliffs and a single access corridor. Although there may be exceptions, defensive sites typically do not show evidence of long-term intensive habitation, and they are believed to have been used as areas of refuge during times of siege. On the North Coast, trauma noted on skeletal remains indicates a high level of warfare, which may have required the establishment of defensive sites.

5.2.3 Shell Middens

Shell middens sites most often represent household refuse deposits resulting from the extended use of a habitation site, but they may also indicate non-habitation areas used intensively for harvesting and processing shellfish. On the Central Coast, the primary component of middens is shell, generally dominated by clam species, followed by mussels and other species such as whelk (Hobler 1988). Other common constituents of habitation-related midden deposits include animal and fish bone and fire-cracked rock. The midden soil matrix is typically highly organic, black, and greasy, with a high ash or charcoal content.

On the outer Central Coast, middens are often large (greater than 25 cubic metres) and may contain over 2,000 cubic metres of cultural material (Hobler 1990). With the exception of large middens in Kwatna Bay and at Namu, the size of middens and the amount of shell they contain tends to decrease as one travels into the fresher waters of the inner coast (Hobler 1970, 1990). This pattern is mirrored at settlements on the North Coast and inland on the banks of the Skeena River. Inland sites such as the Paul Mason and Gitaus sites, contain artifact assemblages indicative of a seasonal occupation, possibly as coastal peoples moved inland to use riverine resources (Fladmark et. al. 1990). Artifacts include chipped stone tools, ground stone net weights and cobble tools. Settlements associated with middens, especially those occupied during the windy winter season, were often located near sources of fresh water, in protected locales suitable for beaching canoes (Hobler 1988).

In their description of two midden sites (FiTc-2 and FiTc-3) in Kiltuish Inlet, Mackie and Eldridge (1988) note that 90% of the matrix is composed of crushed mussel shell, cockle, marine snail, barnacle and charcoal. A small portion of the midden consists of fire broken rock. In addition, they note that, unlike many other shell middens, fish and mammal bone are not present in large numbers. In the Prince Rupert Harbour area however, shell middens indicate a broad hunting-fishing-gathering subsistence base, characterized by shifting focus on various resources throughout time (Fladmark et al. 1990).

Midden deposits are frequently found in association with other archaeological components, such as house platforms, burials or canoe runs. The size of a midden is widely assumed to reflect the length or intensity of occupation. While there is clearly some correlation between midden size and duration of use, Hobler (1990) notes that, in the Bella Bella area, important ethnographically-known winter villages tend to have small, shallow midden deposits, while ethnographic information is sparse for the largest and deepest middens. One explanation for this discrepancy is that the largest middens represent intensive marine resource collection sites that were not used as habitations. Alternatively, this pattern may reflect changes in village locations following European contact, in response to disease and changing subsistence and exchange systems.

Due to their inferred use as refuse dumps, artifacts (typically broken) are often recovered from shell middens, although artifact densities tend to be low. The number of excavated artifacts varies greatly between middens, but in some cases artifact totals can be exceptionally high. Because of the range of materials encountered and long periods of deposition, shell midden sites can be important for the development of cultural chronologies. The possibility of discovering temporally diagnostic artifacts in datable stratigraphic contexts makes middens an extremely significant site type.

Human remains are also often associated with shell midden deposits, indicating that not all middens are refuse dumps. Carlson (1998) suggests that shell or shellfish may have been used as offerings to the dead, and that some shell middens should be considered sacred sites.

Seven habitation sites have been recorded in TFL 25, six of which have hell midden components. Additional field inventory would almost certainly locate additional habitation sites in the TFL.

5.2.4 Wet Sites

Wet sites are rare, but they may be found in locations with permanently high water tables, for example in or near the ocean, lakes, rivers, or wetlands. Inundation creates an oxygen-free environment that can allow preservation of normally perishable materials, such as wood or plant materials. Considering the ethnographically-documented predominance of wood and plant fibres as raw materials in traditional First Nations cultures, wet sites may be of great significance in reconstructing past cultural patterns. For example, the late precontact period village midden at Axeti in Kwatna Bay contained a water-logged component in the intertidal zone that yielded braided rope, woven mats and wooden wedges (Hobler 1976, 1990). The mud at Axeti contained twice as many artifact types as adjacent non-waterlogged midden deposits, illustrating that stone artifacts found in most archaeological sites are not representative of entire assemblages. Within the TFL 25 study area there is some potential for wet-sites to exist in mudflats, such as at the end of Kiltuish Inlet, although no wet sites have been recorded to date.

5.2.5 Rock Art (Pictographs and Petroglyphs)

Two distinct types of rock "art" are found on the Central and North Coast: pictographs (images painted on a rock surface, usually with red ochre pigments) and petroglyphs (images carved or pecked into a rock surface, sometimes enhanced with pigments). Recorded pictographs are far more common (n=265) on the Central Coast than are recorded petroglyphs (n=59). Interestingly this pattern is reversed for the North Coast Forest District Study area where petroglyphs (n=223) outnumber pictographs (n=71) (Commonwealth Historic Resource Management Ltd. and Millennia Research 1996). There are nine rock art sites recorded in the TFL 25 area, of which seven are pictographs and 2 are petroglyphs. Additional sites of both types probably can be expected in the TFL.

Pictographs are usually situated in highly visible locations such as prominent bluffs on the ocean. Petroglyphs have been recorded in a variety of locales, including villages, intertidal bedrock outcrops, and isolated ritual bathing areas. Common motifs include zoomorphic, anthropomorphic or geometric symbols, such as animals, fish, whales, human figures, circles, coppers, and masks. Lundy's (1974) thesis on Northwest Coast rock art synthesized data from over 600 rock art sites and found that some designs were unique to the coast, while others showed similarities with neighbouring culture areas, including the Interior Plateau.

The function of Northwest Coast rock art is not well understood and little traditional knowledge about these types of sites has been recorded. The carvings and paintings may be of a ceremonial, spiritual or commemorative nature, they may record important cultural events and natural phenomena, or they may define traditional rights and ownership of economically valuable territories.

Dating of rock art is problematic, and dating techniques have not been widely applied on the Northwest Coast. Petroglyphs are often assumed to have the potential to represent a greater time depth than pictographs due to preservation factors (Wilson 1995). No studies have been undertaken in British Columbia to test this assumption and little is known regarding possible functional, temporal or cultural differences between pictographs and petroglyphs. Hobler (1988) speculates that much of the apparent stylistic difference between pictographs and petroglyphs may be less a function of age than the result of limitations inherent in the different media. A small number of recorded petroglyph sites appear to depict European sailing ships, indicating that the practice of rock carving persisted into post-contact times.

5.2.6 Burials

Pre-contact and early post-contact burials have often been recorded as archaeological sites. Various burial patterns are known on the Central Coast, differing according to cultural group and time period. Hobler (1988) observed that aboriginal burial practices in the Bella Bella region changed through time. Some of the main Heiltsuk burial locations include shell middens, caves or rockshelters, islets, trees, and burial grounds or cemeteries. Another type of feature associated with burials is the mortuary pole. Burton (1986) noted eight burial sites with mortuary poles in the Bella Bella area. For the Haisla, wooden monuments on graves were traditional and these monuments continued even after Christian grave interment practices were adopted (Hamori-Torok 1990).

A great deal of research has been conducted with regard to Tsimshian burial practices. Most of the burials investigated were interred in shell middens. Cybulski's (1972, 1975,

1978) analysis of the burial complex in the Prince Rupert Harbour area revealed that complex social systems and trade networks were in place by at least 2,500 years ago.

Partly because soil conditions in middens are relatively favorable to the preservation of bone, excavations at some early pre-contact shell middens have recovered human burials. Few midden burials are known for the inner Central Coast, and evidence of midden burials more recent than about 1,500 B.P. is extremely rare in all areas (Hobler 1988). Since that date, the disposal of the dead tended to take place in isolated areas, such as in rockshelters, in trees or on islets, within one or two kilometres from villages. Although these types of burials tend to be correlated with habitation sites, the association has not been systematically studied.

Burials in caves or rockshelters typically consist of several individuals placed in grave boxes. These boxes may be of traditional adzed cedar construction or they may show European influence in design and construction, such as the use of metal tools and nails. While cave and rockshelter burial sites are largely of pre-contact age, this form of interment definitely continued for some time into the post-contact period.

Tree "burials" are similar to rockshelter burials in that the remains were typically placed in cedar boxes, then positioned in trees or on raised platforms. When the box or tree decayed, the remains scattered on the ground below. Preserved evidence recovered from rockshelter and tree burials indicates that these practices are at least 500 years old, although they may be much older (Wilson 1995).

Early historical burial grounds consist of wooden grave structures within which the deceased were placed in boxes. Two main types have been recorded: log cribhouses of traditional design, and grave structures of European-influenced construction that resemble miniature houses with milled lumber and windows (Burton 1986). Traditional cribhouses were constructed of logs piled on four sides. They are much less common and their state of preservation suggests that they predate the European-influenced grave structures, indicating the retention of traditional burial patterns after contact. The Haisla, for example, continued to place traditional wooden monuments on graves, often atop European marble headstones.

5.2.7 Culturally Modified Trees

Since the late 1980s, and particularly in the 1990s, considerable research has focused on the analysis of culturally modified trees (CMTs). A CMT is usually defined as "a tree that has been altered by native people as part of their traditional use of the forest" (Ministry of Forests 1997). The most common types of CMTs are bark-stripped trees and aboriginally logged trees. Bark stripping involved the removal of sections of outer bark, usually from cedars, for use as a raw material. Aboriginally logged trees were fully or partially felled to provide wood for the construction of houses, canoes, and other items. Tall stumps can also indicate aboriginal logging.

Specific scar patterns, tool marks and morphology are used to identify and assess CMTs. Bark stripped trees may have a long continuous tapered strip or a rectangular section removed, or they may be girdled by the removal of bark around the entire circumference of the tree. Aboriginally logged trees include planked trees, sectioned trees, canoe trees, undercut trees, trees tested for heartwood soundness, notched trees and felled trees (Mobley and Eldridge 1992; Ministry of Forests 1997). Other types of CMTs include sap, pitch or kindling collection trees; delimbed trees, blazed trees, and dendroglyphs (carved trees) and dendrographs (painted trees) (McRanor 1997) - sometimes incorrectly labeled 'arborglyphs/ arboriglyphs' and 'arborgraphs/ arborigraphs' (e.g., Eldridge 1991, Ministry of Forests 1997).

Little research has been undertaken regarding the association of CMTs with other site types, however, CMTs may correlate with villages, middens and trails. CMTs are often identified near the foreshore area, but have also been recorded several kilometres inland, and on landforms ranging from flat beaches to steep slopes. Both red and yellow cedar, as well as hemlock were commonly used; however, almost all recorded CMTs are western redcedars. CMTs are most commonly found in stands of old growth forest.

Dendrochronology (tree-ring dating) is used to date CMTs, and this technique sometimes reveals scars that have completely healed over. At present, the oldest reported CMT date in British Columbia is AD 1467 (Eldridge and Eldridge 1988; Ministry of Forests 1997), but aboriginal forest utilization undoubtedly predates this. Since CMT dating is completely reliant on the survival of the tree itself, and few species live longer than a few hundred years, direct evidence in the form of CMTs is limited to perhaps the 1,000 years.

There are 33 recorded CMT sites in TFL 25, but additional sites are known to exist. Western Forest Products has identified a number of CMT sites, and has modified their operations to avoid them, in consultation with First Nations. These sites have not been officially recorded and added to the Provincial Heritage Register.

5.2.8 Fish Traps

Stone wall or wooden weir fish traps were typically built at the mouths of streams or rivers to catch spawning salmon or in the intertidal zone to capture other fish feeding near shore. Stone fish traps consist of loosely piled rock walls, sometimes showing complex histories of repair and expansion. Some stone wall traps may have incorporated additional perishable components such as stakes, nets or basket traps.

Fish weirs commonly consist of a line of wooden stakes protruding above the river floor and are thought to have been designed exclusively to trap spawning salmon (Hobler 1990). Due to their perishable nature and their use in highly dynamic riverine environments, fish weirs may be under-represented in the archaeological record. Stone wall fish traps are usually located in the intertidal zone and are exposed only at low tide, while wooden stake fish weirs may be found in the intertidal or in the lower reaches of rivers.

Hobler (1988) observed that all recorded fish traps on the Central Coast occur at elevations within the range of normal tides, and that the walls appear to have been kept intentionally low in order to maximize the number of times they were exposed and covered during normal tidal cycles. By comparing the distributions of stone wall fish traps and wooden fish weirs, Hobler (1988) was able to distinguish distinct patterns. He found that stone traps were found in relatively protected locations and were associated with the smaller streams common on the outer coast. In contrast, on the inner coast, where rivers are larger, stone traps were replaced by wooden weirs.

In another study, Pomeroy (1976, 1980) analyzed the locations of stone wall fish traps in the Bella Bella region and identified two types: fish traps built in the tidal reaches of small streams, and those built on beaches not associated with a nearby stream. Stream traps were the most common type and were used to capture salmon entering creeks to spawn. Beach traps, consisting of long walls that follow beach contours, were used to capture any species that came in to shore at high tide to spawn or feed.

Hobler (1988) further found that fish traps and shell middens are mutually exclusive in their distribution in the Hakai area. The reason for this is not understood, but it may relate to the differential distribution of fish and shellfish resources. In comparison with shell middens, fish traps are more widely dispersed and are found in a wider range of locales. In TFL 25, four fish trap sites have been recorded, but no fish weirs have been documented. None of the recorded fish trap sites have associated shell midden deposits.

5.2.9 Canoe Runs

Canoe runs consist of long narrow beach areas cleared of rocks and debris to facilitate the landing of canoes. Hobler (1988) found that the runs averaged about 8 metres long and 2 metres wide and varied from simple rough clearings to carefully constructed runs. He observed that while the majority of canoe runs in the Hakai area were associated with middens or other evidence of settlement, one example provided access to an area that had been intensively used for bark stripping and another appeared to have been strategically located to allow residents of a nearby village to avoid paddling into exposed rough winter waters. Five canoe run sites have been documented in TFL 25. One is associated with a CMT site, and another with a habitation; the remainder are recorded as single component canoe run sites.

5.2.10 Lithic Sites

While lithic artifacts and debitage are commonly recovered from previously discussed site types such as middens and habitations, other sites are defined primarily as lithic scatters. These sites may reflect quarry areas, stone tool manufacturing or maintenance sites, or hunting locales. Lithic sites can be extremely significant, in part because the durability of lithic artifacts presents the potential for the survival of very old specimens. In addition, stone tool manufacturing techniques underwent stylistic changes over time for which specific chronologies have been constructed. Unfortunately, many lithic scatter sites are isolated or surface finds, which makes them difficult to date or interpret. Lithic sites have been found at all elevation ranges on the Northwest Coast, from intertidal beaches to obsidian quarries in alpine areas of the Rainbow Range (Apland 1979).

Two specific types of lithic sites are believed to date to the earliest known periods of human occupation on the Central Coast. Intertidal lithic sites and elevated lithic sites are thought to relate to periods of lower and higher sea-levels following deglaciation of the Central Coast. Elevated lithic sites in the Bella Coola region have recently been found at elevations as high as 200 metres above sea-level (Hobler 1995). Sites of this type are also thought to be very old, dating to periods of higher sea-levels, perhaps 10,000 years ago.

Intertidal lithic sites often contain chipped (rather than ground) stone material, and therefore they are believed to be relatively old (Apland 1977). These sites are found on the middle and outer coasts, and they are interpreted as the remains of cultural deposits from periods of rising sea-levels, perhaps 2,000 or 3,000 years B.P., according to Hobler (1990).

Lithic artifacts manufactured from obsidian (volcanic glass) are useful for reconstructing prehistoric trade patterns. The composition of the trace elements in obsidian varies according to its source and can be "fingerprinted" using X-ray fluorescence analysis (Nelson, D'Auria and Bennett 1975; James et al. 1996). Using this technique, archaeologists determined that obsidian recovered from the Early Period component at the Namu site was from a source in the Rainbow Range some 120 km away, suggesting that regional trade networks were already in place at that time (Carlson 1996). Obsidian is also present in most North Coast assemblages from the earliest known Prince Rupert Harbour deposits (5000 to 3500 years BP) to those that date to the mid 1800s. The presence of obsidian is thought to mark an established trade system on the Coast (Fladmark et. al 1990).

5.2.11 Post-Contact ("Historic") Sites

While all archaeological sites relating to human activities since the period of contact between First Nations and European cultures are commonly termed "historic", the term is most often used to refer specifically to sites of non-aboriginal origin or to aboriginal sites containing manufactured trade goods. This does not, of course, imply that earlier aboriginal cultures lacked a history, and many archaeologists use the term "post-contact" to refer to historic period sites.

Typical post-contact sites found on the Northwest Coast include structures (e.g., forts, cabins, mills, barns, canneries), trails, shipwrecks, rail lines, hunting features (e.g., traps), mining features (e.g., mineshafts or tailings piles), and logging features (e.g., flumes). Archaeological techniques supplement documentary evidence to enhance our understanding of the past. For example, using historical documentation to supplement archaeological investigations, Hobler (1990) identified a beach clearing in Restoration Bay on Burke Channel that may have been intended for careening Captain George Vancouver's ship Discovery. The clearing corresponded with written accounts that the ship was to be repaired while in the bay.

None of the 55 archaeological sites recorded in TFL 25 are listed as historic sites.

5.3 Site Distribution

The following section presents a discussion of site distribution, based primarily on data for the Central Coast. Some distinct site distribution patterning may be expected in the TFL 25 area, due to the Southern Tsimshian's annual journey to the Nass River to fish for eulachon, and the Haisla's reported greater dependence on land mammal hunting.

5.3.1 The Existing Archaeological Site Inventory

Archaeological research design biases and changes in site recording standards are clearly indicated in the current site inventory. Varying field techniques and different levels of intensity have been employed in different areas. For example, early inventories tended to focus on shorelines, with few forays inland. Leen's 1984 rock art survey, for example focused only on pictograph and petroglyph sites. Many early studies relied heavily on informant testimony to locate a large number of sites as quickly as possible. These surveys would be biased toward large, relatively recent, ethnographically-known sites, such as late pre-contact or early post-contact villages, at the expense of earlier sites or those with more limited use or visibility. Burton (1986) notes that the use of informant testimony was likely a factor in the observed clustering of sites in the Bella Bella area, on the assumption that informants would be more familiar with locations near their homes.

A further problem that has probably skewed known site distributions toward over-representation of shoreline versus inland sites is the fact that prior to the early 1990s, CMTs were not consistently recorded as archaeological sites. The recent focus on cultural resource management, including intensive survey for CMTs in advance of forestry operations, has begun to produce a substantial body of information on CMT types and distribution in a short time period. However, few previously recorded non-CMT sites have been revisited to determine whether CMTs are also present. During this study, three previously unrecorded CMT sites were added to the GIS database, using information provided in impact assessment reports tat pre-date the inclusion of CMTs as archaeological sites.

Changing sea-levels, the decomposition of perishable archaeological remains, and other natural and cultural transformation processes have also affected the preservation and visibility of archaeological sites. These factors have combined to produce an archaeological site register that is strongly skewed to coastal locales. Figure 6 shows the locations of all recorded sites in TFL 25.

Chatan et al. (1996) noted some general patterns in the distribution of archaeological sites in the Central Coast region. The outer coast is characterized by large shell midden deposits with relatively uniform site distributions, In contrast, site clustering at river mouths and other landforms that interrupt the steep fjord topography, is marked on the middle and inner coasts. Burton (1986) observed site clustering in the Bella Bella area and speculated that this was representative of actual pre-contact and post-contact population distributions, such as the grouping of early historic populations around Fort McLoughlin and Old Bella Bella. She also observed that all of the historic burial grounds are in close proximity to Bella Bella (representing the amalgamation of historic native populations), and that burial sites located further from Bella Bella are all caves or rockshelters, suggesting that they may be older.

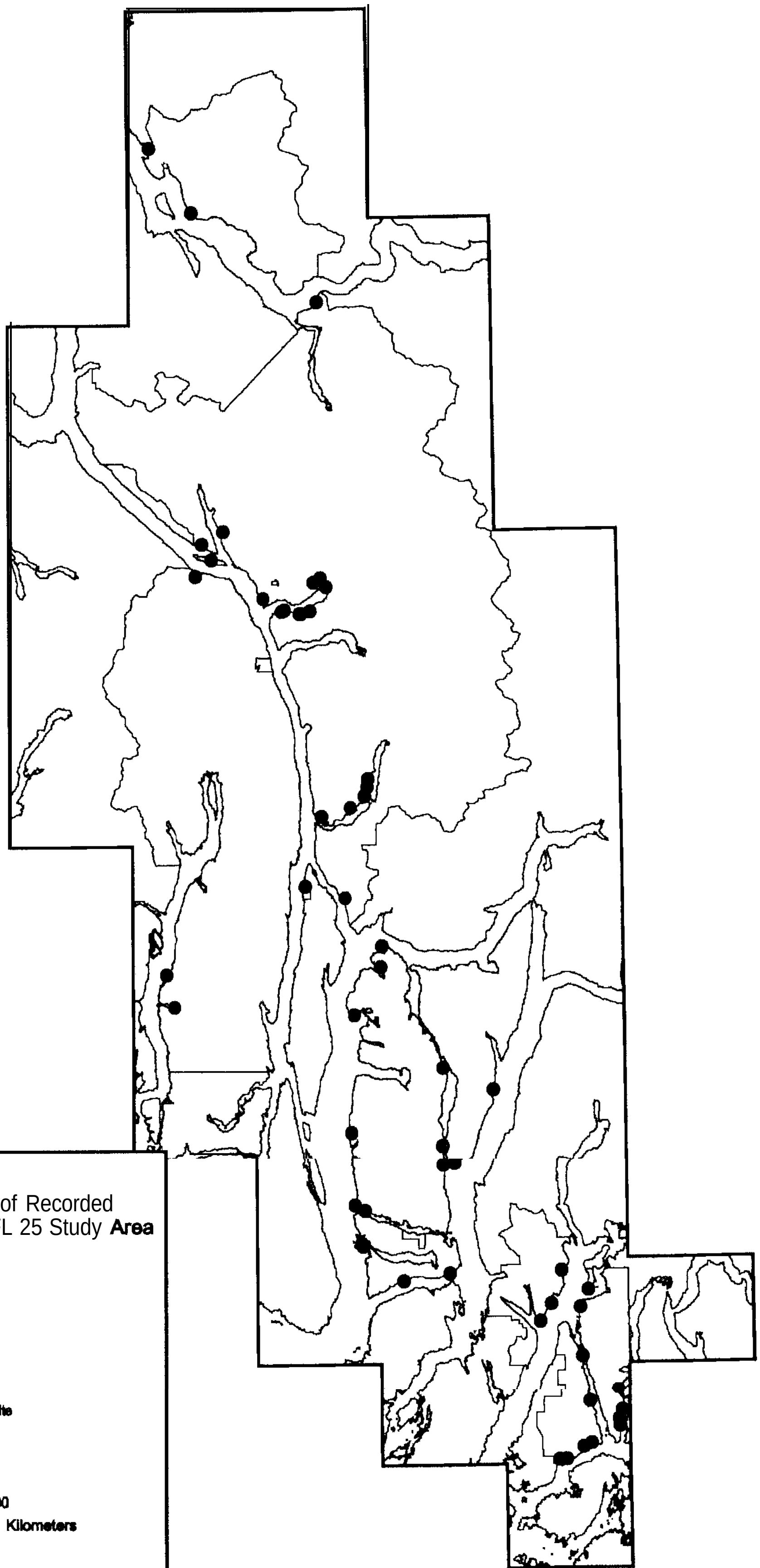


FIGURE 6: Locations of Recorded Archaeological Sites in TFL 25 Study Area

For the inner coast, access to a range of resources seems to have been a more important factor for settlement location than was the presence of a salmon-bearing stream (Lepofsky 1985; Hobler 1990). In the Bella Coola Valley, access to animal resources and salmon reportedly were a minimum requirement for ethnographic settlement, but a wide range and variety of resources was more important than any single resource (Lepofsky 1985).

5.3.2 Site Distribution on the Central Coast

The tentative site distribution patterns discussed above are generally consistent with ethnographic information about the settlement and subsistence practices of the Central Coast First Nations. Greater emphasis on marine resources should be archaeologically evident for the Heiltsuk, Kitasoo (Hilton 1990) and Kwakwaka'wakw (Codere 1990) sites, in comparison with Nuxalk and Oweekeno sites.

5.3.3 Site Distribution in TFL 25 and Surrounding Areas

Most recorded archaeological sites on the North Coast are situated in the major river valleys of the Nass and Skeena and the mainland and island coastlines. Inland sites are typically associated with prime fishing locales along the river shores (Comrnonwealth Historic Resource Management Ltd. and Millennia Research 1996). Halpin and Seguin (1990:269) suggest that ideal village locations were those that possessed a wide variety of floral and fauna1 resources, were located in sheltered locales, and had some natural defense from attack. According to Mackie (cited as personal communication 1992 in Commonwealth Historic Resource Management Ltd. and Millennia Research 1996:35), the islands in the Skeena River were heavily used, some as fortification sites.

Sacred areas were typically located around villages, though most would not be archaeologically detectable. Some natural features, such as the lava tubes on the Tseax River, were used by young Nisga'a women for puberty rituals (School District 92 [Nisga'a] in Commonwealth Historic Resource Management Ltd. and Millennia Research 1996:35).

Temporary campsites were typically situated along lake shores, particularly those in close proximity to major travel corridors. These sites may leave archaeological traces in the form of hearths, trails, CMTs, artifact scatters, cache pits, and roasting features. Though few sites have been recorded along lake shores, this is likely more indicative of archaeological survey bias than a reflection of site distribution.

Archer (personal communication 1999) concludes that while the shorelines were the most intensively used areas, there are many oral records that describe inland hunting forays. He stated that it would seem likely that lakeshores served as camping locales for hunters or those travelling overland to trade.

According to Seguin Anderson, based on "the patterns of use of the landscape by the Tsimshian, it is a virtual certainty that there are in fact archaeological sites in every part of the region" (in Commonwealth Historic Resource Management Ltd. and Millennia Research 1996).

Garfield (1984) further explains that

> All of the productive lands and shores were apportioned. Lineage-owned districts extended along the rivers and shores, and back into the hinterland wherever there were foods or raw materials and means of access. Though it is difficult to document, it is probable that the boundaries of owned areas were not sharply defined in heavily wooded, mountainous country, which could not be easily reached from streams or the shores of inlets and lakes.
>
> By the time the Europeans arrived, there were no unclaimed land or sea food resources of a kind important in the Indians' economy. Though no directly comparable data are available for the Tsimshian, the fact is strikingly shown in surveys made in 1945 in connection with United States government hearings on Tlingit and Haida claims in southeastern Alaska. Not only were lands and beaches listed by the Indians as lineage property, but also offshore halibut and codfish banks, seal and sea lion rocks, stretches of beach and portions of streams, hunting and berrying grounds, and houses and cabins (in Commonwealth Historic Resource Management Ltd. and Millennia Research 1996, Appendix I).

In summary, virtually the entire TFL area has some potential to hold archaeological sites. Village and shell midden sites are expected in protected bays, often at the mouths of streams. Resource camps may be found on lake shores or along rivers. CMT sites could be found virtually anywhere, but may be more common near the shoreline, in the vicinity of villages, around lakes, or along aboriginal trails.

To manage heritage resources, it is necessary to focus available resources on areas that have the greatest relative potential for conflicts between heritage resources and land developments. One way to achieve this is through predictive modelling, which helps to identify constraints against the presence or preservation of archaeological sites, and to highlight areas where sites are most likely to exist. The following sections describe the methods and results of the predictive models developed and applied in this study.

6.0 GIS ANALYSIS

Computer analyses were used to summarize the terrain characteristics of recorded sites in TFL 2.5, as well as the general landscape. The results of the analyses were used to evaluate the appropriateness of the Central Coast model, and to help assess the study results.

6.1 GIS Analysis of Recorded Archaeological Sites

The slope, elevation, and distance to nearest salt water and fresh water (river, stream or lake) was calculated for each site. Forest stand composition (cedar percentage), age class, and height class were determined for CMT sites. The following sections present the GIS results for habitation and CMT sites, as they were the key site types that were modelled.

6.1.1 Coastal Habitations

Only seven coastal habitation sites have been recorded in the TFL 25 study area, in contrast to the 957 sites in the Central Coast LRMP area and 343 in the North Coast TSA. Table 2 compares the terrain attributes of the TFL 25 habitation sites with those of the Central Coast and North Coast, using median values. On the northwest coast, aboriginal villages and shell midden sites are strongly associated with sheltered bays, islands and the heads of inlets and fjords.

Table 2. Comparison of Terrain Attributes for Recorded Habitation Sites in TFL 25, the Central Coast LRMP Area, and the North Coast TSA (Median Values).

	TFL 25 SITES	CENTRAL COAST SITES	NORTH COAST TSA SITES
Slope	27%	15%	8%
Elevation	18 m asl	5 m asl	11 metres asl
Distance to Salt Water	35 metres	30 metres	7 metres
Distance to Fresh Water	108 metres	4 16 metres	409 metres

Slope

The slope of each coastal habitation site was determined from the GIS grid values, and frequencies were calculated for slope ranges. The slope value of each cell consists of an average of the slope for that cell and those of the adjacent cells on all sides. The TFL 25 sites had slope values ranging from 6% to 58%, with a median of 27%. Six of the seven sites had slope values lower than 30%. On the Central Coast, habitation site slopes ranged from 0% to 129%, with a median of 15%. North Coast TSA habitation sites had a range of 0% to 48%, with a median of 8% (Figure 7)

In cases where a habitation site lies on a small flat landform next to an abrupt slope, the averaging function could over-estimate the actual slope of the site. In addition, the spot elevation interval and the 25 metre DEM grid size may be inadequate to discern small, flat landforms, and in some cases narrow terraces or beaches may have been misinterpreted as steep slopes.

Elevation

Elevations for the TFL 25 habitation sites ranged from 2 m to 48 m asl, with a median of 18 m. Five of the seven sites are less than 20 m asl. In the North Coast TSA, recorded habitation site elevations range from 1 m to 51 m asl, with a median of 11 m. In the Central Coast LRMP area, the range was from 1 m to 95 m, with a median of 5 m asl (Figure 7).

Distance to Salt Water

Distance to the nearest source of salt water was determined for each recorded coastal habitation site. Six of seven sites are within 100 metres, with the seventh being

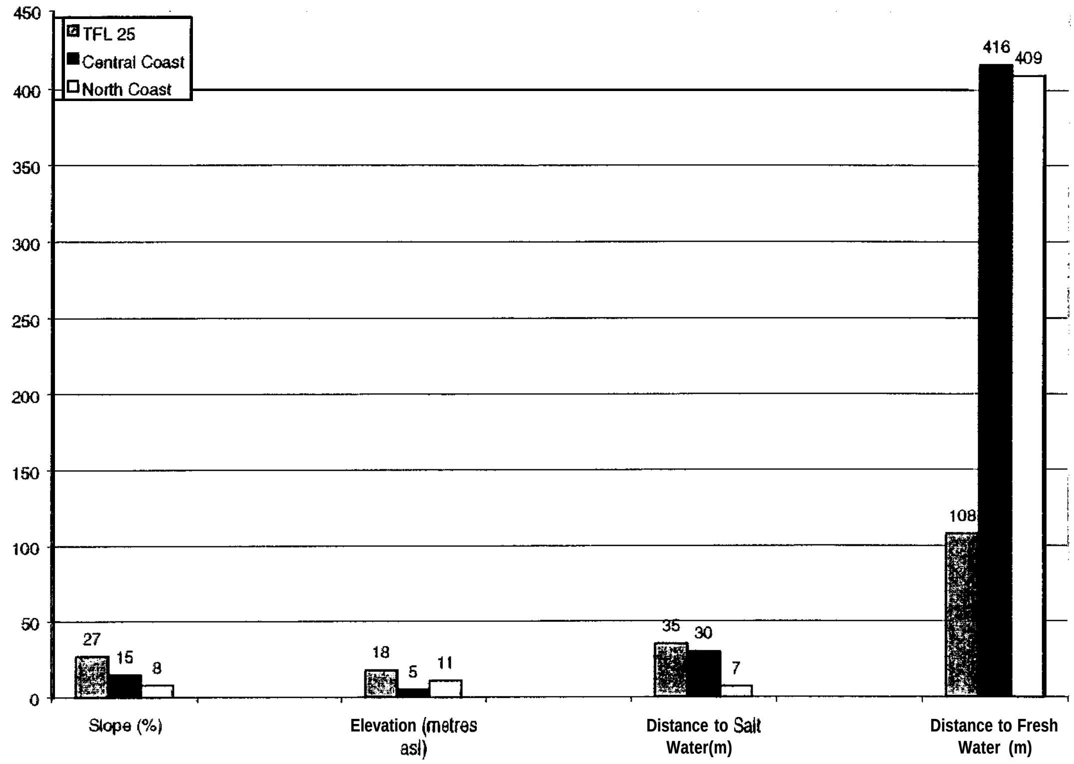
151 metres from the shore. The median distance is 35 metres. On the Central Coast, the median distance to the coastline is 30 metres, compared with 7 metres in the North Coast TSA (Figure 7).

Distance to Fresh Water

Distance to the nearest source of fresh water was also calculated for each recorded coastal habitation site. In TFL 25, the sites range from 19 metres to 455 metres from the nearest mapped fresh water source, with a median of 108 metres (Figure 7). Most of the sites are near interrnittent or relatively minor streams, and none have been recorded on lake shores to date.

On the Central Coast, there does not appear to be a strong correlation between coastal habitation sites and fresh water sources. Only 23% of recorded sites fall within 100 metres of fresh water, and just 37% are within 200 metres. Thirty percent of recorded sites are more than 500 metres from a source of fresh water, possibly indicating that water was transported to the site (defensive sites, for example), or that rain water was collected. Alternatively, the water source may not have been coded on the TRIM base map. In the North Coast TSA, the range was from 1 metre to more than 2 km, with a median of 409 metres.

Figure 7. Summary of terrain characteristics of recorded habitation sites in TFL 25.



6.1.2 CMT Sites

According to data supplied by the Archaeology Branch, 34 CMT sites have been recorded in TFL 25. Additional CMTs have been located by Western Forest Products and have been managed in consultation with First Nations. These sites have not been formally recorded, and the data were not available for this study. CMT sites have been found along the coast, on islands and inland, but most recorded examples are in close proximity to the shoreline. While the majority are single component sites, one CMT site is associated with a habitation, one with a fish trap, and one with a canoe run, The following section describes the terrain attributes of the recorded CMT sites in TFL 25. Table 3 and Figure 8 summarize the information and compares the TFL 25 CMT data with those of the Central Coast LRMP area and the North Coast TSA.

Slope

CMT sites in TFL 25 have been recorded on a range of landforms, and the limited data do **not show a correlation between site location and slope (see Figure 8). According to the**

GIS data, the slopes of recorded CMT sites range from 2% to 97%, with a median of 3 1% and a mean of 36%. This lack of patterning is inconsistent with the results of similar studies for the Central Coast LRMP (Golder Associates 1999a) and for the North Coast TSA (Golder Associates 2000), which showed a more obvious correlation of slope and CMT site location (Figure 8, Table 3).

Elevation

CMT sites range in elevation from 1 metre to 490 metres above sea-level, with a median of 83 metres. This pattern may be a result of limited archaeological inventory of higher elevations, and CMT sites probably can be expected in higher elevation yellow cedar stands.

Distance to Salt Water

Recorded CMT sites were found to correlate fairly strongly with the marine shoreline on the central and north coasts, with about 70% of the recorded sites falling within 300 metres of the shoreline in both cases. In TFL 25, more than half the recorded sites are within 200 metres of the shoreline, and 79% are within 300 metres. Recorded CMT sites range from 8 metres to more than 1 kilometre from the nearest salt water, with a median distance of 181 metres. This pattern is at least partially related to archaeological survey coverage, rather than actual site distribution, although an association between shoreline habitation sites and CMT sites is also expected.

Distance to Fresh Water

On the Central Coast, recorded inland CMTs generally tend to occur along major rivers (notably the Bella Coola) and near lakes, although the trend in the existing data is not strong, with only 33% of recorded Central Coast CMT sites falling within 100 metres of a fresh water source, and 53% within 200 metres. In the North Coast TSA, the correlation between CMT sites and fresh water sources is questionable, at best. In TFL 25, the association appears to be somewhat stronger, with more than 70% of the recorded CMT sites falling within 200 metres of a fresh water source and a median distance of 126 metres. The data set does not show a correlation with major rivers or lakes; associations with fresh water are primarily in relation to intermittent streams. However, a small sample size and limited and unrepresentative archaeological inventory coverage may affect the distribution pattern. Moreover, the dense hydrology of the study area, and the northwest coast in general, limits the usefulness of this variable for modelling.

Forest Cover

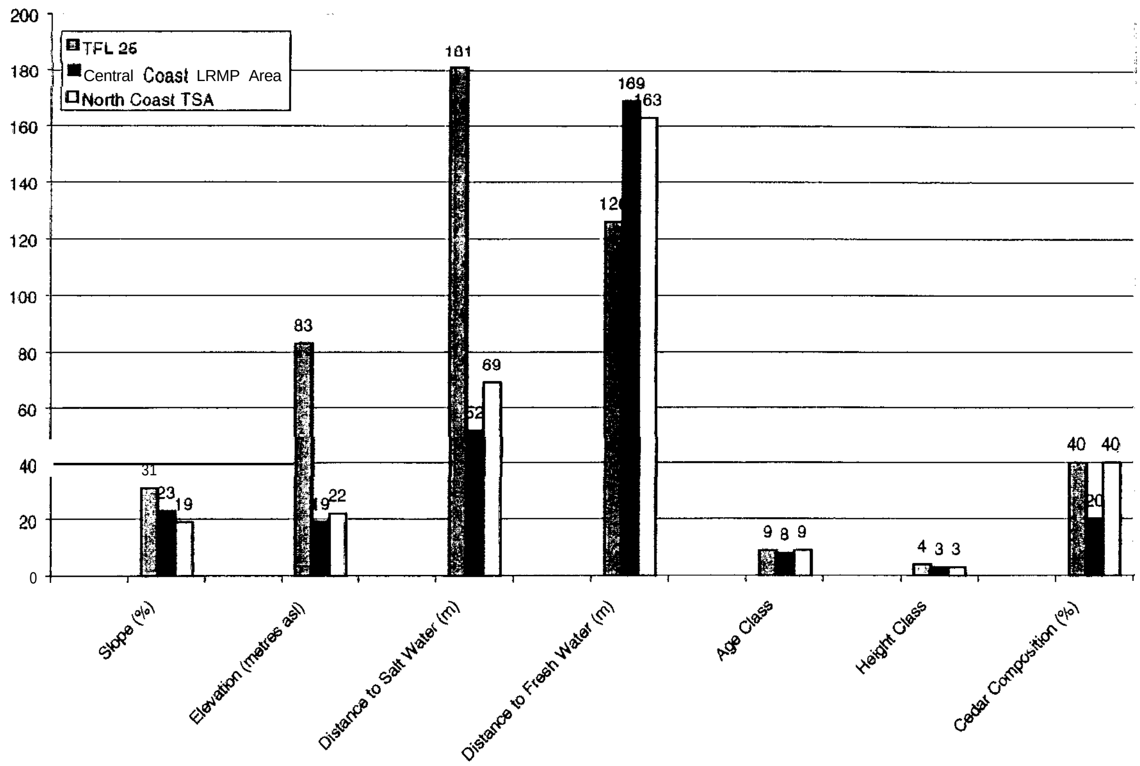
Where data were available, the height class, age class and cedar composition (in percent) was determined for each recorded CMT site, using forest cover data supplied by Western Forest Products. Of the 34 recorded CMT sites in the TFL, height class, age class and cedar data were available for 28 sites (82%). Of these, 89% are in forests of height class 3 or greater (greater than 28 m tall), with class 4 being the most common (46% of recorded CMT sites having height class data). All of the CMT sites that had age class data (n=28) are coded as age class 8 (25%) or 9 (75%). Together, these two age classes generally define "old growth".

The cedar composition of TFL 25 stands with recorded CMTs varies widely, with no obvious trends, although nearly one-third of the sites are in stands with 20% cedar. This lack of patterning is also evident in the North Coast TSA and, to a lesser extent, in the Central Coast LRMP area, where a modest correlation of CMTs with low cedar percentage stands is suggested. Despite the lack of quantitative data, cedar composition was considered in the CMT model under the expectation that the quantity of cedar may correlate positively with site density and size, if not occurrence. Field investigations will be required to test this assumption.

Table 3. Comparison of Terrain Attributes (Median Values) for Recorded CMT sites in TFL 25, the Central Coast LRMP Area, and the North Coast TSA.

Attribute	TFL 25	Central Coast LRMP Area	North Coast TSA
Slope	31%	23%	19%
Elevation	83 metres asl	19 metres asl	22 metres asl
Distance to Coast	181 metres	52 metres	69 metres
Distance to Fresh Water	126 metres	169 metres	163 metres
Age Class	9	8	9
Height Class	4	3	3
Cedar Composition	40%	20%	40%

Figure 8. Summary of terrain characteristics of recorded CMT sites in TFL 25.



6.2 GIS Analysis of Terrain

A number of GIS analyses were completed characterize the TFL 25 landscape. Variables that were believed to be important for predicting archaeological site locations were assessed in terms of their overall distribution in the TFL. These analyses, taken together with the analysis of recorded archaeological sites, helped to select variables for modelling. Data for the major modelling variables are discussed in the following sections, and are compared with similar calculations for the Central Coast LRMP area and the North Coast TSA.

6.2.1 Slope

Slope is widely considered a defining terrain variable for predicting the locations of many site types, particularly habitations. Table 4 shows the distribution of various slope classes across TFL 25, Central Coast, and North Coast study areas. These data clearly illustrate the steep, rugged nature of much of the northwest coast, with less than a quarter of the TFL having a gradient of less than 30%. Regional similarities across the study areas are also evident.

Table 4. - Slope Classes in TFL 25 and Adjacent Areas

Slope	Area (ha.)	% of Study Area	Central Coast LRMP (%)	North Coast TSA (%)
0-15%	24,390	8	15	n/a
0-20%	37,413	13	20	23
0-30%	67,596	23	30	34
0-40%	102,235	35	n/a	44
0-70%	210,166	72	n/a	75
0-90%	254.266	88	84	87

6.2.2 Elevation

Elevation ranges are also pertinent for site prediction. Most major habitation sites, including villages and marine resource harvesting locations, will be at low elevations. Habitation sites at higher elevations are expected to be much less common, although resource camps for hunting, plant collecting, or other special purposes may be present in the TFL. Elevation is also an important factor in identifying the ranges of red and yellow cedar, which were used for CMT modelling. Finally, elevation data can be used as a cross-reference, to ensure that the GIS is calculating slope accurately. Table 5 summarizes the elevation data for TFL 25.

Table 5 - Elevation Ranges in TFL 25 and Adjacent Areas

Elevation	Area (ha.)	% of Study Area	Central Coast LRMP (%)	North Coast TSA (%)
O-10 m asl	1,304	0.4	0.7	1
O-20 m asl	3,364	1	1.6	4
O-100 m asl	32,864	11	n/a	22
O-300 m asl	108,013	37	n/a	45
O-400 m asl	138,148	48	n/a	53
O-1000 m asl	259,639	89	n/a	88
O-l 100 m asl	1,806,093	93	64	92

6.2.3 Distance to Shoreline

Distance to the shoreline is considered to be a very important landscape variable, since the First Nations of the study area have primarily maritime-oriented cultures. Many archaeological site types are expected to be associated with foreshore or near-shore contexts. Table 6 represents TFL 25 in terms of distance to the coastline, with comparative data for the central and north coasts.

Table 6 - Distance to Coastal Shoreline in TFL 25 and Adjacent Areas

Distance to Coastal Shoreline	Area (ha.)	% of Study Area	Central Coast LRMP (%)	North Coast TSA (%)
O-100 m	7,773.6	3	2	4
0-200 m	15,149.6	5	4	6
O-300 m	22,223-l	8	6	9
O-500 m	35,613.9	12	n/a	13
O-1000 m	65,886.8	23	14	22
O-2000 m	113.845.2	39	23	36

6.2.4 Islands

Islands were used intensively by First Nations for resource collection, habitation, defensive sites, burials, and other purposes. Over 12,000 ha. (41.5%) of TFL 25 is made up of islands, of which 12, 037 ha. are larger than 50 ha. in area. In addition, there are over 100 ha. of islands in rivers and lakes.

6.2.5 Distance to Fresh Water

Four categories of fresh water were considered in the analysis: two-line rivers (>20 m bank-to-bank, as defined by TRIM), definite rivers (year-round flow), intermittent rivers (seasonal flow), and lakes. Lakes smaller than 5 ha. in area were excluded. Table 7 provides a breakdown of the amount of the study area within various distances of fresh water, with comparative data from the central and north coast study areas. These calculations show that TFL 25 has dense hydrology, and most of the area is relatively near a fresh water source. For this reason, distance to fresh water may not be a powerful discriminating variable for site modelling.

Table 7 - Distance to Nearest Fresh Water in TFL 25 and Adjacent Areas

Water Source	*Distance (metres)*	*Area (ha.)*	*% of Study Area*	*Central Coast LRMP (%)*	*North Coast TSA (%)*
Two Line River	100	1,827	0.6	1	1
	200	3696	1	2	2
	300	5,679	2	3	3
	500	10,033	4	n/a	4
Definite River	100	29,258	10	12	14
	200	59,068	20	24	27
	300	88,153	30	32	37
	500	142,561	49	n/a	56
Intermittent River	100	101,844	35	4	29
	200	180,775	62	10	51
	300	228,964	79	61	67
	500	270,418	93	n/a	83
Lake	100	12,501	4	2	2
	200	29,632	10	8	5
	300	42,292	15	n/a	8
	500	91,699	32	n/a	13

Table 7 - Distance to Nearest Fresh Water in TFL 25 and Adjacent Areas (cont'd)

Water Source	*Distance (metres)*	*Area (ha.)*	*% of Study Area*	*Central Coast LRMP (%)*	*North Coast TSA (%)*
Nearest Fresh Water (Any Class)	100	129,201	45	n/a	51
	200	231,928	80	n/a	72
	300	256,152	88	n/a	81
	500	282,778	97	n/a	86

6.2.6 Cedar Content

Presence of cedar was considered important to the CMT model, which focused on bark-stripped and aboriginally logged cedar CMTs. According to the forest cover data, 112,837 ha. of TFL 25 (39% of the area) contains at least 1% cedar, and 67,104 ha. (24%) contains 50% or more cedar (Table 8). This suggests considerable potential for CMT sites, assuming other landscape variables are conducive to bark stripping or aboriginal logging activities.

6.2.7 Age and Height Class

The age and height classes of cedar stands are important for evaluating the relative probability of CMTs being present. The models focused on age classes 8 and 9, which together typically define old growth, because CMTs are most likely to be intact in old growth stands. Height class was considered to be important primarily for excluding stunted stands that probably would not be valuable for bark or timber.

Table 8 summarizes the species composition and relevant age and height classes of cedar stands in TFL 25 and adjacent areas.

Table 8 - Summary of Relevant Forestry Data for TFL 25 and Adjacent Areas.

Stand Class	Area (ha.)	% of Study Area	Central Coast LRMP (%)	North Coast TSA (%)
Cedar Present	112,837	39	30	55
Cedar < 50%	45,734	16	16	24
Cedar 50%+	67,104	23	14	31
Cedar 60%+	46,460	16	n/a	25
Cedar 70%+	29,260	10	n/a	16
Cedar 80%+	20,501	7	n/a	7
Cedar 90%+	1,310	0.5	n/a	1
Age Class 6+	140,414	48	32	59
Age Class 7+	140,190	48	n/a	58
Age Class 8+	140,023	48	31	57
Age Class 9+	124,497	43	n/a	33
Height Class 3+	110,738	38	25	29
Height Class 4+	75,195	26	n/a	12
Age Class 6+ and Height Class 3+	110,538	38	n/a	n/a
Age Class 8+ and Height Class 3+	110,507	38	n/a	n/a

Figure 9 illustrates all stands in the study area containing cedar, Figure 10 shows cedar stands with age classes of 6 or greater and height classes of 3 or greater, and Figure 11 shows cedar stands with age classes of 8 or greater and height classes of 3 or greater.

6.2.8 Distance to Nearest Recorded Archaeological Site

Certain site archaeological site types tend to co-occur, because the activities that produced them are related. An exploratory analysis was completed to determine how much land was within 250 metres of a recorded site of any type. Distance to recorded sites was not expected to be a significant variable because only a fraction of the total site universe has been recorded. Table 9 summarizes the “distance to recorded site” calculations.

Table 9. Distance to Nearest Recorded Archaeological Site in TFL 25 and Adjacent Areas

Cultural Feature	Distance	TFL 25 Area (ha.)	TFL 25 % of Study Area	Central Coast (%)	North Coast TSA (%)
Recorded Site	250 m	750	0.3	0.4	0.3

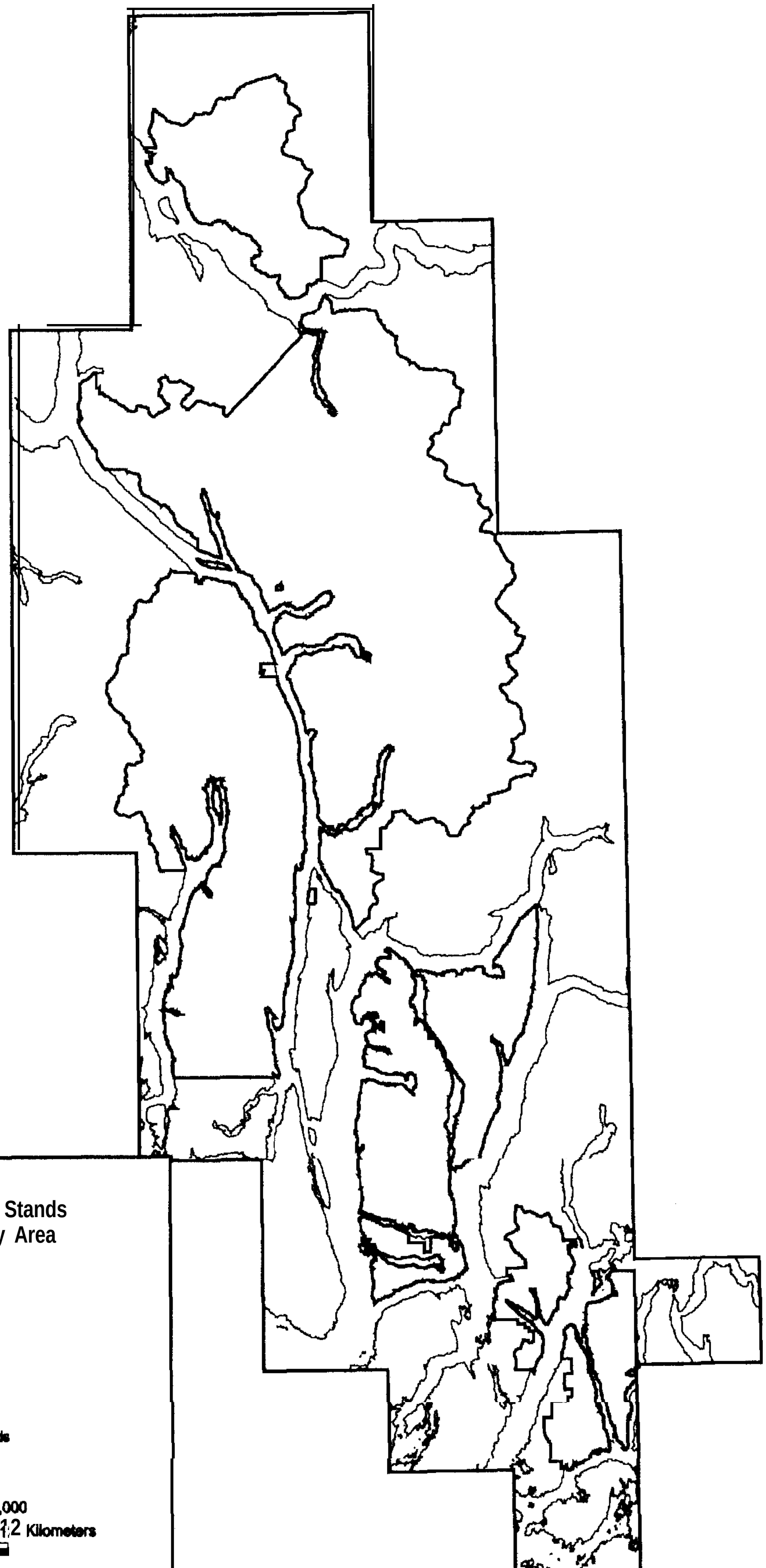


FIGURE 9: Cedar Stands in TFL 25 Study Area

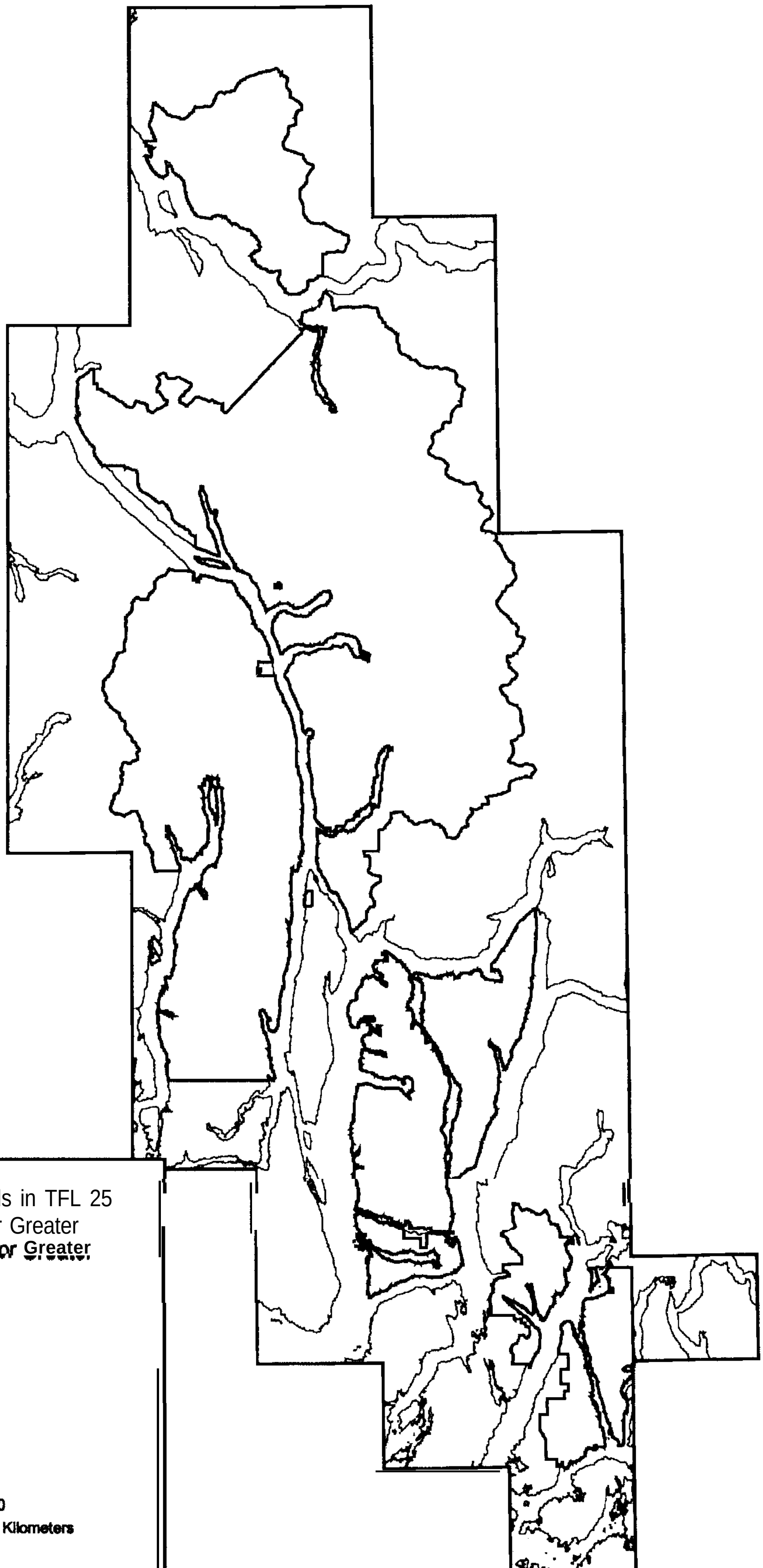


FIGURE 10: Cedar Stands in TFL 25
with Age Class of 6 or Greater
and Height Class of 3 or Greater

N

Study Area
Cedar Stands

Scale - 1:750,000
6 0 6 12 Kilometers

Golder Associates

Projection: UTM Zone 9
Datum: NAD 83

Layout: 8.5 by 11 - Portrait

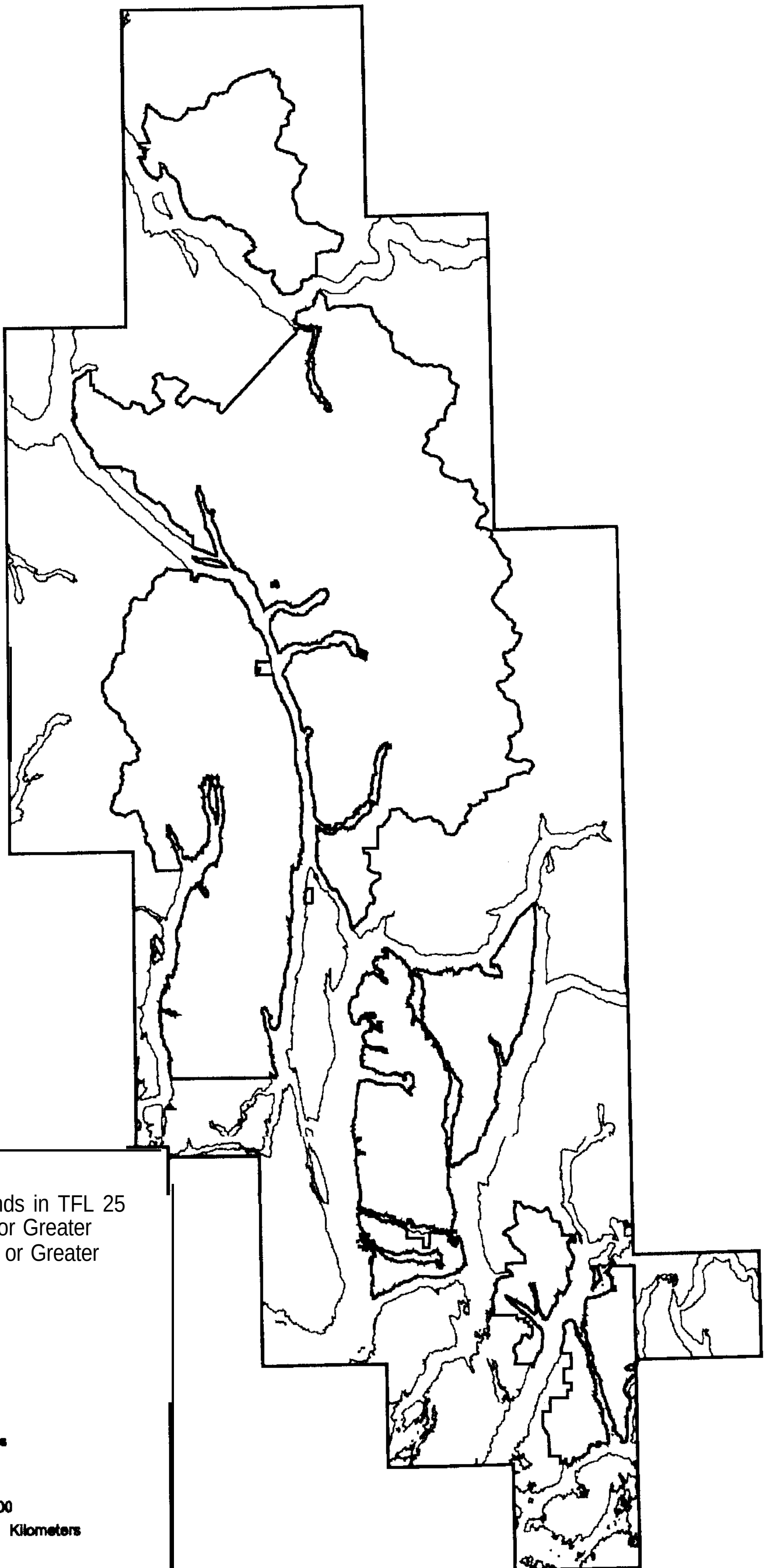


FIGURE 11: Cedar Stands in TFL 25 **with** Age Class of 8 or Greater and Height Class of 3 or Greater

N

Study Area
Cedar Stands

Scale - 1:750,000

6 0 6 12 Kilometers

Golder Associates

Projection: UTM Zone 9
Datum: NAD 83

7.0 PREDICTIVE MODELLING

One of the primary objectives of this study was to produce archaeological site potential maps that could be used to assess the need for archaeological field assessments prior to development, and to assist with planning operations such that impacts to archaeological sites are minimized. To produce these maps, it was necessary to develop a series of GIS-based predictive models.

Following a review of archaeological literature and other relevant documents, and GIS analysis of the landscape and recorded archaeological sites in the study area, it was concluded that predictive models developed for the Central Coast, and later applied to the North Coast TSA, should be generally applicable to TFL 25.

Models were applied for coastal habitations (including shell middens), inland habitations (riverine and lakeshore), and culturally modified trees. The following sections define and describe the three models. Each discussion includes an explanation of underlying assumptions of the model, and a summary of the modelling rules.

Those areas that best meet the criteria of the models, and therefore are predicted to have the greatest site potential, are labeled Class I lands. Locations that meet slightly less stringent criteria are identified as Class II lands. Class III lands are the remaining areas, which are predicted to have relatively low archaeological sensitivity. It should be noted that low potential does not indicate a total lack of potential for archaeological sites, and unanticipated archaeological sites could exist in these areas.

Not all archaeological site types were modelled. Several site types, such as small lithic scatters, burials, trails, rock art (pictographs and petroglyphs), canoe runs, stone quarries, and fish traps or weirs, were not specifically modelled due to insufficient data or a lack of detailed understanding of their spatial distributions. It is anticipated that some of these sites may be accounted for by the coastal habitation model, as it is assumed that they will generally (although not always) be associated with village locations or in similar environmental contexts.

7.1 Data Sources

The following data sources were used for modelling:

- Terrain Resource Information Management (TRIM) maps (1:20,000 scale, ARC/INFO format);
- Gridded Digital Elevation Model (25 m grid size);
- Forest cover data (1:20,000 scale, ARC/INFO format);
- Recorded archaeological site data (1:50,000 scale paper maps; ARC/INFO point data and associated database; site forms and sketch maps, where available).

7.1.1 TRIM and Gridded DEM

The TRIM base maps provided the most consistent and reliable source of spatial data used in this study. Complete coverage of the study area was obtained from Western Forest Products. A "Gridded DEM Product" available from Geographic Data B.C., was used for the analysis. The Gridded DEM represents a re-sampled version of the TRIM DEM in which spot elevations are interpolated to create a grid of elevations at 25 metre interval, allowing a 25 m pixel size for modelling.

Features extracted from the Gridded DEM and TRIM coverages include elevation contours and point files, surface hydrography, shorelines and islands. Surface hydrographic features such as two-line rivers (bank to bank width greater than 20 metres), definite and intermittent rivers, lakes, and wetlands were also extracted and merged into a single raster coverage.

7.1.2 Forest Cover Data

Forest cover data were provided by Western Forest Products. Several thematic coverages that pertained to the distribution, age, and height of major tree species, primarily western red and yellow cedar were extracted. Forest cover attributes used for modelling included: age class, height class and stand composition (cedar percentage). The selected data were subsequently exported into a raster database and merged into contiguous data layers.

7.1.3 Recorded Archaeological Site Data

The Archaeology Branch provided three sources of data for recorded archaeological sites in the study area, including:

- GIS point data and an associated database for the recorded archaeological sites;
- original site forms and sketch maps;
- 1:50,000 scale NTS maps showing recorded site locations.

The archaeological site database was derived from the Provincial Heritage Register Database (PHRD). These sources were cross-referenced to ensure that all location and site type data were current and as accurate as possible prior to modelling. The data quality assurance process is described below.

7.2 Quality Assurance of Archaeological Site Data

An accurate database of known sites and their attributes is crucial to the development of effective predictive models of archaeological resources. To this end, 1:50,000 NTS paper maps indicating recorded site locations and PHRD site type data were checked against the original B.C. Site Inventory forms and maps to establish correspondence between primary and secondary sources. In cases of differing data, the site forms and maps were assumed to be the authoritative sources of information, because they were recorded by in-field personnel. Any deviations were noted and corrected, and the revised information was compared with GIS data provided by the Archaeology Branch. Where necessary, corrections were made to the GIS point coverages and associated database, and noted in the comments field of the database.

One site (FeTe-2) had been mis-plotted on the NTS map and had incorrect site type data in the PHRD. An additional twelve sites had vague or incomplete data, and it was necessary to infer the site type, locations, or size from available data sources. The remainder of the site records were accurate or were corrected during the Central Coast LRMP and North Coast TSA studies.

8.0 PREDICTIVE MODELLING

The terms of reference for this project entailed running the previously developed CMT model over the southern portion of TFL 25, within the Central Coast LRMP area. To ensure consistency in the datasets, the coastal habitation, inland habitation, and CMT models were all run on the entire TFL 25 area. As shown in the Central Coast study (Golder Associates 1999a), the coastal and inland habitation models are general enough to account for a range of site types that tend to be spatially associated with habitations (e.g., rock art, burials, canoe runs, intertidal lithic scatters).

Model rules were divided into two classes, based on predicted archaeological site potential. The highest site potential rating (Class I) was assigned to locations that would best support the aboriginal cultural activities that are could have created archaeological sites. Similar, but slightly less favourable conditions resulted in a Class II (moderate site potential) rating. For example, the difference between Class I and Class II might be based on wider water buffers, a broader slope range, or inclusion of additional biogeoclimatic zones. The models are described in the following sections.

8.1 CMT Model

Previous archaeological work (e.g., Eldridge and Stafford 1996, Stryd and Eldridge 1993) has shown that CMTs, and particularly bark-stripped trees, may occur in low frequencies almost anywhere on the landscape. However, some patterning is apparent, with the highest density of CMTs found to date being near the shoreline, in major valley bottoms, on islands, near aboriginal village sites or other occupation sites, or along trails (Stryd and Eldridge 1993). Elevation was introduced as a modelling variable because the distributions of red and yellow cedar are elevation-dependent.

Cedar content was considered to be important because the majority of recorded CMTs are cedars. Although cultural modifications on hemlock and other species have been reported, relatively little is known about their ages or distribution, and it was therefore considered prudent to exclude them from modelling. The CMT model predicts that CMT site density will increase with cedar content, simply because more cedars are available for harvesting. However, this relationship requires field testing, and there is some evidence to suggest that CMT site potential is highest in areas with few cedars (Allen Banner, pers. comm. 2000).

Due to the extensive history of logging on the northwest coast, it was reasoned that the majority of intact CMTs will be found in older forest stands. Since the cutoff date for automatic protection under the Heritage *Conservation* Act is A.D. 1846, an emphasis was placed on age class 8 and 9 stands (141 years old and older) for identifying the zones with highest predicted CMT potential. GIS analyses of recorded CMT sites in the TFL generally supported these interpretations. Age classes 6 and 7 were added to the Class II model based on the forestry characteristics of recorded CMT sites. It should be noted that more recent CMTs may require management consideration under the Forest Act and/or the Forest Practices Code, as possible evidence of aboriginal rights.

Height class limits were set to exclude stunted trees at the upper limit of the cedar range, because these trees are often twisted and short, and therefore are less likely to have been used for aboriginal logging or bark stripping. It is noted that six recorded CMT sites in the study area are in stands listed as age class 0, probably indicating that the CMTs have been harvest. All other recorded CMT sites are in age class 8 or 9 stands.

Slope, elevation, and distance to salt or fresh water were included on the basis of relationships inferred from the spatial distribution of known CMT sites in the study area and adjacent regions, and information found during the literature review. Cutoff values for the models were based on analyses of recorded CMT sites, with the exception of distance to fresh water, which was inferred from anthropological literature (e.g., Turner 1998).

8.1.1 Model Variables

Based on the literature review, GIS analyses, and inferences about the physical requirements of bark stripping and logging, the following variables were predicted to correlate with the occurrence of recorded CMT sites:

- species composition (cedar percentage as defined by forest cover data)
- height class
- age class
- elevation
- slope
- distance to a river or lake, and
- distance to the coast

81.2 Model Rules

Based on the landscape characteristics of recorded CMT sites in the North Coast TSA and the Central Coast LRMP area, a review of literature pertaining to bark stripping and aboriginal logging, and an evaluation of other CMT models in coastal settings (e.g., Arcas Consulting Archeologist 1998, Millennia Research 1999), the model shown in Table 10 was developed for culturally modified trees.

Table 10. Predictive Model for Culturally Modified Tree Sites

Class I (Highest Potential	
Forest Type	Species Composition >= 50% Cw or Yc AND Height Class >= 3 AND Age Class >= 8
	AND
Terrain	Slope = 0-30% AND elevation = O-l 100 metres asl
	AND
Hydrology Buffers	Distance to coast = O-300 metres OR distance to two line river or definite river or intermittent river or lake = O-200 metres
Class II (Moderate Potential)	
Forest Type	Species Composition >0% Cw or Yc AND Height Class >= 3 AND Age Class >= 6
	AND
Terrain	Slope = 0-90% AND elevation = O-l 100 metres asl
	AND
Hydrology Buffers	Distance to Coast = O-1000 metres OR distance to two line river or definite river or intermittent river = O-300 metres OR distance to lake = 200 metres

To summarize Table 10, a high CMT site potential rating (Class I) was assigned to forest stands that have at least 50% red or yellow old growth cedar, are on landforms with slopes of 30% or less, are between sea-level and 1100 metres asl, and are near the ocean or a fresh water source. Moderate potential ratings (Class II) were assigned if all the following conditions are met: cedar greater than 100 years old is present, the slope is less than 90%, the elevation is less than 1100 metres asl, and the location is within 1 km of the ocean or within 300 metres of a stream or 200 metres of a lake.

8.2 Coastal Habitation Model

For the purposes of modelling, coastal habitation sites were considered to include villages, shell middens (with or without clear evidence of settlement), and house depressions, if they are within 2 kilometres of the coastline. Similar sites further inland were considered under the inland habitation model. Ethnographic information and existing archaeological data suggest that, with the exception of sites on the few major rivers and large lakes in the study area, the vast majority of habitation sites will be on or near the coastline. In an overview of Heiltsuk traditional territory, all recorded shell midden sites are within 2.4 kilometres of the coast line (Millennia Research 1997), and this distance was considered in setting the arbitrary 2 kilometre cut-point to distinguish between coastal and inland habitation sites. The GIS analyses discussed above support these interpretations.

8.2.1 Model Variables

Given the maritime focus of North Coast First Nations cultures, it was assumed that most coastal habitation sites would be located on relatively flat landforms near the shoreline and often near a source of fresh water. Many of the recorded sites in the North Coast area are in sheltered bays or on islands, and some ethnographic and archaeological references describe village sites on island beaches or at the mouths of rivers (Capes 1976). It is recognized that there will be exceptions to these patterns, such as defensive/refuge sites, which may be surrounded by steep terrain, and to which water may have been transported fi-om another source (Lepofsky 1985).

The variables used for the coastal habitation model were:

- slope
- elevation
- distance to coastline
- distance to fresh water (lake, river or stream), and
- size of island

8.2.2 Model Rules

Based on recorded site and landscape data, supplemented by archaeological and ethnographic information, the model shown in Table 11 was developed for coastal habitation sites.

Table 11 Predictive Model for Coastal Habitation Sites

Class I (Highest Predicted Potential)		
Case 1: Mainland Coast and Islands Larger than 50 ha.		Distance to coastline = O-100 m OR Distance to definite or intermittent river (IF within 200 **m** of coast) = O-100 m OR Distance to double line rivers = 0- 100 m OR Distance to lakes (IF larger than 5 ha.) = O-100 m
	AND	Slope = 0%-30%
	AND	Elevation = O-30 m asl
Case 2: Small Coastal Islands (<=50 ha.)		Distance to coastline = O-100 m
	AND	Slope = 0%-20%
	AND	Elevation = O-30 m asl
Class II (Moderate Predicted Potential)		
Case 1: Mainland Coast and Islands Larger than 50 ha.		Distance to coastline = O-300 m OR Distance to lake (IF greater than 5 ha.) = O-200 m OR Distance to double line river = O-200 m
	AND	Slope = 0%-30%
	AND	Elevation = O-30 m

Table 11 Predictive Model for Coastal Habitation Sites (cont'd)

Case 2: Islands (no size restriction. Includes fresh water islands)		Distance to coastline = O-200 m
	AND	Slope = 0%-30%
	AND	Elevation = O-30 m asl
Class II (Moderate Predicted Potential)		
Case 3: Mainland River Valleys (lower reaches)		Distance to coastline = 200-2000 m
	AND	Distance to double line river = O-100 m
	AND	Slope = 0%-30%
Class III		
(Lowest Potential)		All other lands

8.2.3 Inland Habitation Model

Habitation sites further than 2 km from the coastline were considered inland sites. No such sites have been recorded to date in TFL 25. An all-encompassing habitation model designed to account for all types of habitations in the study area would have to be very general and likely would result in exaggerated site potential in many locations.

The information reviewed for this study suggests that, with the exception of sites on major rivers and possibly large lakes, inland habitations will be relatively rare. Where present, it is assumed that settlement sites would require level, well-drained ground and a source of fresh water. Most inland habitations can be expected to have associated trails, especially where canoe access is restricted.

8.2.4 Model Variables

For the purposes of this study, all inland habitation sites are, by definition, at least 2 km from salt water, and marine islands are excluded. Additional variables used in the model are slope and distance to fresh water (lakes and double line, definite, and intermittent rivers). The model focuses on confluences of rivers and inlets and outlets of lakes, where slope conditions are appropriate for habitation.

8.2.5 Model Rules

Based primarily on inferences fi-om archaeological and ethnographic information fi-om other areas of the province, the following simple model (Table 12) was developed for inland habitations:

Table 12 Predictive Model for Inland Habitation Sites

Class I Highest Predicted Potential)		
		Slope = 0-20%
	AND	Distance lake (IF > 5 ha.) = O-100 m IF distance to definite river = O-100 m OR Distance to two line river = O-100 metres IF distance to definite River = 0-100 m OR Distance to two line river = O-100 metres IF distance to lake = O-l 00 m
	AND	Distance to coastline > 2000 metres
Class II (Moderate Predicted Potential		Slope = 0-20%
	AND	Distance lake (IF > 5 ha.) = O-200 m IF distance to definite river = 0-100 m OR Distance to two line **river** = O-200 metres IF distance to definite River = O-100 m OR Distance to two line river = O-200 metres IF distance to lake = O-200 m
	AND	Distance to coastline > 2000 m
Class III		All other lands

9.0 MODELLING RESULTS

9.1 Dataset I

Dataset I consists of grids representing predicted archaeological site potential, and an accompanying database. Areas of predicted archaeological site potential were ranked as Class I or Class II, in order of relative site potential. As defined in Section 7, Class I lands meet the most stringent model criteria, and are predicted to have the highest density and variety of sites. Class II lands are predicted to have moderate site potential (i.e., fewer sites and a narrow range of site types will be found than in Class I). All other lands are considered to be Class III lands. These areas represent the lowest predicted site potential and they should hold few sites and a very limited range of site types. These lands are assessed as having the greatest physical constraints against human occupation or the preservation of archaeological sites. It is important to reiterate that not all site types could be modelled, and some sites may exist in Class III zones. However, it is expected that such sites will be relatively rare.

The total modelled area encompasses 290,370 hectares. The study area was divided into a 25 metre grid and each cell was assigned a score for each model. The grid values correspond with Class I and Class II archaeological potential classifications. A "composite" model was created to combine the results of the coastal and inland habitation and CMT models into one overarching model so that areas with overlapping results for more than one model will be shown as the higher class of the two results. For example, areas with moderate predicted potential (Class II) for CMTs and high potential (Class I) for coastal habitations would be shown as Class I. On the overview plot, habitation potential overlaid CMT potential, to highlight areas that were predicted to have potential for CMTs only.

9.2 Model Results

9.2.1 Area Results

The composite model results indicated that 12,426 hectares, or 4.3% of the study area falls within Class I lands (Figure 12). Class II model results account for an additional 66,714 hectares (23% of the study area), for a total of 79,140 hectares of Class I or Class II lands (27.3% of the study area). Table 13 compares these results with area data for the Central Coast and the North Coast TSA. Differences in the relative portions of Class I and Class II lands for the study areas may reflect variable amounts of old growth cedar.

Table 13 - Summary of Predictive Modelling Results for TFL 25 and Adjacent Areas

Archaeological Class	% of Land	% of Land	% of Land (Hectares)
	TFL 25 Model	**Central Coast**	**North Coast**
Class I	4.3%	3%	5.5%
Class II	23%	16.7%	16.5%
Class III	72.7%	80.3%	78%

9.2.2 Capture Rates

The results of the predictive models were compared against the limited database of recorded sites in TFL 25 to assess their success rate. Table 14 shows the success rates of the coastal habitation, inland habitation, and CMT models. Due to the small sample size for TFL 25, Central Coast LRMP and North Coast TSA data are provided for comparison. The capture rates indicate the proportion of recorded sites that were correctly predicted by the composite model (i.e., a combination of Class I and Class II results), using a 100 metre site buffer. Where sites are less than 200 metres apart, the buffers overlap, creating a single polygon. For this reason, the number of habitation site polygons shown in Table 14 is slightly smaller than the actual number of sites.

Table 14 - Capture Rates of Predictive Models

Model	Total Number of Sites	Within Class I or Class II	Within Class I or Class II	Within Class I or Class II
	TFL 25	**TFL 25**	**Central Coast**	**North Coast TSA**
Coastal Habitation	3	100%	941 (98.3%)	293 (98%)**
Inland Habitation	3	0%	34 (87%)	n/a
CMT	33	97%	125 (64.4%)*	138 (80%)

*Although only 64.4% of the CMT sites were correctly predicted by the Central Coast CMT model, an additional 35.1% were accounted for by Class I or Class II in one of the other models, for an overall capture rate of 99.5%. Corresponding data for the North Coast TSA, are 162 sites and 94%.
** Since only five inland habitation sites have been recorded in the North Coast TSA, coastal and inland habitations were combined for the capture rate analysis.

The capture rates for TFL 25 are based on such a small sample size that they are of limited value. Considerably more field data will be required to test the effectiveness of the models. The Central Coast and North Coast data suggest that the models are relatively efficient, based on a comparison of capture rates and the percentage of land mass categorized as Class I or Class II. The poor inland habitation results for TFL 25 should not be evaluated on the basis of the extremely small sample size, but the model should be revisited once inland site data have been collected. Similarly, the high capture rate for CMT sites should not be over-emphasized, given the considerable amount of land encompassed by the model results, and considering the small number of recorded sites. Further refinement of all three models is clearly required, following the collection of additional field data.

9.3 Dataset II Known Archaeological Sites

Dataset II consists of a database of recorded archaeological sites. Recorded sites are presented as an ARCINFO point coverage. Some site locations or site type data have been corrected during this project, and these revisions are noted in a "comments" field in the database. Three new CMT sites were added to the database using information derived from consultant's reports.

10.0 DISCUSSION

The model results indicated that the highest archaeological potential for most site types is near the coastline and on islands. This pattern is consistent with the ethnographically-reported Northwest Coast subsistence and settlement system, which focused heavily on marine resources. The CMT and inland habitation models suggest that appropriate landforms for these archaeological sites exist, and that inland site potential should not be overlooked, especially since existing ethnographic and archaeological information probably under-emphasizes aboriginal use of these zones.

The coastal habitation model appears to be very successful. However, it should be possible to refine it further by introducing additional variables, such as wind direction, and beach type, which could reduce the amount of land encompassed by the model without sacrificing its predictive ability. Revisions to this model probably will not be a priority for Western Forest Products, as their operations do not impact the shoreline zone as significantly as the inland forests.

The CMT model is very general, and it likely over-represents actual CMT site potential. Due to a lack of quantifiable field data, and a poor understanding of the decision making processes that guide aboriginal forest utilization practices, it was considered prudent to develop a conservative model that could be refined with additional data. Traditional land use information may be key in improving the CMT model, as cultural factors (such as land ownership, territorial boundaries, spiritual concerns, etc.) may play important roles in determining the pattern of forest use.

11.0 RECOMMENDATIONS

The following recommendations relate to polygons of archaeological potential identified in Dataset I of this AOA. It is important to note that an archaeological overview assessment is an evolving planning tool that is subject to revision and updating as new or better data become available. The AOA results should not be interpreted as a static representation of archaeological potential in a given area.

Outlined below are specific recommendations to direct future archaeological work in TFL 25. The three land classes can be viewed as "risk indices" whereby the risk of impacting archaeological sites is predicted to be greatest in Class I lands and lowest in Class III lands. In the absence of detailed field investigations, no location can be considered to be completely risk-free.

11.1 Compilation of Additional Data

Additional data should be compiled to provide a better basis for modelling. As a first step, existing information should be collected from First Nations and Western Forest Products operational staff. It is our understanding that a number of CMT sites have been encountered and managed without officially recording them. These sites should be documented to the extent possible without field investigations, and they should be digitized and added to the GIS database.

All locations that have received archaeological field inspections should be digitized and added to the GIS as a "non-site" coverage. These data would provide important information about places that have been professionally assessed and found not to contain archaeological sites. This type of information is extremely useful both for modelling, and for evaluating model results.

11.2 First Nations Consultation

Copies of this report should be provided to all First Nations with traditional interests in the TFL 25 area. In addition, the communities should be visited to discuss the modelling procedure and to determine whether additional relevant information is available. Specifically, traditional land use information would be invaluable to future modelling refinements, if access to the data can be arranged. The Kitasoo-Xaixais First Nations resource Mapping Project (1995) identifies a number of culturally important areas. Through negotiation, it may be possible to obtain these data in digital form, or to arrange to digitize them. Other First Nations probably have similar information that they may be willing to share, under certain conditions, for cultural resource management purposes.

The model results have indicated that a large portion of TFL 25 has potential for archaeological sites, and management of lands categorized as Class II for CMTs is a particularly important operational concern. It is recommended that First Nations be involved in developing an archaeological site management strategy for TFL 25. In consultation with First Nations, it may be possible to identify priority areas that have high cultural sensitivity, and to develop specific management plans for those areas (particularly with regard to CMT sites). However, it is cautioned that any management plan must satisfy the requirements of the *Heritage Conservation Act* and other relevant legislation.

11.3 Archaeological Impact Assessments

11.3.1 Class I Lands

We recommend that archaeological impact assessments (AIAs) be undertaken in all Class I areas. It is noted that not all Class I lands will contain archaeological sites. The models are based on assessment of the suitability of the terrain to contain preserved archaeological sites but, for various reasons, not all suitable landforms will necessarily have sites. Consequently, impact assessments should include an evaluation of the environmental variables used to develop the model. If the actual field conditions are found to differ from those assumed by the GIS, such that archaeological site potential would be constrained (e.g., the slope is steeper than indicated by the DEM), then the AIA could be downgraded to a less-detailed “preliminary field reconnaissance” (PFR) on the judgement of the field archaeologist. A PFR generally consists of foot traverses of a sample of the proposed development area, with no subsurface testing.

All impact assessments must be completed under a Heritage Inspection Permit, issued by the Archaeology Branch under section 14 of the *Heritage Conservation Act* (HCA). Western Forest Products should be aware that First Nations are provided a 30-day review period during which they are invited to comment on the proposed methodology of an HCA permit. Depending on the referral review capacity of the First Nation and their assessment of the proposed methods, permit issuance may take up to six weeks. For efficiency and cost-effectiveness, we recommend that a "blanket" permit be obtained for all of TFL 25. This approach would negate the need to obtain separate permits for each field inspection, an would help to ensure a consistent approach to all field assessments.

A PFR does not require a permit, but we recommend that a permit be obtained in the event that field observations indicate that an impact assessment is warranted. This approach would allow the field crew to initiate an AIA immediately, negating the need for a return trip if subsurface testing, artifact collection, or CMT sampling is necessary. Western Forest Products should be aware, however, that non-permit field assessments can be undertaken, as long as no invasive testing is undertaken and no archaeological sites are altered in any way. This approach may be useful in situations where time is of the essence, and a blanket permit is not in place.

11.3.2 Class II Lands

Areas rated as Class II are predicted to have moderate archaeological potential, and they are expected to hold fewer sites and fewer site types than Class I lands. From a risk management perspective, Class II presents the greatest challenges because it covers an extensive area, and because the information available for modelling was often inadequate to make a firm prediction of site potential.

Although site occurrence is predicted to be lower than in Class I, Class II lands should also receive archaeological field inspection. A PFR is considered an appropriate level of investigation for all Class II lands, including those rated by the models as having potential for CMTs only. A PFR may lead to a recommendation for an impact assessment, or additional work may not be warranted.

Only 2.6% of the TFL (about 7,500 ha.) is predicted to have Class II potential for habitation sites, and consequently it may be practical to undertake AIAs of any developments that may be planned in those areas. As recommended for Class I areas, the impact assessment permit should include a provision for reducing the intensity of the assessment if field observations indicate that site potential is low.

A significant amount of land falls within the Class II CMT designation and, depending on the amount of development planned for these areas, it may not be feasible to conduct field studies over 100% of this area. If this is the case, three main risk management approaches are suggested:

1. a ground-truthing inventory of a sample of Class II CMT lands could be undertaken to assess the model results. If possible, the sample could encompass areas identified as priorities for Western Forest Products and First Nations. Based on the inventory results, the CMT model should be adjusted, if necessary

2. archaeological impact assessments could be required for a sample of the Class II CMT lands. For example, 50% of proposed roads and cutblocks falling within Class II CMT lands could be selected for PFR, with the results serving as ground truthing inventory.

3. Western Forest Products may decide to manage only Class I CMT lands, accepting the risk associated with waiving the requirements for field assessments of lands ranked as Class II for CMT sites.

Option 3 is the least preferred of these strategies and carries the greatest risk to the Western Forest Products. It is strongly recommended that any management approach that does not involve field assessment of all Class II lands should be developed in consultation with First Nations, the Archaeology Branch, and the Ministry of Forests. It is emphasized that any risk management strategy is subject to the Heritage Conservation Act and other relevant legislation.

The location and recording of CMT sites does not necessarily require the presence of a professional archaeologist. Properly trained First Nations crews or forestry personnel are authorized to undertake CMT work that does not require a permit, and this approach may be cost-effective. Field activities that do not require a permit include locating and recording CMT sites, but <u>not</u> the removal of CMT samples or subsurface testing. We recommend that an archaeologist be retained to undertake any archaeological work requiring a permit, and for all areas assessed as having potential for non-CMT sites.

11.4 Class III Lands

Class III areas are predicted to have relatively low archaeological potential due to environmental constraints on human use or on site preservation. No archaeological assessment is recommended for Class III lands. It should be noted however, that all site potential classes defined in this report are relative. Low potential does not mean no potentia/l, and there is always the possibility that unanticipated archaeological sites may occur in Class III areas. Should field observations, consultation with local First Nations or other information sources indicate the potential for archaeological sites to be present in a Class III area, a field reconnaissance should be undertaken as outlined above to evaluate the site potential of the area.

11.4.1 Management of Unanticipated Sites

Efforts should be made to ensure that forestry crews working in the field are familiar CMTs so they can make at least preliminary identifications when necessary. If archaeological materials, including CMTs, are accidentally discovered during development, all work in the immediate area should be stopped or altered such that the archaeological site is not impacted. The Archaeology Branch, Ministry of Forests District Manager, and local First Nation(s) should be contacted immediately to discuss appropriate site management measures. Emergency impact management measures, such as artifact collection, controlled excavation or CMT sampling, may be required to mitigate damage to any newly identified site(s).

11.4.2 Identification of Un-Modelled Site Types

Because sea-levels and vegetation have changed over the millennia, some sites may be found on old sea terraces that may lie some distance above present sea-level. Forestry field crews should note the presence of such terraces, which may be indicated by flat terrain with marine clay composition, possibly with shell in the matrix. Other landforms of potential archaeological interest include rockshelters (protected overhangs) and caves (whether on the shoreline or inland), and crevices in rock faces along the shoreline. If such features are observed, an archaeologist should be retained to test the area for archaeological deposits, regardless of the predicted archeological potential class.

Any obvious cultural features, such as rock wall fish traps, wooden fish weirs, and canoe runs should be reported by forestry crews and inspected by an archaeologist. Fish traps and weirs typically are found in the intertidal zone or at the lower reaches of streams, while canoe runs are clearings on rocky beaches, used to facilitate the landing of canoes.

11.5 Model Refinement

Newly available data, including field assessment results and GIS data, should be periodically reviewed for their potential to enhance the predictive models. To address data gaps, an emphasis should be placed on palaeoenviromnental, fish, shellfish and wildlife habitat, and shoreline morphology data. The predictive models should be re-evaluated and refined as new data become available. We suggest that the models should be reviewed every two years.

11.6 Study Limitations

This study provides a good basis for making archaeological resource management decisions in TFL 25, and for guiding future archaeological inventory and impact assessment studies. However, the results are limited by certain factors, which are discussed below:

- There was no field component to this study and consequently, the predictive models are untested;
- Only GIS-ready data were used for this study, and the quality of the data varied. Some additional information sources, such as salmon, shellfish, and mountain goat habitat, prevailing wind directions, and traditional land use data could be useful for modelling, but they would require digitizing and/or authorization for use;
- The modelling results are limited by the resolution and accuracy of the digital elevation and TRIM base map data;
- The existing archaeological site inventory for the area is very limited and skewed toward CMT sites near the coastline, and to shoreline habitation sites. Archaeological information for inland areas is negligible;

- Not all archaeological site types were modelled, due to gaps in baseline data. It is anticipated that certain un-modelled site types will be accounted for by the habitation and CMT models, but this assumption has not been tested;

- The project would have benefited from more direct involvement of members of the First Nations whose territories encompass portions of TFL 25.

12.0 CLOSURE

This report was prepared for the use of the Western Forest Products and the Archaeology Branch. Its use by First Nations or other appropriate agencies is encouraged, but any decisions made on the basis of the report by third parties are the responsibility of such third parties. This study was not intended to address issues of traditional land-use or aboriginal rights or title, and it is presented without prejudice to land claims or treaty negotiations. The project was specifically intended to address forestry concerns, and the results and recommendations may not be appropriate for other types of developments.

We trust that this report meets with your current requirements. Should you have any questions, or require further information, please contact the undersigned.

Yours very truly,

GOLDER ASSOCIATES LTD.

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APPENDIX I

GLOSSARY OF TECHNICAL TERMS

Aboriginally-logged tree: A tree that has been felled, planked or otherwise modified to obtain wood by First Nations people.

Adze: A woodworking tool typically consisting of a wedge-shaped ground stone blade hafted or bound onto a wooden handle.

Archaeology: The study of human cultures though the material remnants of their activities.

Artifact: A portable object manufactured or intentionally modified by human action, Examples include stone tools, cedar baskets and wooden utensils.

A.S.L.: Above Sea-Level, based on the position of the sea's surface at mean level between high and low tide.

Bark-strip scar: A section of a tree in which the outer bark has been removed, exposing the underlying wood.

Biface: A general term for stone artifacts that have been modified on two opposing sides, or faces. Examples include stone projectile points and knives.

Biogeoclimatic zone: An ecosystem classification scheme based on vegetation, soils, topography and climate.

Blazed tree: A tree displaying chop marks used to indicate a boundary, trail, trapline or other feature on the landscape.

Borden Number: A system for numbering archaeological sites which divides Canada into a series of rectangles based on latitude and longitude. Each rectangle (or Borden block) is given a four letter code and sites are numbered sequentially as they are recorded in each block. For example, FcSm-11 is the Borden number for the Tsini Tsini site near Bella Coola, B.C.

B.P.: Before Present; a dating convention often used with radiocarbon dating. "Present" is universally considered to be A.D. 1950.

Burial Site: A site used for the placement of human remains. Some sites referred to as "burials" do not actually involve burying the dead. A number of different burial practices were used by aboriginal people, including cremation, interment in trees, rockshelters, grave houses and cemeteries. In many cases, the remains were placed in cedar boxes prior to interment.

Cache pit: An underground storage feature, usually used to preserve dried food, but also sometimes used to store tools and other items.

Canoe run: A long narrow beach area cleared of rocks to facilitate the landing of boats on shore.

Cobble Tool: A tool produced by striking flakes from the edge of a cobble to produce a working edge.

Culture: 1. A pattern of human activity transmitted between individuals by teaching; includes both material culture (e.g., artifacts and features) and non-material culture (e.g. practices and beliefs). 2. A term used by some archaeologists to refer to an assemblage of cultural material recurring in a restricted geographic area within a specified time period.

Culture History: An archaeological construct used to describe cultural changes over time, often based on variations in artifact styles.

Culturally Modified Tree (CMT): A tree that has been intentionally altered by First Nations people as part of their traditional use of the forest. Examples of CMTs include bark stripped trees, blazed trees, planked trees and notched trees.

Dendroglyph: A carved tree used for a traditional First Nations purpose, such as marking an important cultural location or a territorial boundary. Also sometimes called an arborglyph/arboriglyph.

Dendrograph: A painted tree used for a traditional First Nations purpose. Also sometimes called an arborgraph/arborigraph.

Dentalium: A long, thin mollusk shell used for ornamentation by Northwest Coast cultures; considered a wealth item and sometimes used as a form of currency. Dentalium is known to have been traded widely in pre-contact times.

Ethnography: A detailed descriptive study of a culture through participant-observation techniques, including interviews with community members.

Ethnohistory: The study of the past using both non-Western, indigenous historical records (particularly oral traditions) and early historic written records.

Eulachon: A fatty type of smelt, highly valued by First Nations along the Northwest Coast. Various other spellings are common, including oolichan and ooligan.

Eustatic: Pertaining to changes in absolute sea-level on a global scale, and not regional changes produced by localized movements of land or the sea floor.

Excavation: The controlled and systematic removal and exploration of subsurface archaeological deposits.

Faunal Remains: The remains of animals, fish or shellfish, found in archaeological deposits which have not been intentionally modified for use as tools, ornaments, etc.

Feature: A cultural component of an archaeological site, such as a housepit or hearth, that cannot be removed intact from the site.

Fire-cracked rock: Stone that has been altered as a result of rapid or alternate heating and cooling, caused, for example, by stone boiling or in campfires.

Fish trap: A wall of loosely piled stones used to capture fish feeding in the intertidal zone, sometimes incorporating perishable components such as stakes, nets and basketry traps.

Fjord: A long, steep-sided coastal inlet produced as a result of intense glaciation of a previously existing river valley.

Flake: A piece of stone intentionally removed from a core during the manufacture of stone tools. Flakes were sometimes used as expedient tools and may show evidence of retouch or use wear.

Geographic Information System (GIS): A computerized database and analysis system with the primary functions of capturing, storing and manipulating geographic information. Geographic information contains a combination of location, attribute and topographical data.

Glacier: An extended ice mass that originates as compacted snow at high mountain elevations. When the ice achieves a certain depth it will begin to move from its point of origin.

Grease trail: A trail used by aboriginal people as part of a regional exchange system; the term is a reference to eulachon oil, a commonly-traded commodity.

Groundstone: A class of stone tools, manufactured by pecking, grinding and polishing to achieve the desired shape.

Ground truthing: Field investigations designed to assess the accuracy of inferences or predictions made about a dataset. Ground truthing is often used in cultural resource management to test the results of predictive modelling studies.

Historic site: A site dating from the period following early contact between First Nations and European or Euro-American cultures. Includes sites produced by Native and non-Native activities.

Holocene: A geological term referring to the post-glacial period spanning approximately the past 10,000 years, following the Pleistocene Ice Age.

Impact Assessment: In archaeology, a study designed to assess possible impacts of proposed developments on archaeological resources. Impact assessments typically incorporate documentary research, field inspections, and other lines of inquiry. Recommendations regarding the significance of any archaeological resources encountered and resource management strategies are usually provided.

Inventory: The compilation of information on archaeological resources within a given project area, through documentary research and field investigations, often supplemented with interviews. Inventory does not typically include an assessment of the significance of these resources or of potential development-related impacts upon them.

Isostatic: Pertaining to sea-level changes resulting from the tendency of the earth's crust to maintain a state of equilibrium, in which forces tending to elevate balance with those tending to depress. For example, continental plates may be depressed under the weight of glacial ice, and rebound following ice melting, resulting in variations in relative sea-level.

Lithic: Of, or pertaining to, stone. In archaeology, a general term for stone tools and debitage.

Microblade: A small parallel-sided blade removed from a core using a distinctive "punch" technique. Microblades were typically set into bone or wood handles to form cutting tools.

Midden: A deposit of soil and cultural debris produced as byproducts of human activities. Middens of clam and mussel shell, often containing artifacts, are common on the coast of British Columbia.

Mitigation: Archaeological work required to lessen the impact of a development on an archaeological site; typically consists of the excavation of the site or a representative sample thereof.

Old growth: Natural stands of old and young trees and their associated plants, animals and ecological systems, that have remained essentially undisturbed by human activity. The age and structure of old growth forests varies by forest type and between biogeoclimatic zone.

Oral history: A method by which aspects of an individual's life experience and cultural knowledge are collected by an interviewer.

Oral tradition: A non-material process of creating, transmitting and preserving cultural knowledge across generations.

Overview: An assessment of the archaeological resources present in a defined study area. Typically includes an assessment of the potential for unexplored areas to contain archaeological sites

Pebble Tool: A common term synonymous with "cobble tool". A pebble tool may be bifacially or unifacially worked, often with the original rounded cortical portion opposite the working edge left unmodified.

Petroform: An alignment of rocks intentionally produced by human activity, such as a stone wall fish trap or canoe run.

Petroglyph: An image carved or pecked into a rock surface, sometimes enhanced with pigments.

Pictograph: An image painted on a rock surface, typically using red ochre pigments.

Planked tree: A log or tree from which a long, flat piece of timber has been removed.

Pleistocene: The most recent geological period of glaciation, beginning about 1.6 million years ago and continuing until the onset of the Holocene between 13,000 and 10,000 B.P.

Post-contact: The period of time following early contact between First Nations and European cultures. Contact occurred intermittently over a period of approximately 50 years, between the late eighteenth and early nineteenth centuries. Written documents, in conjunction with archaeological data and oral tradition, can be used to study this period.

Potlatch: A feasting complex that is the central social and political institution among First Nations of the Northwest Coast and portions of the adjacent Interior Plateau, which employs the reciprocal redistribution of material goods to establish and reinforce sociopolitical order.

Pre-contact: The period of time prior to the earliest contact between First Nations and European cultures, for which written documents are unavailable. Research into this time period relies on archaeological information and oral tradition. Contact occurred intermittently over a period of approximately 50 years, between the late eighteenth and early nineteenth centuries.

Predictive Model: A construct developed to make inferences about unobserved phenomena based on the observed characteristics of similar phenomena. In archaeology, models are often used to predict site distributions in areas that have not been examined in the field.

Probabilistic survey: Archaeological field inventory involving the random selection of survey units with the intention of eliminating judgmental biases regarding site distribution and location normally inherent in archaeological survey. Typically, the study area is divided into units of high, moderate and low archaeological potential, based on topography, physiography, and other factors, and specific units are then randomly selected for field inspection.

Projectile Point: A sharpened implement used to tip a projectile such as a spear, arrow or dart. Projectile points were typically made from stone, bone, wood, shell or metal.

Quarry: A source area for lithic materials used in the production of stone tools. Such areas are often characterized by dense concentrations of flaking or chipping debris.

Radiocarbon Dating: A technique used to determine the age of organic material through analysis of the proportions of naturally-occurring radioactive carbon isotopes.

Reconnaissance: Non-intensive field investigation designed to assess the archaeological site potential of landforms within a prescribed area. Reconnaissance typically does not involve subsurface testing.

Rockshelter: A small cave or rock overhang used for shelter, habitation, or human burials.

Significance: In cultural resource management, the relative scientific, cultural, public, economic and historic importance of an archaeological site.

Site: A place exhibiting physical evidence of past human activity.

Stratigraphy: The layering of natural and cultural subsurface deposits in archaeological sites.

Subsistence strategy: A cultural system for obtaining and processing food and raw materials.

Tapered bark-strip: A relatively long bark removal feature which narrows to a point at the upper end.

Test hole: A deep cut or chop into a tree, to check the soundness of heartwood. Test holes have been found on standing trees, on windfallen trees, and on sections of aboriginally logged trees

Topography: The physical features of an area, for example mountains and rivers.

Traditional Territory: An area used by a cultural group for subsistence, ceremonial and other cultural practices.

Traditional Use Area: A natural area used by First Nations people to practice traditional activities including, but not limited to, resource gathering (e.g., plant gathering, hunting, fishing, etc.), raw material procurement (e.g. stone quarries, timber or bark harvesting areas, etc.) and ceremonial or spiritual activities. Traditional use sites may lack physical evidence of their use, but maintain cultural significance to a living community of people.

Uniface: An artifact that has been modified, usually through the removal of flakes, on one face or side of its cutting edge only.

Weir: A type of fish trap consisting of a line of wooden stakes placed at the mouth of a river designed to trap spawning salmon, often incorporating additional elements such as nets or basketry traps.

APPENDIX II

ATTRIBUTES OF RECORDED ARCHEOLOGICAL SITES IN TFL 25