

REFERENCE PLAN OF COVENANT AREAS OVER PART OF
THE EAST 1/2 OF SECTION 28 AND FRACTIONAL SECTION 29,
BOTH OF DENMAN ISLAND, NANAIMO DISTRICT.

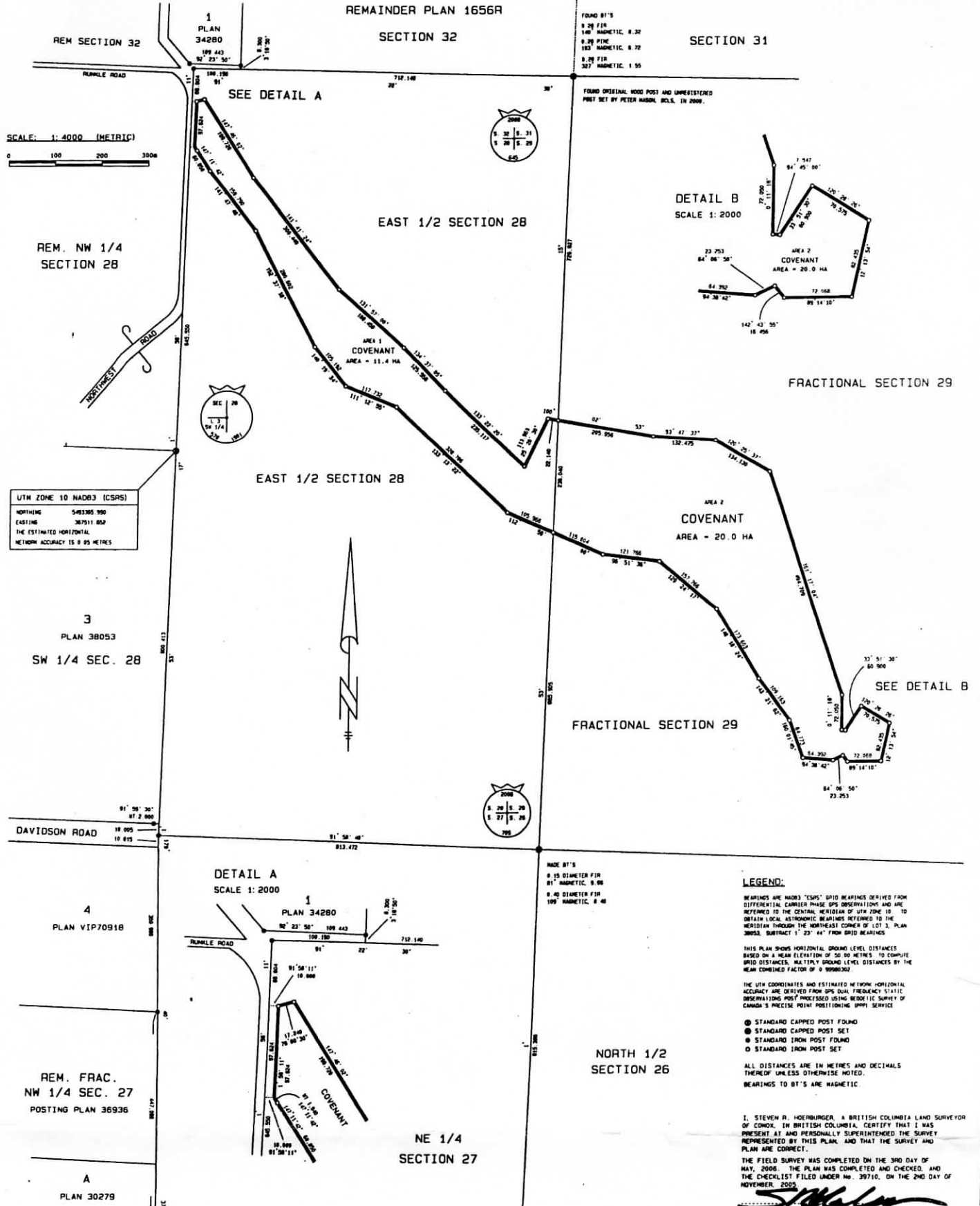
PURSUANT TO SECTION 99(1) (a) OF THE LAND TITLE ACT.
B.C.G.S. 92F.056

BOOK OF REFERENCE		
AREA	LOT	AREA REQUIRED
1	EAST 1/2 SECTION 28	11.4 HA
2	FRACTIONAL SECTION 29	20.0 HA

PLAN VIP

DEPOSITED IN THE LAND TITLE OFFICE
AT VICTORIA, B.C., THIS
DAY OF _____, 20__

REF: _____ REGISTRAR



SCHEDULE B

Attached to and forming part of the Covenant Agreement between the Denman Island Conservancy Association, Covenant Holder, and the Owner, _____, dated as of the ____ day of _____ 2006.

1.0 Acknowledgment

The Owner and Ryan Durand (Biologist, Taara Environmental – 46054 King Avenue, Chilliwack BC 604-795-4969 rdurand@taara.ca) hereby acknowledge and agree that the following is an accurate description of the Railway Grade Marsh Complex, as of the reference date of this Agreement.

The Owner and Covenant Holder acknowledge that this document is a summary of the 91 page baseline documentation report that contains additional information, maps, and 141 photographs. Copies of the full report and all photographs are held by each party.

2.0 Property Location and Description

The Covenant Area is located on the north end of Denman Island. It is located within a multi-parcel property locally known as the 4064 Lands. The covenant area abuts Northwest Road and access is also possible from private roads that lead from Northwest Road and Lake Road.

3.0 Significance of the Land and Amenities

The Covenant Area is located in the Strait of Georgia Ecoregion of the Georgia-Puget Basin Ecoregion of the Georgia Depression Ecoprovince. The Covenant Area lies within one of BC's rarest forest types; the Coastal Douglas-fir moist maritime (CDFmm) biogeoclimatic ecosystem.

Four Biogeoclimatic Site Series were classified on the Covenant Area. They included:

- Polygons 1, 2 and 4 were CDFmm06 CwBg – Foamflower
- Polygon 3 was CDFmm05 CwFd - Kindbergia and CDFmm11 Cw - Skunk Cabbage
- Polygon 5 was CDFmm05 CwFd - Kindbergia and CDFmm10 Pl - Sphagnum
- Polygons 6 to 10 and 12 were CDFmm05 CwFd - Kindbergia
- Polygons 11 and 13 were CDFmm10 Pl - Sphagnum

Jenny Balke of the Denman Conservancy Association (1998) describes how the Covenant Area has been identified and protected by various government agencies, the community, and scientific assessments:

“The Railway Grade Marsh Complex has been identified by Government agencies and the Denman Island community as a significant area for conservation for many years. The Marshes were designated as Environmentally Sensitive Areas by the Islands Trust in its Official Community Plan of 1991, and a Development Permit Zone was established

around the Marshes. The Marshes were one of the important areas described in the submission to the Vancouver Island, Regional Protected Area Strategy, Goal 2 Initiative in 1993; they were also included in the Sensitive Ecosystem Inventory in 1994. The Marshes were included in the Denman Protected Area Network by the Denman Conservancy Association in 1996. The Marshes are part of a large marsh complex that has a very high sensitivity score in the Islands Trust Fund's environmental significance rating system (1997). In addition, the Marshes are designated as an ecologically sensitive wetland feature which is included on the "Ecological Sensitivity" and "Proposed Protected Area" maps prepared by Silva Ecosystem Consultants for the Ecosystem-based Assessment of Denman Island (May 1998). Thus, the long-term designation of the Marshes as a significant conservation feature reinforces the need for protection of the area in a natural state."

Balke (1998) also describes the ecological importance of the Covenant Area as:

"The Railway Grade Marsh complex consists of 3 major vegetation types. In the open-water portion there is submerged aquatic vegetation, including 2 unique plants for Denman Island [Greater Bladderwort (*Utricularia minor*) and Diverse-leaved water-starwort (*Callitriche heterophylla*)]; in the marsh edge there is emergent and drowned vegetation, including numerous large snags; and in the forested upland community there is predominantly mature second-growth Douglas-fir, with a component of western red cedar, western hemlock, grand fir, red alder and big leaf maple, and with diverse shrub and herb layers. These vegetative communities support a considerable wildlife population including breeding and over-wintering waterfowl on the Pacific Flyway migration route, such as Wood Duck, Bufflehead, Mallard and Canada Goose; numerous passerines; a large population of at least 4 species of amphibians; 3 reptile species; a variety of mammals; and at least 2 fish species including salmonid fry which have been observed in Railway Creek. The snags and large trees surrounding the marsh, particularly around Eagle Marsh, provide nest and perch habitat for Bald Eagles and other raptors. These stands of mature trees and snags in combination with open bodies of water are critical for cavity nesting water fowl species (Wood Duck and Hooded Merganser) in this habitat.

The Railway Grade Marsh complex's aquatic vegetation demonstrates a sequence of successional stages. Downstream communities are dominated by Slough sedge (*Carex obnupta*) and are nutrient rich. Upstream is progressively oligotrophic with increasing acidity. Labrador Tea (*Ledum groenlandicum*) and Cusick's sedge (*Carex cusickii*) appear and become increasingly dominant. At the upstream (southern end) is a sphagnum bog with a patch of truly ombrotrophic sphagnum, which is unique to Denman Island. This ecological gradient provides opportunities for scientific study of the spatial and temporal sequences and climatic influences that are occurring here. There is a need to protect the Marshes to allow the natural evolution of this process and retain the opportunity for non-invasive scientific study."

It should be noted that the above descriptions were written before the 1990s logging. The descriptions of the wetland complexes and partially submerged snags are still accurate, but much of the upland forests were heavily disturbed. With the exception of small remnant patches, little mature forest remains. In many areas logging occurred to the edge of wetlands and almost all of the streams were completely clear cut. These disturbances are further discussed in Section 6.0.

Even with the large impact from the logging, the wetland complexes appeared to be functional and still supported a diverse community of flora and fauna. In particular use of the open water areas by waterfowl was significant.

Two rare ecosystems (based on the Rare Ecosystem Explorer of the BC Conservation Data Centre, 2005) were identified in the Covenant Area. Polygon 13 and a portion of Polygon 11 contained the red-listed shorepine / peat-mosses CDFmm (*Pinus contorta* / *Sphagnum* spp. CDFmm). Small pockets of the blue-listed common cattail Marsh (*Typha latifolia* Marsh) occurred in Polygons 5.

Several other rare plant associations were identified, but due to the time of year in which the survey was conducted it was not possible to determine if the associations were of sufficient size to be considered viable ecosystems. Additional inventories during the spring and early summer is required to make an accurate assessment.

4.0 The Management Vision

There are no current uses of the Covenant Area. The adjacent area of the property may be subdivided and developed into an unknown number of residential and/or farm lots. Nielsen (2005) also suggests that the Covenant Area may form part of a larger protected area network through the property and that it is unlikely that any subdivided parcels will contain portions of the Covenant Area.

The DCA (2005) describes the management goals for the Covenant Area, as described in the Conservation Covenant, as:

"The Management Goals will be governed by the intent of the conservation covenant: (a) to protect, preserve, conserve, and maintain, enhance or restore the Covenant Area, and the Amenities, in a Natural State subject to section (c) below; (b) to prevent any occupation or use of the Covenant Area that will impair or interfere with the Natural State of the Covenant Area or the Amenities subject to section (c) below; (c) to provide, at the Covenant Holder's sole discretion, limited public access to portions of the Covenant Area."

5.0 Site History

Ownership of the Covenant Area has changed many times. The Covenant Area was owned in the 1980's by Weldwood Canada. In May of 1995 the Covenant Area was purchased by the John Hancock Timber Resources Group of Boston. In 1997 it was sold to 4064 Investments Ltd. of British Columbia. Since that time the majority of the Covenant Area has been logged. (John Millen, 2001)

The Covenant Area has a rich history of logging dating back to the early 1900's. John Millen (2005) provides a brief history of the Covenant Area below (full version in Appendix 3 of the full Baseline Inventory Report):

"Those of us who hiked the Old Railway Grade before the area was logged in the late 1990s remember the mossy mounds across the trail in the pattern of the old railway ties. They date from the era of the 1920s and 30s when railway logging was prevalent on Denman Island.

The earliest stories of logging on the Island are of horse logging. Although oxen were used in the district, no one tells of them being used here. The first industrial innovation was the steam donkey that powered winches used for hauling logs out of the forest to a landing from where they could be taken down a skid road to the beach by teams of horses.

Railroad technology was well established in the area because of its use in the coalmines at Cumberland. Soon after the First World War the first logging railroad was built on

Denman Island. It ran a total length of 3 miles, from near the cemetery on Denman Road, northwest towards Chickadee Lake and followed down the line of Lake Road to reach Denman Point where the logs could be put into Baynes Sound. On the sandy spit of Denman Point traces of the pattern of ties can still be seen.

Next a longer line, starting in Henry Bay was built. This was the railroad that paralleled the 'Railway Grade marsh'. The line extended southeast to the vicinity of Swan Road. A railway spike picked up in 1997 only a few hundred meters west from Swann Road suggests that it reached that area. Railway logging was made obsolete when trucks became powerful enough to haul logs."

The old railway grade has been identified by the DCA (2005) as a significant historical/heritage amenity based on the BC Land Title Act which states that:

"219 (5) For the purpose of subsection (4) (b), "amenity" includes any natural, historical, heritage, cultural, scientific, architectural, environmental, wildlife or plant life value relating to the land that is subject to the covenant."

Specifically, the DCA (2005) states that the railway grade "has features of alignment and gradient that distinguish it from other roadbeds of its era and the hand-excavated 'cuttings' are also characteristic of that earlier time."

6.0 Improvements and Disturbances

The only improvements located within the Covenant Area were a road that ran between Polygon 12 and 13, multiple old logging roads, and the historic rail grade that ran roughly parallel to the covenant area along the southern edge. The old logging roads were mainly created for the 1990s logging (although many may run over even older roads) and occur throughout the Covenant Area. Some were still accessible by 4x4 vehicles or ATVs, but many were impassible for a variety of reasons.

The entire Covenant Area has been disturbed at least twice. As previously mentioned, logging occurred early 1900's and again in the late 1990s. The turn of the century logging incorporated the use of a rail line that ran parallel to the marsh complex and likely removed all mature trees in the area. The 1990s logging involved clear cutting of almost all the adjacent lands and several of the polygons. Many of the wetland polygons were logged to the edge of permanent water, but large remnant stands were left in some areas.

Adjacent logging in the 1990s has resulted in many indirect disturbances to the Covenant Area. Disturbances included:

- Increased windthrown trees along the edge of the most recent logging due to edge effect. In some areas the number of windthrown pole/sapling sized trees was such that the forest was almost impassable. Sporadic older second growth trees along the edge of the logged areas also succumbed to windthrow.
- Alterations in forest stand structure and composition. With the adjacent logging exposure to sun and wind was significantly altered. In areas where stands remain, the change in sun and wind exposure has resulted in a region along the edge of the logging and into the Covenant Area where vegetation was unhealthy, sparse or even absent. Pole sapling density was also higher in many areas than it would be expected under the canopy of young conifer forests that generally dominate the area.

- Significant hydrological alterations including at least one permanent stream that is now reduced to ephemeral flows.

Most of the polygons contained varying amounts of the logged area around the edges. As the legal survey was not completed nor the exact borders of the covenant known at the time of the baseline survey, these areas were not specifically sampled, rather they were included within the wetland complex polygons. Since these areas were already heavily disturbed from past logging, they are of limited importance from a future covenant monitoring perspective. The logged areas were, however, captured in most of the sample and photostop photographs.

For the most part, the adjacent logged areas were fairly homogenous in nature. They contained the expected stumps and thick slash from logging and were in various stages of primary and secondary succession. Canada thistle (*Cirsium arvense*), bracken (*Pteridium aquilinum*), and pearly everlasting (*Anaphalis margaritacea*) dominated the logged areas with common occurrences of various rushes and sedges in the frequent seepage areas. Scotch broom (*Cytisus scopariu*), Himalayan blackberry (*Rubus discolor*), and English holly (*Ilex aquifolium*) occurred sporadically, but the potential for increased populations of these invasive species is high given the disturbed nature of the logged areas.

Natural regeneration of conifers was sporadic. In areas that were burned, such as old landings and slash piles, shorepine often occurred in dense clumps. Western white pine (*Pinus monticola*) and grand fir (*Abies grandis*) occurred sporadically, while western red cedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), and western hemlock (*Tsuga heterophylla*) occurred in small to large clumps throughout the area. Most of the regeneration was in the form of young saplings and occurred in the low shrub layer, with the exception of some occurrences along streams and water receiving areas. Regeneration was seriously retarded by the abundant deer population in the area. Few fir, cedar, or hemlock seedlings and saplings escaped browse resulting in many deformed and misshapen saplings. The constant browse is a factor that will retard the regeneration time, result in less healthy tree populations, and as the pine are not browsed, it may result in a higher composition of pine than would be otherwise expected.

7.0 Inventory

The following description of the property is from the baseline inventory survey conducted on September 13 to 15, 2005 by Ryan Durand.

7.1 Topography

The Covenant Area is located in an area of varied topography which was strongly influenced by glacial action. Polygons 1 to 3 were situated in a small valley at the toe of a northwest running ridge. The valley rose steeply to the northeast, while the southwest had a slight slope. Polygon 4 encompassed the transition from the valley to a higher elevation bench where the Polygons 6 to 13 were located. With the exception of Polygon 6, the remaining polygons were all located within depressions with slight to moderate slopes rising to the northeast and southwest. Polygon 6 was flat with moderate to steep slopes on the western and southern sides.

7.2 Hydrology

The Covenant Area encompasses one of the most important aquatic features on the northwest of Denman Island; a relatively intact wetland complex that contains unique wetland types for the island. Jenny Balke of the Denman Conservancy Association (1998) describes the Covenant Area as:

“The Railway Grade Marsh complex (Marshes) is a large, intact, drainage system consisting of a true bog, 2 large shallow open water wetlands with associated marsh shorelines (Eagle Marsh and Railway Marsh), connected by an intermittent waterfall, and a creek (Railway Creek) draining to the ocean. There is a need to protect the water of the Marshes and the surrounding area, in order to prevent the negative impacts of human activities and to aid in the maintenance of the integrity of this aquatic system.”

In addition to the main marsh complex, there are a variety of ephemeral and intermittent streams that feed the wetlands. Several of the streams that were mapped as permanent by Silva Ecosystem Consultants in 1998 before the area was logged are now reduced to ephemeral or intermittent flows.

The wetland complex is primarily fed by groundwater from the massive aquifer contained within the adjacent Quadra Sands. As the landscape surrounding the wetland complexes has been largely denuded of vegetation, the hydrology of the wetland complex has likely been radically altered from its pre-disturbance state. Any precipitation event is likely to enter the wetland complex within a short period of time as the vegetation that would normally retain it is largely absent. This reduction in vegetation is the likely reason that most streams are now ephemeral or intermittent.

7.3 Vegetation Inventory

Thirteen polygons were delineated in the Covenant Area (Figure 1). Each polygon contained distinct vegetation types and/or physical features. A summary of the polygons is given in Table 1. Detailed descriptions, vegetation lists, and photographs are in the remainder of this report (refer to Appendix 1 of the full Baseline Inventory Report for explanations of the codes used in the polygon descriptions and vegetation tables).

Within the polygons a total of 20 polygon sample sites and 5 photostops were established during the survey. Each polygon had at least one sample site. Several polygons also had one to several photostops to capture areas that were not significantly distinct from the rest of the polygon in terms of vegetation composition and structure, but required photographic coverage for future monitoring. Note that due to the time of year in which the survey was conducted and the objectives of the survey, the vegetation lists and associated descriptions were not considered to be comprehensive.

Figure 1 shows the location of the sample sites and photostops. Note that on the map the code P1S1 is used to mark polygon sample sites (where P1S1 stands for Polygon 1 Site 1) and PS1 is used to mark photostops (where PS1 is Photostop 1).

Table 1. Description of Vegetation Types by Polygon

Polygon	Description	BEC Site Series	Surface Area (ha (% of CA))	# Sample Sites	Photostop Numbers
1	Young conifer riparian forest	CDFmm06	0.28 (0.89)	1	0
2	Logged riparian forest	CDFmm06	3.48 (11.12)	3	PS1
3	Shallow open water / marsh / riparian forest	CDFmm06 / 11	6.83 (21.81)	3	PS2 & PS3
4	Logged	CDFmm06	1.98 (6.31)	1	PS4
5	Shallow open water / riparian forest	CDFmm 05 / 10	4.59 (14.64)	2	PS5
6	Logged	CDFmm05	3.42 (10.92)	1	0
7	Young conifer forest	CDFmm05	1.19 (3.80)	1	0
8	Logged	CDFmm05	0.43 (1.37)	1	0
9	Young conifer forest	CDFmm05	2.82 (9.00)	2	0
10	Young conifer forest -	CDFmm05	1.26 (4.02)	1	0

	logged				
11	Sphagnum Bog / Marsh / Swamp	CDFmm10	2.21 (7.05)	2	0
12	Logged riparian forest	CDFmm05	2.01 (6.42)	1	0
13	Bog	CDFmm10	0.92 (2.93)	1	0

7.3.1 Polygon 1

Polygon 1 (P1) was located on the northwest corner of the Covenant Area adjacent to Northwest Road. The polygon encompassed a small stand of young coniferous forest with Railway Creek running through the polygon to the northeast.

The stand was dominated by an irregular cover of Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and red alder (*Alnus rubra*), with occurrences of grand fir (*Abies grandis*) and western red cedar in the understory. The shrub layer contained salal (*Gaultheria shallon*), red huckleberry (*Vaccinium parvifolium*), and dull Oregon grape (*Mahonia nervosa*), while the herb layer was diverse with over 20 species occurring.

P1 has been highly disturbed by early 1900's and 1990s logging. Many large old stumps were observed from the historic logging, while the 1990s logging occurred on all sides of the polygon with the exception of the road edge. The 1990s logging only removed sporadic trees from within the polygon, but has caused indirect disturbances to the health of the stand.

Railway Creek ran through the middle of the polygon. The creek appeared to have water flowing year round and it supported a diverse population of emergent and aquatic vegetation.

7.3.2 Polygon 2

Polygon 2 (P2) encompassed a linear logged section of from the old railway grade on the west to the toe of the northwest running ridge to the east. Railway Creek ran through the approximate middle of the polygon. The entire polygon was clear cut in the 1990s, with rare leave trees left along the creek. Remnant trees included red alder, western hemlock and Douglas-fir, while the shrub layer was more diverse with clumps of young trees and woody shrubs such as willow (*Salix* sp.) salal, red huckleberry and dull Oregon grape. The herb layer was diverse and contained many species of emergent plants along the watercourse. Vegetation cover was most abundant and diverse along the watercourse, with the adjacent logged areas containing bracken (*Pteridium aquilinum*) thistles (*Cirsium* sp.) and other primary successional species.

7.3.3 Polygon 3

Polygon 3 (PS3) encompassed a long narrow shallow open water wetland bounded by a steep (30% average) slope to the northeast and gentle slopes to the southwest. Remnant Douglas-fir, western red cedar and western hemlock of various age classes occurred along the fringes of the wetland. The southeast quarter of Polygon 3 had significant stands of remnant forest, with several veteran hemlock and cedar occurring to the south and a young Douglas-fir and shorepine forest occurring across the dry, rocky steep slopes of the northeastern valley side. The polygon also contained logged areas along the western and eastern boundaries. The logged areas were not sampled as they were added to the polygon after the legal survey was completed.

The wetland was characterized by shallow open water with large patches of cattail (*Typha latifolia*), sedges (*Carex* spp.), yellow pond lilies (*Nuphar lutea*) and other emergent and aquatic species. Large woody debris was common in the marsh in various stages of decomposition. The fringe of the marsh was lined with snags of Douglas-fir, western red cedar and western hemlock. Ephemeral (possibly intermittent) creeks feed the wetland in the middle of the south side near

Photostop 2, through Polygon 4 to the east, and from Polygon 6 in the north. P3 was classified as a shallow open water wetland.

The wetland contained excellent wildlife habitat with a variety of nesting and food sources. Numerous species of birds were observed, and over 250 mallards were counted on the open water. The northwest end of the pond was blocked by a beaver dam (Photo RGM-130905-R1-33) which strongly influenced the water levels in the pond. An active beaver dam (Photo RGM-140905-R2-15) was located on the north side of the pond.

The old rail grade ran roughly parallel with P2 and P3 on the south side. Two roads ran parallel upslope of P3 on the north side, ending about three quarters of the length of the polygon as the valley slopes steepened. At the end of the roads the remnant forest was more intact.

7.3.4 Polygon 4

Polygon 4 (P4) encompassed a moderately sloped area to the east of P3 within a narrowing, steep sided valley with 30% slopes. A road ran parallel to the polygon along the southern slope. The polygon comprised a transitional area from the edge of the P3 wetland to the higher elevation edge of the Polygon 5 marsh complex and logged areas of Polygon 6. An additional area along the south was added to the polygon after the completion of the legal survey. This area was not sampled during the inventory but was believed to be more or less similar in nature to the rest of the polygon, with the exception of more pole sapling to young conifer trees occurring.

The entire polygon was clear cut in the 1990s with rare red alders and big-leaf maples (*Acer macrophyllum*) the only trees remaining. The polygon was primarily dominated by rushes, bracken, and thistles with sporadic regeneration of pole sapling western hemlock, Douglas-fir, and western red cedar in the shrub layer.

P4 contained a significant seepage of ground water between the two marsh complexes, with evidence that surface flow occurs during the wet season. The surface water flow is likely fed and maintained by groundwater seepage, but as shown by the scouring of the channel, it is likely that rain events on the barren and partially compacted soils of the logged areas result in surges of water through the polygon and into the P3 wetlands.

7.3.5 Polygon 5

Polygon 5 (P5) encompassed a large wetland area in the east of the Covenant Area. The wetland is locally known as the Eagle Marsh. P5 was dominated by a thick cover of sedges and rushes with sporadic occurrences of shallow open water with yellow pond lilies and cattails. The fringes of the wetland had an abundance of snags with Labrador tea (*Ledum groenlandicum*), limited occurrences of hardhack (*Spiraea douglasii*), and various water tolerant species. The snags gave way to patches of shorepine, western hemlock, Douglas-fir, western red cedar and rare Sitka spruce (*Picea sitchensis*) as the water table dropped. Patches of forest that were not logged the 1990s occurred adjacent to the polygon in Polygons 7 and 9.

The wetland was classified as primarily marsh with sporadic occurrences of shallow open water. The shallow open water areas contained little water at the time of the survey.

Due to the difficulties in placing permanent markers in the marsh, all sample sites were located around the edge. As such, the sites did not adequately inventory the biodiversity of the wetland complex.

7.3.6 Polygon 6

Polygon 6 (PS6) encompassed the crest the northern valley slope above P4 and between the P3 wetland complex and the forested area of Polygon 7. The polygon was clear cut in the 1990s, with the exception of clumps of small non-merchantable trees. An important ephemeral stream connected the two marsh complexes through the north side of P6. Logging occurred over the stream and the remnants of a skidder crossing were found across the stream in the form of a series of logs laying parallel in the stream and on both banks.

The polygon contained clumps of Douglas-fir, western red cedar, and western hemlock. The trees were generally in poor health and windthrow was common. Thick patches of third growth Douglas-fir, western red cedar, and western hemlock pole saplings were common. The remainder of the polygon was dominated by sporadic shrubs and a dense layer of bracken, grasses and other early successional herbaceous species.

The polygon was enlarged after the completion of the legal survey to include additional areas to the northwest. While the additional area was not sampled during the baseline survey, it was not considered to be significantly different the rest of the polygon.

7.3.7 Polygon 7

Polygon 7 (P7) encompassed a forested region that wrapped around the northwest corner of the P5 wetland. The polygon was dominated by a young, single storied even aged stand of western hemlock. Sporadic occurrences of pole/sapling western hemlock, western red cedar and shorepine occurred in the low and tall shrub layers, along with salal and red huckleberry. The herb layer was sparse (likely due to the time of year) with various sedges and rushes near the edge of the P5 wetland. Moss occurred in thick mats throughout the area.

Large patches of windthrown trees were common along the adjacent logged areas, and many of the trees that occurred along the edge of the polygon were in poor health. Wildlife trees within the polygon were rare.

7.3.8 Polygon 8

Polygon 8 (P8) encompassed a clear cut area between the forested regions of P7 and P9 and to the north of the P5 wetland. Polygon 8 was completely cleared in the 1990s logging. With the exception of a small clump of shorepine near the edge of the Polygon 5 wetland, the tree layer was absent. Thick regeneration of western hemlock and shorepine occurred along the western edge of the polygon, while the remainder of the area was largely devoid of trees and shrubs.

7.3.9 Polygon 9

Polygon 9 (P9) encompassed a narrow conifer stand along the eastern edge of the Covenant Area. The polygon was highly irregular with stand characteristics changing significantly from the north to the south. Canopy cover for the polygon varied and included western red cedar, Douglas-fir, western hemlock, shorepine, western white pine, grand fir and red alder in response to changing moisture regimes. The shrub layer varied from thick to sparse with typical species including salal, dull Oregon grape and pole/sapling conifer species. Herbaceous cover was generally sparse to absent, mainly due to the time of year in which the survey was conducted.

The polygon served as an important buffer between the logged areas and the wetland complexes, reducing the direct impacts of the logging on the wetland. Avian and deer use were high throughout the area.

7.3.10 Polygon 10

Polygon 10 (P10) encompassed a partially logged area surrounded by P9 forest on all but the eastern side. The polygon had characteristics similar to P9, but as it was partially logged in the 1990s it was considered to be a separate polygon.

The polygon was characterized by a highly irregular stand of pole/sapling to young coniferous trees with frequent roads and cleared areas. Much of the stand was undergoing self thinning with the pole/sapling layer dying out. Seepage sites were common as the polygon was the transition area between the Polygon 11 wetland and former upland forests. The main tree cover was an irregular mixture of western hemlock, western red cedar, red alder and shorepine. Much of the stand was in poor health and windthrow was common.

Ground cover varied between the numerous seepage sites and dryer raised areas. The seepage sites contained a variety of rushes, sedges and other water loving species, while the drier areas had little to no herbaceous vegetation due to the dense tree cover (and possibly the time of year).

Deer and avian use of the polygon was high. Numerous deer trail, browse and wildlife trees were observed.

7.3.11 Polygon 11

Polygon 11 (PS11) encompassed a diverse wetland / forest area in the south of the Covenant Area. The polygon was a transitional area between the marsh of P5 and the forested upland areas. The diversity of the numerous ecosystem types found in this polygon made the identification of distinct boundaries highly subjective. P11 ranged from conifer dominated forests around the northern and eastern edges to a treed swamp / bog area in the middle, to small pockets of marsh in the south. P11 was connected to the Polygon 12 (P12) and 13 wetlands by a small stream that flowed along the southern edge of the polygon from P12.

The polygon was mainly coniferous, but contained sporadic occurrences of red alder in swamps areas on the south edge. Main tree species were diverse and included western red cedar, western hemlock, shorepine, western white pine, and stunted Sitka spruce in the bog area. Shrubs were diverse and generally formed continuous thick covers of Labrador tea and salal, while the herb layer contained numerous species of sedge and rush, deer fern, and bog cranberry. A thick moss layer was found on a substrate of decomposing organic material, including various species of sphagnum mosses.

Limited historic logging occurred throughout the polygon, but few large stumps were observed. The polygon was not directly affected by the 1990s logging and was considered to be one of the most intact wetlands of the Covenant Area.

7.3.12 Polygon 12

Polygon 12 (PS12) encompassed a clear cut area in the southeast corner of the Covenant Area. The polygon contained a small ephemeral stream that connected the bog in Polygon 13 to the wetlands of P11. The polygon was completely clear cut with the exception of a small patch of spindly western red cedar, Douglas-fir and shore pine along the stream. Much of the remnant patch of trees was in poor health and succumbing to windthrow. Very little regeneration has occurred within the remainder of the polygon (except minor amounts along the stream) and it was dominated by Canada thistle and bracken.

P12 also contained a small detached area to the northwest of P11. This area was added to the polygon after the completion of the legal survey. While it was not sampled during the baseline

inventory, it is assumed to have similar characteristics (although lacking any water courses) as P12 and was therefore added to the polygon.

7.3.13 Polygon 13

Polygon 13 (PS13) encompassed a small sphagnum bog that was detached from the rest of the Covenant Area by the road that runs north-south along the eastern edge of the Covenant Area. The polygon was characterized by a small circular bog with remnant trees around the fringe. The Covenant Area buffer around the bog was mostly logged with few leave trees, and it also contained the north-south running road. The bog contained standing water all year in small pockets as indicated by the occurrence of skunk cabbage. The remainder of the bog was dominated by grasses, sedges, and rushes with rare occurrences of Labrador tea. Various species of sphagnum moss occurred throughout the area. Large decaying logs were common in the bog.

Evidence of historic logging was observed in the bog. The 1990's logging did not directly impact the wetland, but it was logged to the edge of the wetland in many places. The roads that bordered the wetland to the west and south have likely altered the hydrology and resulted in higher water levels than would otherwise be expected.

7.4 Wildlife

The Covenant Area contains important local and regional wildlife habitat. The permanent open water of the Polygon 3 wetland is of particular importance as a stop over on the Pacific Flyway. The wetlands provide important habitat to numerous species of bird, amphibian, and reptile.

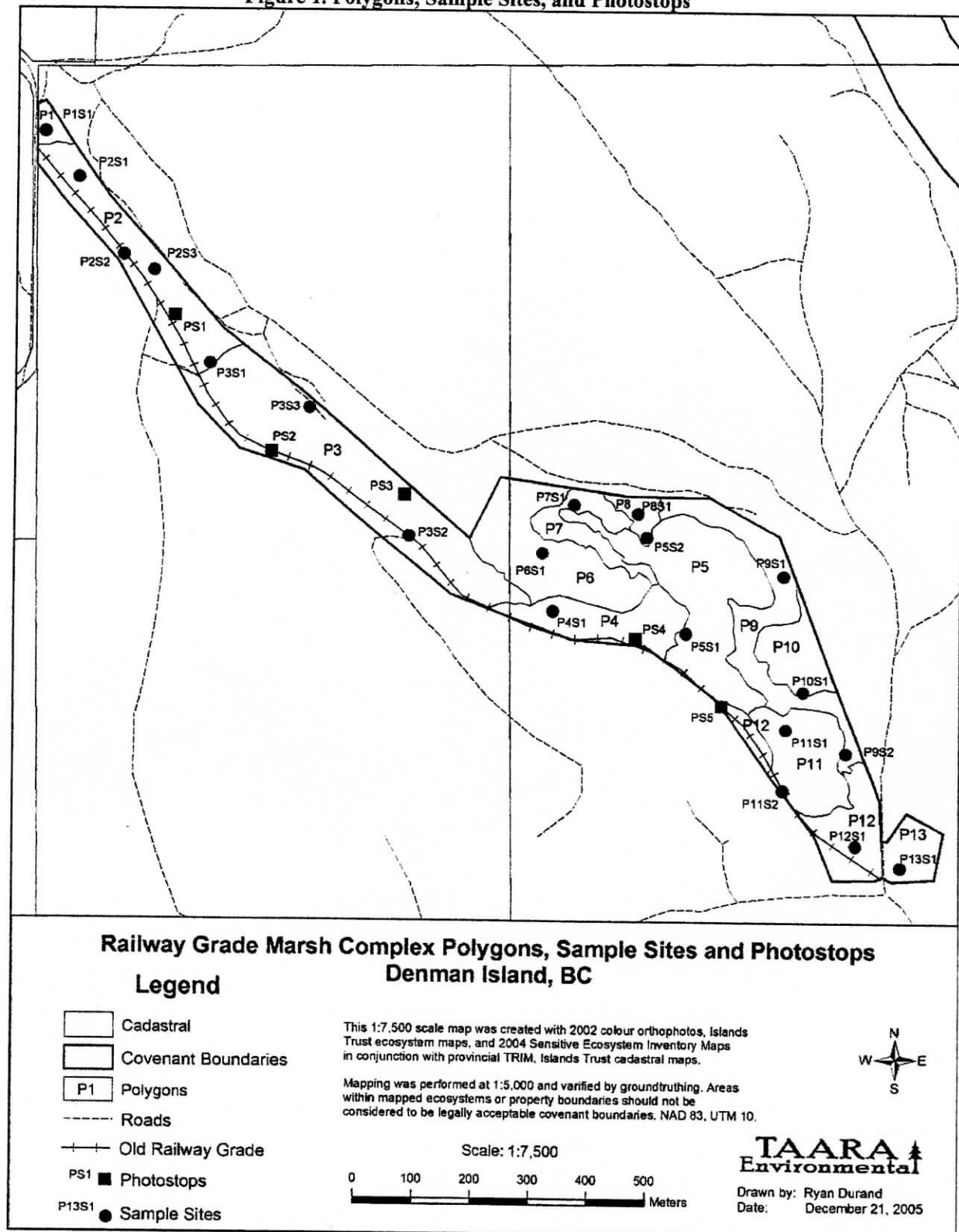
Jenny Balke (1998) describes the wildlife usage of the Covenant Area as:

"The Railway Grade Marsh complex...vegetative communities support a considerable wildlife population including breeding and over-wintering waterfowl on the Pacific Flyway migration route, such as Wood Duck, Bufflehead, Mallard and Canada Goose; numerous passerines; a large population of at least 4 species of amphibians; 3 reptile species; a variety of mammals; and at least 2 fish species including salmonid fry which have been observed in Railway Creek. The snags and large trees surrounding the marsh, particularly around Eagle Marsh, provide nest and perch habitat for Bald Eagles and other raptors. These stands of mature trees and snags in combination with open bodies of water are critical for cavity nesting water fowl species (Wood Duck and Hooded Merganser) in this habitat."

During the survey between 250 and 400 mallards (*Anas platyrhynchos*) were observed at one time in the Polygon 3 open water. Numerous additional water fowl were observed at the same time, and great blue herons (*Ardea herodias*) were seen on the water each morning. Incidental bird sighting during the survey included dark eyed juncos (*Junco hyemalis*), brown creepers (*Certhia americana*), red shafted northern flickers (*Colaptes auratus*), red-breasted nuthatches (*Sitta canadensis*), winter wrens (*Troglodytes troglodytes*), and chipping sparrows (*Spizella passerina*). Black tailed deer (*Odocoileus hemionus*) were also frequently observed.

8.0 Baseline Inventory Maps

Figure 1. Polygons, Sample Sites, and Photostops



10.0 References

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