HEALING BROKEN LANDS

A Research Methodology for the Long Term Monitoring of the Sustainable Community Design at Ty-Histanis

Tla-o-qui-aht First Nations and Canadian Mortgage and Housing Corporation Monitoring Plan

Can good practice in land development based on principles of sustainable planning and design, rehabilitate and re-naturalize a damaged eco-system and, at the same time, provide affordable infrastructure and housing that promotes good human health and positive economic development?

PREPARED FOR: Canada Mortgage and Housing Corporation

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INTRODUCTION

BACKGROUND

The Tla-o-qui-aht First Nations territory is located on the west coast of Vancouver Island, British Columbia, in Clayoquot Sound. It is a growing Nation that can trace their occupation of the study site back 10,000 years. The Nation hopes to create a lasting community that promotes good health, enhances and restores the natural ecosystems, and has a positive impact on the local and regional economy.

The establishment of the Pacific Rim National Park Reserve in the early 1970s created a major impediment to the expansion of Esowista Indian Reserve No. 3 (IR 3), one of two occupied Reserves belonging to the Tla-o-qui-aht First Nations. Since that time, physical development at Esowista consumed all of the developable land on the small Reserve. Overcrowded housing conditions reached a crisis for the First Nation and they had to turn away many Tla-o-qui-aht families and individuals who were anxious to return to their homeland. As a result of these pressures, nine years ago, the Tla-o-qui-aht First Nations began a process to address their immediate and future community development land needs. This process culminated in the successful negotiation of a Memorandum of Understanding (MOU) between the First Nation, Indian and Northern Affairs Canada and Parks Canada. The MOU, formally signed in 2003, set in motion the transfer of 86 hectares of land from Pacific Rim National Park Reserve to Esowista IR 3. A commitment was made by the parties to the MOU to explore and apply practical, sustainable community development principles to the planning, design and construction of the new, expanded community.

In 2006, the Tla-o-qui-aht Village of Esowista reclaimed 86 hectares northwest of the village site from the Pacific Rim Nation Park Reserve and added it to IR 3 from the Government of Canada, now known as the Ty-Histanis. The land has seen 60-100 years of disturbance by modern society on its natural environment. The land represents the site of an expansion of the Esowista Village to accommodate 160+ new homes and community buildings.

In planning the Tla-o-qui-aht subdivision of Ty-Histanis and its various components, community visioning workshops and regional planning sessions were conducted, and at these meetings members identified priorities in pursuing their goal of a sustainable community. Priorities included: affordable housing, environmental protection, recreation, sustainable economic development, health, infrastructure, education and land use planning (DNA, 2007).

Tla-o-qui-aht First Nations developed their vision for Ty-Histanis:

> ***To create a model community that achieves a balance between the principle of ecological integrity and Tla-o-qui-aht First Nation's principles of Isaak (Respect) and Hishuk ish' tsawalk (everything is one and all is inter-connected). This model community must achieve a careful balance that respects the desires and aspirations of the current and future residents of Esowista with the desire to develop a sustainable community.***

This document is the final part of a larger CMHC Part IX research project that included comprehensive design charrettes, integrated design processes, community consultations, analysis of community scale renewable energy systems, housing design workshops and design collaboration by stakeholders.

STUDY AREA: "TY-HISTANIS" COMMUNITY EXPANSION

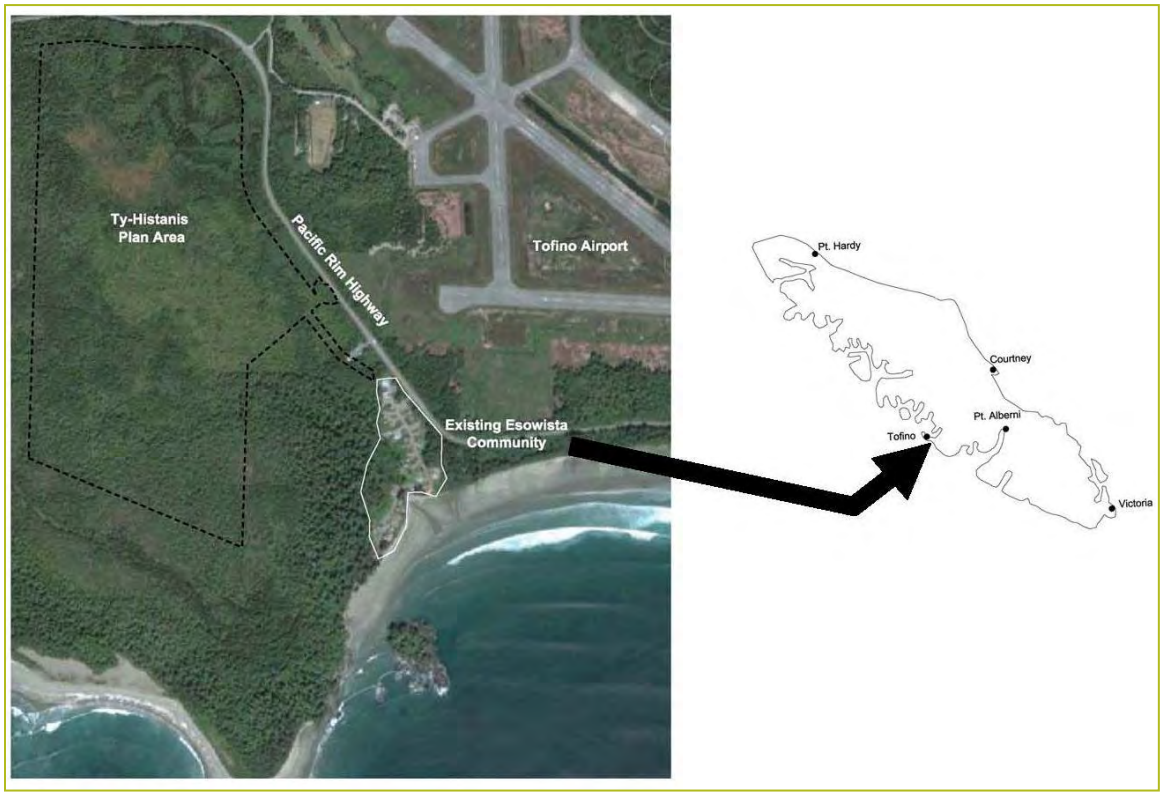

FIGURE 1: STUDY AREA

Phase 1 of Ty-Histanis has been constructed with the development of 68 lots and 74 housing units. Additionally, Tla-o-qui-aht has received funding to design and construct a Health Centre (planned start is April 1st, 2012, construction to extend into the 2013/14 fiscal year) and plans to build a multi-purpose community building in the Community Core as funding permits.

Additional works that have been completed during Phase 1 of the neighbourhood development include:

- Two Highway Access Entrances
- Bridge over Esowista Creek for Road #1
- Roads, Footpaths & Drainage System
- Sanitary Sewers
- Sewage Lift Stations with connection to a sewage force main to the District of Tofino's sewage collection, treatment and disposal system
- Water Reservoir & Booster Pump Station
- Water Mains
- Site Works & Landscaping
- Lot Services (water, sewer, district heat)
- District Geoexchange Heating System
- Power & Telephone Servicing
- Legal Survey

In the fall of 2010, 17 units were started and built:

Multi-family residence:

- 9 Two-bedroom unit elder complex built – (CMHC section 10 – 2011)

Single-Family residence:

- 2 Two-bedroom single family residences built (CMHC section 95 – 2011)
- 4 Three-bedroom single family residences built (CMHC section 95 – 2011)
- 1 Four-bedroom single family residence built (CMHC section 95 – 2011)

In the winter of 2011/2012, 27 units started construction:

Multi-family residence:

- 3 Two-bedroom duplexes (CMHC Section 10)
- 1 Three-bedroom duplex (CMCH Section 10)

Single-Family residence:

- 5 Three-bedroom single family residences being constructed (3-CMHC Section 10 & 2-CMHC Section 95)
- 9 Four-bedroom single family residences being constructed (2-CMHC Section 10 & 7-CMHC Section 95)
- 1 Five-bedroom single family residence being constructed (CMHC Section 10)
- 1- Three-bedroom sing family residence being constructed (owner mortgage)
- 1-Four-bedroom sing family residence being constructed (owner mortgage)

EQUILIBRIUM FUNDING

A submission in September 2009 was made to Canada Mortgage and Housing Corporation (CMHC) and Natural Resources Canada (NRCan) for the Equilibrium funding (EQuilibrium™ Communities Initiative). The purpose of this funding was to provide additional technical support needed to enhance design of community infrastructure and housing. The overall goal of the EQuilibrium™ Communities Initiative is to accelerate the adoption of sustainable approaches to neighbourhood design.[1]

TLA-O-QUI-AHT TRIBAL PARKS CONTEXT – "EVERYTHING IS ONE"

The Tla-o-qui-aht Tribal Parks are indigenous watershed management areas designated in Tla-o-qui-aht Traditional Territory (Haa'hulthii) by the Tla-o-qui-aht Ha'wiih (hereditary chiefs). The first one, Meares Island Tribal Park, was designated in the early 1980s as a reaction to unfavourable logging practices while more recent work has been forwarded in partnership with Parks Canada, Western Canada Wilderness Committee, Ecotrust Canada and others as a proactive process of establishing healthy economy, within a balance of environmental security and social-cultural prosperity.

In Tla-o-qui-aht's recent history, litigation (e.g. Meares Island court case) and political engagement (e.g. treaty negotiations) have been used to ensure meaningful participation of Tla-o-qui-aht members in the

[1] Canadian Housing Observer 2011, Sustainable Housing and Communities, CMHC

management of lands and resources. The Tribal Parks Establishment Project emphasized collaborative and ecosystem-based management as integral strategies.

The purpose of designating the Haa'uukmin Watershed as a Tribal Park is to preserve and manage the Watershed as part of the Haahuulthii of the Tla-o-qui-aht Hawiih and according to the Tla-o-qui-aht Principles of Hishuk ish' tsawalk (everything is one, and all is inter-connected) and Huupukwanim (Chief's Laws and Responsibilities). From the Parks perspective, the establishment of contiguous protected areas through a watershed management approach can enhance the ecological integrity of existing designated Parks and Park Reserves.

The Tribal Park Designation and the Principles of Hishuk ish' tsawalk (everything is one and all is inter-connected) are intended to deliver a healthy ecosystem for the unborn generations to come. The Tribal Park is a model for sharing the Haahuulthii and is also a means of recognizing the inherent right of Tla-o-qui-aht to manage and monitor the Haahuulthii. The Tribal Park speaks to the co-existence of Qu'actup (Human Beings) to work together to ensure healthy homelands and healthy People.

PROJECT OBJECTIVES

Designed to be a long-term research project/monitoring program focusing on whether or not sustainable development makes a difference.

> *Can good practice in land development, based on principles of sustainable planning and design, provide affordable infrastructure and housing that promotes good human health and positive economic development and, at the same time, rehabilitate and re-naturalize a damaged eco-system?*

The preparation of a monitoring and assessment plan and methodology to determine:

- General community population health and well-being before and after occupancy at the new Esowista Village. Prepare a draft of a comprehensive survey that will produce comparative values of general population health.
- The energy, water and resource efficiency and performance of the community systems, individual houses and community buildings.
- The positive or negative impact of the development activities on the natural ecosystems common to the area, such as: re-establishing salmon populations in the stream, the re-naturalization of flora and fauna to the overall site, and specific areas where previous development activities have damaged the previously existing conditions.

PROJECT SCOPE/DELIVERABLES

Design of the monitoring plan with frequency of assessments, interim reporting periods, and budgets required during monitoring and for reporting. This may form the basis for a formal proposal that may require multiple funding partners.

RESEARCH METHODOLOGY AND PROTOCOLS GUIDELINES

The Tla-o-qui-aht First Nations is a member of the Nuu-chah-nulth Tribal Council (NTC), a group that represents specific collective interests of member First Nations. The NTC has historically led the development and implementation of research protocols on behalf of all members; however, as capacity for research increases at the community level, each member First Nation is developing their own research protocols that both complement and further delineate cultural, social and environmental norms (Tla-o-qui-aht First Nations research protocols currently in development).

Appendix B presents the most recent research protocols to guide the Tla-o-qui-aht First Nations community and Nation-wide research relationships until the Tla-o-qui-aht First Nations' research protocols are approved, at which point they will refer to those guidelines in future research.

MONITORING AND ASSESSMENT PLAN

HUMAN WELL-BEING INDICATORS

Health can be defined on both a micro and macro level; measuring individual health as well as community health is necessary to demonstrate change in a longitudinal study. Individual health refers to physical and mental health conditions which, when seen in increased frequency in specific populations, assist to isolate environmental causation and implement solutions to improve overall **determinants of health**. Community health is comprised of determinants of health which make up an individual's local environment, influencing the way individuals in communities access food, socialize, work, play and support each other. The interconnectedness of individual and community health is highly statistically correlated and can be demonstrated through relationships between food and physical health or stress and mental health. Awareness of the interconnectivity of environment and health can be observed in the way health funding and programs are allocated.[2]

In health and community programming it is useful to measure both individual health as well as community health; looking at the number of individuals with specific health issues or the frequency of health issues ensures an accurate view of physical and mental health conditions in a community. Measuring the amount of programs available to specific demographics leads to information on the community's health. Health and community programs are categorised into three levels of access: clinical, targeted and universal. These three levels of programming refer to the accessibility of service and correspond to the amount of preventative strategies in the program:

- Clinical programs, often referred to as 'interventions', are specific programs dealing with chronic illness, moderate to severe mental health, and other health issues requiring increased attention. These programs are required when early interventions and preventative strategies have not succeeded in managing or preventing the health issue.
- Targeted programming refers to programming which is designed for a specific age group, demographic or issue. These are early intervention programs and are comprised of a combination of treatment, prevention and education to reduce the impact of maladaptive behaviours later in the lifespan.
- Universal programming refers to programs which anyone can take part in; they are rooted in preventative strategies, modelling and education. These can take shape in programs such as maternal groups, cultural practise or basketball leagues.

The balance, use and availability of these three types of programs serve to illustrate barriers experienced in a region and are one of the most useful indicators of community health which can be measured in a sustainable manner. [3]

Working with the existing network of health professionals in local participating communities, as well as the Central Region Vancouver Island Health Authority, specific human well-being indicators will be identified. Health and well-being factors will be selected based on significance and direct correlation to

[2] http://www.who.int/social_determinants/en/
http://www.phac-aspc.gc.ca/ph-sp/approach-approche/pdf/summary_table.pdf
[3] http://www.public.asu.edu/~davidpm/classes/psy536/Offord.pdf

environmental factors as well as the existence of baselines and the ability to sustainably measure long term outcomes.

Identified areas will be defined, relevance explained and a rationale for its measurement presented. For each indicator related to the identified human well-being factors benchmarks, existing data sources, measurement tools, collaborators and limitations will be identified.

ESOWISTA COMMUNITY/TY-HISTANIS

HOUSING AND POPULATION

In this case, 'housing' refers to a structure inhabited by an individual, family or multiple families in which the inhabitants spend at least 1/3 of their time over a lifetime. Housing and health have statistically significant correlations. Overcrowded homes and poorly maintained structures have a significant effect on individual and family health and wellbeing. The impacts of living in such conditions manifest in both physical health and mental health, but also impact community health. As demonstrated in the charts and information below, environments play a significant role in individual physical health, mental health, even childhood development and achievement.[4] A holistic approach to health is necessary to measure and achieve healthier communities. Housing and population indicators serve as a baseline by which to correlate other human and health indicators. For consistency purposes, a baseline from the 2006 census data has been used to demonstrate housing status; for further analysis and future accuracy, in-community tracking of such information will provide a more complete picture while eliminating uncertainty of the accuracy of the new long form census data.

TABLE 1: HOUSING AND POPULATION INDICATORS

Indicator	# Multifamily homes	Dwellings requiring major repair	Dwellings constructed more than 10 years ago	Dwellings constructed in the past 10 years
Benchmark	15	55	75	10
Existing Data Sources	2006 Census Housing records	2006 Census Housing records	2006 Census Housing records	2006 Census Housing records
Measurement	# of multi-family homes	# of dwellings requiring major repair	# of > 10 year old homes	# of < 10 year old homes
Frequency of Assessment	3- to 5-year assessment cycle. Optional enhancement through survey and in-community tracking numbers monitored annually and reported out during assessment cycle.			
Budget Required	Survey Component @ $4,400 – 60 hour contract including survey design testing and implementation. Cumulate, analyse and report 3 – 5 years @ $2,200 – estimation based on 30 hour contract.			
Collaborators	Tla-o-qui-aht First Nation, Nuu-cha-nulth Tribal Council			
Barriers Limitations	Long form census availability/validity and community participation & future ownership of statistical analysis in lieu of census information.			

[4] http://www.phac-aspc.gc.ca/ph-sp/oi-ar/09_housing-eng.php
http://www.who.int/hia/housing/en/index.html

INDIVIDUAL HEALTH

Individual health is the health of the mind and body, the relationship which influences an individual's ability to contribute to employment, community and family. Over a lifespan, an individual can encounter a number of challenges which relate to body and mind. Healthy living practices, environment, education and community inclusion are key elements to leading a full and healthy life. High incidences of physical and mental health issues in a community are indicative of systemic issues serving as useful markers of change in a population's health management. Physical and mental health indicators recorded are obtained through Vancouver Island Health Authority Aboriginal Health statistic's tracking premature mortality. The benchmarks recorded are set to reflect Potential Years of Life Lost (PYLL) per 1,000 population and are specific to the Central Vancouver Island region, but challenging to identify information for specific communities. Clinical interventions and health programming are currently divided between Nuu-chah-nulth Tribal Council Health, Vancouver Island Health Authority and in-community programming; thus health indicators are fragmented and best represented by PYLL. Ideally, an in-community system to track referrals to clinical interventions (demonstrating cases in which a formal diagnosis exists), extensive treatment and monitoring would be necessary in order to maintain consistency. Tracking of these community-specific individual health indicators will ideally be owned by the community health services and provide a basis for evaluation and future program implementation.

PHYSICAL HEALTH

Physical health is the measurement of overall condition of an individual's body. Numerous factors contribute to physical health: nutrition, exercise, genetics, age, environment and lifestyle choices to name a few. The environment in which an individual spends the majority of their life, as well as personal lifestyle choices, have major impacts on physical health later in life and correlate with the expression or repression of specific genetic disorders. For the purpose of this monitoring proposal, where chronic health concerns were chosen by the availability of data and significance to environment, the following chronic health conditions are tracked through aboriginal mortality rates in the Central Vancouver Island Region representing potential years of life lost in a population of 1,000.

TABLE 2: PHYSICAL HEALTH INDICATORS

Indicator Tracked through Premature Mortality (PYLL)	Circulatory System Diseases (Cardiac)	Respiratory System Diseases	Infectious/ Parasitic Diseases	Cancer	Cerebrovascular Disease (Stroke)	Medically Treatable Diseases
Benchmark	16.33 (other resident 8.11)	7.06 (other resident 1.6)	7.5 (other resident 1.6)	9.19 (other resident 14.3)	5.0 (other resident 1.4)	3.5 (other resident 0.7)
Existing Data Sources	Vancouver Island Health Authority Aboriginal and Regional Health Statistics VIHA Aboriginal Health Plan Statistical Update Summary Office of the Provincial Health Officer (2007). Pathways to Health and Healing: 2nd Report on the Health and Well-being of Aboriginal People in British Columbia, Provincial Health Officer's Annual Report 2007.					
Measurement	PYLL is a measure of premature death. PYLL estimates the total number of years a population might have lived if they hadn't died prematurely due to any cause PYLL is					

Indicator Tracked through Premature Mortality (PYLL)	Circulatory System Diseases (Cardiac)	Respiratory System Diseases	Infectious/ Parasitic Diseases	Cancer	Cerebrovascular Disease (Stroke)	Medically Treatable Diseases
	defined as the years of life lost when a person dies before the age of 75 years from all causes. PYLL is expressed per 1,000 population and is age-standardized to the Statistics Canada 1991 Canadian population under age 75.[5]					
Frequency of Assessment	Annual health statistics should be gathered and accumulated for accurate evaluation and programming and incorporated into daily operations. Information can be cumulated and reported out every 3 – 5 years to demonstrate health successes and barriers.					
Budget Required	Development and implementation of community indicator monitoring @ $12,500 – based on coordination @ $69/hour for 10 – 20 hours per month, one year cycle Cumulate, analyse and report 3 – 5 years @ $2,500 – estimation based on 36 hour contract					
Collaborators	Vancouver Island Health Authority Planning and Community Engagement Department, Vancouver Island Health Authority Aboriginal Health, Tla-o-qui-aht Health Department, and Possible Universities					
Barriers Limitations	Tla-o-qui-aht Health Department is currently interested in developing evaluation and health statistic tracking procedures. Community members receive health treatment through Nuu-chah-nulth Tribal Council, Vancouver Island Health Authority and AANDC, thus numbers are not specific to community and held in multiple domains.					

MENTAL HEALTH

Mental health refers to the state of an individual's emotional and cognitive wellbeing. Although poor mental health is often attributed to individual life choices or genetic predispositions, research demonstrates strong correlations to the influence of community, early childhood supports and environment on mental health. A healthy network of family and/or community assists individuals in developing healthy coping mechanisms, provides support in times of stress, and decreases the incidence of severe mental health and addictions. Additional limitations to gathering accurate quantifiable evidence on mental health in a community exists in the nature of certain mental health concerns; an individual must pursue treatment or fall under the mandate of the mental health act, putting themselves or other individuals at risk to receive diagnosis and treatment. Utilizing regional aboriginal health statistics provides a very small look into the realities of a community; benchmarks currently reflect mortality due to mental health and addictions in the health region, but could be more accurately tracked through in-community referral tracking and evaluations.

TABLE 3: MENTAL HEALTH INDICATORS

Indicator Tracked through Premature Mortality (PYLL)	Alcohol Related Mortality	Drug Induced Mortality	Smoking Attributable Mortality	Mortality Caused by Suicide
Benchmark	38.2 (other resident 7.0)	7.6 (other resident 3.5)	7.9 (other resident 7.2)	18.2 (other resident 4.4)
Existing Data	Vancouver Island Health Authority Aboriginal and Regional Health Statistics			

[5] http://www.albertahealthservices.ca/Publications/ahs-pub-pr-def-potl-life-lost.pdf

Indicator Tracked through Premature Mortality (PYLL)	Alcohol Related Mortality	Drug Induced Mortality	Smoking Attributable Mortality	Mortality Caused by Suicide
Sources	VIHA Aboriginal Health Plan Statistical Update Summary. Office of the Provincial Health Officer (2007). Pathways to Health and Healing: 2nd Report on the Health and Well-being of Aboriginal People in British Columbia, Provincial Health Officer's Annual Report 2007.			
Measurement	PYLL is a measure of premature death. PYLL estimates the total number of years a population might have lived if they hadn't died prematurely due to any cause PYLL is defined as the years of life lost when a person dies before the age of 75 years from all causes. PYLL is expressed per 1,000 population, and is age-standardized to the Statistics Canada 1991 Canadian population under age 75.			
Frequency of Assessment	Annual health statistics should be gathered and accumulated for accurate evaluation and programming and incorporated into daily operations. Information can be cumulated and reported out every 3 – 5 years to demonstrate health successes and barriers.			
Budget Required	Development and implementation of community indicator monitoring @ $12,500 – based on coordination @ $69/hour for 10 – 20 hours per month, one year cycle Cumulate, analyse and report 3 – 5 years @ $2,500 – estimation based on 36 hour contract.			
Collaborators	Vancouver Island Health Authority Planning and Community Engagement Department, Vancouver Island Health Authority Aboriginal Health and Tla-o-qui-aht Health Department and Possible Universities			
Barriers Limitations	Tla-o-qui-aht Health Department is currently interested in developing evaluation and health statistic tracking procedures. Community members receive health treatment through Nuu-chah-nulth Tribal Council, Vancouver Island Health Authority and AANDC, thus numbers are not specific to community and held in multiple domains.			

COMMUNITY HEALTH

Community health is the overall health and sustainability of a community's economic, social and cultural opportunities which can be measured independently and observed by the health of individuals residing in its boundaries. Employment, education, community cohesion and culture all play a major role in the way in which we interact in our community, shaping our perceptions, interpersonal relationships and overall wellbeing. Data on community health can be derived through long form census community profiles and in-community reporting. Due to the nature and uncertainty around the updated long form census, indicators have been set with in-community monitoring in mind. As First Nation communities continue to assume control of their health and monitoring programs, these constructs can be built into the evaluation process.

EMPLOYMENT

The act of employment can be defined as an activity to which an individual devotes time for monetary or community recognition. This can encompass employment activities involving money or goods paid for services rendered, or voluntary activities to which an individual devotes their time out of personal interest or obligation. Employment plays a major role in social determinants of health: it has influence on our social activities, community involvement, lifestyle and purchasing ability. The food we prepare, home we live in, and activities we choose to participate in are influenced by our personal purchasing power. When

under the poverty line, these decisions are compromised, more affordable rentals can be unhealthy or crowded, and prepackaged high caloric food is often a more viable purchase than whole foods.[6]

TABLE 4: EMPLOYMENT INDICATORS

Indicator	Participation Rate	Employment Rate	Unemployment Rate	Average total income
Benchmark	61.5	51.9	15.6	$16 865
Existing Data Sources	2006 Census	2006 Census	2006 Census	2006 Census
Measurement	% of individuals participating in paid employment activities	% of individuals employed	% unemployed individuals	Average total income
Frequency of Assessment	Analysis on a 3- to 5-year schedule, in combination or independent of the long form census.			
Budget Required	Survey Component @ $4,400 – 60 hour contract including survey design testing and implementation. Cumulate, analyse and report 3 – 5 years @ $2,500 – estimation based on 36 hour contract.			
Collaborators	Tla-o-qui-aht First Nation Social Development and Possible Universities			
Barriers Limitations	Long form census availability /validity. Community participation in statistical analysis.			

EDUCATION

Education levels have a major impact on future employment and annual salary, and are thus highly correlated with an individual's quality of life. Educational achievement also correlates with an individual's ability or willingness to seek help for health or social concerns. Human Resource and Skills Development Canada has placed considerable resources into promoting four literacies and five essential skills. Literacy and essential skills correlate directly to high school completion, but are comprised of hard (measurable) and soft (not measurable) life skills. The four literacies – reading, numeracy, writing and document use; and the five essential skills – computer use, thinking, oral communication, working with others and continuous learning, can be obtained in a variety of different environments. A high school education is often the implied minimum for these skills.[7]

[6] http://www.phac-aspc.gc.ca/ph-sp/oi-ar/04_employment-eng.php
[7] http://www.hrsdc.gc.ca/eng/workplaceskills/LES/index.shtml

TABLE 5: EDUCATION INDICATORS

Indicator	No Degree, Certificate or Diploma	High School Completion	Trades/ Apprenticeship or other non-university diploma	University Degree (Bachelor level or higher)
Benchmark	190	40	25	0
Existing Data Sources	2006 Census	2006 Census	2006 Census	2006 Census
Measurement	# individuals with no degree, certificate or diploma	# individuals with high school diploma only	# individuals with trades/ apprenticeship or other non-university diploma	# of individuals with university degree or higher
Frequency of Assessment	Graduations and school funding are numbers collected annually, a 3-5 year reporting cycle would decrease cost.			
Budget Required	Enhancement of in community tracking @4,400 – estimation allows for survey or the development of additional tracking @ 60 hours Cumulate, analyse and report 3 – 5 years @ $2,500 – estimation based on 36 hour contract			
Collaborators	Tla-o-qui-aht First Nation, School District 70, NTC Education, Possible Universities			
Barriers Limitations	Long form census availability /validity Community and/or Tribal Council participation in statistical analysis			

CULTURAL INDICATORS

Cultural indicators refer to language, food, art, medicine and ceremonies which are unique to a specific population. Strong culture increases individual social support, inclusion, good health and community cohesion. In First Nation communities, family and culture are important keystones to the health of the community. The rejuvenation of traditional practises promotes healthy individuals, families, community and development. As nations return to a more sovereign form of governance it is anticipated traditional practices will increase in combination with community health. Although some indicators may be challenging to track, the rejuvenation of cultural practices is an integral part of health in First Nation communities. Some benchmarks are not available or based on estimates; it is hoped that these indicators or a similar set of indicators will be adopted as a framework for evaluation of cultural progress.

TABLE 6: CULTURAL INDICATORS

Indicator	Language (# Speakers and fluency)	Traditional Food harvesting and consumption	Art	Ceremonies	Traditional Medicine and Healing
Benchmark	23 Fluent speakers 22 Understand or somewhat understand 30 Learning speakers	Community Lunches – 64 # of workshops and meetings (currently undetermined)	No benchmarks currently available	No benchmarks currently available	No benchmarks currently available

Indicator	Language (# Speakers and fluency)	Traditional Food harvesting and consumption	Art	Ceremonies	Traditional Medicine and Healing
		35 + community members with knowledge and eagerness to teach			
Existing Data Sources	First Peoples Language Map of BC http://maps.fphlcc.ca/	TFN Health and Social Development	TFN Community Members	TFN Health and Social Development	TFN Health and Social Development
Measurement	# Fluent Speakers # Individuals Who Understand, Somewhat Speak # Learning Speakers	# of community lunches annually # of workshops and meetings with traditional foods served # of community members with knowledge educating others	# of Traditional arts and crafts workshops	# of Ceremonies around life events annually (baby welcoming, graduation, etc.)	# of Workshops with traditional medicines and healing
Frequency of Assessment	Cultural indicators should be set, gathered and accumulated for accurate evaluation and programming on an annual basis and incorporated into daily operations. Information can be cumulated and reported out every 3 – 5 years to demonstrate successes and barriers				
Budget Required	Development and implementation of community indicator monitoring @ $12,500 – based on coordination @ $69/hour for 10 – 20 hours per month, one year cycle Cumulate, analyse and report 3 – 5 years @ $2,200				
Collaborators	Tla-o-qui-aht First Nation Health and Social Development, Language speakers, and Possible Universities				
Barriers Limitations	With the exception of Nuu-chah-nulth language many of the cultural indicators have never been tracked. Monitoring additional indicators associated with culture will assist in evaluating the efforts of the community initiatives.				

COMMUNITY COHESION

Community cohesion refers to the way in which a community supports and engages its individual members. A healthy community hosts a wide range of activities fostering healthy development, relationships and activities. When engaged and active in their community whether it is social, sport or cultural activities an individual's mental and physical health is significantly increased.

TABLE 7: COMMUNITY COHESION INDICATORS

Indicator	# Community Events	# Health and Social Development Programs	# Sports Teams	# Traditional Practices
Benchmark	No framework in place to set benchmarks			
Existing Data Sources	TFN community members, Health and Social Development, Education			
Measurement	# Community gatherings annually	# Health and Social Development outreach based programs	# of Sports teams	# Practices Average # of participants
Frequency of Assessment	Indicators should be set, gathered and accumulated for accurate evaluation and programming on an annual basis and incorporated into daily operations. Information can be cumulated and reported out every 3 – 5 years to demonstrate successes and barriers			
Budget Required	Development and implementation of community indicator monitoring @ $12,500 – based on coordination @ $69/hour for 10 – 20 hours per month, one year cycle Cumulate, analyse and report 3 – 5 years @ $2,200			
Collaborators	TFN Hawiih, Admin, Social Development, Health, Education, and Possible Universities			
Barriers Limitations	Currently with in TFN there is no framework for tracking these items, multiple groups offer events, practices and activities with no centralised tracking. A framework will need to be adopted in order for tracking and evaluation to take place.			

ECONOMIC EFFICIENCY INDICATORS

Economic efficiency refers to the allocation, and management, of available resources to maximize output.

ENERGY CONSUMPTION

Energy consumption refers to the amount of energy that is spent, using sources such as electricity and fuel, to power our daily lives; from the appliances we use and transport we take, to household lighting and heating, the water we use, cooling and refrigeration, washing and drying, cooking and other miscellaneous electrical loads. Consuming energy, as necessary as it is, causes a wide range of health and environmental impacts, from habitat loss associated with the extraction of the raw materials required to produce energy, to the health effects associated with pollution resulting from the burning and other use of those raw materials. Furthermore, reducing energy consumption can reduce energy costs, resulting in financial savings for consumers – in this case already cash-strapped communities. Findings from performance monitoring on five EQuilibrium™ Houses show that "$18,000 in better windows, insulation,

and appliances reduced energy bills by up to 85%"[8]. Reducing energy consumption can also reduce Green House Gas (GHG) emissions, which will have a positive impact on climate change, air and water quality, and ultimately, human health and well-being. According to an International Energy Agency report published in 2006, improved energy efficiency in buildings, industrial processes and transportation could reduce the world's energy needs in 2050 by one third, and help control global emissions of greenhouse gases.[9] Thoughtful use of energy – including houses designed from the get-go for smarter energy consumption – which involves exploring energy efficiency indicators, is thus important for both the economic and physical health of a community.

TABLE 8: ENERGY CONSUMPTION INDICATORS

Indicator	Electrical Consumption based on residential type	Geoexchange Energy System Consumption based on residential type	Total Energy Consumption based on residential type	GHG admission based on residential type	# of Wood stoves based on residential type
Benchmark	Esowista	N/A	Esowista	Conversion of Esowista numbers	0
Existing Data Sources	Currently TFN Housing collects all hydro bills from residents.				
Measurement	BC Hydro Smart Meter (MJ/m^2)	BTU Monitor (BTU) - unconfirmed	Adding electrical & geoexchange consumption	Conversion of Total Energy Consumption	
Frequency of Assessment	Data collected monthly and compiled yearly, but analysis every 3 – 5 years. Otherwise, an assessment of random samples of residential types in analysis years could reduce costs.				
Budget Required	Collection of bills each year is 12 days per year @6,600 (if smart meters installed and collaboration with BC Hydro, then this cost will go down significantly). Cumulate, analyse and report 3 – 5 years @ $2,500. (collect water info at same time)				
Collaborators	TFN Housing, BC Hydro and Unconfirmed utility company for the Geoexchange Energy System – Possibly Fortis BC and Possibly Universities, Ministry of Energy and Mines, and Natural Resources Canada				
Barriers Limitations	Individuals pay their own BC hydro bill and provide a copy to the Housing Manager for her to monitor; however, individual owners are not required to do this, so would need to get their approvals. BTU meters are planned to be installed, however a utility company has not been confirmed to run the geothermal as of March 28, 2012. Wood stoves data might be hard to correlate.				

In addition, an EnerGuide Rating System (ERS) test for energy efficiency and air tightness test (blower door test) could be performed on random samples based on residential types with control sites on Esowista residents. This would require a certified energy advisor and would cost roughly an additional $300-500 per home tested.

[8] EQuilibrium™ Healthy Housing for a Healthy Environment: 'Performance Monitoring Results from 5 EQilibrium™ Houses and some Lessons Learned'.
[9] Sophie Hebden (2006-06-22). "Invest in clean technology says IEA report". Scidev.net

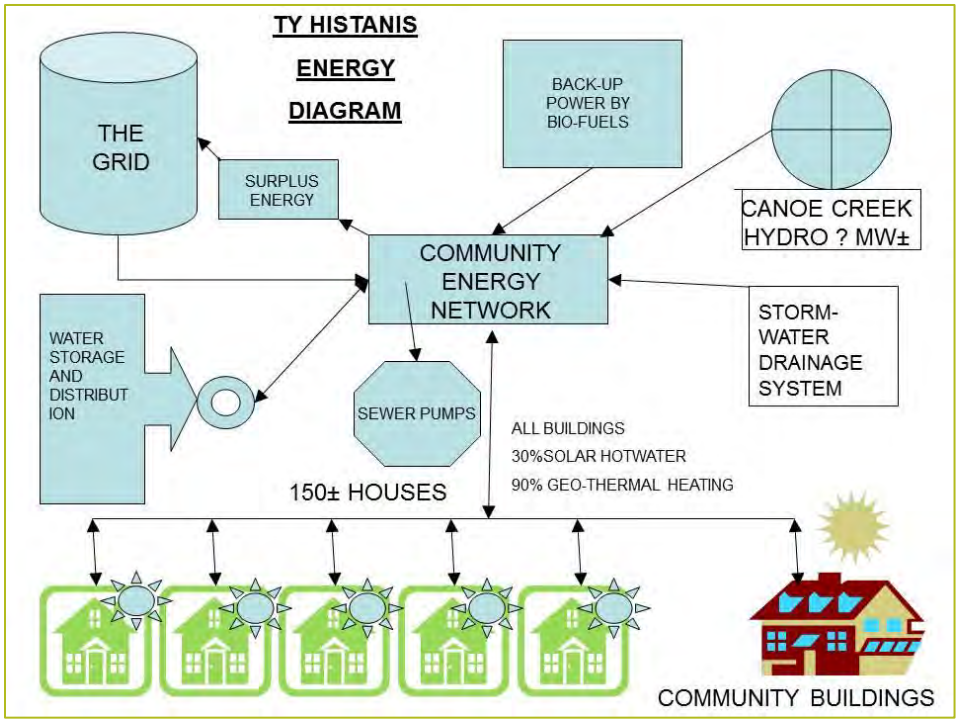

FIGURE 2: TY-HISTANIS COMMUNITY ENERGY NETWORK DIAGRAM

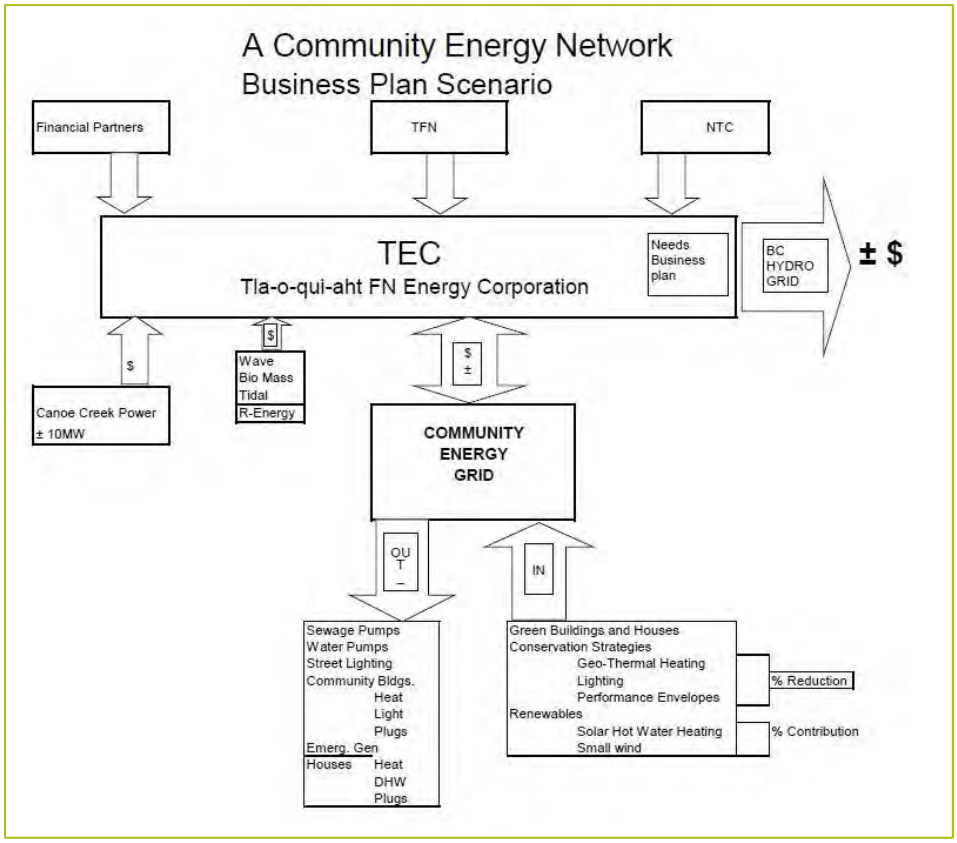

FIGURE 3: COMMUNITY ENERGY NETWORK BUSINESS PLAN SCENARIO

WATER CONSUMPTION

Water consumption refers to the use of water to satisfy the various needs of the population and industry, with two main categories being distinguished: water consumption related to the everyday needs of people (drinking, cleaning, food preparation etc) and to the provision of public services and amenities in a community; and industrial or technical water consumption. Water, like shelter (see below), is one of the basic necessities for human and community health, wealth and well-being. In Canada particularly, the importance of protecting our water resource cannot be stressed enough, given that it fuels a large portion of the economy. Unfortunately, the perception that Canada is one of the richest sources of fresh water has led to constant misuse, even abuse, of the resource, with pressure on this resource only growing. For example, between 1972 and 1996, Canada's rate of water withdrawals increased by almost 90%, from 24 billion m^3/yr (cubic metres per year) to 45 billion m^3/yr. But, our population increased by only 33.6% over the same period, illustrating the growth in our thirsty lifestyles. As the readily available supplies of fresh water are being used up, we begin to see that there are real limits to how much water we can count on.[10] To remain healthy, communities must monitor their water consumption and implement real conservation efforts for better water efficiency, to ensure that this lifeblood of all existence does not run out.

British Columbia, in particular, is one of the world's highest consumers of potable water. British Columbians use about 490 litres of water per person per day compared with the Canadian average of 329 litres per person per day. Many communities have implemented conservation initiatives to reduce demand on a finite resource and to save on expensive drinking water and wastewater infrastructure. For example, in 2006, the District of Tofino adopted a Water Conservation Bylaw which includes a multi-stage water conservation strategy, depending on the available water supply including identification of leaks, outdoor watering restrictions, voluntary residential and commercial water cut backs, and state of emergency (water only available for hospital and emergency purposes).

Tla-o-qui-aht First Nations identified potable water use reduction as a sustainability goal for Ty-Histanis.[11]

TABLE 9: WATER CONSUMPTION INDICATORS

Indicator	Average Potable water consumption based per person per day	% of water recovered from non-potable sources
Benchmark	Use Esowista (need to install water meter for control)	0
Existing Data Sources	250 litres per person per day	N/A
Measurement	Water Meter	Comparison of water bills with residence with these systems incorporated
Frequency of Assessment	Data collected monthly and compiled yearly, but analysis every 3 – 5 years.	
Budget Required	Data collection with energy data collection. Cumulate, analyse and report 3 – 5 years @ $1,250.	
Collaborators	TFN, AANDC, and Possibly Universities	

[10] Environment Canada, 'Wise Water Use'. www.ec.gc.ca
[11] Draft Tla-o-qui-aht First Nation Potable Water Reduction Strategy 2011

Indicator	Average Potable water consumption based per person per day	% of water recovered from non-potable sources
Barriers Limitations	Currently there are no water meters on houses, but instillation is planned.	

HOUSING AFFORDABILITY

Shelter is one of life's most basic necessities, yet housing affordability – or non-affordability – can make this basic need, which directly affects human health and wellbeing, problematic. Incomes amongst Tla-o-qui-aht First Nations, for example, are low, which means that housing payments must remain low to remain within the affordability threshold (not expending more than 25% of income for housing). This means that current rental and homes for sale in the Tofino area are out of the reach of the majority of Tla-o-qui-aht First Nations members.[12] This must be addressed; healthy communities require healthy community members, which requires high quality, affordable housing that, furthermore, is less expensive to maintain and operate than the current housing model.

TABLE 10: HOUSING AFFORDABILITY INDICATORS

Indicator	% of mortgage or rent plus energy costs by residential type	% of residential types with mortgage or rent equal to or lower than the area average
Benchmark	Use Esowista comparison and Tofino comparison	Esowista 2 bedroom $200 3 bedroom $350 4 bedroom $500 100 % lower than Tofino Average (Sept 2009)[13]
Existing Data Sources	Esowista data available but needs calculation	
Measurement	$ Payment	$ Payment
Frequency of Assessment	Every 3 – 5 years	
Budget Required	Cumulate, analyse and report 3 – 5 years @ $2,500	
Collaborators	TFN Housing and Possibly Universities	
Barriers Limitations	Collecting mortgage information from individual home owners	

[12] Tla-o-qui-aht First Nations Sustainable Housing Initiative: EQilibrium Communities Initiative Submission, September 2009.
[13] Ibid. Appendix 7: Performance Indicator Details pg 3.

BUILDING STANDARDS & PRACTICES (RESIDENTIAL CONSTRUCTION TO REDUCE ENERGY)

With increasing emphasis being placed on the importance of reducing energy consumption – to improve health, both current and future, of both the planet and its inhabitants – building standards and practices need to incorporate energy-reducing measures. This means looking at the use of local renewable energy resources to reduce electrical demands and greenhouse gas emissions, and integrate into all housing and community buildings energy efficient (and ultimately cost-efficient) design features.

TABLE 11: BUILDING STANDARDS & PRACTICES INDICATORS

Indicator	% of LEED certified homes built	% of EQ designed homes built	Maintenance cost for Band Owned Housing	Household Satisfaction survey
Benchmark	0	0	No benchmarks currently	No benchmarks currently
Existing Data Sources	N/A			
Measurement	%	%	$	%
Frequency of Assessment	Information can be cumulated and reported out every 3 – 5 years to demonstrate successes and barriers. Household survey should be done with all residents.			
Budget Required	Survey Component @ $2,200 – 30 hour contract including survey design testing and implementation for benchmark. Survey repeated, cumulate, analyse and report 3 – 5 years @ $5,500 – estimation based on 80 hour contract.			
Collaborators	TFN Housing and Possibly Universities			
Barriers Limitations				

LOCAL MATERIALS AND LABOUR USED IN BUILDING

To ensure community health, wealth and well-being, communities must solve the riddle of how to create jobs, social wealth and environmental health from resources in their territories; resources that historically have been harvested to benefit far-away interests first. To do this, they can adopt a 'circle of wealth' approach, which will see them thoughtfully designing practices to use local materials and local labour in building. This approach has the potential to see communities growing whatever timber they need within their territory; harvesting that timber with our own building needs in mind; designing their homes so that they make use of the products they can produce on the land; and finally, training community members to manage the full cycle of activity, from forestry to construction. This means wealth – in terms of both jobs and local resources – remains in the community, building up that community to remain strong and sustainable over the long term and fostering community spirit and togetherness.

TABLE 12: LOCAL MATERIALS & LABOUR USAGE INDICATORS

Indicator	% of dollars spent on TFN members paid for local building (out of total labour costs)	% of dollars spent on Nuu-chah-nulth members paid for local building (out of total labour costs)	% of dollars spent on local Alberni Clayoquot district residence for local building (out of total labour costs)	% of dollars spent on others employed for local building (out of total labour costs)	% of dollars spent on local materials sourced and produced for local building (out of total building material costs)
Benchmark	0	0	0	0	Locally sourced gravel (need to find dollar value)
Existing Data Sources	N/A				
Measurement	% of dollars spent				
Frequency of Assessment	Yearly or as building takes place				
Budget Required	There is an assumption that 25 buildings will go up per year for the next 5 years and reduce significantly thereafter. Estimated @ $9,000 per year for the first 5 years and @ $1,000 a year afterwards. Also, need to collect information on existing > 40 homes already built in Ty-Histanis will require analysing past work @ $9,000 to start				
Collaborators	TFN Housing and TFN Membership, and Possibly Universities				
Barriers Limitations	Over 40 units have been started, so some of this data might be hard to collect after the fact from the contractor. In addition, working with individual home owners on labour and material might be difficult to access information. The information is very difficult to budget as it will depend on building timing and number of contractors.				

WASTE REDUCTION

Waste, which is directly linked to human development, both technological and social, refers to unwanted or useless materials. Excessive waste has environmental, social, health and economic costs for communities. Reducing waste means reducing these implied costs to communities (disease; water, soil and air contamination; greenhouse gas emissions related to waste treatment and disposal which contributes significantly to climate change; and the more literal costs of waste management etc). Simply put, less waste means less landfill, which is good for the health and wealth of both the environment and the population.

TABLE 13: WASTE REDUCTION INDICATORS

Indicator	Recycling	Composting	Solid Waste
Benchmark	No benchmarks currently		
Existing Data Sources	No Existing Data sources, but Garbage pickup costs are available		
Measurement	Number of households that have recycling boxes	Number of households that compost	Analysis of Nations' bill divided by membership

Indicator	Recycling	Composting	Solid Waste
Frequency of Assessment	Information can be cumulated and reported out every 3 – 5 years to demonstrate successes and barriers		
Budget Required	Survey Component @ $4,400 – 60 hour contract including survey design testing and implementation for benchmark (this should be done with Community Food Production to reduce costs and survey fatigue). Cumulate, analyse and report every 3 – 5 years @ $2,500.		
Collaborators	TFN, Alberni Clayoquot Regional District, and AANDC		
Barriers Limitations	Collecting data may meet with some resistance.		

COMMUNITY FOOD PRODUCTION

Food security is defined as "the ability of all people at all times to have access to sufficient nutritious, safe, personally acceptable, culturally appropriate foods that are produced, procured and distributed in ways that are sustainable, environmentally sound and socially just. Food security promotion requires attention to food quality, quantity, availability, affordability and accessibility."[14] Food security is an increasing global concern, even within Canada where the natural resources have long been held as some of the most abundant in the world. Indeed, according to British Columbia Ministry of Health, one in 10 British Columbians do not currently have access to healthy food. For communities and their members to remain sustainable for the long term – both economically and physically – the implementation and monitoring of food security becomes essential. This, in turn, means thoughtfully planning for community food production in terms of both community and individual community member's gardens etc.

TABLE 14: COMMUNITY FOOD PRODUCTION INDICATORS

Indicator	% of dwellings with greater than 2x1 metre food garden	% of dwellings within 500m of community garden plots
Benchmark	No benchmark currently	
Existing Data Sources	N/A	
Measurement	%	Distance in meters
Frequency of Assessment	Information can be cumulated and reported out every 3 – 5 years to demonstrate successes and barriers	
Budget Required	Survey Component @ $4,400 – 60 hour contract including survey design testing and implementation for benchmark (this should be done with Waste Reduction to reduce costs and survey fatigue). Cumulate, analyse and report 3 – 5 years @ $2,500	
Collaborators	TFN, Clayoquot Biosphere Trust, and Coastal Family Resource Coalition	
Barriers Limitations	Collecting data may meet with some resistance.	

TRANSPORTATION

Transportation – the way we get around from place to place, from home to work, to the grocery store, and various civic and other amenities – plays an essential role in keeping a community vibrant. This is especially true of rural communities, many of which are many kilometres from other inhabited areas. Access and close proximity to buses and other transport connecting communities to other regions and, importantly, to places where jobs are available, are essential. Equally, however, healthy communities

[14] British Columbia Ministry of Health www.health.gov.bc.ca/healthyeating/foodsecurity.html

should be designed to encourage walking or cycling to and from daily destinations wherever possible, fostering health, wellness and sustainability, and reducing costs as well as greenhouse gas emissions produced by motor vehicles and other transit options.

TABLE 15: TRANSPORTATION INDICATORS

Indicator	% of dwellings within 800m of a grocery store	% of dwellings within 800m of a restaurant / cafe	Jobs within 5 km radius	Proximity to Civic Amenities (school, libraries, community centres)	% of occupants within 400m of transit access point
Benchmark	0	0	No benchmark currently	15 kilometers	0
Existing Data Sources	N/A	N/A	Unavailable	Distance to Tofino	N/A
Measurement	%	%	#	Kilometers	%
Frequency of Assessment	Every 3 – 5 years.				
Budget Required	Survey Component @ $4,400 – 60 hour contract including survey design testing and implementation for benchmark (this should be done with Waste Reduction and Community Food Production to reduce costs and survey fatigue). Cumulate, analyse and report 3 – 5 years @ $2,500				
Collaborators	TFN and Alberni Clayoquot Regional District				
Barriers Limitations	Seasonal employment issues				

Relative Humidity and **Indoor Air Quality versus Outdoor Air Quality** was not added to the monitoring because of high expense to test. However, if budget is available, random sampling of houses every 3-5 years would provide good information on how well the systems installed are working.

ECOLOGICAL INTEGRITY INDICATORS

Ecological integrity is generally defined as being the condition of an ecosystem that has not been altered by the result of human activities such as pollution, environment degradation or loss of native species.[15] To maintain the ecological integrity of any area, it is important to know the health condition of that ecosystem, abundance of native species and biological communities, rates of change and supporting processes, which is likely to persist in the face of disturbance, hence the need for ecological integrity indicator monitoring. Ty-Histanis subdivision falls within the Coastal Western Hemlock Zone, Very Wet Hypermaritime Subzone (CWHvh1).

The construction phase of any community presents certain challenges in protecting the environment. Mitigations are put in place in an effort to prevent negative impacts (e.g. settling ponds and sediment barriers to prevent damage to fish and fish habitat). Once construction is completed the efficacy of protection measures must be assessed to ensure that the efforts have been successful.

[15] Parks Canada, www.pc.gc.ca

Short-term Monitoring (Two Seasons Post Construction):

Required to assess the effectiveness of mitigations dealings with the constructions of the community, and primarily focused on road crossings (bridge and culverts). This was identified as a requirement in the Canadian Environment Assessment Agency (CEAA) determination statement (2007, Appendix A) by the CEEA. This is almost complete and will provide some of the baseline information for the long-term monitoring.

Long-term Monitoring:

Addresses concerns pertaining to the vision of a sustainable community and includes assessing wildlife hazards and the safety of the community members, water quality and fish habitat, and other issues identified by community members and regulatory documents. (Refer to community planning documents, and CEAA – Appendix A.)

WILDLIFE / HUMAN CONFLICTS

Instances of wildlife/human conflicts can be taken as a proxy measurement of ecological integrity. In order to achieve community development which is both safe and ecologically responsible, conflicts between humans and wildlife (bears, grey wolves, cougar, and deer) must be accounted for and minimized. A number of community development factors are at the root of these conflicts, such as poor handling of attractants and development induced ecosystem disruption and habitat fragmentation.

Bear/Garbage sightings

The area surrounding Ty-Histanis is inhabited and regularly visited by black bears. One of the main attractants for bears to residential developments is garbage. In particular, April to October is black bear season, however not all bears go into hibernation when there is an available food supply during winter, such as garbage. All community properties where there is the potential for bear-garbage conflicts, even those with bear-resistant garbage containers should be subject to monitoring and record all instances to provide a reliable baseline. The continued monitoring of this indicator will track the efficacy of waste management practices as well as provide inferential data regarding bear habitat infringement and population density.

Cougar and Wolf foraging sightings

The region that Ty-Histanis occupies is home to a number of large predator mammals. For predators such as wolves and cougars, the area likely represents a very small overall component of their overall hunting territories; therefore, the impacts of development of a limited spatial extent are considered to be of low magnitude. The overall significance of habitat loss on hunting areas of predators on a local and regional level is considered to be low. Nevertheless, monitoring of these populations is key to assessing overall ecosystem health, as they perform necessary ecosystem functions such as predation. The monitoring of large predator species is also important when considering community health and safety.

Deer foraging sightings

Black-tail deer can be taken as indicators of ecological integrity and diversity at broad, landscape scales in Ty-Histanis. Monitored sightings have high potential value for land-use planning. Several characteristics

make deer particularly suited as ecological indicators of developments in forest settings. First, they have relatively large, and often, seasonally migratory home ranges, therefore requiring management of landscapes rather than isolated patches of habitat. Deer also require a habitat that is particularly diverse in food and cover and are therefore more prevalent in thriving ecosystems. As such, black-tail deer sightings provide a means of evaluating land-use alternatives. While deer are not common in the Ty-Histanis area, they have become more recently in Ucluelet. The change in forest cover (closed canopy) around the Pacific Rim Park and around Kennedy Lake is pushing the deer to more attractive forage areas, and Ty-Histais area is one of the larger openings on the north end of the Park. Tracking of these sightings will ideally be owned by the community as well as Parks Canada staff.

Animal-vehicle collisions

As Ty-Histanis will accommodate the seasonal ranging ground for many species of large mammals as well as a residential road network, encounters between vehicles and wildlife are to be expected. Monitored collisions have will benefit land-use planning. Their potential should not be overlooked in efforts aimed at development management in an ecosystem context and the maintenance of biologically diverse wildlife communities. Recording and reporting collisions will ideally be owned by the community as well as Parks Canada staff.

TABLE 16: WILDLIFE/HUMAN CONFLICT INDICATORS

Indicator	Bear sightings	Deer foraging sightings	Cougar and Wolf sightings	Bear Proof garbage bins	Animal-vehicle collisions (#)
Benchmark	See CEAA 2007 and more recent short term monitoring			0	Need to find
Existing Data Sources	CEAA 2007 and Short-term monitoring done with remote sensor camera's around road crossings (not compiled yet)			Not Available	Need to find
Measurement	# of reported incidents and motion detecting camera's at 2 road crossings (already established) and another 4 as development proceeds should be established near playground and near community trails as community development proceeds (see Figure 4.)			# of bins	# of reported incidents
Frequency of Assessment	Wildlife camera should be conducted for spring and summer – 16 weeks. Data collected weekly is ideal but bi-weekly is also fine and compiled yearly, but analysis every 3 – 5 years. Data received from reporting parties and recorded in wildlife observation database.				
Budget Required	Cameras are an estimated $1,500 each ($9,000). Collecting data and replacing batteries etc bi-weekly is roughly ($2,200 yearly). Estimated database development for tracking @ $2,200 – 30 hour contract. Cumulate, analyse and report 3 – 5 years @ $5,000 – estimation based on 60 hour contract.				
Collaborators	Parks Canada, TFN Tribal Parks Guardians, AANDC and Conservation Officer				
Barriers Limitations	Cameras are expensive and could malfunction if information is not collected timely. Some of the costs would be reduced if Parks staff or Tribal Parks Guardians collect data in their bi-weekly routines.				

FIGURE 4: TY-HISTANIS COMMUNITY DEVELOPMENT PLAN SHOWING THE PROPOSED SHORT TERM MONITORING LOCATIONS ASSESSING THE EFFECTIVENESS OF BRIDGE AND CULVERTS IN MAINTAINING CARNIVORE MOVEMENT. THE BASE MAP SHOWS WILDLIFE CORRIDORS IN THE COMMUNITY AREA (MACMILLAN, 2010). THE RED CIRCLES INDICATE PROPOSED MONITORING SITES WITHIN THE COMMUNITY DEVELOPMENT AREA WHERE WILDLIFE MOVEMENT CORRIDORS CROSS ROADWAYS AND COINCIDE WITH EITHER A BRIDGE OR CULVERT CROSSING. THE GREEN OVALS ARE PROPOSED MONITORING SITES IN UNDEVELOPED AREAS OF THE COMMUNITY OR ALONG KNOWN WILDLIFE MOVEMENT CORRIDORS THAT WILL SERVE AS BASELINE MONITORING SITES FOR COMPARISON TO THE IMPACTED SITES.

STREAMS AND WATER QUALITY

Water quality monitoring can be defined as the sampling and analysis of water constituents and conditions. This may include things like introduced pollutants such as pesticides, metals and oil, as well as constituents found naturally in water that can still be affected by human activities and influences, such as dissolved oxygen, bacteria and nutrients, all of which can be influenced by properties such as pH and temperature. It goes without saying that for the health and wellbeing of an entire community and its

ecosystem – including flora, fauna and human populations – water quality in its surrounds must be closely monitored to provide information that describes current conditions (and potential health hazards), and possible future changes. Water quality monitoring allows communities to identify and determine a number of issues crucial to community health. These include things like whether waters in the community are meeting quality standards for designated uses (fishing, drinking, swimming etc); identifying specific pollutants and sources of that pollution; and determining possible trends and potential problems. Monitoring stream quality naturally plays a big role in monitoring final water quality by allowing communities to understand the impacts of land-use activities on water quality and enabling informed decision-making around managing and protecting their water resources.

Stormwater Management and Hydrology

It has been previously noted that drainage will be one of the most significant challenges at the Ty-Histanis site due to the flat topography and high annual rainfall[16]. The open bogs and extensive sphagnum moss areas act as a buffer and possess a natural detention capacity, preventing stormwater surges to local watercourses. The current stormwater management plan includes a sub-grade storm sewer pipe system (beneath road ways) in addition to the proposed swales and catchbasins. Additionally, storm sewer service connections will be provided for most residential lots. Monitoring areas will include drainage, surface water and groundwater and potential sedimentation. The monitoring of these systems will be essential to ensure the development is not disturbing natural hydrological processes and community safety during storm surges.

TABLE 17: STREAMS & WATER QUALITY INDICATORS

Indicator	Sediment Control and Storm run-off	% of area disturbed within 5 metres adjacent to all streams.
Benchmark	Parks Canada surface monitoring program	Need to develop % area disturbed (using aerial photographs or site assessment)
Existing Data Sources	Parks Canada surface monitoring program. Data has been collected twice per year at specified times from predetermined locations in and near the Park	Aerial photographs and CEAA 2007 report
Measurement		% areas disturbed (mineral soil)
Frequency of Assessment	12 sites picked at Ty-Histanis that are tested 2 times a year with the Parks Canada surface monitoring program (see Figure 5.)	Assessment every 3-5 years
Budget Required	Lab analysis – $ 210.00/site sample, which includes 31 heavy metals, the nutrients; ammonia, nitrate, nitrite, TKN and TDP as well as BOD, COD and hardness, assume 12 sites at a minimum of twice per year (12X210X2 = $5040 + GST = $5,650) On site data collection of: DO, % oxygen saturation, water temperature, pH, conductivity, alkalinity will	One Day assessment every 3-5 years @ $1,000 with brief report.

[16] David Nairne and Associates. 2003. Tla-o-qui-aht First Nations, Esowista Expansion Feasibility Study. September 2003.

Indicator	Sediment Control and Storm run-off	% of area disturbed within 5 metres adjacent to all streams.
	require the acquisition of equipment including: Oxyguard dissolved oxygen metre that also measures % saturation and water temperature -$1,200 pH meter – $120 conductivity meter – $120 lab alkalinity testing kit –$ 45 portable turbidity meter - $1,850 O&M - shipping, other smaller equipment, repairs, office supplies $500 annually Cumulate, analyse and report 3 – 5 years @ $3,000 – estimation based on 60 hour contract, if not done with Parks Analysis.	
Collaborators	Parks Canada, TFN Tribal Parks Guardians, AANDC and Possibly University of Vancouver Island (PAPR)	
Barriers Limitations	Significant financial investment required for analysis and equipment. In addition, reducing the number of sites might not give you a good sample.	

FIGURE 5: TY-HISTANIS COMMUNITY DEVELOPMENT PLAN SHOWING THE PROPOSED SHORT TERM MONITORING LOCATIONS FOR ASSESSING THE EFFECTIVENESS OF BRIDGE AND CULVERTS IN PROTECTING FISH HABITAT – STREAM WATER QUALITY. THE BASE MAP SHOWS WILDLIFE CORRIDORS IN THE COMMUNITY AREA (MACMILLAN, 2010). THE BLUE DOTS REPRESENT INDICATE SAMPLING SITES BELOW CULVERT BRIDGE LOCATIONS, THE WHITE CIRCLES INDICATE AREAS ABOVE (BASELINE SITES).[17]

VEGETATION (INDIGENOUS FLORA)

Green space can be defined as undeveloped space designated for habitat restoration and preservation. Sustainable development in Ty-Histanis seeks to balance the integrity of both the human and natural environment for the benefit of both. Ecologically sustainable development is that which seeks to maintain or enhance the resiliency of the local ecosystem.

[17] Parks Canada 2011, Draft Proposal for Ty-Histanis Community Development Post Construction Monitoring Proposal.

Old Growth Forest Extent

Almost 26% of the Pacific Rim park area surrounding Ty-Histanis was clear-cut prior to park to the 1970s. The extent of old-growth forest in the park changed negligibly over the past 15 years. Continued monitoring at Ty-Histanis will be crucial to gauging the overall health and resiliency of the floral ecosystem. Under any particular environmental regime, older ecosystems will generally be more complex than younger ecosystems.

Invasive Flora Spread

Invasion by exotic species is problematic to the stability of ecosystems. Exotic species present a threat to the integrity of natural flora by driving ecological changes such as the displacement and replacement of indigenous species. In Ty-Histanis, English ivy and Scotch broom are two invasive species of note. Both of these opportunistic species thrive due to anthropogenic processes such as canopy disturbance and clearing. Understanding trends in the spread and density of invasive flora through monitoring will ideally be owned by the community as well as Parks Canada staff.

Habitat Fragmentation

As the area surrounding Ty-Histanis has been subject to logging of old-growth forests and construction of roads and other infrastructure, these activities have produced a distribution of old-growth characterized by large blocks and/or scattered small patches embedded in a landscape of clear-cuts and second-growth forest. The size of these fragments and the intensity of the activities directly relate to their ability to retain their biological diversity. In order to characterize the magnitude of fragmentation on the landscape in Pacific Rim, Parks Canada adopted a taxon-specific approach to monitoring, focused on ecological groups most likely to be strongly affected this fragmentation. The continued use of this system is intended to gauge the level of fragmentation and ecological response associated with development activities at Ty-Histanis.

TABLE 18: VEGETATION INDICATORS

Indicator	Old Growth forest extent	Invasive flora spread	Habitat fragmentation	% of Tree Canopy Cover	
Benchmark	60.2%	<80% cleared			
Existing Data Sources	Parks Canada SoPR 2008	Parks Canada SoPR	Parks Canada SoPR	Pre-Construction Aerial Photos	
Measurement	% in coverage	% of invasive population cleared	FragCube method of Habitat Frag. Analysis[18]	Aerial Photographs or Satellite Imagery or site observations	
Frequency of Assessment	Every 3 – 5 years				
Budget Required	Negligible, monitor	Monitoring only: 40hr	16hr contract for $1,120 on	Negligible, monitor	

[18] Parks Canada Agency. Contribution of satellite remote sensing to the State of the Park Report for the Pacific Rim National Park Reserve. Report of a Workshop 19-21 September 2007 Ucluelet, B.C.

Indicator	Old Growth forest extent	Invasive flora spread	Habitat fragmentation	% of Tree Canopy Cover	
	satellite imagery. $300 per period	contract for $2,800 on 3/5 year cycles	3/5 yr cycles	satellite imagery. $300 per period	
Collaborators	Parks Canada, TFN Tribal Parks Guardians and Possibly University of Vancouver Island (PAPR)				
Barriers Limitations	Aerial Photographs may not always be available for this area on regular frequency but will work with Parks Canada and utilize satellite imagery where necessary.				

SPECIES AT RISK

As defined by the Species at Risk Act, "species at risk" means an extirpated, endangered or threatened species or a species of special concern.[19] Under the Species at Risk Act, it is unlawful to kill, injure, possess, disturb or interfere with the species; destroy, disturb or interfere with the habitat of the species; or damage, destroy, obstruct or remove a natural resource on which the species depends for its life and propagation. Monitoring this using collection and management of information on species at risk within communities is key to enabling them to assess the conservation status of each species, predict the impacts of community projects on species and their habitat, assist in conservation or development planning, support ecological research and monitoring, and for educational purposes. Ultimately, monitoring and stewardship of species at risk at the community level is important to ensure that the land, air, water, plants, animals and culture that have been a part of life for so long, can be passed on to future generations.

In the site area in Pacific Rim Park, there have been identified a number of species at risk of extinction. In order to ensure the ecological sustainability of this residential development, it is imperative that these species be offered the utmost monitoring and protection. Several species at risk have been identified as a concern regarding the development at Ty-Histanis. These include for example Great blue heron, Marbled murrelet, Northern goshawk, Western screech-owl, Red-legged frog, Dromedary jumping-slug and Western Toad. One of the most valuable tools in preserving these species is increased public awareness. A joint effort between the local school district, Parks Canada and the Tla-o-qui-aht First Nation would be ideal in addressing this pressing local concern

TABLE 19: SPECIES AT RISK INDICATORS

Indicator	# of public awareness presentations	Sampling for presence and pop. density	Sampling for road induced mortality (DJS WT and RLF)	
Benchmark	Annual updates	To be determined	To be determined	
Existing Data Sources	NA	Parks Canada SoPR 2008 CEAA 2007 report	Parks Canada SoPR 2008 CEAA 2007 report	
Measurement		Numerical	numerical	
Frequency of Assessment	Annual	Every 3-5 years	Every 3-5 years	
Budget	Community	Contract for 10 days of	Contract for 5 days of	

[19] www.pc.gc.ca

Indicator	# of public awareness presentations	Sampling for presence and pop. density	Sampling for road induced mortality (DJS WT and RLF)	
Required	meeting updates $200	monitoring and compilation $5,000	monitoring and compilation $2,500	
Collaborators				
Barriers Limitations		Finding financial support on a regular, ongoing basis.	Finding financial support on a regular, ongoing basis.	

RESTORATION ENHANCEMENT ACTIVITIES

In order to offset some of the ecological damages resulting from previous activities in Pacific Rim Park Reserve, the residential development in Ty-Histanis will incorporate an aspect of ecological restoration. Ecologically sustainable development is that which seeks to maintain or enhance the resiliency of the local ecosystem, habitat and population restoration activities will be essential as will the monitoring of their effectiveness.

Salmon Population

Due to past habitat loss and environmental degradation salmon populations originating from Pacific Rim Park's preserve and elsewhere in British Columbia, salmon populations have declined considerably over the past few decades. The salmon life cycle is important in the transport of energy and nutrients between the ocean, estuaries, and freshwater environments with significant contribution of nitrogen to coastal forest communities. Many species of wildlife depend on salmon and in turn play key roles in providing for the health and sustainability of the ecosystems upon which salmon depend. If the health of salmon populations improves, increases in the populations of many of the associated wildlife species would be expected.

Herpetofauna (frogs and salamanders)

From the ecological perspective, amphibians are regarded as good ecological health indicators. Due to high degree of sensitivity, either during tadpole stage or as adults, they respond to very slight change in the environment. Such responses have been used to indicate habitat fragmentation, ecosystem stress, impact of pesticides, and various anthropogenic activities. Four amphibian species were observed during field assessments and amphibian surveys at Ty-Histanis. Adult red-legged frogs were observed and a number of egg masses were observed in throughout the site area. The calls and several egg masses of Pacific treefrog were observed at several locations. Western red-backed and wandering salamander were also found on invertebrate survey. Continued monitoring of these populations will be informative of the overall ecosystem health at Ty-Histanis.

TABLE 20: RESTORATION ENHANCEMENT INDICATORS

Indicator	Salmon repopulation	Restoration of natural flora	Restoration of natural fauna
Benchmark	To be determined	To be created	To be determined.
Existing Data Sources	DFO, CEAA 2008 report.	Parks Canada State of Parks Report 2008	Parks Canada State of Parks Report 2008

Indicator	Salmon repopulation	Restoration of natural flora	Restoration of natural fauna
Measurement	Presence/absence, Population estimates	% in coverage change from baseline measurement	Population estimates
Frequency of Assessment	Annual, especially for road crossing efficacy	3 – 5 years	3 – 5 years
Budget Required	Fry trapping and habitat monitoring annual contract 10 days @ $5,000, semi-annual after 10yrs	Monitoring only, baseline contract 4 days @ $2,200, monitoring 2 days @ $1,100	Monitoring only, Baseline contract 4 days at $2,200, monitoring 2 days @ $1,100
Collaborators	DFO/ TFN/ Parks Canada	Parks Canada/TFN	Parks Canada/TFN
Barriers Limitations	Ongoing long term funding for monitoring difficult to find.	Ongoing long term funding for monitoring difficult to find.	Ongoing long term funding for monitoring difficult to find.

APPENDIX A

TABLE 21: 3-YEAR FREQUENCY OF MONITORING DATA COLLECTION AND BUDGET FOR HEALING BROKEN LANDS

Indicators	2012**	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
																						0
Human Well-being Indicators *																						0
Housing and Population	$4,400		$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	21900
Individual Health	$12,500		$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	30000
Community Health	$21,300		$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	38800
Economic Efficiency Indicators																						0
Energy Consumption	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	86800
Water Consumption	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	78050
Housing Affordability	2500		$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	20000
Building Standards & Practices (residential construction to reduce energy)	$7,700		$5,500			$5,500			$5,500			$5,500			$5,500			$5,500			$5,500	46200
Local Labour and Material Use	$9,000	$9,000	$9,000	$1,000	$1,000	$9,000	$1,000	$1,000	$9,000	$1,000	$1,000	$9,000	$1,000	$1,000	$9,000	$1,000	$1,000	$9,000	$1,000	$1,000	$9,000	93000
Waste Reduction	$4,400		$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	21900
Community Food Produduction			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	17500
Transportation			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500			$2,500	17500
Ecological Integrity Indicators																						0
Wildlife /Human conflicts	$ 13,400	$ 2,200	$5,700	$2,200	$ 2,200	$5,700	$2,200	$ 2,200	$5,700	$2,200	$ 2,200	$5,700	$2,200	$ 2,200	$5,700	$2,200	$ 2,200	$5,700	$2,200	$ 2,200	$5,700	81900
Streams and Water Quality	$ 12,065	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	87065
Indigenous flora fauna (green space)	$ 4,520		$ 4,520			$ 4,520			$ 4,520			$ 4,520			$ 4,520			$ 4,520			$ 4,520	36160
Species at Risk	$ 7,500	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	64000
Restoration Enhancement activities	$ 9,400	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	124800
																						0
Total	115285	25700	73170	17700	17700	73170	17700	17700	73170	17700	17700	73170	17700	17700	73170	17700	17700	73170	17700	17700	73170	865575

* Amounts represent indicators developed and/or monitored as a batch, if indicator is developed/monitored at diferent yearly intervals estimated amount would be relevant for each individual indicator above the batch. Example: Individual Health indicator monitoring developed in 2013@ $12,500 VS Physical Health indicator monitoring developed in 2012 and Mental Health indicator monitoring developed in 2014 @ $25,000

**Proposed monitor implementation year and/or benchmark development

TABLE 22: 5-YEAR FREQUENCY OF MONITORING DATA COLLECTION AND BUDGET FOR HEALING BROKEN LANDS

Indicators	2012**	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
																					$ -
Human Well-being Indicators *																					$ -
Housing and Population	$4,400				$2,500					$2,500					$2,500					$2,500	$ 14,400.00
Individual Health	$12,500				$2,500					$2,500					$2,500					$2,500	$ 22,500.00
Community Health	$21,300				$2,500					$2,500					$2,500					$2,500	$ 31,300.00
Economic Efficiency Indicators																					$ -
Energy Consumption	$3,300	$3,300	$3,300	$3,300	$5,800	$3,300	$3,300	$3,300	$3,300	$5,800	$3,300	$3,300	$3,300	$3,300	$5,800	$3,300	$3,300	$3,300	$3,300	$5,800	$ 76,000.00
Water Consumption	$3,300	$3,300	$3,300	$3,300	$4,550	$3,300	$3,300	$3,300	$3,300	$4,550	$3,300	$3,300	$3,300	$3,300	$4,550	$3,300	$3,300	$3,300	$3,300	$4,550	$ 71,000.00
Housing Affordability	2500				$2,500					$2,500					$2,500					$2,500	$ 12,500.00
Building Standards & Practices (residential construction to reduce energy)	$7,700				$5,500					$5,500					$5,500					$5,500	$ 29,700.00
Local Labour and Material Use	$9,000	$9,000	$9,000	$9,000	$9,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$ 60,000.00
Waste Reduction	$4,400				$2,500					$2,500					$2,500					$2,500	$ 14,400.00
Community Food Produduction					$2,500					$2,500					$2,500					$2,500	$ 10,000.00
Transportation					$2,500					$2,500					$2,500					$2,500	$ 10,000.00
Ecological Integrity Indicators																					$ -
Wildlife /Human conflicts	$ 13,400	$ 2,200	$ 2,200	$ 2,200	$5,700	$2,200	$ 2,200	$ 2,200	$ 2,200	$5,000	$2,200	$ 2,200	$ 2,200	$ 2,200	$5,000						$ 53,300.00
Streams and Water Quality	$ 12,065	$ 2,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 2,700	$ 2,700	$ 5,700	$ 75,365.00
Indigenous flora fauna (green space)	$ 4,520				$ 4,520					$ 4,520					$ 4,520					$ 4,520	$ 22,600.00
Species at Risk	$ 7,500	$ 200	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 200	$ 200	$ 7,700	$ 41,300.00
Restoration Enhancement activities	$ 9,400	$ 5,000	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 7,200		$ 5,000		$ 5,000	$ 2,200	$ 5,000		$ 5,000		$ 7,200	$ 88,200.00
																					$ -
Total	$ 115,285	$ 25,700	$ 25,700	$ 25,700	$ 73,170	$ 17,700	$ 17,700	$ 17,700	$ 17,700	$ 64,470	$ 12,700	$ 17,700	$ 12,700	$ 17,700	$ 59,470	$ 15,500	$ 10,500	$ 15,500	$ 10,500	$ 59,470	$ 632,565.00

* Amounts represent indicators developed and/or monitored as a batch, if indicator is developed/monitored at diferent yearly intervals estimated amount would be relevant for each individual indicator above the batch. Example: Individual Health indicator monitoring developed in 2013@ $12,500 VS Physical Health indicator monitoring developed in 2012 and Mental Health indicator monitoring developed in 2014 @ $25,000

**Proposed monitor implementation year and/or benchmark development

TABLE 23: MIXED-INTERVAL FREQUENCY OF MONITORING DATA COLLECTION AND BUDGET FOR HEALING BROKEN LANDS

Indicators	2012**	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
																						0
Human Well-being Indicators *																						0
Housing and Population	$4,400			$2,500			$2,500					$2,500					$2,500					14400
Individual Health	$12,500			$2,500			$2,500					$2,500					$2,500					22500
Community Health	$21,300			$2,500			$2,500					$2,500					$2,500					31300
Economic Efficiency Indicators																						
Energy Consumption	$3,300	$3,300	$3,300	$5,800	$3,300	$3,300	$5,800	$3,300	$3,300	$3,300	$3,300	$5,800	$3,300	$3,300	$3,300	$3,300	$5,800	$3,300	$3,300	$3,300	$3,300	79300
Water Consumption	$3,300	$3,300	$3,300	$4,550	$3,300	$3,300	$4,550	$3,300	$3,300	$3,300	$3,300	$4,550	$3,300	$3,300	$3,300	$3,300	$4,550	$3,300	$3,300	$3,300	$3,300	74300
Housing Affordability	2500			$2,500			$2,500					$2,500					$2,500					12500
Building Standards & Practices (residential construction to reduce energy)	$7,700			$5,500			$5,500					$5,500					$5,500					29700
Local Labour and Material Use	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	189000
Waste Reduction	$4,400			$2,500			$2,500					$2,500					$2,500					14400
Community Food Produduction				$2,500			$2,500					$2,500					$2,500					10000
Transportation				$2,500			$2,500					$2,500					$2,500					10000
Ecological Integrity Indicators																						
Wildlife /Human conflicts	$ 13,400	$ 2,200	$ 2,200	$5,700	$ 2,200	$ 2,200	$5,700	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$5,700	$ 2,200	$ 2,200	$ 2,200	$ 2,200	$5,700	$ 2,200	$ 2,200	$ 2,200	$ 2,200	71400
Streams and Water Quality	$ 12,065	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 2,700	$ 2,700	$ 5,700	$ 2,700	$ 2,700	$ 2,700	$ 2,700	78065
Indigenous flora fauna (green space)	$ 4,520			$ 4,520			$ 4,520					$ 4,520					$ 4,520					22600
Species at Risk	$ 7,500	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 200	$ 200	$ 7,700	$ 200	$ 200	$ 200	$ 200	41500
Restoration Enhancement activities	$ 9,400	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 7,200	$ 5,000	$ 5,000	$ 5,000	$ 5,000	118200
																						0
Total	115285	25700	25700	73170	25700	25700	73170	25700	25700	25700	25700	73170	25700	25700	25700	25700	73170	25700	25700	25700	25700	819165

* Amounts represent indicators developed and/or monitored as a batch, if indicator is developed/monitored at diferent yearly intervals estimated amount would be relevant for each individual indicator above the batch. Example: Individual Health indicator monitoring developed in 2013@ $12,500 VS Physical Health indicator monitoring developed in 2012 and Mental Health indicator

**Proposed monitor implementation year and/or benchmark development

APPENDIX B

PROTOCOLS & PRINCIPLES FOR CONDUCTING RESEARCH IN A NUU-CHAH-NULTH TRIBAL CONTEXT[20]

Declaration by the Ha-wiih of the Nuu-chah-nulth Nation November 1, 1994

Since time Immemorial, we the Nuu-chah-nulth Ha'wiih are the rightful owners and carry the full authority and responsibility to manage and control all that is contained within each of our Ha-houlthee. Strict traditional laws and teachings dictate that it is our responsibility to govern our territories by managing and protecting all lands, waters and resources within our Ha-houlthee to sustain our muschim and our traditional ways of life.

Our authority and ownership have never been extinguished, given up, signed away by Treaty or any other means or suspended by any law. We continue to seek a just and honourable settlement of the land and sea question within all of our respective territories.

Through our governing laws and powers, the Ha'wiih endorse, support and direct our respective Nations to enter negotiations with the governments of Canada and British Columbia to reach agreements and/or treaties which will recognize and re-affirm our ownership and governing authorities over our respective Hahoulthee.

This endorsement and support is provided on the basis and understanding that the Ha'wiih are and will continue to direct negotiations as decision-makers and active participants, consultants and/or advisors throughout negotiations and discussions regarding all of the lands, waters, resources and governance issues

RATIONALE

1. We are aware that researchers are knowledge brokers, people who have the power to construct legitimating arguments for or against ideas, theories or practices. They are collectors of information and producers of meaning, which can be used for or against Indigenous interests.
2. The Nuu-chah-nulth Tribal Council recognizes its responsibility to address the need for an organizational protocol for individuals and groups conducting research in Nuu-chah-nulth territory.
3. The Nuu-chah-nulth Research Ethics Committee shall approve any proposed research conducted with more than one Nuu-chah-nulth community in accordance with established protocols and procedures.
4. This protocol has been developed to assist researchers in ensuring that they meet the appropriate protocols of the Nuu-chah-nulth communities when conducting research in their territories, as well as providing a mechanism of ensuring that research that is conducted within Nuu-chah-nulth communities is done in an ethical and appropriate manner.

[20] Nuu-chah-nulth Tribal Council Research Committee, April 2008

IMPLICATIONS FOR RESEARCH

Research that involves Nuu-chah-nulth communities and its members as participants, either directly or indirectly must ensure that research protocols uphold the principle of protection. Ideally, the researcher will partner with communities and involve them in the development of the research project.

1. The Nuu-chah-nulth Tribal Council is committed to respecting the goals and aspirations of Nuu-chah-nulth-aht involved in research. This includes the maintenance of Nuu-chah-nulth control over resources, including people and the knowledge they carry.
2. **Partnership:** Where Nuu-chah-nulth-aht are participants in research and have a major interest in the outcome of a research project, then a working relationship should be established between the researcher and the participants or representatives of the participating community(ies).
3. **Protection:** The researcher must ensure the protection of Nuu-chah-nulth-aht participants and resources prior to the onset of research, during data collection and compilation, during and after dissemination of data.
4. **Participation:** All Nuu-chah-nulth-aht have a right to participate in or refuse participation in research. Reasons for inclusion and exclusion in research must be clearly outlined prior to onset of research. Participants must be given adequate time (24 hour minimum) to consider their participation in the research and must be permitted to withdraw participation at any time without consequences.

PROTOCOLS

Nuu-chah-nulth-aht have protocols unique to their communities. These protocols differ from community to community. It is the responsibility of the researcher to identify these protocols through consultation with appropriate community members.

1. Community Contacts
2. Hawiih
3. Elected Council
4. Community Resources

PRINCIPLES

Any and all research proposed to be conducted with more than one Nuu-chah-nulth community must apply for approval with the Nuu-chah-nulth Research Ethics Committee. Communities may choose to have the Nuu-chah-nulth Research Ethics Committee review applications to conduct research in their individual community. The criteria for approval will be as follows:

1. The researcher(s) complete(s) the Nuu-chah-nulth Research Ethics Committee Application for Approval and;
2. The purpose of conducting research is clearly stated and indicates a benefit to Nuu-chah-nulth communities and;
3. That any risks associated with participation in the research are outweighed by definitive benefits and;
4. That there will be minimal disruption to the community as a result of conducting the research and;
5. That there is no deception involved in the research process.
6. That researchers, data collectors and any other individuals involved in the research process are clearly identified and their qualifications to conduct research are provided and;

7. That once the research is complete, the data will be disseminated to individual participants and participating communities in such a manner that is comprehensible and useful to those individuals and;
8. That the researcher has identified where ownership of the data rests and has indicated that Nuu-chah-nulth-aht will continue to retain at least partial ownership and have full rights to utilize that information obtained as a result of the research outcomes.
9. That a plan is clearly laid out regarding what will happen with the data collected once the research is complete.

ETHICS

The principles of conduct governing an individual or a group:

1. **Respect for Persons:** incorporates at least two ethical convictions:
    a. **Autonomy:** individuals should be treated as autonomous agents. Individual is capable of deliberation about personal goals and of acting under the direction of such deliberation. The individual is permitted to enter into research voluntarily and with adequate information.
    b. **Protection:** persons with diminished autonomy are entitled to protection. Not every human being is capable of self-determination. These individuals need to be protected and ensured that decisions are made in their best interest.
2. **Beneficence:** making an effort to secure the well-being of participants. Two general rules are associated with ensuring that this principle is upheld:
    a. Do no harm.
    b. Maximize possible benefits and minimize possible harms. This rule considers that learning what will benefit may require exposing persons to risk. The problem is to decide when it is justifiable to seek certain benefits despite the risks involved, and when the benefits should be foregone because of the risks.
3. **Justice:** refers to fairness in distribution or what is deserved and the idea that equals should be treated equally. The following formulations provide suggestions as to how burdens and benefits should be distributed:
    a. To each person an equal share.
    b. To each person according to individual need.
    c. To each person according to individual effort.
    d. To each person according to societal contribution.
    e. To each person according to merit.

*Whenever research supported by public funds leads to the development of therapeutic devices and procedures, justice demands both that these not provide advantages only to those who can afford them and that such research should not unduly involve persons from groups unlikely to be among the beneficiaries of subsequent applications of the research.[21]

[21] Nuu-chah-nulth Tribal Council Research Ethics Committee (2008) Protocols and Principles for Conducting Research in a Nuu-Chah-nulth Context. Available online at http://www.fnehin.ca/uploads/docs/NTC_Research_Protocol.pdf Last Accessed March 26, 2012.