

Alberta Biodiversity  
Monitoring Institute

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# 2010 Human Footprint Map Layer Version 1.1 - Metadata

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# **1 Summary**

The Alberta Biodiversity Monitoring Institute (ABMI) tracks changes in human footprint across the province of Alberta. One of the goals of the Institute is to provide credible and understandable information on the amount and location of multiple human footprints to support natural resources management. This document provides metadata related to the 2010 Human Footprint Map Layer (Version 1.1) that ABMI has created. This GIS polygon layer includes all human footprints created up to December 31, 2010. This layer is continuously being updated, and new versions of this document will be released periodically.

## **2 Background on the Alberta Biodiversity Monitoring Institute**

The ABMI was initiated in 1997 through a broad partnership of industry, government and academia. ABMI is tasked with tracking status and change to biodiversity at regional and provincial scales, and providing relevant and objective information to policy makers, scientists and the general public.

The Institute collects information on thousands of terrestrial and aquatic species (mammals, birds, fish, mites, aquatic invertebrates, vascular plants, lichens, and moss), habitat structures, and human footprints at 1656 sites spaced systematically on a 20-kilometre grid across the entire province. Each of the 1656 sites is sampled once every 5 years using a set of scientifically reviewed protocols. In addition, human footprint data is compiled across the province and summarized on an ongoing basis. This standardized data collection is designed to reduce duplication and increase cost efficiency for provincial and regional monitoring commitments, and to provide managers with better understanding of cumulative impacts on the environment from multiple industries and human activities.

## **3 Human Footprint in the Layer**

### **3.1 Footprints**

Human footprint refers to the geographic extent of areas under human use that either have lost their natural cover (e.g., cities, roads, agricultural land, industrial areas) or whose natural cover is periodically or temporarily replaced by resource extraction activities (e.g., forestry, seismic lines, surface mining). Human footprint areas can maintain many native and introduced species, particularly as temporary disturbances recover through time. ABMI monitoring of species and habitat elements includes the components of biodiversity that occur in these areas. This layer includes all human footprint areas that have been created.

### **3.2 Staff Training**

Technicians received 4-6 hours of training before they began interpreting and digitizing human footprint. The mapping procedure was reviewed and a brief tutorial presented on ArcGIS editor and methods for efficiently editing several layers simultaneously. There was also in-depth descriptions for each feature class as it appears in SPOT imagery, and cues for its detection and interpretation. Rules for size threshold differentiation among natural and human features were provided. Key points concerning layer precedence (Table 2) and usage of existing arcs and boundaries were highlighted.

Interpreters then digitized the human footprint in a township over the course of three or four days. This work was checked, discussed and inconsistencies and misinterpretations were corrected.

### 3.3 Quality Control Process

GIS interpreters met briefly each morning to discuss interpretation and editing uncertainties. Problem areas were scrutinized by the entire team to resolve the uncertainty and to ensure consistency among interpreters. In addition, the team checked a randomly selected townships from each technician's work on a weekly basis. All interpretations and delineations were discussed and any inconsistencies among interpreters were resolved to ensure and enhance consistency and accuracy.

Data obtained from non-ABMI sources (e.g., SRD Base Layer database) typically were used with no modifications, with the following exceptions:

- 1) Features were screened for appropriate range of dates (i.e., data from January 1, 2011 or later were removed), and
- 2) Missing features were added to sub-layers 4.1 (Reservoirs), 4.10 (Well Sites), and 4.18 (Cut Blocks) using SPOT images for guidance.

All other external data sources were used without verification against SPOT images. External data sources, however, may have been subject to quality control procedures by their supplier.

## 4 Sub-layers

The ABMI Human 2010 Footprint Map Layer, Version 1.1, is the product of multiple sub-layers. Each sub-layer is described below, as is the final single layer that combines the sub-layers. Also provided is a brief description of the layer contents, the source of the data, geometric (shape) type (i.e., polygon, linear, point), modifications made to the layer by ABMI, and the associated human footprint codes. Note that a given sub-layer may contribute to multiple human footprint codes. Linear features were buffered into polygons according to the buffer widths described in Table 1. Buffer widths were determined with the aid of the 2010 SPOT 5 (2.5m resolution) image. The order of precedence of each sub-layer in the creation of the 2010 Human Footprint Layer, Version 1.1 is given in Table 2. Each type of human footprint was given a 4-digit code<sup>1</sup>. A list of these codes and a brief description is given in Table 3.

### 4.1 Reservoirs

*Order of Precedence:* B

*Layer Contents:* Water Reservoirs

*Source Data:* SRD Base Layer Database (Hydropoly); additions made by ABMI using the 2010 SPOT image.

*Original Shape Type:* Polygon

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<sup>1</sup> For full details: Alberta Biodiversity Monitoring Institute. 2012. Manual for Estimating Human Footprint Intactness, Version 2012-03-26. Alberta Biodiversity Monitoring Institute, Alberta, Canada.

*Modifications:* Data were not verified against 2010 SPOT image. All features were included regardless of date.

*Layer Contributes to the Following HF Codes<sup>2</sup>:*

- **1903** Reservoir

*Accuracy:* Created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data have a spatial accuracy of approximately 10 m.

## 4.2 Borrow Pits, Sump, Dug-outs and Lagoons

*Order of Precedence:* C

*Layer Contents:* **Borrow Pits:** Includes pits dug to build forestry and well-site roads. They are always associated with a road, are rectangular in shape, approximately <1ha and may or may not be filled with water.

**Sump & Lagoons:** Interpreted the same as borrow pits but were more closely associated with well-sites than roads.

**Dugouts:** Interpreted the same as borrow pits but were more closely associated with agriculture, typically pasture, than roads.

*Source Data:* Borrow pits, sumps and dugouts were created by ABMI using the 2010 SPOT image. The SRD Base Layer was used as a reference in interpretation. Lagoons were contained within the SRD Base Layer Database (Hydropoly).

*Original Shape Type:* Buffered points

*Layer Contributes to the Following HF Codes:*

- **1901** Dug-out, Borrow-pit, Sump
- **1902** Lagoon

*Accuracy:* Digitized as points from 2010 SPOT image at 1:15000 scale and buffered with square polygons (Table 1). Data for the center point have a spatial accuracy of approximately 7.5 m.

## 4.3 Canals

*Order of Precedence:* F

*Layer Contents:* Canals, Human-created Water Passageway

*Source Data:* SRD Base Layer Database (Hydropoly, Streamline)

*Original Shape Type:* Linear

*Modifications:* Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1910** Canal

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data for the center line of the canals have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

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<sup>2</sup> Note that a given sub-layer may contribute to multiple HF codes. Similarly, a given HF code may be derived from several sub-layers.

#### 4.4 Non-vegetated Impermeable Surfaces

*Order of Precedence:* D

*Layer Contents:* Active non-vegetated industrial sites, paved & gravel surfaces of roads (does not include vegetated road margins).

*Source Data:* Information from mines was created by ABMI using the 2010 SPOT image.. Information from roads was created based on buffers of the SRD Base Layer Database (Paved and Gravel Roads)

*Original Shape Type:* polygons for mines and linear (with buffers) for roads.

*Modifications:* Features dated December 31, 2010 or earlier were retained as were features without dates. Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1206** Industrial Non-vegetated (Low human density)
- **1301** Lin20Hard. Linear road/industrial features >20 m wide
- **1302** Lin10Hard. Linear road/industrial features 10-20 m wide
- **1401** Lin5Hard. Linear road/trail/path/industrial features 2-10 m wide

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data for the center line of the feature have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

#### 4.5 Rail Lines Hard Surface

*Order of Precedence:* E

*Layer Contents:* Railway tracks and associated gravel pad; does not include vegetated margins.

*Source Data:* SRD Base Layer Database (Rail Line)

*Original Shape Type:* Linear, with buffers added.

*Modifications:* Features dated December 31, 2010 or earlier were retained as were features without dates. Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1301** Lin20Hard. Linear road/rail/industrial features >20 m wide

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data for the center line of the feature have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

#### 4.6 Vegetated Surfaces of Roads, Trails, and Railways

*Order of Precedence:* G

*Layer Contents:* Green margin (verge) of roads, trails, and railways. Does not include the hard surface (e.g., paved portion of roads, or rail/gravel portion of railways).

*Source Data:* SRD Base Layer Database

*Original Shape Type:* Linear

*Modifications:* Features dated December 31, 2010 or earlier were retained as were features without dates. Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1701** VegetatedRoad. Roads, trails and paths with unimproved surfaces
- **1702** RoadVerge. Vegetated verges and ditches along roads and railways.
- **1501** Lin20Soft. Linear urban/industrial features >20 m wide
- **1502** Lin10Soft. Linear urban/industrial features 10-20 m wide
- **1601** Lin5Soft. Linear urban/industrial features 2-10 m wide

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data and Indian Remote Sensing (IRS) Images. Data for the center line of the feature have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

#### **4.7 Mine Sites**

*Order of Precedence:* A (for MINES-DISTURBED-NO-VEG, MINES-PITLAKE), H (for MINES-DISTURBED-VEG, MINES-PITLAKE)

*Layer Contents:* Areas of ground that were consistently open and/or expanding over multiple years, usually close to lakes or rivers, were considered to be mines/gravel pits.

*Source Data:* Created by ABMI using the 2010 SPOT image. Features already in the SRD Base Layer were used as a reference during interpretation.

*Original Shape Type:* Polygon

*Modifications:* Checked against 2010 SPOT image and updated accordingly.

*Layer Contributes to the Following HF Codes:*

- **1204** Commercial/Industry Vegetated (High human density)
- **1205** Industry Vegetated (Low human density)

*Accuracy:* Digitized from 2010 SPOT image at 1:15000 scale. Mines <1ha (e.g., small gravel pits) were included. Data have a spatial accuracy of approximately 7.5m.

#### **4.8 Industrial Sites**

*Order of Precedence:* I

*Layer Contents:* Industrial sites.

*Source Data:* Created by ABMI using the 2010 SPOT image. The SRD Base Layer was used as a reference in interpretation.

*Original Shape Type:* Buffered points were used for sites <1ha (buffered area 1ha) and for sites 1-5ha (buffered area 5ha), polygons were used for sites >5ha.

*Modifications:* Created by ABMI.

*Layer Contributes to the Following HF Codes:*

- **1204** Commercial/Industry Vegetated (High human density)
- **1205** Industry Vegetated (Low human density)



*Accuracy:* Digitized from 2010 SPOT image at 1:15000 scale. Data have a spatial accuracy of approximately 7.5m.

#### **4.9 Wind Generation Facility**

*Order of Precedence:* L

*Layer Contents:* Wind turbines. Turbines were typically located in southern Alberta and were identified by their long shadows with three blades.

*Source Data:* Created by ABMI

*Original Shape Type:* Buffered points (30x30m square buffer)

*Modifications:* Created by ABMI using 2010 SPOT image. The SRD Base Layer was used as a reference.

*Layer Contributes to the Following HF Codes:*

- **1205** Industry Vegetated (Low human density)

*Accuracy:* Digitized from 2010 SPOT image at 1:15000 scale. Data for the center point have a spatial accuracy of approximately 7.5m.

#### **4.10 Well Sites (Energy)**

*Order of Precedence:* J

*Layer Contents:* Well sites.

*Source Data:* SRD Base Layer Database (Well Sites), ABMI

*Original Shape Type:* Buffered points with square buffer of 1 hectare.

*Modifications:* Features dated December 31, 2010 or earlier were retained as were features without dates. Features dated January 1, 2011 or later were removed. Well sites within the SRD base layer were not verified against the 2010 SPOT image. No well sites were deleted from the SRD base layer. ABMI made additions based on 2010 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1205** Industry Vegetated (Low human density)

*Accuracy:* SRD data was supplied by the Energy Utilities Board (EUB) and acquired through IHS Energy (Canada) Ltd. This data contains Active, Abandoned and Newly Licensed Wells. Sites added by ABMI were digitized at 1:15000, and were required to have a road leading to the site; the presence/absence of a gravel pad was not consistently used as a criteria. Data for the center point of the added well site have a spatial accuracy of approximately 7.5m.

#### **4.11 Seismic Lines**

*Order of Precedence:* S

*Layer Contents:* Seismic Lines

*Source Data:* SRD Base Layer Database

*Original Shape Type:* Linear with buffer added.

*Modifications:* Features dated December 31, 2010 or earlier were retained as were polygons without dates. Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image. Features were buffered according to Table 1.

*Layer Contributes to the Following HF Codes:*

- **1601 Lin5Soft.** Linear urban/industrial features 2-10 m wide

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data for the center line of the feature have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

#### 4.12 Urban and Rural Residential

*Order of Precedence:* O

*Layer Contents:* **Urban Residences:** A polygon was drawn around areas having >100 buildings per quarter section. These polygons included both residential and industrial development. Areas within the urban/residential polygons >5ha with natural vegetation were excluded.

**Acreages:** A polygon was drawn around developments having a density of 10 - 100 buildings per quarter section. The buildings may be either residential or industrial in nature. Areas within quarter sections not associated with the development (i.e., natural spaces) were not included. May include industrial sites if these could not be distinguished from acreage developments.

**Rural Residences:** For rural developments <5ha with less than ten buildings per quarter section, a point was placed on the rural dwelling and the point was classified as <1ha or 1-5ha. For rural developments <5ha the actual “yard” area was mapped and did not include crops. Rural residences >5ha were drawn with polygons. This feature may include industrial sites if these could not be distinguished from rural development.

**Future Residential:** Areas cleared for building developments but did not yet have any buildings.

*Source Data:* 2010 SPOT image

*Original Shape Type:* Buffered points were used for sites <1ha (buffered area 1ha) and for sites 1-5ha (buffered area 5ha), polygons were used for sites >5ha.

*Modifications:* None. New layer was created from 2010 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1101 Urban.** Residential Urban (residential areas in cities, towns, villages, cottages, ribbon developments, etc; areas that are dominated by dwellings – usually >1 building per ha)
- **1102 Rural.** Residential Rural Dominated by Buildings (usually >1 building per ha; e.g., farmstead, ranch, acreages, lodges, etc)

*Accuracy:* Digitized from 2010 SPOT at 1:15000. Each building must have an associated road. Data have a spatial accuracy of approximately 7.5m.

#### 4.13 Recreation & Other Vegetated Facility

*Order of Precedence:* K

*Layer Contents:* Unpaved aircraft runways, grave yards, golf courses, campgrounds, and baseball diamonds, parks, shelterbelts, ski hills, DND exercise areas, low vegetation surrounding airport runways, clearings from old industrial activity

that is now vegetated. This layer was also used to identify green-space features that do not fit into other categories such as storage areas and parking lots.

*Source Data:* Created by ABMI

*Original Shape Type:* Polygon

*Modifications:* Created by ABMI using 2010 SPOT image. The SRD Base Layer was used as a reference.

*Layer Contributes to the Following HF Codes:*

- **1103** Urban/Rural Greenspace – grave yards, race tracks, religious areas, golf courses, campgrounds, shelterbelts, ski hills, DND exercise areas, low vegetation surrounding airport runways, clearings from old industrial activity that is now vegetated, etc.)

*Accuracy:* Digitized from 2010 SPOT at 1:15000 scale. Data have a spatial accuracy of approximately 7.5m.

#### 4.14 Transmission Lines

*Order of Precedence:* M

*Layer Contents:* Electrical Transmission Lines

*Source Data:* SRD Base Layer Database (Powerlines)

*Original Shape Type:* Linear

*Modifications:* Features dated December 31, 2010 or earlier were retained as were features without dates. Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image. Features were buffered according to Table 1.

*Layer Contributes to the Following HF Codes:*

- **1501** Lin20Soft. Linear urban/industrial features >20 m wide

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data for the center line of the feature have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

#### 4.15 Pipelines

*Order of Precedence:* R

*Layer Contents:* Oil & Gas Pipelines

*Source Data:* SRD Base Layer Database (Pipelines)

*Original Shape Type:* Linear

*Modifications:* Features dated December 31, 2010 or earlier were retained as were polygons without dates. Features dated January 1, 2011 or later were removed. Data were not verified against 2010 SPOT image. Features were buffered according to Table 1.

*Layer Contributes to the Following HF Codes:*

- **1501** Lin20Soft. Linear urban/industrial features >20 m wide

*Accuracy:* Linear portion was created by SRD using 1:20 000 Access data updated using Indian Remote Sensing (IRS) Images. Data for the center line of the feature

have a spatial accuracy of approximately 10m. Features were buffered according to Table 1.

#### **4.16 CFO, and Other High Density Livestock**

*Order of Precedence:* N

*Layer Contents:* Confined feeding operations (CFO), interpreted as the presence of large buildings and fenced pens appearing to be used for the purpose of feeding and confining pigs, chickens, or cows.

*Source Data:* SRD - Lethbridge

*Original Shape Type:* Polygon

*Modifications:* ABMI added to this layer using the 2010 SPOT image as reference.

*Layer Contributes to the Following HF Codes:*

- **1204** Commercial/Industry Vegetated (High human density)

*Accuracy:* ABMI additions were drawn at a 1:15000 scale. Data have a spatial accuracy of approximately 7.5m.

#### **4.17 Cultivation**

*Order of Precedence:* P

*Layer Contents:* Agricultural Areas used for Cultivation

*Source Data:* Created by ABMI using the 2010 SPOT image. GVI and AVI were used for reference when available.

*Original Shape Type:* Polygon

*Modifications:* None. Created new by ABMI.

*Layer Contributes to the Following HF Codes:*

- **2000** (Agricultural Cultivation)

*Accuracy:* Digitized by ABMI using 2010 SPOT at 1:15000. Cultivated areas <5ha were not included in layer. Polygon borders were approximate. For the overall footprint layer, the polygon borders were clipped by existing features in other sub-layers (e.g., road buffers). Data have a spatial accuracy of approximately 7.5m.

#### **4.18 Cut Blocks**

*Order of Precedence:* Q

*Layer Contents:* Areas where forestry operations have occurred (clear-cuts, selective harvest, salvage logging, etc.)

*Source Data:* SRD, FRI, & individual companies.

*Original Shape Type:* Polygon

*Modifications:* AVI data was updated by FRI and company data where available. ABMI added to and corrected this layer using the 2010 SPOT image as reference.

*Layer Contributes to the Following HF Codes:*

- **3501** CBClear10. Clearcut block <10 years with no ground disturbance during reforestation (<20% of the live trees retained at harvest)

- **3511** CBClear 20. Clearcut block 11-30 years with no ground disturbance during reforestation (<20% of the live trees retained at harvest)
- **3521** CBClear30. Clearcut block >30 years with no ground disturbance during reforestation (<20% of the live trees retained at harvest)
- **3531** CBClearUnknow. ClearCut block unknown years with no ground disturbance during reforestation

*Accuracy:* Digitized by ABMI using 2010 SPOT at 1:15000. Cut blocks <5ha were not included in layer. Polygon borders were approximate. For the overall footprint layer, the polygon borders were clipped by existing features in other sub-layers (e.g., road buffers). Data have a spatial accuracy of approximately 7.5m.

## 5 Creation of Single Human Footprint Layer

The sub-layers described in Section 4 above were processed using the ArcGIS command “UPDATE” to create a single layer. The layers were organized according to their order of precedence (Table 2) such that a sub-layer with high precedence (e.g. sub-layer A) would mask all layers of lower precedence (e.g. sub-layers B-R).

The 2010 Human Footprint Layer, Version 1.1 is a polygon layer in which each polygon indicates the footprint type (see Table 3). A list of all human footprint types (FEATURE\_TY) in the 2010 Human Footprint Map Layer is provided in Table 4.

The 2010 Human Footprint Layer, Version 1.1 is available in two formats in ArcGIS FGDB (v9.3):

1. A single mosaic layer that contains HF data for the entire province
2. A tiled format in which the HF layer is divided into 801 tiles based on the National Topographic System of Canada (NTS).

**Table 1.** Buffer widths (m) for linear features derived from 2010 SPOT images measured at a scale of 1:15000. Buffer widths were estimated from multiple locations (minimum of 25 locations per feature type) on the 2010 SPOT image.

<b>HF code</b>	<b>Feature Type</b>	<b>Buffer Size (m) (to each side for linear features)</b>
1301 1702	INTERCHANGE-RAMP	Paved Surface: 9 Paved Surface + Green Verge: 26
1301 1702	ROAD-PAVED-DIV	Paved: 10 on each line Median & Ditch: 34 buffer on each line minus the pave
1301	ROAD-PAVED-UNDIV-4L	Paved Surface: 15 Paved Surface + Green Verge: 15
1301 1702	ROAD-PAVED-UNDIV2L	Paved Surface: 9 Paved Surface + Green Verge: 22
1302 1702	ROAD-PAVED-UNDIV-1L	Paved Surface: 6 Paved Surface + Green Verge: 13.5
1302 1702	ROAD-GRAVEL-2L	Gravel Surface: 7 Gravel Surface + Green Verge: 22
1302 1702	ROAD-GRAVEL-1L	Gravel Surface: 5 Gravel Surface + Green Verge: 14
1701	ROAD-UNIMPROVED	6
1701	TRUCK-TRAIL	6
1701	ROAD-UNCLASSIFIED	6
1701	FORD-WINTER-XING	On Water: 0 On Land: 5
1701	ROAD-WINTER-ROAD	9
1501 1502	Pipeline	12
1502	Power Line (Transmission)	19
1302 1702	Rail Line	Track: 5 Track + green 12
1601	Seismic (Cut) Line, pre 2005	3
1601	Seismic (Cut) Line, post 2005	2
1910	CANAL	1
1910	CANAL-MAJ	2
1910	CANAL-MAJ-REP-PRI	2
1901	Dugout, Borrow-pit, Sump	Dugout: 48m, Borrow-pit: 68m Sump: 46m
1205	Wells	1ha square
1205	Windmills	30x30m square
1204	Heavy Commercial/Industry (High Human Density)	Sites <1ha: 1ha circle Sites 1-5ha: 5ha circle
1205	Heavy Commercial/Industry	Sites <1ha: 1ha circle

<b>HF code</b>	<b>Feature Type</b>	<b>Buffer Size (m) (to each side for linear features)</b>
	(Low Human Density)	Sites 1-5ha: 5ha circle
1102	Rural Residential	Sites <1ha: 1ha circle Sites 1-5ha: 5ha circle

**Table 2.** Order of precedence for sub-layers contributing to the 2010 Human Footprint Layer, Version 1.1.

<b>Sub-layer</b>	<b>Order of Precedence</b>
Mine Sites (see Section 4.7)	A
Reservoirs	B
Borrow Pits, Sump, Dug-outs and Lagoons	C
Non-vegetated Impermeable Surfaces	D
Rail Lines Hard surface	E
Canals	F
Vegetated Surfaces of Road, Trails, and Railway	G
Mine Sites (see section 4.7)	H
Industrial Sites	I
Well Sites (Energy)	J
Recreation & Other Vegetated Facility	K
Wind Generation Facility	L
Transmission Lines	M
CFO, and Other High Density Livestock	N
Urban and Rural Residential	O
Cultivation	P
Cut Blocks	Q
Pipelines	R
Seismic Lines	S



**Table 3.** Human Footprint Codes and a Brief Description

***1000 Urban & Industrial Features & Infrastructure***

***1100 Urban & Rural Features (habitats where people live, non-industrial)***

- 1101 Urban. Residential Urban (residential areas in cities, towns, villages, cottages, ribbon developments, etc; areas that are dominated by dwellings – usually >1 building per ha)
- 1102 Rural. Residential Rural Dominated by Buildings (usually >1 building per ha; eg. farmstead, ranch, acreages, lodges, etc)
- 1103 Urban/Rural Greenspace – grave yards, religious areas, golf courses, campgrounds, shelterbelts, ski hills, DND exercise areas, low vegetation surrounding airport runways, clearings from old industrial activity that is now vegetated, etc.)

***1200 Industrial & Resource Extraction Features (habitats associated with heavy industrial development)***

- 1204 Commercial/Industry Vegetated (High human density). Ground cleared for industrial & commercial development with the vegetation regrown in areas around the commercial/industrial facilities (airports, industrial parks, factories, refineries, hydro generating stations, pulp & paper mills, pump stations, malls, parking lots, zoos, CFO, etc.)
- 1205 Industry Vegetated (Low human density). Ground cleared by Industry and then Revegetated (coal and mineral surface mines with the vegetation regrown in areas around the facilities or on abandoned facilities (gravel pits with vegetation regrowing, heavy oil sand and spoil piles with vegetation regrowing, oil and gas well pads, wind mills, communication towers, etc.)
- 1206 Industry Non-vegetated (Low human density). Ground cleared by Industry with no Vegetation Present (active coal and mineral surface mines without vegetation, active gravel pits without vegetation, heavy oil sand without vegetation, unreclaimed end-pit lake, etc.)

***1300 Hard & Wide Linear Features (length >50 times the width, >10m wide, hard surface /non-vegetated [gravel road, paved road, railway, paved airport runway, etc.]***

- 1301 Lin20Hard. Linear road/rail/industrial features >20 m wide
- 1302 Lin10Hard. Linear road/rail/industrial features 10-20 m wide

***1400 Hard & Narrow Linear Features (length >50 times the width, ≤10m wide, hard surface /non-vegetated [gravel or paved linear feature])***

- 1401 Lin5Hard. Linear road/trail/path/rail/industrial features 2-10 m wide

***1500 Soft & Wide Linear Features (length >50 times the width, >10m wide, soft surface /vegetated [packed soil, pipeline right of way, transmission line, etc.], not including roads)***

- 1501 Lin20Soft. Linear urban/industrial features >20 m wide
- 1502 Lin10Soft. Linear urban/industrial features 10-20 m wide

***1600 Soft & Narrow Linear Features (length >50 times the width, ≤10m wide, soft surface /vegetated [seismic line, etc.]***

- 1601 Lin5Soft. Linear urban/industrial features 2-10 m wide

***1700 Vegetated Roads, Verges and Ditches (unimproved vegetated roads and the areas along the edge of roads)***

- 1701 VegetatedRoad. Roads, trails and paths with unimproved surfaces

1702 RoadVerge. Vegetated verges and ditches along roads  
**1900 Human-created Water Bodies**

1901 Dug-out, Borrow-pit, Sump  
1902 Lagoon  
1903 Reservoir  
1910 Canal

### **2000 Agricultural Cover Types**

**2100 Cultivated Crops** (*must be evidence of cultivation visible during the photo interpretation*)

2101 Crop. Annual cereal crop  
2102 Irrig. Irrigated land  
2103 Other agriculture (orchard, horticulture, etc)  
2104 ArgBare. Bare soil that is created as part of agricultural activities

**2200 Pasture & Forage**

2205 Pasture  
2206 Forage crop

### **3000 Managed Forest**

3501 CBClear10. Clearcut block <10 years with no ground disturbance during reforestation (<20% of the live trees retained at harvest)  
3502 CBStructure10. Structured cut block <10 years with no ground disturbance during reforestation (>=20% of the live trees retained at harvest, this includes tree retention harvest, thinning, & understory protection)  
3503 CBDisturb10. Cutblock <10 years with ground disturbance during reforestation visual on the air photo (ploughing, mounding, etc)  
3511 CBClear 20. Clearcut block 11-30 years with no ground disturbance during reforestation (<20% of the live trees retained at harvest)  
3512 CBStructure 20. Structured cut block 11-30 years with no ground disturbance during reforestation (>=20% of the live trees retained at harvest, this includes tree retention harvest, thinning, & understory protection)  
3513 CBDisturb20. Cutblock 11-30 years with ground disturbance during reforestation visual on the air photo  
3521 CBClear30. Clearcut block >30 years with no ground disturbance during reforestation (<20% of the live trees retained at harvest)  
3522 CBStructure30. Structured cut block >30 years with no ground disturbance during reforestation (>=20% of the live trees retained at harvest, this includes tree retention harvest, thinning, & understory protection)  
3523 CBDisturb30. Cutblock >30 years with ground disturbance during reforestation visual on the air photo  
3531 CBClearUnknow. ClearCut block unknown years with no ground disturbance during reforestation  
3532 CBStructureUnknow. Structured cutblock unknown years with no ground disturbance during reforestation  
3533 HumanDisturbUnknow, Human modified forests unknown years with ground disturbance during reforestation visual on the air photo

**Table 4.** List of all human footprint types (FEATURE\_TY) in the 2010 Human Footprint Map Layer, Version 1.1.

FEATURE_TY	ABMI FPRINT CODE	PUBLIC CODE
ACREAGE	1102	Rural (Residential/Industrial)
AGRICULTURE_CLEARING	2205	Cultivation (Crop/Pasture/Bare Ground)
BORROWPITS	1901	Borrow-Pits/Dugouts/Sumps
CANAL	1910	Canals
CANAL-MAJ	1910	Canals
CANAL-MAJ-REP-PRI	1910	Canals
CFO	1205	High Density Livestock Operation
CULTIVATION	2000	Cultivation (Crop/Pasture/Bare Ground)
CUTBLOCK	3501, 3511, 3521, 3531	Cut Blocks
CUTLINE-TRAIL	1601	Seismic line
CUTLINE-TRAIL-WITHIN-CLEARING	1601	Seismic line
DUGOUT	1901	Borrow-Pits/Dugouts/Sumps
FORD-WINTER-XING	1701	Road/Trail (Vegetated)
GRVL-SAND-PIT	1205	Mine Site
IND-HIGH	1204	Industrial Site Rural
IND-LOW	1205	Industrial Site Rural
INTERCHANGE-RAMP	1301	Road – Hard Surface
MINES	1205	Mine Site
MINES-DISTURBED-NO-VEG	1205	Mine Site
MINES-DISTURBED-VEG	1205	Mine Site
MINES-PITLAKE	1205	Mine Site
MINES-UNDISTURBED	1205	Mine Site
LAGOON	1902	Municipal (Water and Sewage)
OPEN-PIT-MINE	1205	Mine Site
PEAT	1205	Peat Mine
PIPELINE	1502	Pipeline
RECREATION	1103	Other Disturbed Vegetation
RESERVOIR	1903	Reservoirs
RESIDENCE_CLEARING	1101	Urban
RLWY-ABANDONED	1302	Rail – Hard Surface
RLWY-DBL-TRACK	1301	Rail – Hard Surface
RLWY-FORMER	1302	Rail – Hard Surface
RLWY-MLT-TRACK	1301	Rail – Hard Surface
RLWY-SGL-TRACK	1301	Rail – Hard Surface

RLWY-SPUR	1301	Rail – Hard Surface
ROAD-GRAVEL-1L	1302	Road – Hard Surface
ROAD-GRAVEL-2L	1302	Road – Hard Surface
ROAD-PAVED-DIV	1301	Road – Hard Surface
ROAD-PAVED-UNDIV-1L	1302	Road – Hard Surface
ROAD-PAVED-UNDIV-2L	1301	Road – Hard Surface
ROAD-PAVED-UNDIV-4L	1301	Road – Hard Surface
ROAD-UNIMPROVED	1701	Road/Trail (Vegetated)
ROAD-UNCLASSIFIED	1701	Road/Trail (Vegetated)
ROAD-WINTER-ROAD	1701	Road/Trail (Vegetated)
RURAL_1-5ha	1102	Rural (Residential/Industrial)
RURAL_GT_5ha	1102	Rural (Residential/Industrial)
RURAL_LESS_1ha	1102	Rural (Residential/Industrial)
SOFT_INTERCHANGE-RAMP	1702	Road – Vegetated Verge
SOFT_RLWY-ABANDONED	1702	Rail – Vegetated Verge
SOFT_RLWY-DBL-TRACK	1702	Rail – Vegetated Verge
SOFT_RLWY-MLT-TRACK	1702	Rail – Vegetated Verge
SOFT_RLWY-SGL-TRACK	1702	Rail – Vegetated Verge
SOFT_RLWY-SPUR	1702	Rail – Vegetated Verge
SOFT_ROAD-GRAVEL-1L	1702	Road – Vegetated Verge
SOFT_ROAD-GRAVEL-2L	1702	Road – Vegetated Verge
SOFT_ROAD-PAVED-DIV	1702	Road – Vegetated Verge
SOFT_ROAD-PAVED-UNDIV-1L	1702	Road – Vegetated Verge
SOFT_ROAD-PAVED-UNDIV-2L	1702	Road – Vegetated Verge
SUMPS	1901	Borrow-Pits/Dugouts/Sumps
TAILING-PILE	1205	Mine Site
TRAIL-ATV	1701	Road/Trail (Vegetated)
TRAIL-ATV-INDEFINITE	1701	Road/Trail (Vegetated)
TRANS-LINE	1502	Transmission Line
TRUCK-TRAIL	1701	Road/Trail (Vegetated)
URBAN_RESIDENCE	1101	Urban
WELL	1205	Well Site
WELL-ABAND	1205	Well Site
WELL-CBM	1205	Well Site
WELL-GAS	1205	Well Site
WELL-GAS-ABAND	1205	Well Site
WELL-GAS-CAPPED	1205	Well Site
WELL-OIL	1205	Well Site
WELL-OIL-ABAND	1205	Well Site

WELL-SPOT07	1205	Well Site
WELL-WATER	1205	Well Site
WELL-WATER-ABAND	1205	Well Site
WELL_MODEL_FOREST	1205	Well Site
WINDMILLS	1205	Wind Generation Facility