

Alberta Biodiversity  
Monitoring Institute

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# **2007 Human Footprint Map Layer Version 4.2 - Metadata**

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## Table of Contents

1	Summary .....	1
2	Background on the Alberta Biodiversity Monitoring Institute .....	1
3	Human Footprint in the Layer.....	1
3.1	Footprints .....	1
4	Sub-layers .....	1
4.1	Reservoirs .....	2
4.2	Borrow Pits, Sump, Dug-outs and Lagoons .....	2
4.3	Canals.....	3
4.4	Roads (Paved and Gravel Surface) .....	3
4.5	Rail Lines Hard Surface.....	3
4.6	Vegetated Surfaces of Roads, Trails, and Railways .....	4
4.7	Mine Sites .....	4
4.8	Industrial Sites .....	4
4.9	Wind Generation Facility.....	5
4.10	Well Sites (Energy).....	5
4.11	Seismic Lines .....	6
4.12	Urban and Rural Residential.....	6
4.13	Recreation & Other Vegetated Facility.....	7
4.14	Transmission Lines .....	7
4.15	Pipelines .....	8
4.16	CFO, and Other High Density Livestock.....	8
4.17	Cultivation.....	8
4.18	Cut Blocks.....	9
5	Creation of Single Human Footprint Layer .....	9

# **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 2007 Human Footprint Map Layer (Version 4.2) that ABMI has created. This GIS polygon layer includes all human footprints created up to December 31, 2007. 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.

## **4 Sub-layers**

The ABMI Human 2007 Footprint Map Layer, Version 4.2, 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 2007 SPOT 5 (2.5m resolution)

image. The order of precedence of each sub-layer in the creation of the 2007 Human Footprint Layer, Version 4.2 is given in Table 2. Each type of human footprint was given a 4-digit code. A list of these codes and a brief description is given in Table 3. All ABMI-created data were drawn at a 1:15,000 scale; the scale for data from other sources are provided below for each sub-layer.

#### 4.1 Reservoirs

*Order of Precedence:* A

*Layer Contents:* Water Reservoirs

*Source Data:* SRD Base Layer Database (Hydropoly); additions made by ABMI using the 2007 SPOT image.

*Original Shape Type:* Polygon

*Modifications:* Data were not verified against 2007 SPOT image. All features were included regardless of date.

*Layer Contributes to the Following HF Codes<sup>1</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.

Data added by ABMI were drawn at a 1:15000 scale.

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

*Order of Precedence:* B

*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 2007 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 2007 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.

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<sup>1</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.

### 4.3 Canals

*Order of Precedence:* E

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

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

*Original Shape Type:* Linear

*Modifications:* Features dated January 1, 2008 or later were removed. Data were not verified against 2007 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.

### 4.4 Roads (Paved and Gravel Surface)

*Order of Precedence:* C

*Layer Contents:* All paved and gravel roads, does not include vegetated margins.

*Source Data:* SRD Base Layer Database (Paved and Gravel Roads)

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

*Modifications:* Features dated December 31, 2007 or earlier were retained as were features without dates. Features dated January 1, 2008 or later were removed. Data were not verified against 2007 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **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:* D

*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, 2007 or earlier were retained as were features without dates. Features dated January 1, 2008 or later were removed. Data were not verified against 2007 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:* F

*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, 2007 or earlier were retained as were features without dates. Features dated January 1, 2008 or later were removed. Data were not verified against 2007 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:* G

*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 2007 SPOT image. Features already in the SRD Base Layer were used as a reference during interpretation.

*Original Shape Type:* Polygon

*Modifications:* Checked against 2007 SPOT image and updated accordingly.

*Layer Contributes to the Following HF Codes:*

- **1205** Heavy Industry (Low human density). Bare and/or Vegetated Ground clear for Industry (coal and mineral surface mines, gravel pits, heavy oil sand development, spoil piles, etc.)

*Accuracy:* Digitized from 2007 SPOT image at 1:15000 scale. Mines <1ha (e.g., small gravel pits) were included. Data have a spatial accuracy of approximately 7.5m. Data added by ABMI were drawn at a 1:15000 scale.

#### 4.8 Industrial Sites

*Order of Precedence:* H

*Layer Contents:* Industrial sites.

*Source Data:* Created by ABMI using the 2007 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** Heavy Commercial/Industry (High human density). Intense industrial & commercial development (airports, industrial parks, factories, refineries, hydro generating stations, pulp & paper mills, pump stations, malls, parking lots, zoos, etc.)
- **1205** Heavy Industry (Low human density). Bare and/or Vegetated Ground clear for Industry (communication towers, etc.)

*Accuracy:* Digitized from 2007 SPOT image at 1:15000 scale. Data have a spatial accuracy of approximately 7.5m.

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

*Order of Precedence:* K

*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 2007 SPOT image. The SRD Base Layer was used as a reference.

*Layer Contributes to the Following HF Codes:*

- **1205** Heavy Industry (Low human density). Bare and/or Vegetated Ground clear for Industry (wind mills)

*Accuracy:* Digitized from 2007 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:* I

*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, 2007 or earlier were retained as were features without dates. Features dated January 1, 2008 or later were removed. Well sites within the SRD base layer were not verified against the 2007 SPOT image. No well sites were deleted from the SRD base layer. ABMI made additions based on 2007 SPOT image.

*Layer Contributes to the Following HF Codes:*

- **1205** Heavy Industry (Low human density). Bare and/or Vegetated Ground cleared for Industry (oil and gas well pads)

*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:* R

*Layer Contents:* Seismic Lines

*Source Data:* SRD Base Layer Database

*Original Shape Type:* Linear with buffer added.

*Modifications:* Features dated December 31, 2007 or earlier were retained as were polygons without dates. Features dated January 1, 2008 or later were removed. Data were not verified against 2007 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:* N

*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. 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:* 2007 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 2007 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; eg. farmstead, ranch, acreages, lodges, etc)

*Accuracy:* Digitized from 2007 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:* J

*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 2007 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 2007 SPOT at 1:15000 scale. Data have a spatial accuracy of approximately 7.5m.

#### **4.14 Transmission Lines**

*Order of Precedence:* L

*Layer Contents:* Electrical Transmission Lines

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

*Original Shape Type:* Linear

*Modifications:* Features dated December 31, 2007 or earlier were retained as were features without dates. Features dated January 1, 2008 or later were removed. Data were not verified against 2007 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:* Q

*Layer Contents:* Oil & Gas Pipelines

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

*Original Shape Type:* Linear

*Modifications:* Features dated December 31, 2007 or earlier were retained as were polygons without dates. Features dated January 1, 2008 or later were removed. Data were not verified against 2007 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:* M

*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 2007 SPOT image as reference.

*Layer Contributes to the Following HF Codes:*

- **1205** Heavy Industry (Low human density). Bare and/or Vegetated Ground clear for Industry (CFO)

*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:* O

*Layer Contents:* Agricultural Areas used for Cultivation

*Source Data:* Created by ABMI using the 2007 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 2007 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:* P

*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 2007 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 2007 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 2007 Human Footprint Layer, Version 4.2 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 2007 Human Footprint Map Layer is provided in Table 4.

The 2007 Human Footprint Layer, Version 4.2 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 2007 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 2007 SPOT image.

HF code	Feature Type	Buffer Size (m) (to each side for linear features)
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 2007 Human Footprint Layer, Version 4.2.

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

**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 Heavy Commercial/Industry (High human density). Intense industrial & commercial development (airports, industrial parks, factories, refineries, hydro generating stations, pulp & paper mills, pump stations, malls, parking lots, zoos, etc.)
- 1205 Heavy Industry (Low human density). Bare and/or Vegetated Ground clear for Industry (coal and mineral surface mines, oil and gas well pads, wind mills, CFO, communication towers, gravel pits, heavy oil sand development, spoil piles, 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 [packed soil, pipeline right of way, transmission line, etc.], not including roads*)**

- 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 2007 Human Footprint Map Layer, Version 4.2.

<b>FEATURE_TY</b>	<b>FOOTPRINT CODE</b>
RESIDENCE_CLEARING	1101
URBAN_RESIDENCE	1101
ACREAGE	1102
RURAL_1-5ha	1102
RURAL_GT_5ha	1102
RURAL_LESS_1ha	1102
RECREATION	1103
IND-HIGH	1204
CFO	1205
GRVL-SAND-PIT	1205
IND-LOW	1205
MINES	1205
OPEN-PIT-MINE	1205
PEAT	1205
TAILING-PILE	1205
WELL	1205
WELL-ABAND	1205
WELL-CBM	1205
WELL-GAS	1205
WELL-GAS-ABAND	1205
WELL-GAS-CAPPED	1205
WELL-OIL	1205
WELL-OIL-ABAND	1205
WELL-SPOT07	1205
WELL-WATER	1205
WELL-WATER-ABAND	1205
WELL_MODEL_FOREST	1205
WINDMILLS	1205
INTERCHANGE-RAMP	1301
RLWY-DBL-TRACK	1301
RLWY-MLT-TRACK	1301
RLWY-SGL-TRACK	1301
RLWY-SPUR	1301
ROAD-PAVED-DIV	1301
ROAD-PAVED-UNDIV-2L	1301
ROAD-PAVED-UNDIV-4L	1301
RLWY-ABANDONED	1302
RLWY-FORMER	1302
ROAD-GRAVEL-1L	1302
ROAD-GRAVEL-2L	1302

ROAD-PAVED-UNDIV-1L	1302
PIPELINE	1502
TRANS-LINE	1502
CUTLINE-TRAIL	1601
CUTLINE-TRAIL-WITHIN-CLEARING	1601
FORD-WINTER-XING	1701
ROAD-UNIMPROVED	1701
ROAD-UNCLASSIFIED	1701
ROAD-WINTER-ROAD	1701
TRAIL-ATV	1701
TRAIL-ATV-INDEFINITE	1701
TRUCK-TRAIL	1701
SOFT_INTERCHANGE-RAMP	1702
SOFT_RLWY-ABANDONED	1702
SOFT_RLWY-DBL-TRACK	1702
SOFT_RLWY-MLT-TRACK	1702
SOFT_RLWY-SGL-TRACK	1702
SOFT_RLWY-SPUR	1702
SOFT_ROAD-GRAVEL-1L	1702
SOFT_ROAD-GRAVEL-2L	1702
SOFT_ROAD-PAVED-DIV	1702
SOFT_ROAD-PAVED-UNDIV-1L	1702
SOFT_ROAD-PAVED-UNDIV-2L	1702
BORROWPITS	1901
DUGOUT	1901
SUMPS	1901
LAGOON	1902
RESERVOIR	1903
CANAL	1910
CANAL-MAJ	1910
CANAL-MAJ-REP-PRI	1910
CULTIVATION	2000
AGRICULTURE_CLEARING	2205
CUTBLOCK	3501, 3511, 3521, 3531