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Land Use and Digital Elevation Mapping for Otago Regional Council – April 2022

TECHNICAL METHODOLOGY DOCUMENT

01.04.2022

The Otago Regional Council have asked Great South to create an updated Land Use Map for the Otago Region, while including updated technical inputs (irrigation & elevation).
These include a:

- Current (2022) Land Use Map (from AgriBase™ records);
- Technical base map bringing in Climate, New Irrigation, & Topographic features (Srinivasan et al. 2021, Monaghan et al 2021, & Otago DEM);
- Digital Elevation Model (DEM) for the Otago region; and
- Methodology report (amended from the documented Otago & Southland methods, M. Couldrey (Great South), 2021, Pearson and Couldrey, 2016, and Pearson and Couldrey, 2018);
- Metadata report (outlining key metadata).

The Otago Regional Council will supply Great South with the AgriBase™ records required for this work. These include:

- AgriBase™ – *AgB_ORC_022022.shp* (current February 2022 records);
- New Irrigation Layer – *Otago Irrigated Area Layer 2021_26Oct2021.shp*; and the
- Current ORC Rates Database – Rates_2022.shp (record of rated land class).

The Otago Regional Land Use Technical Document records the process followed to create the current Land Use Map; the Digital Elevation Model; and the Technical Land Use – Base-Map.

Regional Land Use

Land use can be defined as the activity or activities for which land is used, and the same land can support multiple uses. Land use identifies the purpose for what the land is committed, which includes production of goods (such as crops, timber, animal products) and services (such as recreation, public services and natural resources protection). It differs from land cover, which describes the physical state of the land (vegetation type, soils, exposed rocks, water bodies).

The Otago Regional Land Use Map 2022 complies information from Land Information New Zealand (LINZ); Assure Quality's – AgriBase™ data source; Otago Regional Council's Rating Database Resource; DOC administered Protected Areas; QEII (Queen Elizabeth II National Trust); is also previously unclassified/unknown land uses are inferred from the Land Use/Cover Area frame Survey (LUCAS) Land Use Map from MfE; as well as the Land Cover Database (LCDB v.5) from Manaaki Whenua – Landcare Research.

Otago Technical Land Use – Base-Map

Technical Land Use Base-Map Summary

The technical land use layer adds biophysical, and management (irrigation infrastructure), to the Regional Land Use Map to make more detailed analysis of land use and likely contaminant losses from agriculture.
The Technical Land Use Base-Map essentially breaks the Otago landscape into basic “OVERSEER® blocks” using slope, soils, and climate, as well as a range of management practises (irrigation etc.).

Methodology for the Technical Land Use Base-Map

The biophysical characteristics of the Otago region were compiled.

Topography / Relief (Slope)

The Otago DEM at a 5 metre resolution was created using Forest LiDAR swaths from the LUCAS model; a number of strategic regional LiDAR areas (mostly surrounding regional towns and cities; groundwater bore collar heights (from Otago Maps); geodetic vertical marks; and protected survey marks. The main Digital Elevation Model used is the Southern Mosaic of airborne geophysical gridded data for the South Island. NZP&M – New Zealand Petroleum and Minerals (Ministry of Business, Innovation & Employment (MBIE)) commissioned Thomson Aviation to compile the report Mineral Report Series MR5727. The mosaic MR5729 contains magnetic, radiometric, and elevation data for Otago and Southland. The surveys were conducted from 1997 to 2020 using both helicopters and fixed wing aircraft. SI_S_DEM_NZVD2016 Figure 11. Elevation, pg. 17.
Other digital elevation models – JAXA (Japanese Space Agency), NASA SRTM (shuttle radar topography mission), MERIT, and the New Zealand School of Surveying DEM were used to infill any gaps and provide absolute datum control throughout the analysis.

One hundred and fifteen individual swaths of LiDAR (LiDAR .las datasets) across Otago, collected as part of the analysis of the national LUCAS programme, were analysed and included in the DEM for further processing with a number of other data sources.

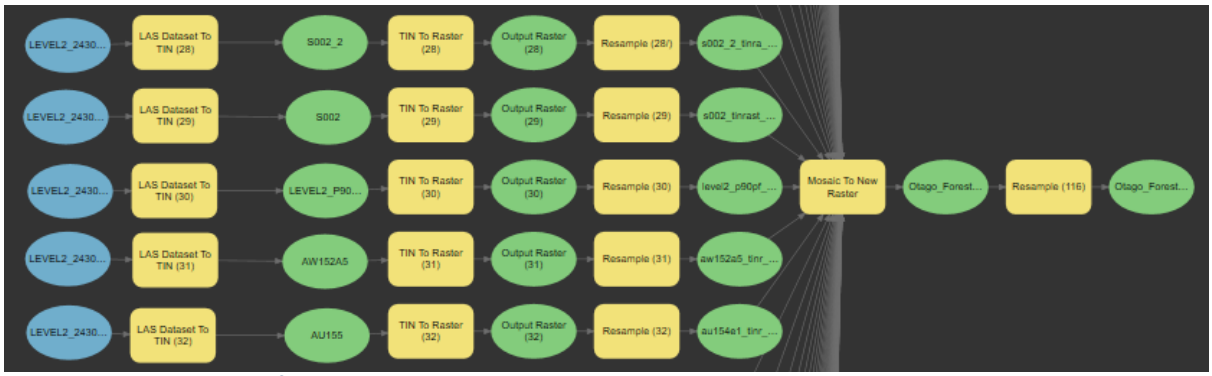

Figure 1: screen capture of the LiDAR capture process and inclusion in the Otago DEM_5m.

Irrigation Areas

Irrigation areas for the technical map were improved using a regional assessment of irrigation completed in 2021 (Otago Irrigated Area Layer 2021_26Oct2021_new.shp).

Identified Anomalies

With the DEM, care was taken to select only the ‘Ground returns’ from the LUCAS Forest LiDAR datasets. This however creates a smaller point cloud that has limitations. The intention of the LUCAS LiDAR was to measure the tree height and forest density across New Zealand – not to return ground points for use in a regional DEM. This means that the outline of the LiDAR elevation is very noticeable.

Improvements will be made when the PGF LiDAR for New Zealand is made available in the next few years, this information as well as other private sector and public sector LIDAR can be stitched into the current Digital Elevation maps.

To reduce the possibilities of errors and misclassifications, the method in which the different datasets are stitched together was altered. No longer were the Agribase™ records bought into the land classified as 'Rural' under the ratings database. Any property with an Agribase™ record was classified and the ORC Rating information was bought in afterwards to fill in the gaps so to speak.

At the time of completing this commission Otago Regional Council staff have been unable to provide details of previously identified errors in the supplies Agribase™, MfE, and LCDB data, and Great South is happy to update the outputs and provide feedback to the data provider to improve data accuracy.

Future Opportunities

As outlined above, when the PGF LiDAR becomes available (from LINZ) over the coming years, consideration should be given to incorporating this elevation dataset into the technical analysis with a view towards capturing temporal data, and driving continued improvement and greater accuracy within the geospatial tools used by Council.

Regards,

Matt Couldrey

References

Couldrey, M. (2021). Otago Regional Technical Methodology Document. Invercargill: Great South Technical Report – 2021. 48p.

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Otago Regional Land Use Map

Detailed Regional Land Use Methodology

This section details the methodology, specifically the code used to create the Otago Regional Land Use Map.

1. Land Information New Zealand

NZ Primary Parcels

01.04.2022
https://data.linz.govt.nz/layer/50772-nz-primary-parcels/

Road and Rail

08.03.2022
Topo50 Map Series; Road Centrelines; Land Information New Zealand; NZ Road Centrelines (Topo, 1:50k)
https://data.linz.govt.nz/layer/50329-nz-road-centrelines-topo-150k/

08.03.2022
Topo50 Map Series; Railway Centrelines; Land Information New Zealand; NZ Railway Centrelines (Topo, 1:50k)
https://data.linz.govt.nz/layer/50319-nz-railway-centrelines-topo-150k/
A permanent way having one or more rails which provides a track for trains or trams.

Select by Attributes:
"parcel_int" IN ('Railway', 'Road')
Select by Location:
nz-railway-centrelines-topo-150k
Select NZ Primary Parcel with a "parcel_int" (parcel intent) of Railway or Road that is intersected by a Railway Centreline
Field Calculator:
New Field:
TEXT; 10 characters
GS_code = RAIL

Select by Attributes:
"parcel_int" IN ('Railway', 'Road')
Select by Location:
nz-road-centrelines-topo-150k
Select NZ Primary Parcel with a "parcel_int" (parcel intent) of Railway or Road that is intersected by a Railway Centreline
Field Calculator:
GS_code = ROAD

2. Agribase™

The starting layer is titled 'Farmtype_clip.shp', this was renamed for the purposes of the task as 'ORC_Agribase-May2021'. This layer contains several attribute fields that were not necessary for the assessment purposes and were turned off.
The fields that were retained areas follows with the field name identified in brackets:

- Unique farm identifier assigned by AsureQuality Ltd. **('FarmID')**
- Property type **('Farm Type')**

Agribase™ "farm_type" code	"farm_type" description	Great South "agri_code"	"agri_code" desciption

ALA	Alpaca and/or Llama breeding	OAN	Other animals
API	Beekeeping & Hives	OAN	Other animals
ARA	Arable cropping or seed production	ARA	Arable land
BEF	Beef cattle farming	BEF	Beef
CAR	Calf Rearing	BEF	Beef
DAI	Dairy cattle farming	DAI	Dairy
DEE	Deer farming	DEE	Deer
		DEESHP	Majority deer, minor sheep stock
		DEEBEF	Majority deer, minor beef stock
		DEESNB	Majority deer, minor sheep & beef stock
DOG	Dogs	OAN	Other animals
DRY	Dairy dry stock	DAISUP	Dairy support
FIS	Fish, Marine fish farming, hatcheries	OAN	Other animals
FLO	Flower growing	FLO	Flower growing
FOR	Forestry	FOR	Forestry
FRU	Fruit growing	FRU	Fruit growing
GOA	Goat farming	OAN	Other animals
GRA	Grazing external stock	LIVSUP	Livestock support
HOR	Horse farming & breeding	OAN	Other animals
LIF	Lifestyle block	LIF	Lifestyle block
		SMH	Small land holding
MPL	Manufacturing Plant	IND	Industrial use
MTW	Meat Slaughter Premises	IND	Industrial use
NAT	Native Bush	NAT	Indigenous Forest
NEW	New record – Unconfirmed farm type	UNK	Unknown use
NOF	Not farmed (idle or non-farm use)	UNK	Unknown use
NUR	Plant nurseries	NUR	Plant nurseries
OAN	Other livestock (not covered by other types)	OAN	Other animals
OPL	Other planted types (not covered by other types)	LIVSUP	Livestock support
OTH	Enterprises not covered by other classifications	UNK	Unknown use
PIG	Pig farming	PIG	Pig farming
POU	Poultry farming	POU	Poultry farming
SHP	Sheep farming	SHP	Sheep farming
SNB	Sheep & beef farming	SNB	Sheep and beef farming
		SND	Sheep and deer farming (deer not majority)
		BND	Beef and deer farming (deer not majority)

		SBD	Sheep, beef, and deer farming (deer not majority)
SPO	Sport Grounds	REC	Recreational use
TOU	Tourism use (campground, motel)	TOU	Tourism use
UNS	Unspecified	UNK	Unknown use
VEG	Vegetable growing	VEG	Vegetable growing
VIT	Viticulture, grape growing, and winemaking	VIT	Viticulture (wine growing)
ZOO	Zoological gardens	OAN	Other animals

- Total area of the property in hectares as reported by farmer/occupier, rounded to one decimal place **('Size ha')**
- Date record was added to Agribase™ **('Source date')**
- Land area devoted to livestock **('aaa_ha')**
- Arable land **('ara_ha')**
- Beef numbers **('bef_no')**
- Sheep numbers **('shp_no')**
- Dairy cattle numbers **('dai_no')**
- Deer numbers **('dee_no')**
- Flowers in hectares – self reported **('flow_ha')**
- Fodder in hectares – self reported **('fodd_ha')**
- Forestry in hectares – self reported **('for_ha')**
- Grazing of other people's/enterprises stock measured in hectares – self reported **('graz_ha')**
- Native bush **('nat_ha')**

Rule 2: Speciality Land Uses.

For some land uses, Agribase™ was determined to be the most reliable source of information. These land uses listed below were retained by RULE 2:

- Forestry (FOR)
- Arable (ARA)
- Flowers (FLO)
- Fruit (FRU)
- Nursery (NUR)
- Tourism (TOU)
- Vegetables (VEG)
- Meat works (MTW)
- Zoological garden (ZOO)
- Bee keeping (API)
- Alpacas (ALA)
- Dogs (DOG)
- Goats (GOA)
- Horses (HOR)
- Other animals (OAN)
- Ostrich birds (OST)
- Pigs (PIG)
- Poultry (POU)

These farm types are separated by Rule 2 into the land use categories identified in Table 1. Rule 2a retains the classification provided by Agribase™, Rule 2b combines all animal types that are not sheep, beef, deer or dairy cows into a classification for other animals.

Speciality Land Uses

Where Agribase classifies farms as FOR, ARA, FLO, FRU, NUR, TOU, and VEG, 'Agri_Code' is the same.
Select by Attributes:
+ New expression
SQL slide
"farm_type" IN ('VIT', 'FOR', 'ARA', 'FLO', 'FRU', 'NUR', 'TOU', 'VEG')
Selection type
Select subset from the current selection
"agri_code" = 'NULL'
Field Calculator:
agri_code = "farm_type" (717 records = "farm_type")
rule2 = 'a'

farm_type IN ('CAR', 'FIS', 'MPL', 'OPL', 'SLY', 'SPO')

Other Animals

Where Agribase classifies farms as API, ALA, DOG, GOA, HOR, OAN, PIG, POU, and ZOO, 'Agri_Code' classification is OAN for Other Animals.
Select by Attributes:
+ New expression
SQL slide
New selection
"farm_type" IN ('API', 'ALA','DOG', 'GOA', 'HOR', 'OAN', 'ZOO')
Selection type
Select subset from the current selection
"agri_code" = 'NULL'
Field Calculator:
agri_code = 'OAN' (100 records = 'OAN')
rule2 = 'b'

Pigs and Poultry

Where Agribase classifies farms as POU for Poultry, 'agri_code' is the same. Where Agribase classifies farms as PIG, for Pig farming, 'agri_code' is the same.
Select by Attributes:
+ New expression
SQL slide
New selection
"farm_type" = 'POU'
Selection type
Select subset from the current selection
"agri_code" = 'NULL'
Field Calculator:
agri_code = 'POU' (20 records = 'POU')
rule2 = 'c'
Select by Attributes:
+ New expression
SQL slide
New election
"farm_type" = 'PIG'
Selection type
Select subset from the current selection
"agri_code" = 'NULL'
Field Calculator:
agri_code = 'PIG' (6 records = 'PIG')
rule2 = 'd'

Rule 3: Support Properties.

In the Agribase™ dataset, the farm type for identifying dairy dry stock is DRY. This category was classified as Dairy Support **(DAISUP)** by RULE3a. Agribase™ Grazing (GRA) category, defined as grazing other people's stock, will be classified as Livestock Support (Rule 6b). Other planted types **(OPL)** with fodder crops **(fodd_ha)** identified as greater than 50% of the farm area (fodd_perha), are classified as Livestock Support **(LIVSUP)** in RULE 6c.

Support Blocks

Where Agribase™ classifies farms as DRY, 'Agri_Code' is classified as DAISUP for dairy support.
Select by Attributes:
+ New expression
SQL slide
New selection
"farm_type" = 'DRY'
Selection type
Select subset from the current selection
"agri_code" = 'NULL'
Field Calculator:
agri_code = 'DAISUP' (50 records = 'DAISUP')
rule3 = 'a'

Where Agribase™ classifies farms as GRA, 'Agri_Code' is classified as LIVSUP for livestock support.
Select by Attributes:
+ New expression
SQL slide
New selection
"farm_type" = 'GRA'
Selection type
Select subset from the current selection
"agri_code" = 'NULL'
Field Calculator:
"agri_code" = 'LIVSUP' (185 records = 'LIVSUP')
rule3 = 'b'

Where Agribase classifies farms as OPL with 'fodd_perha' > 50% of farm area, 'Agri_Code' is classified as LIVSUP for livestock support.
Select by Attributes:
+ New expression
SQL slide
New selection
"farm_type" = 'OPL'
Selection type
Select subset from the current selection
"fodd_percent" >='50'
"StkFactor" <='50'
"agri_code" = 'NULL'
Field Calculator:
agri_code = 'LIVSUP' (7 records = 'LIVSUP')
rule3 = 'c'

Rule 4: Dairy.

Properties that are identified as Dairy **(DAI)** in Agribase™ are classified in a way which will supplement the LUCAS Land Use Map data in classifying this land use in the Otago Land Use Map. This rule would require modification if supplementary information was unavailable. While the LUCAS layer was used to identify the position of the milking platform, Agribase™ data was used to determine runoff blocks **(DAISUP)** and small holdings with less than 100 dairy cows **(DAI)**, which are not captured by LUCAS. A minimum of 10 dairy cow numbers will be used to define a dairy property.

Other livestock present on a dairy property needs to be accounted for as some properties have both dairy and have other livestock on hill country blocks. On these farms, the 'farm_type' recorded in Agribase™ is (DAI). Therefore, other livestock are considered in Rule 4 based on number and type of stock calculated from *Table 1*. Stock units are those used at the national level by the Ministry for Primary Industries (MPI), which Great South has simplified to stock type, as only total numbers are provided in Agribase™. Stock units are used in this classification to identify the main stock type on a property. Attribute fields were added for stock factor **('Stock_Fact')** to calculate the total stock units on a property, and stock factor per hectare **('SF_ha')**, which was calculated from the stock unit field divided by the **'SIZE_HA'** field. The **'SIZE_HA'** field was deemed to provide the most accurate description of area as recorded by the landholder. Attribute fields for each stock type ('DairyStockF', 'BeefStockF', 'DeerStockF', 'SheepStockF') were also added and calculated using the stock number multiplied by the stock unit identified in Table 1.

Table 1: Averaged stock unit (adapted from Beef & Lamb benchmarking tool).

Stock type	Stock unit*
Sheep	1.0
Beef cow	5.5
Deer	2
Dairy cow	7.5
Grazing dairy cow	5.5
Horse	5
Pig	1
Goat	0.8

*NOTE: The resulting stock units identified in this table have been modified for use to approximate stock units based from a total stock number.

Dairy

Where cow numbers **(cow no's)** in Agribase™ are between 10 and 100, and other livestock contribute less than 50 stock units.
If agri_code = NULL:
Select by Attributes:
"dai_nos" >=10 AND "dai_nos" <=100 AND ("BeefSF" + "DeerSF" + "SheepSF") <= 50 AND "Agri_Code" IS NULL
Field Calculator:
agri_code = 'DAICOW' (9 records = 'DAICOW')
rule4 = 'a1'

If agri_code IS NOT NULL:
Select by Attributes:
"dai_nos" >=10 AND "dai_nos" <=100 AND ("BeefSF" + "DeerSF" + "SheepSF") <= 50 AND NOT "agri_code" = 'DAICOW'
Field Calculator:
agri_code2 = 'DAICOW' (12 records = 'DAICOW')
rule4 = 'a2'

Where cow numbers **(cow no's)** in Agribase™ are between 10 and 100, and other livestock contribute less than 50 stock units.
If agri_code = NULL:
Select by Attributes:
"dai_nos" >= 100 AND ("BeefSF" + "DeerSF" + "SheepSF") <= 50 AND "agri_code" IS NULL
Field Calculator:
agri_code = 'DAI' (360 records = 'DAI')

rule4 = 'b1'

If agri_code is NOT NULL:
Select by Attributes:
"dai_nos" >= 100 AND ("BeefSF" + "DeerSF" + "SheepSF") <= 50 AND NOT "agri_code" IS NULL
Field Calculator:
agri_code2 = 'DAI' (15 records = 'DAI')
rule4 = 'b2'

Where **(cow_no's)** are between 10 & 100, and other livestock contribute more than 50 stock units.
If dairy has the higher stock factor Agri Code is DAICOW and Agri Code2 is LIVESTOCK (to be reclassified by RULE 5).
Select by Attributes:
"dai_nos" >=10 AND "dai_nos" <=100 AND ("BeefSF" + "DeerSF" + "SheepSF") >= 50 AND "agri_code" IS NULL
Field Calculator:
agri_code = 'DAI'
rule4 = 'c1' (20 records = 'DAI')

Agri Code is LIVESTOCK (to be reclassified by RULE 5) if other livestock have a higher combined stock factor and Agri Code2 is DAICOW
Select by Attributes:
"dai_nos" >=10 AND "dai_nos" <=100 AND ("BeefSF" + "DeerSF" + "SheepSF") >= 50 AND NOT "Agri_Code" IS NULL
Field Calculator:
agri_code2 = 'DAI' (6 records = 'DAI')
Rule 4 = 'c2'

Where **(cow_no's)** are greater than 100, and other livestock contribute more than 50 stock units.
If Agri Code is NULL classify as 'DAICOW' and Agri Code2 as 'LIVESTOCK'.
Select by Attributes:
"dai_nos" >= 100 AND ("BeefSF" + "DeerSF" + "SheepSF") >= 50 AND "Agri_Code" IS NULL
Field Calculator:
agri_code = 'DAI' (99 records = 'DAI')
rule4 = 'd1'

If Agri Code is NOT NULL classify Agri Code2 as 'LIVESTOCK' (to be reclassified by RULE 5).
Select by Attributes:
"dai_nos" >= 100 AND ("BeefSF" + "DeerSF" + "SheepSF") >= 50 AND NOT "Agri_Code" IS NULL
Field Calculator:
agri_code2 = 'DAI' (9 records = 'DAI')
rule4 = 'd2'

Rule 5: Other Livestock (Sheep, Beef, Deer).

Drystock is a general classification given to Sheep, Beef and Deer farms in OVERSEER® and is the terminology used to describe this farm type in the Otago Land Use Map. Drystock farm classifications varied greatly in Agribase™ depending on how the person completing the survey assessed the land use. To minimise this variation in farm classification, a set of rules were developed based on stock units to assess land use (Table 1). Based on the Great South classification, 50 sheep is approximately equal to 25 deer or 9 beef cows.

A minimum stock factor of 50 (50 sheep/25 deer/9 beef) was applied to this land use type. Using this classification system, the main stock type was identified for each property by the Agri Code used. An indication of intensity of the land use was also given by the stock factor/size_ha field **('SF_ha')**. If properties have an existing Agri Code of ARA, DAISUP, LIVSUP, or LIVESTOCK the code for other livestock is entered in Agri Code2 or it replaces the LIVESTOCK code.

New Definition Query:
"agri_code" IS NULL OR "agri_code2" IN ('ARA', 'DAISUP', 'LIVSUP', 'LIVESTOCK')

Sheep Farms.

Where the sheep stock factor is greater than 50 and the combined beef and deer stock factor is less than 50.
If Agri Code is NULL classify as ‘SHP’.
Select by Attributes:
"SheepSF" >= 50 AND "BeefSF" <=50 AND "DeerSF" <=50 AND "Agri_Code" IS NULL
Field Calculator:
agri_code = 'SHP' (595 records = 'SHP')
rule5 = 'a1'
If Agri Code is NOT NULL classify Agri Code2 as ‘SHP’
Select by Attributes:
"SheepSF" >= 50 AND "BeefSF" <=50 AND "DeerSF" <=50 AND "agri_code2" = ‘LIVESTOCK’
Field Calculator:
agri_code2 = 'SHP' (3 records = 'SHP')
rule5 = 'a2'

Beef Farms.

Where the beef stock factor is greater than 50 and the combined sheep and deer stock factor is less than 50.
If Agri Code is NULL classify as ‘BEF’
Select by Attributes:
"BeefSF" >= 50 AND "SheepSF" <=50 AND "DeerSF" <=50 AND "agri_code" IS NULL
Field Calculator:
agri_code = 'BEEF' (535 records = 'BEEF')
rule5 = 'b1'
If Agri Code is NOT NULL classify Agri Code2 as ‘BEF’
Select by Attributes:
"BeefSF" >= 50 AND "SheepSF" <=50 AND "DeerSF" <=50 AND "Agri_Code2" = ‘LIVESTOCK'
Field Calculator:
agri_code2 = 'BEEF' (4 records = 'BEEF')
rule5 = 'b2'

Deer Farms.

Where the deer stock factor is greater than 50 and the combined sheep and beef stock factor is less than 50.
If Agri Code is NULL classify as ‘DEER’
Select by Attributes:
"DeerSF" >= 50 AND "SheepSF" <50 AND "BeefSF" <50 AND “agri_code” IS NULL
Field Calculator:
agri_code = 'DEER' (68 records = 'DEER')
rule5 = 'c1'
If agri_code is NOT NULL classify agri_code2 as 'DEER'
Select by Attributes:
"DeerSF" >= 50 AND "SheepSF" <50 AND "BeefSF" <50 AND "agri_code2" = 'LIVESTOCK'
Field Calculator:
agri_code2 = 'DEER' (1 record = 'DEER')
rule5 = 'c2'

Mixed Farm Types – Two or more stock types.

Sheep and Beef Farms.

Where both sheep and beef stock factors are greater than 50, with deer stock factor is less than 50.
If Agri Code is NULL classify as ‘SNB’.
Select by Attributes:
("SheepSF"+"BeefSF") >= 50 AND "DeerSF" = 0 AND "agri_code” IS NULL
Field Calculator:
agri_code = 'SNB' (1206 records = 'SNB')
rule5 = 'd1'
If Agri Code is NOT NULL classify Agri Code2 as ‘SNB’.
Select by Attributes:

("SheepSF"+"BeefSF") >= 50 AND “DeerSF" = 0 AND "Agri_Code2" = 'LIVESTOCK'
Field Calculator:
agri_code2 = SNB (11 records = SNB)
rule5 = ‘d2’

Sheep and Deer Farms.

Where both sheep and deer stock factors are greater than 50, with beef stock factor is less than 50.
If Agri Code is NULL classify as ‘SND’
Select by Attributes:
("SheepSF"+"DeerSF") >= 50 AND "BeefSF" = 0 AND "agri_code" IS NULL
Field Calculator:
agri_code = SND (30 records = SND)
rule5 = ‘e1’
If Agri Code is NOT NULL classify Agri Code2 as ‘SND’
Select by Attributes:
("SheepSF"+"DeerSF") >= 50 AND "BeefSF" = 0 AND "agri_code2" = 'LIVESTOCK'
Field Calculator:
agri_code2 = SND (0)
rule5 = ‘e2’

Beef and Deer Farms.

Where both beef and deer stock factors are greater than 50, with sheep stock factor is less than 50.
If Agri Code is NULL classify as ‘BND’
Select by Attributes:
("BeefSF" + "DeerSF") >= 50 AND "SheepSF" = 0 AND "agri_code" IS NULL
Field Calculator:
agri_code = BND (23 records = BND)
rule5 = ‘f1’
If Agri Code is NOT NULL classify Agri Code2 as ‘BND’
Select by Attributes:
("BeefSF" + "DeerSF") >= 50 AND "SheepSF" = 0 AND "Agri_Code2" = 'LIVESTOCK'
Field Calculator:
Agri_Code2 = BND (0)
Rule 5 = ‘f2’

Mixed Livestock Farms.

Where beef, deer and sheep stock factors are greater than 50.
If Agri Code is NULL classify as ‘SBD’
Select by Attributes:
("SheepSF" + "BeefSF" + "DeerSF") >= 50 AND "agri_code" IS NULL
Field Calculator:
Agri_Code = SBD (140 records = SBD)
Rule 5 = ‘g1’
If Agri Code is NOT NULL classify Agri Code2 as ‘SBD’
Select by Attributes:
("SheepSF" + "BeefSF" + "DeerSF") >= 50 AND "agri_code2" = 'LIVESTOCK'
Field Calculator:
Agri_Code2 = SBD (1 record = SBD)
Rule 5 = ‘g2’

Mixed Farm Types – Two or more stock types.

Majority Deer Farms with Other Livestock.

Where the deer stock factor is greater than the other stock factor/s:
If Agri Code is SND reclassify as ‘DEESHP’
Select by Attributes:
"agri_code" = 'SND' AND "DeerSF" > "SheepSF"

Field Calculator:
Agri_Code = DEESHP (17 records = DEESHP)
Rule 5 = ‘h1’
If Agri Code2 is SND reclassify Agri Code2 as ‘DEESHP’
Select by Attributes:
"agri_code2" = 'SND' AND "Deer_SF" > "Sheep_SF"
Field Calculator:
Agri_Code2 = DEESHP (0)
Rule 5 = ‘h2’

If Agri Code is BND reclassify as ‘DEEBEF’
Select by Attributes:
“agri_code" = 'BND' AND "DeerSF" > "BeefSF"
Field Calculator:
agri_code = DEEBEF (18 records = DEEBEF)
rule5 = ‘h3’
If Agri Code2 is BND reclassify Agri Code2 as ‘DEEBEF’
Select by Attributes:
“agri_code2" = 'BND' AND “Deer_SF" > "Beef_SF"
Field Calculator:
Agri_Code2 = DEEBEEF (0)
Rule 5 = ‘h4’

If Agri Code is SNB reclassify as ‘DEESNB’
Select by Attributes:
"agri_code" = 'SNB' AND "DeerSF" > ("SheepSF" + "BeefSF")
Field Calculator:
Agri_Code = DEESNB (0)
Rule 5 = ‘h5’
If Agri Code2 is SNB reclassify Agri Code2 as ‘DEESNB’
Select by Attributes:
"agri_code2" = 'SNB' AND "DeerSF" > ("SheepSF" + "BeefSF")
Field Calculator:
Agri_Code2 = DEESNB (0)
Rule 5 = ‘h6’

Rule 6: Additional Arable Properties.

Arable farms were previously classified by Rule 2a when Agribase™ classified the farm type as ARA. Rule 5, subsequently classified ARA farms which had additional livestock numbers. However, farms classified by Rule 4 and 5, with arable as a secondary land use would not have been identified in this classification. Therefore, Rule 6 identifies properties which have a large amount of arable hectares.

If arable hectares **(ara_ha)** *(self-recorded hectares in arable crops)* are greater than 20% of a property area, a secondary code (Agri Code2) of ARA is applied. If properties already have an ‘Agri Code2’ they have been previously classified as dairy support or livestock support and arable crops are deemed to be grown for the support of livestock under that land use.

Properties classified in Rule 4 and 5, with greater than 20% of the farm area recorded as arable hectares, are classified as ‘Agri Code2’ ARA.
Field Calculator:
New Field
ARA_perHA; DOUBLE; decimal
ARA_perHA = ("ara_ha" / "size_ha”) *100
Select by Attributes:
"ara_perha" >= 20
Field Calculator:

agri_code2 = ARA (96 records = ARA)
rule6 = ‘a’

Rule 7: Lifestyle Blocks and Small Land Holdings.

For the purposes of the land use map a lifestyle (LIF) block is defined by RULE 7a as a rural property between 0.1 and 5 ha. This size limit was selected to include the typical lifestyle block of 4 ha (10 acre) plus one hectare to include slightly larger lifestyle properties. Small holdings are classified as properties between 5 and 40 hectares as defined by Rule 7b. Properties which had been previously classified by Rules 2-6 remain unchanged.

Lifestyle Blocks – Primary Land Use

Lifestyle blocks are defined as rural properties between 0.1 and 5 ha and are classified as LIFE, with a stock factor less than 50.
Select by attributes:
“size_ha” <5 AND “StkFactor“ <50 “agri_code” IS NULL
Field Calculator:
“agri_code” = ‘LIFE’ (2,527 records = LIFE)
“rule7” = ‘a’

Lifestyle Blocks – Secondary Land Use

Select by attributes:
“size_ha” <5 AND “StkFactor“ <50 AND NOT “agri_code” IS NULL AND “agri_code2” IS NULL
Field Calculator:
“agri_code2” = ‘LIFE’ (267 records = LIFE)
“rule7” = ‘b’

Small Land Holding – Primary Land Use

Small Holdings are properties between 5 ha and 40 ha and are classified as SMH.
Select by attributes:
"size_ha" >5 AND "size_ha" <=40 AND “StkFactor“ <0 AND “Agri_Code” IS NULL
Field Calculator:
“agri_code” = ‘SMH’ (964 records = SMH)
“rule7” = ‘c’
Lifestyle blocks with a stock factor greater than 50.
Select by attributes:
“size_ha” <5 AND “StkFactor“ >=50 AND “agri_code” IS NULL
Field Calculator:
“agri_code” = ‘SMH’ (1 record = SMH)
“rule7” = ‘d’

Rule 8: Indigenous Forest Properties.

Properties that are classified as NAT in Agribase™, that have not been previously classified by the above rules, are classified as CON_2. These areas are native cover but may not be under any conservation protection status. As PAN-NZ data will be used to identify conservation areas over Agribase™, these areas will be classified as Unknown land use - Indigenous cover.

Agribase classification of NAT is classified to NAT.
Select by attributes:
farm_type = 'NAT' AND “agri_code” IS NULL
Field Calculator:
“agri_code” = 'NAT' (41 records = NAT)
“rule8” = 'a'

Rule 9: Stock Type Small Land Holding.

The properties remaining without classification in Agribase™ either do not have stock numbers for the property or were unable to be classified by RULE's 4 or 5 as their combined stock factors were less than the 50 stock unit thresholds. In RULE 7 properties less than 40 ha were given an 'Agri Code' of LIF or SMH.

Properties with an 'Agri_Code' of LIF or SMH that have an Agribase™ farm type classification of DAI, SHP, BEF, SNB or DEE the 'Agri_Code2' field is classified the same as the Agribase™ farm type (DAI, SHP, BEF, SNB or DEE).
Select by attributes:
"agri_code" IN ('LIF', 'SMH') AND "farm_type" IN ('SHP', 'BEF', 'SNB', 'DEE', 'DAI', 'OTH', 'OPL', 'FIS') (328)
Field Calculator:
"agri_code2" = "farm_type"
rule9 = 'a'

3. MfE LUCAS programme

Ministry for the Environment – LUCAS NZ Land Use Map 1990 2008 2012 2016 v008
https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-2016-v008/

The Land Use/Cover Area frame Survey (LUCAS) Land Use Map is composed of New Zealand-wide land use classifications (12) nominally at 1 January 1990, 1 January 2008, 31 December 2012 and 31 December 2016 (known as "1990", "2008", "2012" and "2016"). These date boundaries were dictated by the First and Second Commitment Periods of the Kyoto Protocol. The layer can therefore be used to create either a 1990, 2008, 2012 or 2016 land use map depending on what field is symbolised.

Select by attributes:
"LandUse_16" = 'Arable'
Field Calculator:
New field; ARA_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
"LandUse_16" = 'Grassland'
Field Calculator:
New field; GRASS_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
"LandUse_16" = 'Grassland - Dairy'
Field Calculator:
New field; DAIRY_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
"LandUse_16" = 'Grassland - Grazed'
Field Calculator:
New field; GRAZE_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
"LandUse_16" = 'Natural Forest'
Field Calculator:
New field; NATIVE_ha; DOUBLE
Geometry; $area/10000

Select by attributes:

“LandUse_16" = 'Orchards and vineyards'
Field Calculator:
New field; ORCHARD_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
“LandUse_16" = 'Plantation Forestry'
Field Calculator:
New field; FOREST_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
“LandUse_16" = 'Unknown'
Field Calculator:
New field; UNKNOWN_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
“LandUse_16" = 'Urban'
Field Calculator:
New field; URBAN_ha; DOUBLE
Geometry; $area/10000

Select by attributes:
“LandUse_16" = ‘Wetland'
Field Calculator:
New field; WETLAND_ha; DOUBLE
Geometry; $area/10000

LUCAS Classification

Select by attributes:
(("SUM_ARA_ha" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:

Select by attributes:
(("SUM_FOREST" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:

Select by attributes:
(("SUM_ORCHAR" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:

Select by attributes:
(("SUM_DAIRY" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:

Select by attributes:
(("SUM_NATIVE" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:
LandUse = Unknown Land Use – Indigenous Cover

Select by attributes:
(("SUM_GRASS_" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:
LandUse = Unknown Land Use – Pasture

Select by attributes:
(("SUM_GRAZE_" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:
LandUse = Unknown Land Use – Grazed Pasture

Select by attributes:
(("SUM_URBAN_" / "AREA_ha") *100) >=50 AND "LandUse" IS NULL
Field Calculator:
LandUse = Unknown Land Use – Urban

4. LCDB v.5

Manaaki Whenua - Landcare Research – LCDB v5.0 - Land Cover Database version 5.0, Mainland New Zealand
https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/

The New Zealand Land Cover Database (LCDB) is a multi-temporal, thematic classification of New Zealand's land cover. It identifies 33 mainland land cover classes. The classification was revised between versions 1, 2, and 3 but has been consistent thereafter, and always with backward compatibility maintained.

Select by attributes:
"Name_2018" = 'Short-rotation Cropland' AND “LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = ARABLE

Select by attributes:
"Name_2018" IN ('Not land', ‘Sand or Gravel’, 'Landslide’, 'Gravel or Rock’) AND “LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = BARE

Select by attributes:
"Name_2018" IN ('Gorse and/or Broom’, ‘Mixed Exotic Shrubland') AND “LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = EXSCRUB

Select by attributes:
"Name_2018" IN ('Mangrove', 'Herbaceous Saline Vegetation') AND “LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = ESTR

Select by attributes:
"Name_2018" IN ('Forest - Harvested’, ‘Deciduous Hardwoods', 'Exotic Forest') AND "LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = EXTFOR

Select by attributes:
"Name_2018" = ‘Orchard, Vineyard or Other Perennial Crop' AND "LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = HORT

Select by attributes:
"Name_2018" IN (‘Estuarine Open Water’, 'River’, 'Lake or Pond’) AND "LCDB_CODE” IS NULL
Field Calculator:
LCDB_CODE = HYDRO

Select by attributes:

"Name_2018" = 'Surface Mine or Dump' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = MINE

Select by attributes:
"Name_2018" IN ('Indigenous Forest', 'Broadleaved Indigenous Hardwoods') AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = BUSH

Select by attributes:
"Name_2018" IN ('Flaxland', 'Fernland', 'Manuka and/or Kanuka', 'Sub Alpine Shrubland', 'Matagouri or Grey Scrub') AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = NSCRUB

Select by attributes:
"Name_2018" = 'High Producing Exotic Grassland' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = PAS

Select by attributes:
"Name_2018" IN ('Depleted Grassland', 'Low Producing Grassland') AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = LPAS

Select by attributes:
"Name_2018" = 'Permanent Snow and Ice' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = PERMSNOW

Select by attributes:
"Name_2018" = 'Urban Parkland/Open Space' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = REC

Select by attributes:
"Name_2018" = 'Built-up Area (settlement)' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = TOWN

Select by attributes:
"Name_2018" = 'Transport Infrastructure' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = ROAD

Select by attributes:
"Name_2018" IN ('Alpine Grass/Herbfield', 'Tall Tussock Grassland') AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = TUSSOCK

Select by attributes:
"Name_2018" = 'Herbaceous Freshwater Vegetation' AND "LCDB_CODE" IS NULL
Field Calculator:
LCDB_CODE = WETLAND

LCBD Classification

“hectare” – calculate geometry (hectares)

Select by attributes:
(("SUM_ara_ha"/"hectare")*100)>=50 AND GS_code IS null
Field Calculator:
GS_code = ‘ARABLE’
Source = ‘LCDBv.5’ (148 records = ‘ARABLE’)
Select by attributes:
(("SUM_extfor_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘EXTFOR’ (784 records = ‘EXTFOR’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_hort_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘HORT (53 records = ‘HORT’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_hydro_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘HYDRO (220 records = ‘HYDRO’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_nscrub_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘NSCRUB (202 records = ‘NSCRUB’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_Lpas_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘LPAS (689 records = ‘LPAS’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_mine_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘MINE (72 records = ‘MINE’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_native_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘NATIVE (506 records = ‘NATIVE’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_native_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘PASTURE (2,963 records = ‘PASTURE’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_rec_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘RECREATION (397 records = ‘RECREATION’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_res_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘RESIDENTIAL (4,306 records = ‘RESIDENTIAL’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_road_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘ROAD (16 records = ‘ROAD’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_tussock_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘TUSSOCK (133 records = ‘TUSSOCK’)
Source = ‘LCDBv.5’
Select by attributes:
(("SUM_wetland_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘WETLAND (61 records = ‘WETLAND’)

Source = ‘LCDBv.5’

LUCAS

Select by attributes:
(("SUM_arable_ha"/"hectare")*100)>=50 AND GS_code IS null (0)
Select by attributes:
(("SUM_dairy_ha"/"hectare")*100)>=50 AND GS_code IS null (0)
Select by attributes:
(("SUM_forest_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘FOREST’
Source = ‘LUCAS’ (15 records = ‘FOREST’)
Select by attributes:
(("SUM_grass_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘GRASSLAND’
Source = ‘LUCAS’ (151 records = ‘GRASSLAND’)
Select by attributes:
(("SUM_graze_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘GRAZED’
Source = ‘LUCAS’ (177 records = ‘GRAZED’)
Select by attributes:
(("SUM_native_ha_1"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘NATIVE’
Source = ‘LUCAS’ (48 records = ‘NATIVE’)
Select by attributes:
(("SUM_orchard_ha"/"hectare")*100)>=50 AND GS_code IS null (0)
Select by attributes:
(("SUM_urban_ha"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘URBAN’
Source = ‘LUCAS’ (21 records = ‘URBAN’)
Select by attributes:
(("SUM_wetland_ha_1"/"hectare")*100)>=50 AND GS_code IS null
GS_code = ‘WETLAND’
Source = ‘LUCAS’ (45 records = ‘WETLAND’)

5. Protected Areas (PCL)

Name: Protected Areas
Alternate Name1: NaPALIS Protected Areas
Alternate Name2: DOC administered Protected Areas

29.03.2022
https://data.linz.govt.nz/layer/53564-protected-areas/

QEII (Queen Elizabeth II National Trust)
Name: QEII National Trust Open Space Covenant Data

31.03.2022
http://qeiinationaltrust.org.nz/

6. Otago Regional Council Resources

6.1. Rates Database

New Field:
Rates_Code; TEXT; 10 characters

Public Land Use

Select by attributes:
"LandUseDes" IN ('MU Community Services' ,'Com Svcs - Cemeteries & Crematoria','Com Svcs - Defence','Com Svcs - Educational','Com Svcs - Halls','Com Svcs - Medical and Allied','Com Svcs - Multi Use within Commun Srvcs','Com Svcs - Personal/Property Protection','Com Svcs - Religious','Com Svcs - Vacant') AND "rates_code" = ' '
Field Calculate:
rates_code = PUBLIC (1154)
Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Community Uses', 'Vacant - Community Services') AND "rates_code" = ' '
Field Calculate:
rates_code = PUBLIC (0)

Commercial Land Use

Select by attributes:
COMM = "LandUseDes" IN ('MU Commercial', 'Commrcl - Car Parking', 'Commrcl - Multi-Use within Commercial', 'Commrcl - Offices', 'Commrcl - Retail' , 'Commrcl - Services' , 'Commrcl - Vacant' , 'Commrcl - Wholesale') AND "rates_code" = ' '
Field Calculate:
rates_code = COMM (2678)
Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Commercial, 'Commercial A', 'Commercial B', 'Commercial C') AND "rates_code" = ' '
Field Calculate:
rates_code = COMM (4)

Industrial Land Use

Select by attributes:
"LandUseDes" IN ('MU Industrial' , 'Indstrl - Building Mats not Timber', 'Indstrl - Chemcls/Plastics/Rubber/Paper' , 'Indstrl - Depots and Yards' , 'Indstrl - Eng/Metal Wrkng/Appl/Mach' , 'Indstrl - Food, Drink & Tobacco' , 'Indstrl - Multi-Use within Industrial' , 'Indstrl - Other Industries' , 'Indstrl - Textiles, Leather & Fur' , 'Indstrl - Timber Products & Furniture' , 'Indstrl - Vacant') AND "rates_code" = ' '
Field Calculate:
rates_code = IND (2424)
Select by attributes:
LandUseDes = 'MU Vacant or Intermediate' AND ZoneDescri = 'Industrial' AND "rates_code" = ' '
Field Calculate:
rates_code = IND (1)

Lifestyle Land Use

Select by attributes:
"LandUseDes" IN ('MU Lifestyle', 'Lifestyle - Multi-Unit', 'Lifestyle - Multi-Use within Lifestyle', 'Lifestyle - Single Unit', 'Lifestyle - Vacant') AND "rates_code" = ' '
Field Calculate:
rates_code = 'LIFE' (10722)
Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Multi Unit') AND "rates_code" = ' '
Field Calculate:
rates_code = 'LIFE' (0)

Recreational Land Use

Select by attributes:
"LandUseDes" IN ('MU Recreational','Rec - Active Indoor', 'Rec - Active Outdoor', 'Rec - Entertainment', 'Rec - Multi-Use within Recreational', 'Rec - Passive Indoor', 'Rec - Passive Outdoor', 'Rec - Vacant') AND "rates_code" = ' '
Field Calculate:
rates_code = 'REC' (3200)
Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Recreation Open Space - Existing', 'Recreation Open Space - Private', 'Recreation Open Space - Proposed', 'Recreation Open Space - Railway Land', 'Recreational', 'Reserve', 'Reserve - Existing', 'Reserve - Proposed') AND "rates_code" = ' '
Field Calculate:
rates_code = 'REC' (0)

Residential Land Use

Select by attributes:
"LandUseDes" IN ('MU Residential', 'Res - Bach', 'Res - Car Parking', 'Res - Communl Resdnc Dpndnt on Other Use', 'Res - Multi-Unit', 'Res - Multi-Use within Residential', 'Res - Public Communal Licensed', 'Res - Public Communal Unlicensed', 'Res - Single Unit excluding Bach', 'Res - Special Accommodation', 'Res - Vacant') AND "rates_code" = ' '
Field Calculate:
Rates_Code = 'RES' (95376)
Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Residential', 'Residential A', 'Single Unit Ex Bach', 'Single Unit excluding Bach', 'Vacant - Residential') AND "rates_code" = ' '
Field Calculate:
Rates_Code = 'RES' (15)

Rural Land Use

Select by attributes:
"LandUseDes" IN ('MU Rural Industry', 'Rural - Arable Farming', 'Rural - Dairy', 'Rural - Forestry', 'Rural - Market Gardens and Orchards', 'Rural - Mineral Extraction', 'Rural - Multi-Use within Rural Industry', 'Rural - Specialist Livestock', 'Rural - Stock Finishing', 'Rural - Store Livestock', 'Rural - Vacant') AND "rates_code" = ' '
Field Calculate:
Rates_Code = RURAL (16327)
Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Rural', 'Rural A') AND "rates_code" = ' '
Field Calculate:
Rates_Code = RURAL (38)

Unknown Land Use

Select by attributes:
"LandUseDes" = 'MU Vacant or Intermediate' AND "ZoneDescri" IN ('Land in more than one zone', 'Not Known', 'Unknown') AND "rates_code" = ' '
Field Calculate:
Rates_Code = UNKNOWN (15)

Re-classify Rural Areas by Land Use

Select by attributes:
LandUseDes = 'Rural - Arable Farming'
Field Calculate:
rates_code = ARABLE (67)
Select by attributes:
LandUseDes = 'Rural - Dairy'
Field Calculate:

rates_code = DAIRY (1471)
Select by attributes:
"LandUseDes" IN (‘Rural - Forestry’)
Field Calculate:
rates_code = FOR (861)
Select by attributes:
LandUseDes = 'Rural - Market Gardens and Orchards'
Field Calculate:
rates_code = HORT (643)
Select by attributes:
LandUseDes = 'Rural - Mineral Extraction'
Field Calculate:
rates_code = MINE (91)
Select by attributes:
LandUseDes IN ('MU Transport', 'Transport - Air Transport', 'Transport - Multi Use within Transport', 'Transport - Parking', 'Transport - Rail Transport', 'Transport - Road Transport', 'Transport - Vacant', 'Transport - Water Transport')
Field Calculate:
rates_code = TRANSPORT (338)
Select by attributes:
LandUseDes IN ('Utility - Communications', 'Utility - Electricity', 'Utility - Gas', 'Utility - Multi-Use within Utility Srvcs', 'Utility - Other', 'Utility - Sanitary', 'Utility - Vacant', 'Utility - Water Supply')
Field Calculate:
rates_code = UTILITY (728)
Select by attributes:
"rates_code" = ' '
Field Calculate:
rates_code = UNKNOWN (103)

8. Land Use Classification

New Field: Land_Use (TEXT)

GS_code IN ('ARA', 'ARABLE') And StkFactor < 50 (416)
ARABLE

GS_code IN ('ARA', 'ARABLE') And StkFactor >= 50 AND Land_Use IS NULL (252)
Arable with Mixed Livestock

GS_code IN ('BEEF', 'BEF') (516)
Beef

GS_code IN ('DEEBE', 'DEESH') (357)
Majority Deer with Mixed Livestock

GS_code IN ('BND', 'SND', 'SBD') (3228)
Mixed Livestock
SNB (18567)
Sheep& Beef
SHP
Sheep (5029)
GS_code IN ('DAI', 'DAICO', 'DAIRY') AND GS_code2 = ' ' (7456)
Dairy

GS_code IN ('DAI', 'DAICO', 'DAIRY', 'DAISUP') AND NOT GS_code2 = ' ' (676)
Dairy Support

GS_code = 'COMM' (6392)
Commercial Use

GS_code = 'CON' (6698)
Conservation

GS_code = 'DEER' (378)
Speciality Deer

LIVSUP
Livestock Support (1318)

GS_code IN ('EXTFOR', 'FOREST', 'FORESTRY', 'FOR') (5440)
Exotic Forestry

GS_code IN ('LIFE') (15271)
Lifestyle Block

GS_code = 'SMH' (3372)
Small Land Holding

GS_code IN ('FRU', 'NUR', 'VIT') (953)
'Nurseries & Orchards'

GS_code IN ('FLO', 'HORT', 'VEG') (538)
Horticulture

GS_code = 'HYDRO' 'Lakes & Rivers'	(3690)
GS_code IN ('IND', 'MINE') Industrial Use	(6958)
OAN Other Animals	(514)
GS_code IN ('TUSSOCK', 'NSCRUB', 'NATIVE', 'NAT') Indigenous Vegetation	(1206)
PIG Pig Farming	(40)
POU Poultry	(472)
REC, RECREATION Recreational Use	(2602)
PUBLIC Public Use	(2795)
RES, RESIDENTAIL 'Residential Use'	(511610)
GS_code IN ('ROAD', 'RAIL', 'TRANSPORT') Road & Rail	(33908)
GS_code IN ('GRASSLAND', 'LPAS', 'PASTURE', 'GRAZED', 'RURAL') Unknown Land Use – Pastoral	(13108)
GS_code IN ('WETLAND', 'UTILITY', 'URBAN', 'UNKNOWN') Unknown Land Use – Non-Agricultural	(1399)

Land Use Map Colours and Symbology

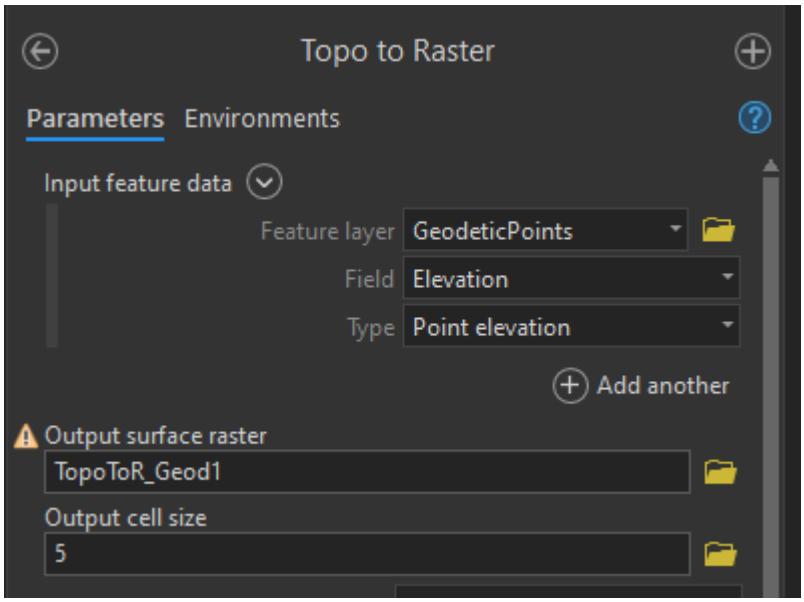
Great South Land Use Class	Symbology Type		#HEX Colour Code
Conservation	Solid colour fill		267300
Plantation Forest	Solid colour fill	Leaf Green	38A800
Sports, Recreation, and Tourism	Solid colour fill	Sage Dust	B4D79E
Sheep and Beef	Solid colour fill	Mango	FFD37F
Sheep	Solid colour fill	Fire Red	E64C00
Beef	Solid colour fill	Tuscan Red	A80000
Mixed Livestock	Solid colour fill	Electron Gold	FFAA00
Majority Deer and Mixed Livestock	Solid colour fill	Solar Yellow	FFFF00
	Hatched fill overlay (stroke with offset 2pt)	Electron Gold	FFAA00
Speciality Deer	Solid colour fill	Solar Yellow	FFFF00
Pig farming	Solid colour fill	Medium Coral	F57A7A
Poultry	Solid colour fill	Autunite Yellow	FFFF73
Arable	Solid colour fill	Ginger Pink	FF00C5
Arable with Mixed Livestock	Solid colour fill	Ginger Pink	
	Hatched fill overlay (stroke with offset 2pt)	Mango	
Horticulture	Solid colour fill	Heliotrope	DF73FF
Flower and Bulb Growers	Solid colour fill	Rhodolite Rose	FFBEE8
Nurseries, Orchards, and Vineyards	Solid colour fill	Purple Heart	73004C
Livestock Support	Solid colour fill	Tourmaline Green	00FFC5
Dairy	Solid colour fill	Ultramarine	4C0073
Dairy Support	Solid colour fill	Amethyst	A900E6
Dairy Support and Other Livestock	Hatched fill overlay	Amethyst	A900E6
	Hatched fill overlay (stroke with offset 2pt)	Electron Gold	FFAA00
Other Animals	Solid colour fill	Mars Red	FF0000
Small Land Holding	Solid colour fill	Lapis Lazuli	005CE6
Lifestyle	Solid colour fill	Yogo Blue	73B2FF
Public Use	Solid colour fill		002673
Residential Use	Solid colour fill		B2B2B2
Commercial Use	Solid colour fill		828282
Industry and Utilities	Solid colour fill		4E4E4E
Roads and Railways	Solid colour fill		E1E1E1
Lakes and Rivers	Solid colour fill		73DFFF
Unknown Land Use – Indigenous Vegetation	Solid colour fill		6E6E6E
Unknown Land Use – Pastoral	Solid colour fill		BEFFE8
Unknown Land Use – Non-agricultural	Solid colour fill		FFFFBE

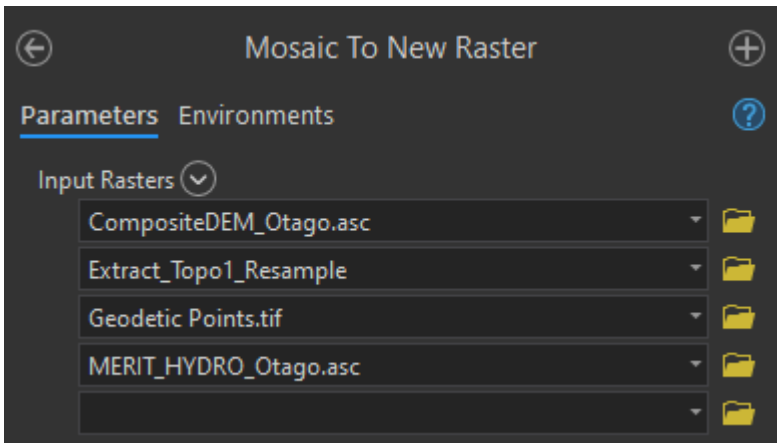
Otago DEM

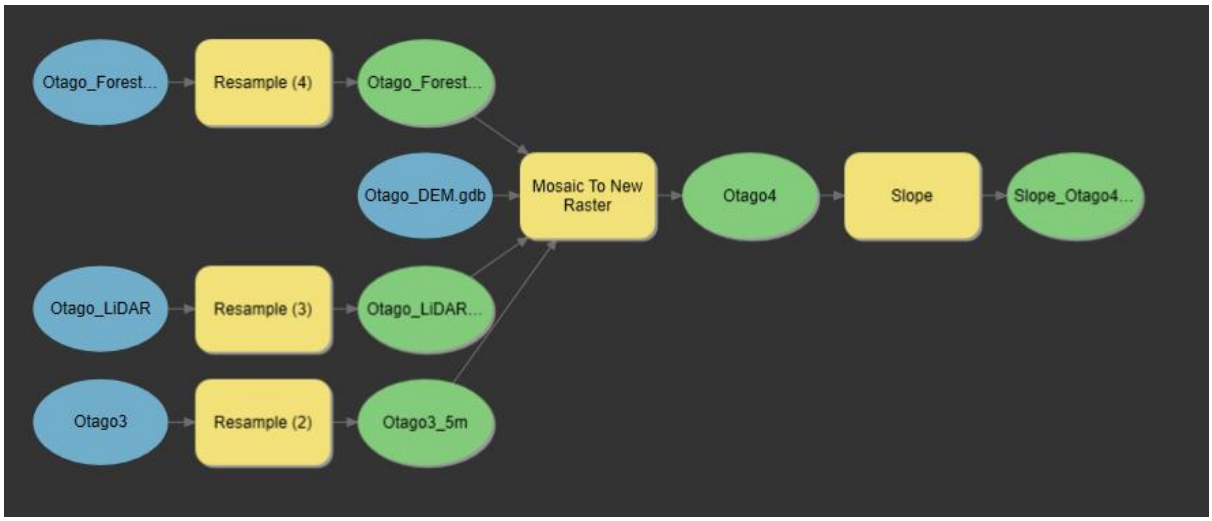
Tool = LAS Dataset to TIN

Input LAS Dataset	[input LUCAS Forestry LiDAR LAS]
Output TIN	[output folder location]
Thinning Type	No thinning
Max output nodes	5000000
Z factor	1
Clip to Extent	[check]

Wells Elevation (1 & 2); Geodetic Marks
Geodetic Points
Tool = Topo to Raster






Otago_Forest...
Resample (4)
Otago_Forest...
Otago_DEM.gdb
Mosaic To New Raster
Otago4
Slope
Slope_Otago4...
Otago_LiDAR
Resample (3)
Otago_LiDAR...
Otago3
Resample (2)
Otago3_5m