Section 1 - GEODATA Specifications

1. Scope of this document

This document sets out the Technical Specification for Geoscience Australia's 1:250 000 and 1:100 000 scale GEODATA topographic vector products, GEODATA TOPO-250K series 2 and TOPO-100K series 1.

This specification sets out the minimum quality standard for the data in terms of its planimetric and altimetric accuracy, geometrical aspects, feature content, topological structure and the rules used in the collection of the data.

The GEODATA TOPO-250K series 2 and TOPO-100K series 1 spatial data is derived from published 1:100 000 and 1:250 000 topographic maps updated with information from Geoscience Australia and other agencies. The bulk of these maps are from the National Topographic Map Series (NTMS) published by Geoscience Australia / AUSLIG, the Royal Australian Survey Corps and from the Joint Operations Graphic series (JOG) published by the Royal Australian Survey Corps. However, in a few cases where maps in these series do not exist mapping from State agencies is used.

2. The Data Model

2.1 The Feature-Based Data Model

The GEODATA Vector Products use a feature-based data model described by the following definitions:

ENTITY: An entity is a real world phenomenon not divisible into phenomena of the same kind.

FEATURE INSTANCE: A feature instance is an abstraction of an entity represented in digital form. The description of a feature instance encompasses only selected properties of that entity. Feature instances can also be referred to as features.

ATTRIBUTE: An attribute is a particular property of a feature or of a feature's property. Attributes can be spatial (or locational) and aspatial (or non-locational).

ATTRIBUTE VALUE: Attribute value is the value assigned to an attribute, either for a feature instance or its attributes.

FEATURE CLASS: A feature class is a group of feature instances defined by a set of rules and having common attributes and relationships that are the properties of the corresponding real world phenomena.

ENTITY CLASS: A group of entities of the same kind, matching the members of a feature class.

The structure of a feature instance in the feature based data model can be summarised as:
feature instance = [*spatial object* + *attribute object*]

Where *spatial object* and *attribute object* are defined as:

SPATIAL OBJECT: The addition of all the locational attributes of the feature instance in the form of geometrical objects such as points, lines or polygons. Spatial objects carry a spatial address that consists of one or more couplets (x, y) or triplets (x, y and z) of coordinates. In the feature-based data model, topological relationships will be carried as part of the spatial object whenever the transfer formats support them. Types of spatial objects used in GEODATA are:

Point

Geometric representation defined by a single 'x, y' co-ordinate couplet or an 'x, y, z' triplet. Three special points are used in the data model.

Entity Point - used to locate point features or area features represented by a point.

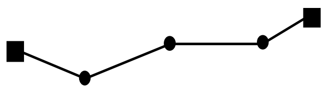
Paracentroid - point within a polygon used to hold information about that polygon. This point is topologically linked to the bounding chains of the polygon.

Every polygon will contain one paracentroid. This point type is sometimes known as a centroid or as a polygon label point.

Node - A point that is an intersection of two or more chains or an end point of a chain. Nodes may carry attribute information.

Chain

A sequence of non-intersecting line segments bounded by nodes (not necessarily distinct) at each end.

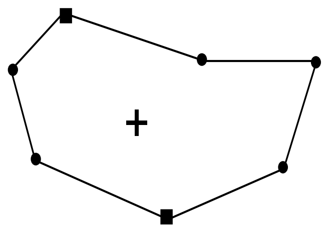


Chains will reference their start and end nodes. Coordinates along a chain are referred to as vertices in this specification.

When a chain is defining a polygon boundary it will reference the polygons to the left and right of the chain with respect to the direction of digitisation.

Polygon

A bounded, continuous region consisting of an interior area, an outer boundary defined by a set of chains, and zero or more, non-nested inner boundaries also defined by sets of chains.



Within a layer the polygons are mutually exclusive. Every polygon will contain one and only one paracentroid.

ATTRIBUTE OBJECT: The non-locational information about a feature instance. These data identify the feature class and the aspatial attributes of a specific instance of the feature class. The attribute object is composed of one or more attributes.

Example 1

Spatial Object	**Attribute Object**	
Chain ($x_1,y_1 \ldots\ldots x_n,y_n$)	<u>Attribute</u>	<u>Attribute Value</u>
	Feature Class:	Road
	Name:	Hume Highway
	Classification:	1 *(represents 'Dual Carriageway')*
	Surface Type:	1 *(represents 'Sealed')*
	National Route Number:	31

Example 2

Spatial Object	**Attribute Object**	
Polygon	Attribute	Attribute Value
	Feature Class:	Island
	Name:	Fraser Island
	State:	5 *(represents 'QLD'))*

2.2 Data Aggregation

The spatial object and attribute object as defined above are the primitive components of data. These data objects are grouped together in a hierarchy which is used for the capture, manipulation and transfer of the data.

2.2.1 Themes

The digital spatial data contained in the GEODATA products are primarily derived from a combination of existing map production material, base digital data, imagery and authorised source material. The data on the source material may be divided into themes, each theme containing logically related geographic information. There are five themes in the 1:250 000 and 1:100 000 Topographic Vector Products - Hydrography, Infrastructure, Relief, Reserved Areas and Vegetation.

2.2.2 Layers

All GEODATA topographic vector data is topologically structured and this is reflected in the way the data is structured and transferred to the client. Each theme consists of one or more layers which are composed of different spatial objects and which convey the topological relationships of the data.

GEODATA Vector Products may contain four types of layers:

- Linear
- Polygon
- Point
- Point/Linear

Linear layers contain chain features representing entities such as windbreaks or pipelines.

Polygon layers contain chains and paracentroids representing area features such as lakes or built-up areas.

Polygons in the same layer cannot overlap.

Point layers contain entity point features representing entities such as buildings or lighthouses.

Point / Linear layers contain a combination of entity point and chain features such as roads and bridges.

2.3 Area of File Coverage

The area covered by each file of spatial data is described as a tile. The tile boundaries are shown in Appendix H. TILE AND MAP BOUNDARIES GUIDE.

3. TOPO-250K and TOPO-100K Data Structure

The GEODATA topographic vector data is topologically structured and additional information about the features will be conveyed by attributes which are held in attribute tables.

All GEODATA topographic vector data share a number of common characteristics which are set out below.

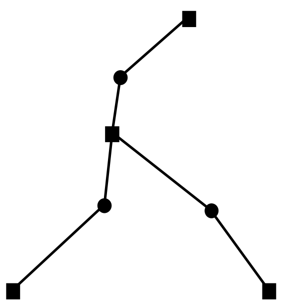
3.1 Spatial Data Integrity

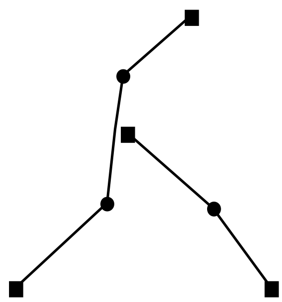
GEODATA topographic vector data will comply with the following rules for spatial data integrity. The rules for maximum allowable errors are described in Appendix J. These rules will be enforced with a 95% confidence level.

The spatial data will have no overshoots, undershoots, broken lines, pseudo nodes or other artefacts of the data capture process. These possible errors in the data are illustrated below. Pseudo nodes will be acceptable where:

- a feature must be broken due to having more than 500 points
- the specification requires a related feature to be placed on a node, for example, railway stations
- symbology or other map attributes change.

Undershoot in data.

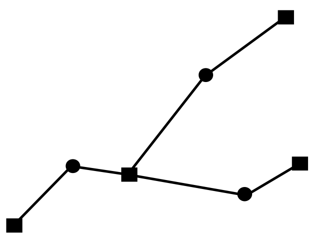


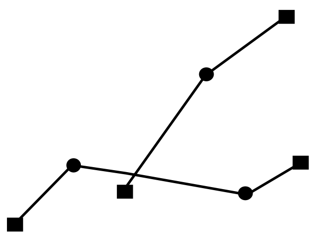


Correct Representation

Incorrect Representation

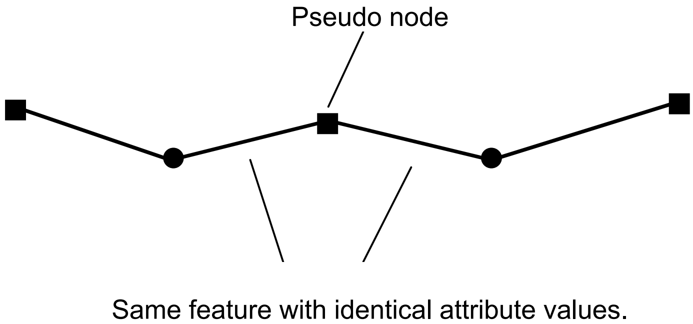
Overshoot in data.





Correct Representation Incorrect Representation

Pseudo-node in data

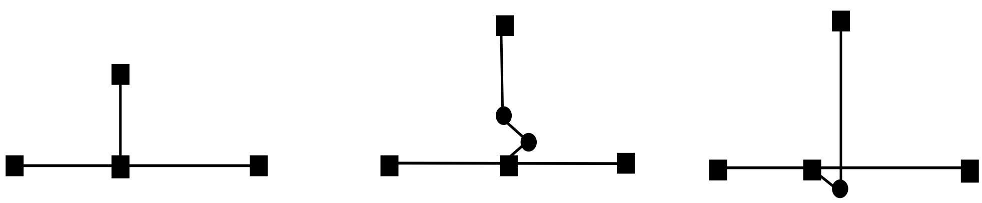


Broken line in data

Correct Representation

Incorrect Representation

Artefacts



Correct Intersection Incorrect Intersection Incorrect Intersection

Linear Feature Spike in Linear Feature

Artefacts such as spikes and deviations of a linear feature from its expected position will be removed from the data to the extent that they will not be visible when the data is plotted or displayed at half its nominal scale ie. 1:125 000 for 1:250 000 data or 1:50 000 for 1:100 000 data.

- All linear features within the same layer will be broken by a node at intersections or at the point where an attribute of the feature changes. A node will exist at these intersection points.

- All polygon boundaries must be closed.

- Every polygon feature will contain a paracentroid which may be used for the positioning of information about the feature.

- Adjacent polygons within a tile will not have an identical set of attributes, once the UFI (1:250 000 scale only) and q_info has been excluded.

- Within a layer there will be no coincident features of the same spatial object type, for example, a line cannot be coincident with another line. Two features in separate layers, which share the same physical position on the source material, will have coincident spatial addresses.

3.2 Point Density Reduction

Point density is controlled so that the locational information is conveyed by the minimum number of points while still retaining the smooth shape of the source information.

The following specifications apply for data point reduction:

- The length of a line segment will be equal to, or greater than 0.000 22 degrees (approx. 25m) for the 1:250 000 product and 0.000 10 degrees (approx. 10m) for the 1:100 000 product. However, for features other than roads, feature instances of less than 20 points will not be filtered (i.e.: such features are an exception to this rule). Sections of the chains, which must be coincident with such features, will also be an exception to the rule.

- The length of a line segment will not be greater than 0.253 68 degrees (approx. 20 000m for the 1:250 000 product and 0.147 degrees (approx 8000m) for the 1:100 000 product).

- For Tile Edge features in all layers the distance between vertices will not exceed 0.002 degrees (approx. 200m).

3.3 Resolution of Co-ordinates

Co-ordinates of all spatial objects will be quoted to the nearest 0.000 01 degrees (approximately 1m) for both the 1:250 000 and the 1:100 000 products.

3.4 Unique Feature Identifier Attribute (TOPO-250K only)

A Unique Feature Identifier (UFI) will be an alphanumeric string attached to each feature instance as an attribute. The UFI will be unique on a national basis and is expected to facilitate the efficient incremental update of GEODATA features.

The Unique Feature Identifier will have the components:

1. A scale identifier code.

2. A theme/layer identifier code.

3. A sequential number allowing for up to 100 000 000 feature instances which is unique for each scale/theme combination. These numbers have been allocated in blocks of 100 000 to each tile.

For example; the code BA00000237 would indicate feature instance 237 in the 1:250000 Hydrography theme. Note: leading zeros will be included for sequential number values less than 10000000.

Scale and theme/layer identifier codes will be in upper case.

The following scale and theme codes have been specified for GEODATA data. The ranges of UFI numbers allocated to tiles are listed at Appendix K (and are only applicable to 1:250 000). Note: allocation of numbers within a tile will not necessarily be in numeric sequence; gaps between numbers are acceptable.

Scale Identifier		Theme Identifier	
B	1:250 000	A	Hydrography
		B	Infrastructure
		C	Framework
		D	Relief
		E	Coastline & State Borders (not used for Topo products)
		F	1:10M General (not used at 1:250 000)
		G	Vegetation
		H	Reserved Areas

3.5 Data Quality Pointer Attribute

Every feature instance will have attached to it a data quality attribute. This attribute, named *q_info* (from Quality INFOrmation), will be nationally unique and is used to point to a record in the Data Quality Table. The Data Quality Table is discussed in chapter 4.3 Feature Quality Information.

The data quality attribute will be an eight character string with two component parts:

1. A map sheet identifier of 5 characters. This will identify the map sheet which is the basis for information in the related record in the Data Quality Table.

2. A number which is unique for the map sheet. Allowance has been made for up to 1000 data quality records per tile.

For example, a *q_info* value of F53147 would indicate that the information in the data quality table is based on the 1:250 000 sheet of SF53-14, Alice Springs and that it is the seventh data quality pointer for this map sheet. The prefix of S is common to all 1:250 000 scale map sheets and has been dropped to save space.

For TOPO-100K tiles the four digit map number will be preceded by the character "S" eg. S90291.

Alpha characters in the q-info attribute will be in upper case.

3.6 Positional Accuracy

The positional accuracy of spatial data is a statistical estimate of the degree to which planimetric co-ordinates and elevations of features agree with their real world values. The planimetric accuracy attainable in the GEODATA Topographic Vector data will be composed of errors from three sources:

1. The positional accuracy of the source material

2. Errors due to the conversion processes.

3. Errors due to the manipulation processes.

3.6.1 The Positional Accuracy of the Source Material

This specification cannot prescribe a figure for the planimetric accuracy of the existing source material (repromat) used for capture of GEODATA as it has already been produced. There is an expectation that the source data complies with the following statement.

Not more than 10% of well defined points will be in error by more than 0.5mm measured on the source material.

Well defined points are those points which are readily identified on the ground and in the data and have not been offset to allow for symbolisation of surrounding features. They are usually at intersections.

Statistically, this relates to a standard deviation on the map (S_m) of 0.31 mm.

New features will be captured to comply with this statement.

SPOT imagery used for the updating of data will have positional accuracy of 30 metres and TM imagery 60 metres. Higher resolution imagery may be supplied for TOPO-100K revision purposes.

3.6.2 Errors Due to the Conversion Processes

The errors due to the digitising process depend on the accuracy of the digitising table set-up or the scanner resolution, systematic errors in the equipment, errors due to software and errors specific to the operator. An accepted standard for digitising is that the line accuracy should be within half a line width. The majority of features in the GEODATA have a line width of 0.2 mm or greater. The half line width is taken as 0.1 mm and this is interpreted as one standard deviation S_{data} for the distribution of errors.

The expectation is that the degradation caused by the scanning processes will be minimal and will be the result of thinning lines to a co-ordinate string. This may result in an added error of +/- 0.2 mm for the thickest lines digitised.

The inaccuracy in setting up the test digitisation and making the measurement S_{test} is estimated to be in the same order of inaccuracy as the digital data being checked. The errors of the digital data and the system used to check this digital data combine using the formula.

$$\begin{aligned} S_{\mathrm{limit}} &= \sqrt{\left(S_{data}\right)^2 + \left(S_{test}\right)^2} \\ &= \sqrt{(0.1)^2 + (0.1)^2} \\ &= 0.14mm \end{aligned}$$

The limit for the standard deviation of the measured errors, S_{limit} = 0.14 mm, and thus two standard deviations, which 95 % of points should lie within, is 0.28 mm. The mean of the errors between the data and the test points should be zero, since there should be no bias in the errors, such as a consistent offset in the position of features. A sample of well defined points in data will be compared with their coordinates derived from the source material and a test statistic of the mean plus two standard deviations must not be greater than 0.28 mm.

As well as the errors in the conversion process outlined above, linear features are also subject to filtering as part of the point density reduction process. If the filtering parameters are not carefully selected the resulting linear feature may not retain sufficient likeness to the source material. To ensure linear features which are faithful to the shape and length of the source material, the following specification will be satisfied.

The separation between the feature instance on the source material and its GEODATA digital representation will not be greater than 0.2 mm at source material scale. That is, 50 m for the 1:250 000 product, or 20 m for the 1:100 000 product.

3.6.3 Errors Due to the Manipulation Processes

The processes used during data manipulation will introduce an error S_{man} not greater than 10% of the S_{data}.

3.6.4 Absolute Planimetric Accuracy

The total statistical error from the source material and digitising process (S_d) discussed above is given by:

$$\begin{aligned} S_{absolute} &= \sqrt{(S_m)^2 + (S_{limit})^2 + (S_{man})^2} \\ &= \sqrt{(0.31)^2 + (0.14)^2 + (0.05)^2} \\ &= 0.34mm \end{aligned}$$

This represents an error of 85m on the ground for 1:250 000 data and 34m for 1:100 000 data.

Alternative and equal ways of expressing this error are:

- Not more than 10% of well defined points will be in error by more than 140m for 1:250 000 data and 56m for 1:100 000 data.

The planimetric accuracy of each feature instance (stated as a standard deviation in metres) is given in the Data Quality Table. The standard value for the features will be the standard deviation unless the source of the feature is known to have a different accuracy (higher or lower), in which case the value adopted will reflect the expectation. A value of 9999 is used when the positional accuracy of the feature is not definable or not applicable. For example, the coordinates of a connector feature do not carry any meaning with respect to positional accuracy and so the value of planimetric accuracy given is 9999.

3.6.5 Absolute Elevation Accuracy

The accuracy of the points captured for the Relief layer varies with the source material and the point determination of each particular point. The following table summarises these accuracies.

	Printed Map	**Compilation Material**	**Digital Topographic Data**
Spot elevation	± 5 metres	± 5 metres	± 5 metres
Spot elevation inside Depression contour	± 5 metres	± 5 metres	± 5 metres
Spot elevation on Sand ridge	± 5 metres	± 5 metres	± 5 metres
Bench mark			± 1 metre
Horizontal control point			± 15 metres

The accuracy of the contours is defined as 1/2 of the contour interval, for example ± 25 metres for a 50 metre contour interval and ± 10 metres for a 20 metre contour interval.

3.7 Edge Match

Features along the edges of every GEODATA tile will be matched with features along edges of the adjacent tiles for position and attributes (subject to the exceptions listed below), providing that the surrounding tiles are available in digital form on the correct datum.

For the TOPO-250K product, continuous arc and polygon features crossing the GEODATA Tile Edge into the Bleed Edge in the Working Database should be split at the GEODATA Tile Edge. In the resultant GEODATA, the geographical coordinates (latitude & longitude) of the nodes of features split by, and meeting, the Tile Edge will fall exactly on the Tile Edge.

For the TOPO-100K product, continuous arc and polygon features in the Working Database should be split where they cross the GEODATA boundary (which equates to the GDA94 Tile Edge) into the extended area defined by the outer AGD66 Tile Edge. Similarly, in the resultant GEODATA, the geographical coordinates (latitude & longitude) of the nodes of features split by, and meeting, the Tile Edge will fall exactly on the Tile Edge.

The edge may not match where:

- Relevant data on the adjacent tile is not yet available on the correct datum
- A feature which apparently crosses the Tile Edge does not exist on the adjoining tile due to temporal differences in the source material. It should be noted that this form of miss-join should be the exception rather than the rule.
- Special Instructions / Action Requests issued by Geoscience Australia give specific instructions negating the requirement to match feature end points at the Tile Edge.

3.8 Notes on Special Features

3.8.1 Tile Edge

The 'Tile Edge' feature defines the boundary of the area covered by the tile. The Tile Edges will be defined as per Appendix H. TILE AND MAP BOUNDARIES GUIDE. Tile edge features will be used to close off polygons which meet the Tile Edge.

3.8.2 Void Polygons

Polygon features may contain holes or voids which cannot be assigned to any feature class within that layer. For example, a Lake in the Waterbody layer may have in the middle of it an area of dry land. This would appear in the data as a polygon with no paracentroid. A number of GIS packages cannot operate unless all polygons have paracentroids so a paracentroid will be added. These empty areas within polygons are collectively known as voids. Types of voids are listed in the Feature class dictionary, Appendix A.

Voids may abut the Tile Edge where the full extent of the void is on two or more tiles.

3.8.3 Connector Feature

Drainage patterns are made up of both linear (narrow streams) and polygon features (such as lakes and swamps) and as such do not constitute a rigorous linear network. To allow linear analysis of drainage networks to be carried out an artificial feature called a "Connector" has been added to the data.

This Connector feature is used to bridge the gap in linear watercourse features where they are separated by water bodies such as lakes, swamps and watercourses that are depicted as area features. The Connector feature is composed of one or more chains in the general location that would be expected if the polygon feature was collapsed to a line. The points that make up this chain cannot be given any value for planimetric accuracy and this is indicated in the Data Quality attribute for the feature by a value of 9999 (not applicable) for the standard deviation of planimetric accuracy.

The Connector will only be used if there is flow across a waterbody polygon feature. Thus if there is only inflow to a lake and no outflow the Connector feature will not be used.

The use of the Connector feature will cease when a watercourse runs into the sea. In cases where the flow is divided (that is, in river deltas or around river islands), the flow will be represented by only one of the possible paths which will be arbitrarily chosen.

All Connectors contained in waterbodies that flow into other waterbodies will be extended to join the Connector on the recipient waterbody (see diagram at chapter 3.9.1 Differentiation between the Sea (inlets) and Watercourses).

Tributary Watercourses flowing into a polygon waterbody will be linked to the waterbody's Connector for the main watercourse with Connectors (see diagram at chapter 3.9.1 Differentiation between the Sea (inlets) and Watercourses).

The general rule for the attribution of Connectors is that Connectors carry the attributes of the river they represent, that is the classification and perenniality shown in Appendix D. In the application of the rule it must be considered that:

- Connectors running through mangroves are perennial
- Rivers can change their perenniality along their course.

3.8.4 Junction Feature

The Junction is a linear feature which occurs in the framework and waterbody polygon layers. It is an artificial line used to separate adjacent polygon areas across which flow can occur. For example, a Junction feature will separate the confluence of two watercourses where both are depicted as polygons on the source material. A Junction also separates watercourse polygons from the Sea. Junctions will usually be two vertice features. Three vertice junction features are permissible where there is a need to 'shape' the junction or control the relationship with the end node on a connector. Multiple vertice junction features are permissible in the framework layer. Junction features are held in both the Waterbody and Framework layers. The Junction features in the Framework layer are replicated in the Waterbody layer to allow closure of water body polygons.

The Junction feature is arbitrarily placed and cannot be given any value for planimetric accuracy. This is indicated in the Data Quality table by a value of 9999 for the standard deviation of planimetric accuracy.

Junction features will not be placed:

- separating 2 water bodies with identical attributes.
- separating polygons of different feature class except separating watercourse polygons, canal polygons, lakes, reservoirs and the sea from one another.

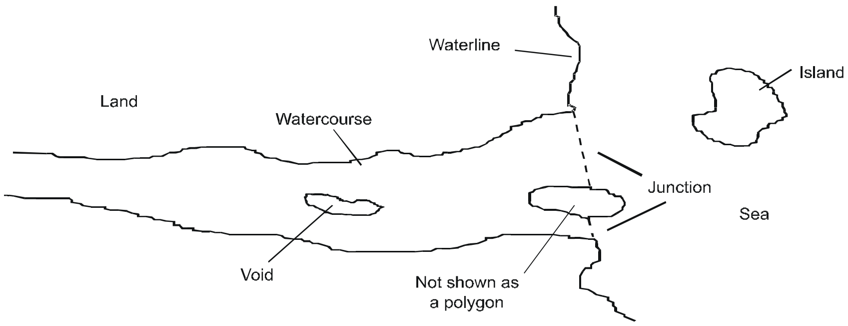
Junction features will be placed:

- separating double line watercourses from other water bodies such as lakes and reservoirs.
- separating waterbody polygons of the same class but with different attributes.
- closing the mouth of rivers (coastline).
- filling the coastal gaps in the framework layer.

3.8.5 Islands

Islands will be represented as polygons coded 'island' when they are fully surrounded by sea.

Islands in inland water features will usually be shown as void polygons and islands partly surrounded by sea will not show as polygons. If named, these islands will be represented by a locality with locality code 9 (waterbody island).

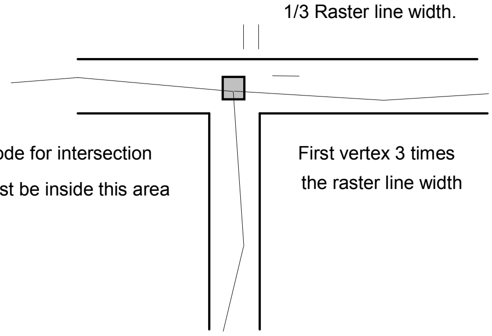


3.8.6 Road and Rail Intersections

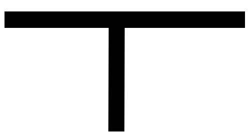
An intersection in digital data will contain the same number of nodes as shown on the source material.

An intersection node will be within 1/6 of the line width of the centre position of the intersection.

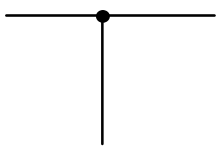
The first vertex in each direction from the intersection node will be at a distance greater than three times the line width unless there is a bend in the road before this distance.



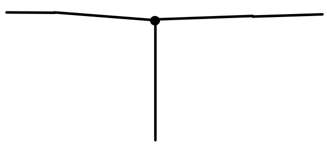
Valid and Invalid Intersections



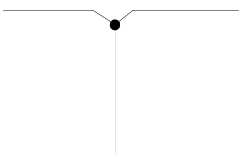
Source Material Intersection



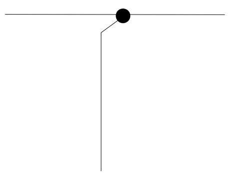
Valid Intersection



Valid Intersection



Invalid   Intersection



Invalid   Intersection

3.8.7 Localities

Localities are point features showing a named place or area. Valid types of localities are shown in Appendix A.

Railway stations will be cloned as localities if the same name is not in use for another Place name, Populated place or Built-up area Locality feature.

Localities with locality code 10 (place name) should be used to define the location of suburbs within large built-up area polygons, see Appendix A.

All localities with locality code 4 (homesteads) will be captured in their true planimetric position.

Localities will coincide with the road network where required, in accordance with the rules prescribed in the ‘Locality’ entity of Appendix A.

3.8.8 Names

Named features will be attributed with the name in full including the type of feature where it is part of the name. For example ‘ESK RIVER’, ‘ORANGE AERODROME’, etc. Usually the type of feature will not be part of the name for railway stations, Locality populated places and Locality place names that identify centres of population. Abbreviations must not be used. Names will be in upper case.

In the naming of localities, the terms 'Mission' and 'Aboriginal Community' should be avoided. Source material for the names of Indigenous communities will be determined by Geoscience Australia.

Plural names associated with a group of features should be assigned to every feature in the group unless the individual features have a name in their own right.

Unnamed features on the edge of the working tile could have a name in the adjacent tile. In these cases the names on the adjacent tile will be used.

In the case of conflicting names for a feature or for features matching across an edge, the incompatibility should be resolved and the features named accordingly. The National Gazetteer of Australia will be used to resolve incompatibilities.

Unnamed river anabranches will carry the river's name. Where a river anabranch is named in its own right it will carry its name (eg. EDWARD RIVER).

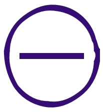
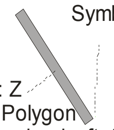
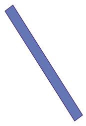
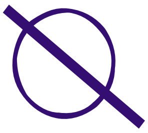
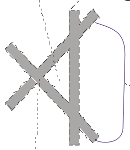
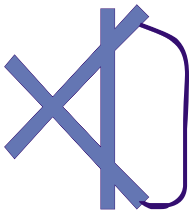
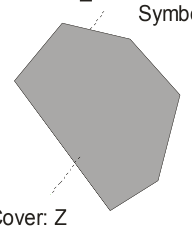
3.8.9 Parks and Waterbodies

Waterbodies will be considered part of parks when they are fully included in the park (see feature class Park in Appendix A). That is, they will not be shown as voids in the parks. In all cases the water bodies will appear as such in the Waterbodies layer.

Note: care should be taken to avoid confusing Park and Reserve - Nature Conservation feature classes (see Appendix A).

3.8.10 Aircraft Facilities

The following examples illustrate how aircraft facilities are depicted as point, arcs and polygons at both 1:100 000 and 1:250 000 scales:

250K Data	250K Map	100K Data	100K Map
Aircraft Facility: Helipad Cover: A Type: Point Feat_code: aircrft_flty Facility: 3		Cover: A Type: Point Feat_code:aircrft_flty Facility: 3	
Aircraft Facility: Landing Ground Cover: 5 Type: Arc Feat_code: runway_c_l Symbol:0 Length: >457m Cover: A Type: Point Feat_code:aircrft_flty Facility: 2		Cover: Z Type: Arc Feat_code:aircrft_f_l Symbol: 702  Cover: Z Type: Polygon Feat_code:aircrft_f_a Facility: 2	
Aircraft Facility: Airport Cover: 5 Type: Arc Feat_code: runway_c_l Cover: A Type: Point Feat_code:aircrft_flty Facility: 3		Cover: Z Type: Arc Feat_code:airc_f_void Cover: Z Type: Arc Feat_code:aircrft_f_l Symbol: 702  Cover: Z Type: Polygon Feat_code:aircrft_f_a Facility: 3 Cover: A Type: Arc Feat_code: Taxiway	
Airport N/A	N/A	Cover: Z Type: Arc Feat_code:aircrft_f_l Symbol: 0  Cover: Z Type: Polygon Feat_code: airport Symbol: 0	N/A

3.8.11 Sea Walls

Sea walls will be shown when they are coincident with the coastline ie. when the wall is wet under normal daily tidal action. Retaining walls adjacent to beaches or in riverbanks do not fall in this feature class.

3.9 Depiction of the Coastal Environment

The Framework, Waterbody and Offshore layers contain features which depict the coastal environment. The area of tidal influence is part of the Sea feature unless it is closed off by a Junction feature.

The line separating the sea and the land (waterline) will be the position of mean high water level. The exception is in mangroves, where the waterline will run on the seaward side.

To preserve the name of a watercourse for its entire length, a Junction will be used to close off tidal portions of named watercourse polygons, where the watercourse flows into an inlet or bay considered part of the watercourse (see chapter 3.9.1 Differentiation between the Sea (inlets) and Watercourses). The polygon formed by closing off inlets will be a Watercourse feature.

The use of the connector feature will cease when a watercourse runs into the sea.

The diagram below illustrates how features are used in GEODATA to represent the riverine and maritime environments. See also Section 3 chapter 6.9.3.

3.9.1 Differentiation between the Sea (inlets) and Watercourses

The interpretation of features as watercourses or inlets should be done by applying the following criteria:

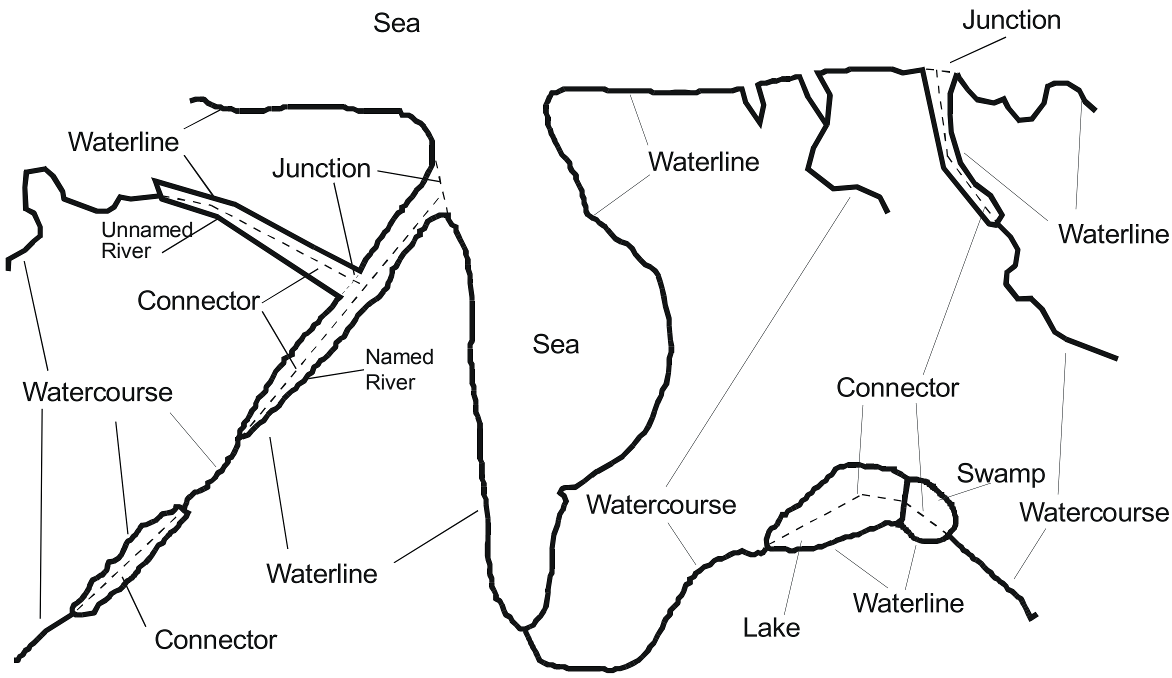
- when the area in question is named as part of the sea (inlet, bay, etc.) it should be considered as such.

- when the polygon feature is named as a river it should be considered as a watercourse.

- when the area in question has no name and there is no linear stream flowing into it, it should be considered as part of the sea.

- when the polygon feature is unnamed, has a single line stream flowing into it and is longer than 4 mm at map scale, it should be considered as a watercourse.

- when the polygon feature is unnamed, has a single line stream flowing into it and is shorter than 4 mm at map scale, it should be considered as part of the sea.



The coastline is represented by chains coded as waterline. These chains are indicative of the mean high water mark except in areas covered by mangroves, where the limit between the sea and the land is considered to be the seaward side of the mangroves.

In the places where walls have been erected to prevent the erosion of the land by the sea, sea walls will replace the waterlines.

4. Quality Information

Quality information allows the users of the data to make informed decisions about the fitness of the data for their application.

Quality information will be provided in three ways:

1. Product quality information
2. Tile quality information
3. Feature quality information

4.1 Product Quality Information

The Product Quality Information will provide data which is specific to the whole product. The Product Quality Information will be stored in the Product Quality Statement. There will be one Product Quality Statement for TOPO–250K, named “topo250k.dqs” and one for TOPO-100K named “topo100k.dqs”. This consists of a history of the source material, a description of the digitising methods and quality aspects that are common to the whole of the topographic vector product such as positional accuracy, attribute accuracy, logical consistency and completeness.

Geoscience Australia will provide the product quality information.

4.2 Tile Quality Information

The Tile Quality Information will provide information which is specific to the tile covered by the data file. The Tile Quality Information will be stored in two types of tables: layer quality tables and layer frequency tables. Each layer of a tile will have associated with it one layer quality table and one layer frequency table. The layer quality table, named <layer name>.tqi, will store primarily name, date, and datum information about the layer. The layer frequency table, named <layer name>.frq, will store frequency counts of each feature type, based on feature code, in that layer.

An example of the content and structure of a layer quality table and a layer frequency table is given in Appendix I.

The layer quality table has the following fields:

the tile name (TILE_NAME) [character; 50, 50 C]

the tile code (TILE_CODE) [character; 10,10,C]

the theme of which the layer is part (THEME) [character; 20, 20, C]

the technical specification to which the data conforms (TECH_SPEC) [character; 20, 20 C]
This specification is coded as GTVPTS followed by the specification's version number.

the date the data passed Geoscience Australia's quality control (QC_PASSED) [date; 8, 10, D]

the software used to convert the data into vector format (FMT_CONV_SW) [character; 30, 30, C]
A standard description will be established for each conversion software used.

the date the data was converted into vector format (FMT_CONV_DT) [date; 8, 10, D]

the datum on which the data is based (DATUM) [character; 30, 30, C]

Field specifications are in the format **field descriptor (field name), [data type; input width, output width, field type code (c = character, d = date, i = integer, b = binary)]**

For initial capture of Series 1 TOPO-100K, the FMT_CON_SW and FMT_CONV_DT fields will be populated in bulk for each work unit with the software used to convert newly scanned layers (FMT_CON_SW) and the date that the conversion was carried out (FMT_CONV_DT).

Staff in Geoscience Australia's Validation and Testing cell will populate the "QC_PASSED" field of the layer quality table. The table will be submitted to the Validation and Testing cell with all other data included.

The layer frequency table has the following fields:

the feature code (FEAT_CODE) [character; 12, 12, C]

the frequency of occurrence of that feature code in the respective layer (FREQUENCY) [binary; 4, 5, B]

Field specifications are in the format **field descriptor (field name), [data type; input width, output width, field type code (c = character, d = date, i= integer, b = binary)]**

4.3 Feature Quality Information

The feature quality information provides feature specific quality information. The feature quality information will be stored in a Data Quality Table. There will be one Data Quality Table per tile, called <TILE CODE (without the preceding "S" at 250K)>DQT. As set out in chapter 3.5 every feature instance will have associated with it a data quality attribute *(q_info)* which will be the link to a record in the Data Quality Table. This table contains data quality information which is relevant to the specific feature instance. Data held in this indirect table consists of the following information about the feature instance:

- the reliability date of the spatial object
- the reliability date of the attribute object
- an estimate of the standard deviation of the horizontal positional accuracy
- an estimate of the standard deviation of the vertical positional accuracy
- the source agency of the feature.

The data quality table has the following fields:

- data quality pointer (Q_INFO) [character; 8, 8, C]
- reliability date of the spatial object (FEAT_REL) [date; 8, 10, D]
- the reliability date of the attribute object (ATT_REL) [date; 8, 10, D]
- the standard deviation of the horizontal positional accuracy (PLAN_ACC) [integer; 4, 4, I]
- the standard deviation of the vertical positional accuracy (ELEV_ACC) [integer; 4, 4, I]
- the name of the agency that performed the original capture (SOURCE) [character; 50, 50 C]

Field specifications are in the format **field descriptor (field name), [data type; input width, output width, field type code (c = character, d = date, i= integer, b = binary)]**

The reliability date of the spatial object **(feat_rel)** is the date of the latest source material where the position of a particular feature was verified.

The reliability date of the attribute object **(att_rel)** is the date of the latest material used to verify at least one attribute value for a feature.

For **first production of a 1:100 000 (TOPO-100K) Series 1 tile**, the Feature (feat_rel) and Attribute reliability (att_rel) dates will be populated as shown in the following 1:100 000 Scale Data Quality Table, and the 'tile completion date' will be the date production work was completed for the tile prior to its first submission to VAT.

For **revision of a 1:250 000 (TOPO-250K) Series 2 tile**, the Feature and Attribute Reliability dates (feat_rel and att_rel) for Q_INFOs with <tile-id>1,2,6 and 9 will be updated with the date of the earliest imagery used for the revision, in accordance with the following 1:250 000 Scale Data Quality Table. The Feature (feat_rel) and Attribute (att_rel) reliability dates already populated for Q_INFOs with <tile-id>3, 4, 5, 7, 8 and 10 will remain unchanged.

The estimate of the standard deviation of the horizontal positional accuracy (plan_acc) will be assigned according to the source material used to capture the feature and the conversion methodology.

Default values for the different feature classes' horizontal positional accuracy are detailed in the feature class dictionary in Appendix A.

The estimate of the standard deviation of the vertical positional accuracy (elev_acc) will be assigned according to the source material used to capture the feature and the conversion methodology. Default values for the different feature classes are detailed in chapter 3.6.5 Absolute Elevation Accuracy.

The source agency (source) will be the official name of the agency that performed the original capture of the spatial object, truncated if it is more than 50 characters long. Where contractors capture data on behalf of Geoscience Australia, the source agency will be GEOSCIENCE AUSTRALIA.

The rules used to code the Data Quality Pointer are set out in chapter 3.5 Data Quality Pointer Attribute.

1:100 000 SCALE DATA QUALITY TABLE

Q_INFO	FEAT_REL	ATT_REL	PLAN_ACC	ELEV_ACC	SOURCE
<tile-id>1	date of earliest imagery	date of earliest imagery	100	9999	
<tile-id>2	date of earliest imagery	date of earliest imagery	9999	9999	
<tile-id>3	tile completion date	tile completion date	100	25	
<tile-id>4	Earliest reliability date of base material / digital data	Earliest reliability date of base material / digital data	100	9999	
<tile-id>5	Earliest reliability date of base material / digital data	Earliest reliability date of base material / digital data	9999	9999	
<tile-id>6	date of earliest imagery	date of earliest imagery	10	15	
<tile-id>7	tile completion date	tile completion date	100	5	
<tile-id>8	tile completion date	tile completion date	9999	25	
<tile-id>9	date of earliest imagery	date of earliest imagery	1	9999	
<tile-id>10	tile completion date	tile completion date	100	1	

1:250 000 SCALE DATA QUALITY TABLE

Q_INFO	FEAT_REL	ATT_REL	PLAN_ACC	ELEV_ACC	SOURCE
<tile-id>1	date of earliest imagery	date of earliest imagery	100	9999	
<tile-id>2	date of earliest imagery	date of earliest imagery	9999	9999	
<tile-id>3	existing (populated) date	existing (populated) date	100	25	
<tile-id>4	existing (populated) date	existing (populated) date	100	9999	
<tile-id>5	existing (populated) date	existing (populated) date	9999	9999	
<tile-id>6	date of earliest imagery	date of earliest imagery	10	15	
<tile-id>7	existing (populated) date	existing (populated) date	100	5	
<tile-id>8	existing (populated) date	existing (populated) date	9999	25	
<tile-id>9	date of earliest imagery	date of earliest imagery	1	9999	
<tile-id>10	existing (populated) date	existing (populated) date	100	1	

5. Data Arrangement

The GEODATA Topographic Vector Products form part of a national, digital, spatial data environment for use by all users of digital spatial data. The features included in this product are arranged in themes and layers as follows.

All features include an attribute for feature code (feat_code) and q_info, and at 1:250 000 a UFI value. For more information on feature classes and associated attributes see Appendix A.

5.1 Framework Layer (All Themes)

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Framework	Polygon	Island Junction Mainland Sea Sea Wall State Border Tile Edge Waterline	Name, State/Territory State/Territory Name	Polygon Chain Polygon Polygon Chain Chain Chain Chain

5.2 Vegetation Theme

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Vegetation	Polygon	Woody Vegetation Mangrove Orchard or Vineyard Plantation Rainforest Tile Edge Vegetation Line Vegetation Void	Cover Density (100K), Growth Form (100K) Planting Type (100K) Planting Type (100K)	Polygon Polygon Polygon Polygon Polygon Chain Chain Polygon
Vegetation Miscellaneous	Linear	Windbreak		Chain

5.3 Infrastructure Theme

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Aeronautical Point	Point (250K)	Aircraft Facility	Name, Aircraft Facility Type	Point
Aeronautical Line	Chain (100K)	Taxiway		Chain
Aeronautical Area	Polygon (100K)	Aircraft Facility Aircraft Facility Line Aircraft Facility Void Airport Tile edge	Name, Aircraft Facility Type	Polygon Chain Polygon Polygon Chain
Built-up Areas	Polygon	Built-up Area Built-up Area Line Built-up Area Void Cemetery Park Rubbish Tip (100K) Tile edge	Name Name Name, Park Code	Polygon Chain Polygon Polygon Polygon Polygon Chain

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Localities	Point	Locality	Name, Locality Code	Point
Buildings Point	Point	Building	Building Code, Building Function (100K)	Point
Cultural Area	Polygon (100K)	Building Landmark Area Cultural Area Line Tile edge	Building Code, Building Function Name, Description	Polygon Polygon Chain Chain
Rail Transport	Point / Linear	Railway Railway Bridge Railway Causeway Railway Station Railway Tunnel Railway Overpass	Name, Tracks, Status, Gauge Name, Tracks, Status, Gauge Name, Tracks, Status, Gauge Name Name, Tracks, Status, Gauge Name, Tracks, Status, Gauge	Chain Chain/Point Chain Point Chain/Point Chain
Road Transport	Point / Linear	Ferry Route Foot Bridge (100k) Foot Track Ford Gate Road Road Bridge Road Causeway Road On Dam Road Tunnel Road Overpass Stock Grid	Name Name Name Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number Name, Classification, Formation, National Route Number, State Route Number	Chain Chain Chain Chain/Point Point Chain Chain/Point Chain Chain Chain/Point Chain Point
Utilities	Point / Linear	Aerial Cableway Conveyor Dam Dry dock Fence Gas Well Landmark Point Mine Storage Tank Yard	Name Name Name Description Name 	Chain Chain Chain Point Chain Point Point Point Point Point
Seismic Lines	Linear	Seismic line/Cleared line		Chain
Powerlines	Linear	Powerline		Chain
Pipelines	Linear	Pipeline	Product Code, Relationship	Chain

5.4 Hydrography Theme

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Drainage	Point / Linear	Canal Connector Lock Rapid Spillway Watercourse Waterfall Waterhole	Name Name, Perenniality, Hierarchy Name Name, Perenniality, Hierarchy Name, Perenniality, Hierarchy Name, Perenniality, Hierarchy Name Name, Perenniality	Chain Chain Point Chain Chain Chain Point Point

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Waterbodies	Polygon	Canal Junction Lake Land Subject to Inundation Mangrove Flat Marine Swamp Rapid Rapid Area Line Reservoir Saline Coastal Flat Salt Evaporator Settling Ponds Swamp Tile edge Waterbody Void Watercourse Waterline	Name Name, Perenniality Name Name, Perenniality, Hierarchy Name Name Name, Perenniality, Hierarchy 	Polygon Chain Polygon Polygon Polygon Polygon Polygon Chain Polygon Polygon Polygon Polygon Polygon Chain Polygon Polygon Chain
Offshore	Polygon	Foreshore Flat Offshore Line Offshore Void Reef Tile edge	 Name, Relationship, Reef 	Polygon Chain Polygon Polygon Chain
Navigation	Point	Lighthouse Offshore Rock Wreck	Name Name, Relationship Name, Relationship	Point Point Point
Waterpoint	Point	Bore Spring Water Tank Waterpoint Windpump	Name (100K) Name (100K) Name (100K) Name (100K), Waterpoint Code Name (100K)	Point Point Point Point Point
Marine Facilities	Linear	Boat Ramp (100K) Breakwater Jetty Wharf		Chain Chain Chain Chain

5.5 Relief Theme

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Spot Heights	Point	Spot Elevation	Elevation, Source, Point Determination	Point
Survey Marks	Point	Bench Mark Horizontal Control Point	Elevation, Code Elevation, Code	Point Point
Sand Ridges	Linear	Sand Ridge	Average Height	Chain
Relief Area	Polygon	Crater Distorted Surface Open Cut/Mining area Relief Area Line Relief Area Void Rocky Outcrops Sand Sand Dunes Tile edge		Polygon Polygon Polygon Chain Polygon Polygon Polygon Polygon Chain
Contours	Polygon	Contour Hypsometric Area Tile edge	Elevation, Contour Code Elevation 	Chain Polygon Chain
Auxiliary Contours	Chain (100K)	Auxiliary Contour	Elevation, Contour Code	Chain

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Morphology	Point / Linear	Cave Cliff Cutting Embankment Levee Razorback Pinnacle		Point Chain Chain Chain Chain Chain Point

5.6 Reserved Areas Theme

Layer	Layer Type	Feature Class	Attributes	Spatial Object
Security Areas	Polygon	Prohibited Area Prohibited Area Line Prohibited Area void Tile edge	Name, Authority Code	Polygon Chain Polygon Chain
Reserved Areas	Polygon	Reserve - Indigenous Area Reserve - Forestry Reserve - Nature Conservation Reserve - Water Supply Reserve Line Reserve Void Tile edge	Name, Authority Code Name, Authority Code Name, Authority Code Name, Authority Code	Polygon Polygon Polygon Polygon Chain Polygon Chain

