



Intergovernmental Committee on Surveying and Mapping



ePlan Protocol LandXML Mapping

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Amendment History

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2.1.1	12 April 2011	Nev Cumerford	Small Editorial Changes and Updated for Location element in Plan Feature re SOP.
2.1.2	6 August 2011	Nev Cumerford	Small editorial changes and the addition of some explanatory text in the following

			elements: <ul style="list-style-type: none">- Amendment- Author- Parcels
2.1.3	15 December 2015	Hamed Olfat	Amended sections 3.2 and 3.12 following the approved changes in 'CgPoints Cardinality & Attributes SOP'
2.1.4	30 May 2016	Hamed Olfat	Inserted a note in section 3.17 following 'Parcel Orientation SOP'

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1 Introduction

The Intergovernmental Committee on Surveying and Mapping (ICSM) is developing a national approach to electronic cadastral survey plans called ePlan. Initial efforts focused on developing an ePlan model, which provides a number of packages and classes (or objects and attributes) to describe a cadastral survey plan. The mechanism chosen for data exchange is LandXML, an international standard for exchanging geospatial information.

An ePlan protocol was developed to map components of the Model to LandXML elements and attributes. A LandXML file that is consistent with the ePlan Model is called a Cadastral Information File (CIF).

To assist the adoption of the ePlan Model, a document is required to provide a mapping from the ePlan Model to LandXML using the Protocol. This document includes much of the information in the ePlan protocol with explanations and examples of how to implement the ePlan model in LandXML as a CIF.

1.1 Purpose

This document specifies the requirements for construction of a CIF using LandXML. It is intended for jurisdictions and 3rd parties interested in implementing the ICSM National ePlan Model into their software and land administration systems.

1.2 Scope

The following are in scope for this document:

- Specification of every valid LandXML data element and attribute included in the ePlan CIF.
- Cardinality of the data elements according to the requirements of the ePlan Model i.e. whether an element is mandatory or optional and number of allowable occurrences.

The following are not in scope for this document:

- LandXML structural requirements to handle scenarios that require LandXML to be structured in a certain way to correctly capture the data.
- Specification of jurisdictional-specific requirements for CIFs, these are specified in jurisdictional level documentation. (Note: while this document defines every element required for the ePlan Model, not every jurisdiction will use all of the elements.)
- Conceptual level specifications that deal with the fundamental understanding of the ePlan model. These are contained in the National ePlan Model Specification.

The LandXML Schema has many more elements and attributes than are listed in this specification; the ones listed here are those used for an ePlan CIF and satisfy the requirements of the ePlan Model.

1.3 References

1. ICSM, *ePlan Protocol – Data Model*, version 1.0, 10 September, 2009, <http://icsm-eplan.govspace.gov.au/eplan-model/>
2. ICSM, *ePlan Protocol – LandXML Structural Requirements*, version 1.0, 15 October, 2010, <http://icsm-eplan.govspace.gov.au/eplan-protocol/>
3. ICSM, *ePlan Protocol – Schema Architecture*, version 2.0, 19 October, 2010, <http://icsm-eplan.govspace.gov.au/eplan-protocol/>
4. LandXML.org, *LandXML Schema*, version 1.2, 29 July, 2008, <http://www.landxml.org/schema/LandXML-1.2/LandXML-1.2.xsd>
5. W3C, *Extensible Markup Language (XML)*, version 1.0, Fifth Edition, <http://www.w3.org/TR/xml/>

1.4 Abbreviations

ePlan

A model for cadastral survey information defined by the ICSM

ICSM

The Intergovernmental Committee on Surveying and Mapping.

XML

Extensible mark–up language.

CIF

Cadastral Information File – The file type used to store the data specified by the ePlan Model.

LandXML

An XML schema used as the platform for a CIF.

1.5 Audience

The following is the primary audience of this document:

- Australian and New Zealand jurisdictions intending to implement ePlan in their land administration systems.
- 3rd party/commercial software developers looking to add ePlan functionality to their software.

In addition, this document will assist anyone interested in how cadastral information portrayed on paper cadastral survey plans is represented in a CIF using LandXML elements and attributes.

1.6 Using this document

Section 1 Introduction

Contains background information on the development of the ePlan CIF, important definitions and references.

Section 2 CIF Element Trees

Provides a list of the XML elements used for an ePlan CIF in the order that they appear in the LandXML schema. Each element name is a link to the relevant section of the document.

Section 3 CIF Elements and Attributes

Describes each element and its attributes in detail. Elements are presented in the order that they appear in the LandXML schema, and each element's child and parent elements are provided along with an example of use.

In section 3, tables are used to assist formatting information. Most table sections are self explanatory; however the following have special meaning:

1. **Cardinality:** this specifies how many child elements of a particular type an element must have, e.g.:
 - a. **0 - *** means zero or more (i.e. the child is optional)
 - b. **1** means exactly one (i.e. if the parent element is used, it must have this element as a child)
 - c. **1 - *** means at least one and possibly more
2. **Type:** this specifies the data type of an attribute. The type can be an XML base type such as "string", or custom type that is defined in the schema. Types used by the Protocol are listed in *Appendix A Attribute Type Definitions*. The following explains the difference between types:
 - a. *Base* – a raw value type, e.g. "string".
 - b. *LandXML Enumerations* – an enumerated type defined in the LandXML Schema, e.g. "stateType".
 - c. *Jurisdictional Enumerations* – an enumerated type defined by a jurisdictional enumerations schema, e.g. "parcelClass". These are defined as skeleton types in the LandXML schema that are extended by the jurisdictional enumerations.
 - d. *Custom Jurisdictional Enumerations* – defined as a base type in LandXML but with a custom enumeration type specified by a jurisdictional enumerations schema, e.g. string (horizontalDatumType) – string is the type defined by LandXML. horizontalDatumType is the custom enumerated type specified by jurisdictional enumeration schemas with enumerated values. Fields must only contain values from this enumerations list.
 - e. *Other Defined Types* – explicitly defined in as a type in LandXML but the underlying type is a base type. These are not extended in the jurisdictional schemas. The underlying LandXML base type is used.

3. Required: this specifies whether an attribute is:

- a. **Required (R)**—the attribute must be used when the element is used and must have a value that is not an empty string.
e.g. `Parcel` elements must have a `name` attribute.
- b. **Conditionally Required (CR)**—the attribute must be used if some condition is met.
e.g. the `CgPoints` element must have a `zoneNumber` attribute if the coordinates being used are MGA
- c. **Optional (O)**—the attribute may be used
e.g. `Amendment` elements have an optional `comments` attribute

XML examples

Throughout this document, XML examples use the following formatting:

```
<Parcel class="road" ...>
  <CoordGeom>
    <Line>
      <Start pntRef="..." />
      <End pntRef="..." />
    </Line>
    <Line>
      ...
    </Line>
  </CoordGeom>
</Parcel>
```

Notes:

1. Sections of code that are not important to the example are replaced by an ellipsis (...)
2. In XML, element names start with a capital letter and attribute names start with a lower case letter. These names can't contain spaces or special characters. In LandXML, names reflect the purpose of the element. Capitalisation is used to assist readability, e.g. `CoordinateSystem`.
3. XPath notation is used to refer to elements in places, e.g.
 - Full reference to Parcel elements: `/LandXML/Parcels/Parcel`
 - Partial reference to Line elements: `//Parcel/Line`
4. Where an attribute value says "set to..." the value in the CIF should be exactly the stated value.

2 CIF Element Trees

2.1 CIF Element Tree with Hyperlinks

```
XML Prolog
LandXML
  Units
    Metric
  CoordinateSystem
  FieldNote
  Application
  Author
  FeatureDictionary
  DocFileRef
  Amendment
  AmendmentItem
  CgPoints
  CgPoint
  Monuments
  Monument
  Parcels
  Parcel
  Parcels
  Title
  Exclusion
  LocationAddress
  RoadName
  AdministrativeArea
  AddressPoint
  ComplexName
  Center
  CoordGeom
  Line
  Start
  End
  Curve
  Start
  End
  Center
  IrregularLine
  Start
  End
  PntList2D or
  PntList3D
  VolumeGeom
  CoordGeom (minimum of 4)
  Line
  Start
  End
  Curve
  Start
```

```
        End
        Center
    IrregularLine
        Start
        End
        PntList3D
PlanFeatures
    PlanFeature
        CoordGeom
            Line
                Start
                End
            Curve
                Start
                End
                Center
            IrregularLine
                Start
                End
                PntList2D or
                PntList3D
        Location
        FieldNote
Surfaces
    Surface
        Definition
            Pnts
                P
            Faces
                F
Survey
    SurveyHeader
        HeadOfPower
        PurposeOfSurvey
        AdministrativeDate
        AdministrativeArea
        Annotation
        Personnel
        SurveyorCertificate
        FieldNote
    ObservationGroup
        ReducedObservation
            FieldNote
        ReducedArcObservation
            FieldNote
        RedHorizontalPosition
            FieldNote
        RedVerticalObservation
            FieldNote
    InstrumentSetup
        InstrumentPoint
```

2.2 CIF Element Tree Diagram

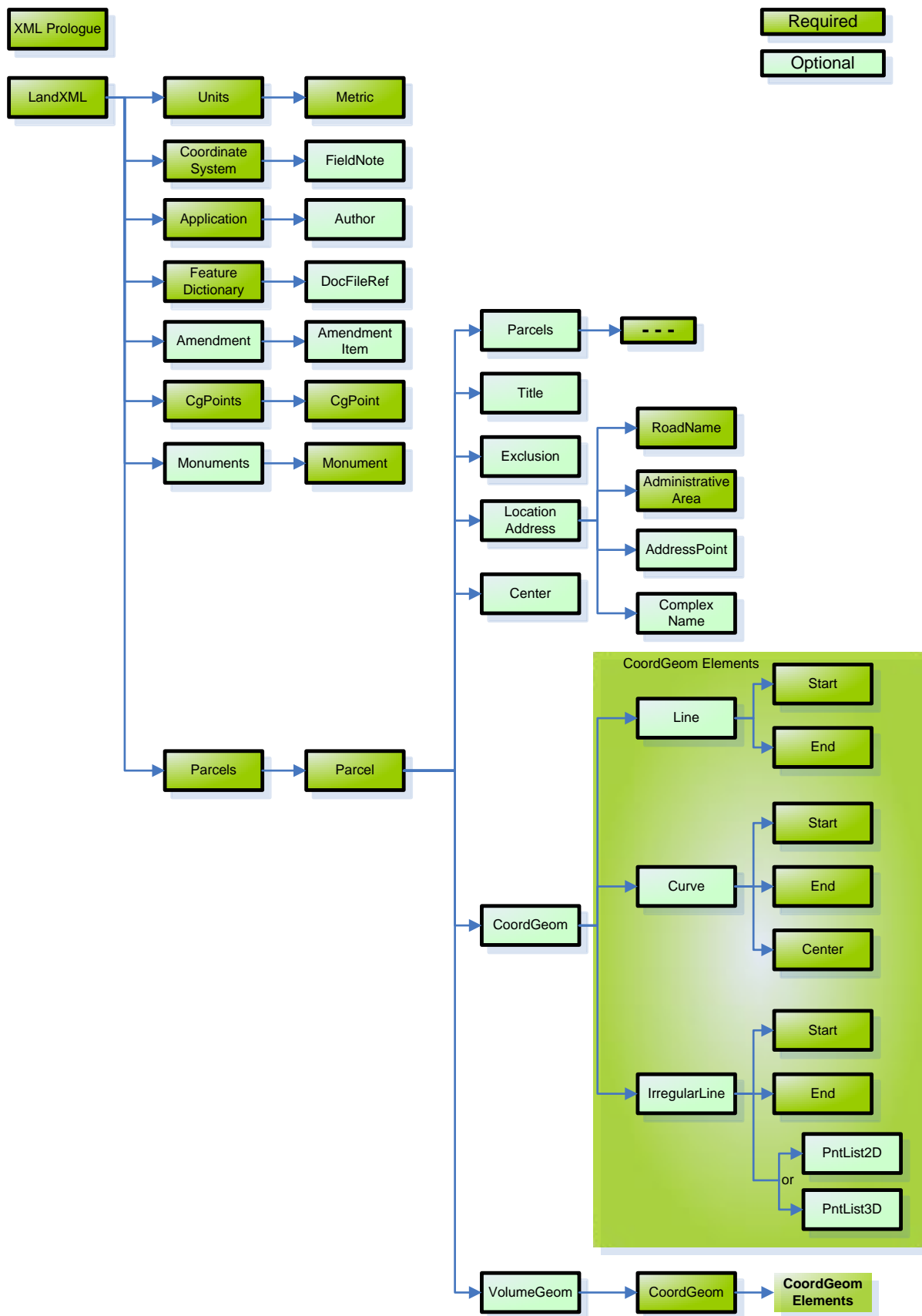


Figure 1: ePlan LandXML Element Tree - Part 1

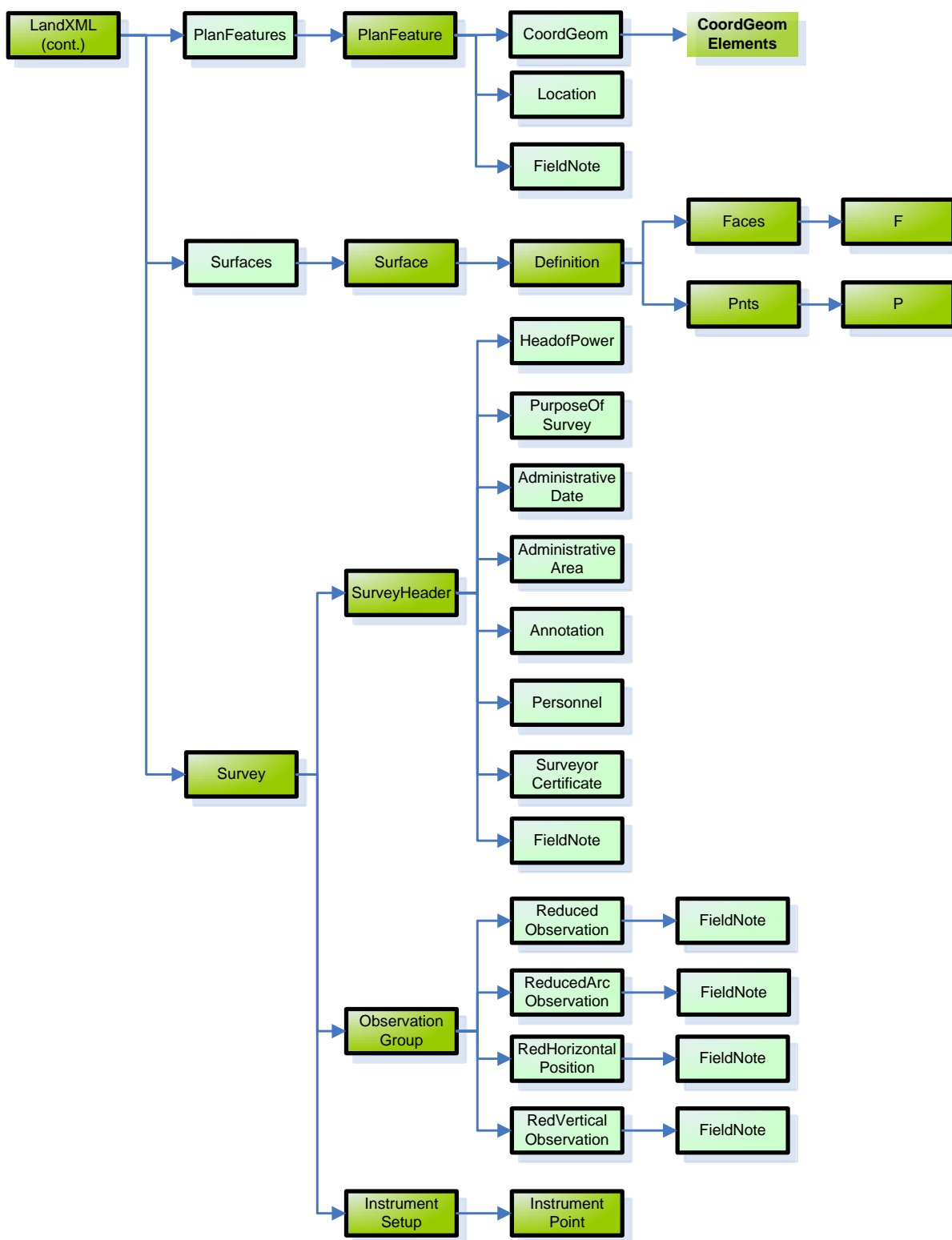


Figure 2: ePlan LandXML Element Tree - Part 2

3 CIF Elements and Attributes

3.1 XML Prolog

Description	All XML files must start with a prolog element that declares the version of XML being used and the character encoding. The XML prolog element is a requirement of the XML specification, see section 1.3 ref. 5.		
Example	<code><?xml version="1.0" encoding="utf-8"?></code>		
Parent Elements	None		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
version	string	R	Set to 1.0
encoding	string	R	Set to utf-8

3.2 LandXML

Description	The first element in the CIF must be a LandXML root element. All other elements are contained inside this element. A CIF must contain one LandXML element.		
Example	<pre><LandXML xmlns="http://www.landxml.org/schema/LandXML-1.2" date="2006-12-19" time="13:56:48" version="1.0" ... > ... Content of the CIF ... </LandXML></pre>		
Parent Elements	None		
Child Elements	Cardinality		
Units	1		
CoordinateSystem	1		
Application	1		
CgPoints	0 - *		
Amendment	0 - *		
Monuments	0 - 1		
Parcels	1		
PlanFeatures	0 - *		
Surfaces	0 - 1		
Survey	1		
FeatureDictionary	1		

Attribute	Type	Required	Description
date	date	R	Date that this version of the CIF was created. ISO 8601 format. e.g. 2010-10-31
time	time	R	Time that this version of the CIF was created. ISO 8601 format. e.g. 13:56:48
version	string	R	Version number of this CIF. e.g. 1.0
xmlns	string	CR	Required if using namespaces. XML namespace, set to: http://www.landxml.org/schema/LandXML-1.2
xmlns:xsi	string	O	XML schema instance, set to: http://www.w3.org/2001/XMLSchema-instance
xsi:schemaLocation	string	O	LandXML Schema Location for validation, set to: http://www.landxml.org/schema/LandXML-1.2 http://www.landxml.org/schema/LandXML-1.2/LandXML-1.2.xsd

3.3 Units

Description	This element defines the measurement units used by the CIF.		
Example	<pre> <LandXML...> <Units> <Metric ...></Metric> </Units> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements			Cardinality
Metric			1
Attribute	Type	Required	Description
			None

3.4 Metric

Description	This element specifies the metric units used in the file.		
Example	<pre> <LandXML...> <Units> <Metric linearUnit="meter" temperatureUnit="celsius" volumeUnit="cubicMeter" areaUnit="squareMeter" pressureUnit="milliBars" angularUnit="decimal dd.mm.ss" directionUnit="decimal dd.mm.ss"> </Metric> </Units> ... </LandXML> </pre>		
Parent Elements	Units		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
areaUnit	metArea	R	Set to "squareMeter"
linearUnit	metLinear	R	Set to "meter"
volumeUnit	metVolume	R	Set to "cubicMeter"
temperatureUnit	metTemperature	R	Set to "celsius"
pressureUnit	metPressure	R	Set to "milliBars"
angularUnit	angularType	R	Set to "decimal dd.mm.ss"
directionUnit	angularType	R	Set to "decimal dd.mm.ss"

3.5 CoordinateSystem

Description	The <code>CoordinateSystem</code> element defines the coordinate system used for CgPoint coordinates in the CIF.		
Example	<pre> <LandXML...> <CoordinateSystem horizontalDatum="Local" verticalDatum="Arbitrary" /> </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements			Cardinality
FieldNote		0 - *	
Attribute	Type	Required	Description
desc	string	O	Used to provide further details about the datum if required.

datum	String (surveyBgDatumType)	CR	Required if a local or arbitrary datum is used this is the orientation of the plan. For example it may be a Local Coordinate System using MGA Bearings
horizontalDatum	string (horzDatumType)	R	Datum of CgPoint horizontal coordinates, e.g. <i>Local, MGA, etc.</i>
verticalDatum	string (vertDatumType)	CR	Enumeration, required if 3D points are used. Datum of CgPoint z coordinate, e.g. <i>Arbitrary, AHD, etc.</i>
ellipsoidName	string (ellipsoidNameType)	CR	Enumeration, required if ellipsoid used. Name of ellipsoid.

3.6 Application

Description	The <i>Application</i> element records information about the surveying software application used to create the CIF.		
Example	<pre> <LandXML...> ... <Application name="ACME CAD 3D 2011" version="2011.0.0"> <Author .../> </Application> ... </LandXML> </pre>		
Parent Elements	<i>LandXML</i>		
Child Elements	Cardinality		
<i>Author</i>	0 - *		
Attribute	Type	Required	Description
name	string	R	The name of the application that created the CIF. e.g. <i>ACME CAD</i>
version	string	R	The version of the application e.g. <i>1.5.63</i>

3.7 Author

Description	The <i>Author</i> element records the details of the operator who created the CIF in the surveying software application. . This is used for contact and training purposes
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Example	<pre> <LandXML...> ... <Application ...> <Author createdBy="CAPTURE\jonesj" /> </Application> ... </LandXML> </pre>		
Parent Elements	Application		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
createdBy	string	R	The name of the person operating the application when the CIF was created

3.8 FeatureDictionary

Description	<p>The <code>FeatureDictionary</code> element specifies the version of the reference data and enumerations list used when building the CIF. Only one Feature dictionary is used to refer to the collection of jurisdictionally specific schemas, see “ePlan Protocol – Schema Architecture” Document. For example, LGA reference data lists may be changed more frequently than jurisdictional enumerations lists and therefore are versioned as a separate feature dictionary.</p>		
Example	<pre> <LandXML...> ... <FeatureDictionary name="ReferenceDataContext" version="NRWQLD-RD-3" /> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements	Cardinality		
<code>DocFileRef</code>	0 - *		
Attribute	Type	Required	Description
name	string	R	The name of the feature dictionary. Names are specified at the jurisdictional level based on the organisation of jurisdictional enumeration and reference data lists.
version	string	R	The version of the feature dictionary used for this CIF.

3.9 DocFileRef

Description	<p>The <code>DocFileRef</code> element records the details about the <code>FeatureDictionary</code> including the names, locations and attributes of the files that comprise the feature dictionary.</p>
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Example	<pre> <LandXML...> ... <FeatureDictionary name="ReferenceDataContext" version="NRWQLD-RD-3"> <DocFileRef name="au-gov-vic-icsm-cif-enumerated-types.xsd" location="http://www.someurl.gov.au/au-gov-vic-icsm-cif-enumerated-types.xsd" fileType="xsd" fileFormat="ASCII"/> </FeatureDictionary> ... </LandXML> </pre>		
Parent	FeatureDictionary		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
name	string	R	File name
location	anyURI	R	Uniform Resource Identifier for the file. Should be public or semi-public.
fileType	string	O	The file type (usually denoted by the file extension).
fileFormat	string	O	The format of the file (e.g. the text encoding, image format etc.)

3.10 Amendment

Description	<p>The Amendment element is used to record amendments made to the file. This element would not normally be used by the creator of the CIF, but by an agency that had received a CIF and wished to track amendments made after receipt. Its primary purpose is to track amendments after registration to satisfy legislative requirements. See the “ePlan Protocol – LandXML Structural Requirements for the application of this element as it may affect future import of CIF to applications.</p>		
Example	<pre> <LandXML...> ... <Amendment dealingNumber="9851236" amendmentDate="2010/08/30" comments="Corrections of monument details"> <AmendmentItem... /> <AmendmentItem... /> ... </Amendment> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements	Cardinality		
AmendmentItem	0 - *		

Attribute	Type	Required	Description
dealingNumber	string	CR	Required if the amendment was made after registration of the CIF and was related to a registered dealing.
amendmentDate	date	R	The date that the amendment took effect.
comments	string	R	A short note about the reason for the change and what it entails.

3.11 AmendmentItem

Description	The <code>AmendmentItem</code> element contains information about individual amendments. <code>AmendmentItem</code> elements require that the LandXML element being amended is uniquely identifiable in the file using its name attribute. Therefore <code>AmendmentItem</code> requires that every element in the file subject to an amendment must be named uniquely across the entire file. <code>AmendmentItem</code> is used primarily for the "strikeout" method where amendment history is tracked within the CIF rather than in a separate dataset. Specific requirements on this element can be found in section 2.4.1 of the LandXML Structural Requirements document.		
Example	<pre> <LandXML...> ... <Amendment ...> <AmendmentItem elementName="Monument" oldName="402" newName="709" /> </Amendment> ... </LandXML> </pre>		
Parent Elements	<code>Amendment</code>		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
elementName	string	R	The name of the element being amended, e.g. if a <code>ReducedObservation</code> element is being replaced then the value of <code>elementName</code> is "ReducedObservation"
oldName	string	CR	Required if an element is being deleted or replaced. If no <code>oldName</code> is supplied it means the element is a new addition to the file.
newName	string	CR	Required if a new element is being added to the file. If no <code>newName</code> is supplied it means that an element is deleted from the file.

3.12 CgPoints

Description	The <code>CgPoints</code> element is a container for all the <code>CgPoint</code> elements in the file. Anywhere else in the CIF that requires a <code>CGPoint</code> must reference a point in this list only.
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Example	<pre> <LandXML...> ... <CgPoints zoneNumber="55"> <CgPoint ...>...</CgPoint> <CgPoint ...>...</CgPoint> ... </CgPoints> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements			Cardinality
CgPoint			1 - *
Attribute	Type	Required	Description
zoneNumber	zoneNumberType	CR	If the horizontal datum as specified by the <code>CoordinateSystem</code> element is MGA then this field specifies the MGA zone for all the CgPoint coordinates. Note that if a survey crosses a zone boundary all of the CIF must be prepared in a single zone.
desc	string	O	Description of the coordinate geometry points collection.
name	string	O	Name of the coordinate geometry points collection.

3.13 CgPoint

Description	<p>A <code>CgPoint</code> represents a point in the CIF. They may represent boundary points, traverse points, reference marks, permanent survey marks and various administrative points. Elements link to CgPoints to attach survey information. Refer to section 2.3 of the LandXML Structural Requirements for a detailed explanation of the relationship between CgPoints and other elements in the CIF.</p> <p>Jurisdictions will use local conventions to name these points.</p> <p>The datum for these coordinates is specified by <code>LandXML/CoordinateSystem@</code>.</p>
Example	<pre> <LandXML...> ... <CgPoints> <!-- Note: coordinate values are stored as the value of the element. Coordinates are space delimited --> <CgPoint name="3-SP194012" state="proposed" pntSurv="traverse">54.239335 78.974338</CgPoint> ... </CgPoints> ... </LandXML> </pre>

Element Content	Coordinate values for the point. Two dimensional coordinates are a coordinate pair of the Northing followed by Easting. Three dimensional coordinates are a coordinate triplet: Northing, Easting and Height. Coordinates are separated by a single space.		
Parent Elements	CgPoints		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier for the point.
oid	string	O	Jurisdictional system identifier for the point, stored in respective jurisdictional point databases or DCDBs. Points created by the survey that have not been allocated an oid by the jurisdiction will not show this attribute.
state	stateType	R	The state of the CgPoint in the context of other CgPoints in the CIF.
pntSurv	survPntType	R	The point type. LandXML enumeration.
localUncertainty	double	O	Local uncertainty of the point in metres
latitude	latLongAngle	O	The latitude of the point
longitude	latLongAngle	O	The longitude of the point
code	string	O	The code of the station, link to other survey systems such as the geodetic framework.
surveyOrder	horizOrderType	O	This is the survey order assigned to the Latitude and Longitude and is usual a defined list.
desc	string	O	Description of the element.

3.14 Monuments

Description	The <code>Monuments</code> element is a container for <code>Monument</code> elements.		
Example	<pre> <LandXML...> ... <Monuments> ... <Monument ... /> <Monument ... /> <Monument ... /> ... </Monuments> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements	Cardinality		
<code>Monument</code>			1 - *
Attribute	Type	Required	Description

			None
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3.15 Monument

Description	The Monument element captures the data specified in section 2.5.2 Survey Marks of the National ePlan Model Specification. It defines the physical attributes of a survey mark on a plan. A Monument is always linked to a CgPoint using the pntRef attribute. The CgPoint defines the survey mark's position and identification. Multiple Monuments can be linked to the same CgPoint . For example, there may be a nail in concrete for the corner and a reference to a brick wall at the same point.		
Example	<pre> <LandXML...> ... <Monuments> ... <Monument name="mon-1" oID="54630" desc="Original lot peg found" pntRef="5-SP123456" type="peg" state="original" condition="reliable" originSurvey="SP654321" /> ... </Monuments> ... </LandXML> </pre>		
Parent Elements	Monuments		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier.
oID	string	O	Internal identifier for the Jurisdiction.
desc	string	CR	Surveyor's description of the monument. Required if the monumentType does not fully describe the monument.
pntRef	pointNameRef	R	Reference to the name attribute of the linked CgPoint .
type	monumentType	R	Jurisdictional list of monument types e.g. iron pin, peg, plaque.
state	monumentState	R	Jurisdictional list of monument states e.g. found, placed.
condition	monumentCondition	O	Jurisdictional list of monument condition values e.g. damaged, reliable.
originSurvey	string	O	If mark is not new, the plan number that placed the mark or last changed the details of the mark.

3.16 Parcels

Description	<p>The Parcels element is a container for individual Parcel elements. Parcels containers can be nested within Parcel elements to capture parcel relationships. See section 2.1 of the LandXML Structural Requirements (ref. 2) document for further information.</p> <p>There is only one LandXML/Parcels element allowed and this contains the collection of all parcels used in the CIF. This collect is also where all the parcels@parcel details such as areas and coordinate geometries are defined.</p> <p>For each //LandXML/Parcels/Parcel element a number of nested Parcels elements are allowed. These collections of Parcels are for purposes such as parcel aggregation and parcel allocations(linkages). All Parcel elements within these collections must refer to a parcel in the //LandXML/Parcels collection using the parcel@pclref attribute.</p>		
Example	<pre><LandXML...> ... <Parcels> <Parcel ...> <Parcels desc="partial" name="1" state="" ... /> </Parcel> ... </Parcels> ... </LandXML></pre>		
Parent Elements	LandXML		
Child Elements			Cardinality
	Parcel		1 - *
Attribute	Type	Required	Description
desc	string	O	Use for //Parcel/Parcels (Parcel Linkages) only. See section 2.1.7 of ref. 2 (LandXML Structural Requirements)
name	string	O	Use for //Parcel/Parcels (Parcel Linkages) only. See section 2.1.7 of ref. 2 (LandXML Structural Requirements)
state	stateType	O	Use for //Parcel/Parcels (Parcel Linkages) only. See section 2.1.7 of ref. 2 (LandXML Structural Requirements)

3.17 Parcel

Description	<p>The <code>Parcel</code> element provides a basic unit to describe a spatial area. A <code>Parcel</code> element can contain a nested <code>Parcels</code> element that has <code>Parcel</code> child elements. There are fewer required attributes for these "sub" parcels, generally only requiring a <code>name</code> and <code>pclRef</code>. Refer to section 2.1 of LandXML Structural Requirements (ref. 2).</p> <p>Note - The orientation of exterior ring of polygons for 2D and 3D Parcels must be clockwise.</p>		
Example	<pre> <LandXML...> ... <Parcels> <Parcel class="lot" parcelFormat="Standard" state="created" parcelType="single" name="1" oID=""> <Center .../> <CoordGeom ...> ... </CoordGeom> </Parcel> </Parcels> <Title .../> <Exclusions .../> </LandXML> </pre>		
Parent Elements	Parcels		
Child Elements	Cardinality		
Center	0 - 1		
CoordGeom	0 - 1		
VolumeGeom	0 - 1		
Parcels	0 - *		
Title	0 - *		
Exclusion	0 - *		
LocationAddress	0 - *		
Attribute	Type	Required	Description
name	string	R	Jurisdictionally defined parcel identifier. Must be unique in the ePlan file. For example, the lot number/parcel number etc. can be used. For multipart parcels, a format defined by jurisdictions ensures unique identification.
oID	string	O	Jurisdictional identifier for internal datasets such as jurisdictional DCDBs.

area	double	O	The legal area. May be required, must be in units as specified in <i>Units</i> element
desc	string	CR	Conditional, if the parcel class="road", description must contain a road name or label. Other conditional requirements are defined at the jurisdictional level.
owner	string	O	For parcels that require a beneficiary e.g. vested roads, easement beneficiaries.
parcelType	string (parcelTypeType)	R	The parcel construct type. e.g. <i>single, multipart, part</i>
state	parcelStateType	R	The state of the parcel in the context of other parcels on the plan. e.g. <i>adjoining, affected, created, extinguished</i>
class	parcelClass	R	In the context of the survey plan, the class that a parcel belongs to i.e. its grouping. e.g. <i>Lot, Common Property, Road, Easement</i>
useOfParcel	useOfParcelType	O	Where further information is required to define the use of a parcel, the value is specified here. e.g. <i>Parish, County, Local Government, Public Reserve, various easement purposes.</i>
parcelFormat	parcelFormat	O	Describes the physical format of a parcel. e.g. <i>Standard, Building, Volumetric</i>
buildingNo	string	O	Mandatory where <i>parcelFormat="Building"</i> Assigned by surveyor
buildingLevelNo	string	O	Mandatory where <i>parcelFormat="Building"</i> Assigned by surveyor
volume	string	O	Mandatory where <i>parcelFormat="Volumetric"</i>
pclRef	parcelNameRef	CR	Reference used to link Parcel elements. See section 2.1 of LandXML Structural Requirements for details on use.
lotEntitlements	string	CR	The lot entitlement for Owners Corporation, Body Corporate or scheme land entity. See § 1.3 References - 2 ICSM, <i>ePlan Protocol – LandXML Structural Requirements, version 1.0, 15 October, 2010, section 2.1.7.6.1</i>

liabilityApportionment	string	CR	The liability for Owners Corporation, Body Corporate or scheme land entity. See § 1.3 <i>References - 2 ICSM, ePlan Protocol – LandXML Structural Requirements, version 1.0, 15 October, 2010, section 2.1.7.6.1</i>
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3.18 Title

Description	The Title element captures all references between parcels in the ePlan to legal documents. This includes land titles but can also include any other legal document or parcel identifier that define rights or ownership of land attached to the parcel. See section 2.1.4 of LandXML Structural Requirements for a detailed description of Title element use.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <Title name="123/1234" titleType="Freehold"/> ... </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	Parcel		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
name	string	R	The reference of the legal document or parcel.
titleType	anySimpleType (titleTypeType)	R	Jurisdictional list of title types

3.19 Exclusions

Description	Exclusions define a reserved area with no defined spatial extent. For example, a council may reserve 10ha for a future road. A single parcel may have multiple Exclusions for different purposes.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> ... <Exclusions exclusionType="road" area="550"/> ... </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	Parcel		

Child Elements			Cardinality
None			
Attribute	Type	Required	Description
exclusionType	exclusType	R	The purpose of the area being excluded from the parcel
area	double	R	The area being excluded from the parcel

3.20 LocationAddress

Description	The <code>LocationAddress</code> element contains street address information for its parent element.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <LocationAddress addressType="" flatType="" flatNumber="" floorLevelType="" floorLevelNumber="" numberFirst="" numberSuffixFirst="" numberLast="" numberSuffixLast=""> <ComplexName.../> <RoadName.../> <AdministrativeArea.../> <AddressPoint.../> </LocationAddress> </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	<code>Parcel</code>		
Child Elements			Cardinality
<code>ComplexName</code>			0 - *
<code>RoadName</code>			1 - *
<code>AdministrativeArea</code>			1 - *
<code>AddressPoint</code>			0 - *
Attribute	Type	Required	Description
addressType	addressTypeType	R	The type of the address. A Parcel could have many addresses as it could have several frontages and be used for different purposes. For example it may have a primary address and several aliases.
flatType	flatTypeType	O	The type of the flat, e.g., unit, townhouse, etc
flatNumber	string	O	The number of the flat
floorLevelType	floorLevelTypeType	O	The type of the floor level
floorLevelNumber	string	O	The number of the floor level

numberFirst	int	O	The street address number or the first street address number in a range of numbers.
numberSuffixFirst	string	O	The alpha suffix of the first street address number. E.g., A
numberLast	int	O	The last street address number in a range of numbers.
numberSuffixLast	string	O	The alpha suffix of the last street address number. E.g., B

3.21 ComplexName

Description	The <code>ComplexName</code> element is used to store the site name and building name.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <LocationAddress ...> <ComplexName desc="Riverview" priority="1"/> <RoadName.../> <AdministrativeArea.../> <AddressPoint.../> </LocationAddress> ... </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	<code>LocationAddress</code>		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
desc	string	R	The site name, building name or other name.
priority	int	R	The priority of the <code>ComplexName</code> is relation to other <code>ComplexName</code> being defined in the <code>LoactionAddress</code>

3.22 RoadName

Description	The <code>RoadName</code> element is used to store the details of the road fronted by the property.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <LocationAddress ...> <ComplexName .../> <RoadName roadNameType="Street" roadName="Smith" roadNameSuffix="" roadType="Public Highway" /> <AdministrativeArea.../> <AddressPoint.../> </LocationAddress> ... </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	<code>LocationAddress</code>		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
<code>roadNameType</code>	<code>roadNameTypeType</code>	R	The type of the road name, e.g. Street, Lane, etc
<code>roadName</code>	string	R	The name of the road (without Type or suffix)
<code>roadNameSuffix</code>	<code>roadNameSuffixType</code>	O	The suffix type of the road name, e.g., East, Upper, West, etc
<code>roadType</code>	<code>roadTypeType</code>	R	the type of the road, e.g., public or private
<code>pclRef</code>	<code>parcelNameRefs</code>	O	Reference to physical road parcel.

3.23 AdministrativeArea

Description	The <code>AdministrativeArea</code> element contains the administrative areas relevant to this survey. It defines a number of different types of administrative areas such as local government and locality. Each entry can link to a parcel element that defines the boundaries of the administrative area.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <LocationAddress ...> <ComplexName .../> <RoadName .../> <AdministrativeArea adminAreaType="Locality" adminAreaName="Moonee Ponds" adminAreaCode="1234" pclRef="1234MooneePonds" /> <AddressPoint.../> </LocationAddress> ... </Parcel> </Parcels> <Survey> <SurveyHeader ...> <AdministrativeArea adminAreaType="LGA" adminAreaName="Moonee Valley" adminAreaCode="349" pclRef="349MooneeValley" /> ... </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	<code>LocationAddress</code> <code>SurveyHeader</code>		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
<code>adminAreaType</code>	<code>adminAreaTypeType</code>	R	Jurisdictional list of administrative area types e.g. LGA, Parish.
<code>adminAreaName</code>	string	R	The full name of the administrative area.
<code>adminAreaCode</code>	string	O	The code or identifier of the administrative area.
<code>pclRef</code>	<code>parcelNameRefs</code>	O	A reference to the <code>name</code> of a parcel element representing this administrative area.

3.24 AddressPoint

Description	The <code>AddressPoint</code> element describes the geographic location of an address using coordinates either contained in a linked <code>CgPoint</code> element or as a space delimited list inside the element.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <LocationAddress ...> <ComplexName .../> <RoadName .../> <AdministrativeArea.../> <AddressPoint addressPointType="Residential" pntRef="pnt1"/> </LocationAddress> ... </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	<code>LocationAddress</code>		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
<code>addressPointType</code>	<code>addressPointTypeType</code>	R	Jurisdictional list of address point types
<code>pntRef</code>	<code>pointNameRef</code>	R	The <code>CgPoint</code> representing the location of the address point. Value must be a <code>CgPoint@name</code> attribute in the CIF.

3.25 Center

Description	<p>The <code>Center</code> element represents either:</p> <ul style="list-style-type: none"> • A nominal centre point for a <code>Parcel</code> element, or • The centre of a <code>Curve</code> element <p>The coordinates are stored in a <code>CgPoint</code> element. The <code>pntRef</code> attribute references the <code>CgPoint@name</code> attribute.</p>		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <Center pntRef="pnt1" ></Center> ... <CoordGeom...> <Curve> <Start.../> <End.../> <Center pntRef="23" /> </Curve> </CoordGeom> </Parcel> </Parcels> <CgPoints> <CgPoint name="pnt1" ...>123.123 321.321</CgPoint> <CgPoint name="23" ...>344.543 834.565</CgPoint> </CgPoints> ... </LandXML> </pre>		
Parent Element	<p><code>Parcel</code> <code>Curve</code></p>		
Child Elements		Cardinality	
None			
Attribute	Type	Required	Description
pntRef	pointNameRef	R	Value must be a <code>CgPoint@name</code> attribute in the CIF.

3.26 CoordGeom

Description	The <code>CoordGeom</code> element is a container for the spatial components of its parent element.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom name="CG-1-PS123456" desc="" state="existing" oID=""> <Line ...> <Start ... /> <End ... /> </Line> ... </CoordGeom> </Parcel> </Parcels> ... <PlanFeatures ...> <PlanFeature ...> <CoordGeom name="CG-1-PF1" desc="" state="existing" oID=""> <Line ...> <Start ... /> <End ... /> </Line> </CoordGeom> </PlanFeature> </PlanFeatures> ... </LandXML> </pre>		
Parent Elements	Parcel PlanFeature VolumeGeom		
Child Elements	Cardinality		
<code>Line</code>	0 - *		
<code>IrregularLine</code>	0 - *		
<code>Curve</code>	0 - *		
Attribute	Type	Required	Description
desc	string	O	Free text description of the element
name	string	CR	Unique ePlan identifier. Attribute is used to associate observations to parcels and identifies if an observation is used for a boundary.
state	stateType	O	LandXML state type
oID	string	O	

3.27 Line

Description	The Line element represents a line between two points. The line may be 2D or 3D depending on the coordinates of the points that define it.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <Line name="LN-1" desc="" oID="" state="" note="" > <Start ... /> <End ... /> </Line> ... </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	CoordGeom		
Child Elements	Cardinality		
Start	1		
End	1		
Attribute	Type	Required	Description
desc	string	O	Free text description of the element
name	string	O	Unique ePlan identifier
state	stateType	O	LandXML state type
oID	string	O	Jurisdictional identifier
note	string	O	For annotation purposes

3.28 Curve

Description	A Curve is a specific type of regular line between two points. It is defined by its start and end points, its radius, direction of rotation and centre point (i.e. radius point).		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <Curve radius="1" rot="cw" name="5b" desc="" state="existing" oID="123456" note=""> <Start ... /> <Center ... /> <End ... /> </Curve> </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	CoordGeom		
Child Elements	Cardinality		
Start	1		
Center	1		
End	1		
Attribute	Type	Required	Description
radius	double	R	The radius of the curve
rot	Clockwise	R	Direction from Start to End
name	string	O	Unique ePlan identifier
desc	string	O	Free text description of the element
oID	string	O	Jurisdictional identifier
state	stateType	O	For use with amendments. LandXML enumeration.
note	string	O	

3.29 IrregularLine

Description	Irregular lines are used to capture non-surveyed lines (e.g. river boundary). An <i>IrregularLine</i> must have a <i>CgPoint</i> as its start and finish point and a point list to define the line between the start and end points.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <IrregularLine name="IL-1" desc="Some river" oID="" state="" note="" source=""> <Start ... /> <End ... /> <PntList2D .../> </IrregularLine> </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	CoordGeom		
Child Elements	Cardinality		
Start	1		
End	1		
PntList2D or PntList3D	1		
Attribute	Type	Required	Description
name	string	O	Unique ePlan identifier
desc	string	R	Free text description of the element. If the boundary is an irregular feature then the feature must be described e.g. "The Left Bank of the Darling River"
oID	string	O	Jurisdictional identifier
state	stateType	O	LandXML state type
note	string	O	For annotation purposes
source	string	O	Required if the line has been adopted from another source. E.g. a previous survey <i>SP1234</i> .

3.30 Start

Description	The Start element represents the start of a number of linear elements such as Curve , Line , IrregularLine (<i>cf. End</i>).		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <Curve ...> <Start pntRef="214"/> <End ... /> <Center ... /> </Curve> </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	Curve IrregularLine Line		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
pntRef	pointNameRef	R	Value must be a CgPoint@name attribute in the CIF.

3.31 End

Description	The End element represents the end of a number of linear elements such as Curve , Line , IrregularLine (<i>cf. Start</i>).		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <Curve ...> <Start .../> <End pntRef="215" /> <Center ... /> </Curve> </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		

Parent Elements	Curve IrregularLine Line		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
pntRef	pointNameRef	R	Value must be a <code>CgPoint@name</code> attribute in the CIF.

3.32 PntList2D

Description	<p>The <code>PntList2D</code> element is used with associated <code>Start</code> and <code>End</code> elements to define a two dimensional line using a sequence of space separated (y, x) or (northing, easting) coordinate pairs that are the content of the element.</p> <p>The first and last coordinate pair must be the same as the associated <code>Start</code> and <code>End</code> points respectively (therefore the element must contain at least two coordinate pairs).</p>		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <IrregularLine ...> <Start .../> <End .../> <PntList2D> 11.11 22.22 ... 33.33 44.44 </PntList2D> </Curve> </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Element Content	<p>A space delimited list of coordinate values in Northing Easting pairing.</p> <pre><PntList2D>N₀ E₀ N₁ E₁ ... N_n E_n</PntList2D></pre>		
Parent Elements	IrregularLine		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
			None

3.33 PntList3D

Description	<p>The <code>PntList3D</code> element is used with associated <code>Start</code> and <code>End</code> elements to define a three dimensional line using a sequence of space separated (y, x, z) or (northing, easting, height) coordinate sets that are the content of the element. The first and last coordinate set must be the same as the associated <code>Start</code> and <code>End</code> points respectively (therefore the element must contain at least two coordinate sets).</p>		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <CoordGeom ...> <IrregularLine ...> <Start .../> <End .../> <PntList3D> 11.11 22.22 9.87 ... 33.33 44.44 10.65 </PntList3D> </Curve> </CoordGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Element Content	<p>A space delimited list of coordinate values in Northing Easting Height. <code><PntList3D>N₀ E₀ H₀ N₁ E₁ H₁ ... N_n E_n H_n</PntList3D></code></p>		
Parent Elements	<p><code>IrregularLine</code></p>		
Child Elements		Cardinality	
None			
Attribute	Type	Required	Description
			None

3.34 VolumeGeom

Description	Defines the properties of a 3D Coordinate Geometry collection.		
Example	<pre> <LandXML...> ... <Parcels> <Parcel ...> <VolumeGeom name="" desc="" state="" oID=""> <CoordGeom ... /> <CoordGeom ... /> <CoordGeom ... /> <CoordGeom ... /> </VolumeGeom> </Parcel> </Parcels> ... </LandXML> </pre>		
Parent Elements	Parcel		
Child Elements			Cardinality
CoordGeom			4 - *
Attribute	Type	Required	Description
name	string	O	Unique ePlan identifier
desc	string	O	Free text description of the element
state	stateType	O	For use with amendments. LandXML enumeration.
oID	string	O	Jurisdictional identifier

3.35 PlanFeatures

Description	A container for <code>PlanFeature</code> elements. Multiple <code>PlanFeatures</code> elements are used as a container for a specific category of plan feature.		
Example	<pre> <LandXML...> ... <PlanFeatures name="PFGROUP1" desc="Occupation"> <PlanFeature.../> ... </PlanFeatures> <PlanFeatures name="PFGROUP2" desc="Feature"> <PlanFeature.../> ... </PlanFeatures> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements			Cardinality
PlanFeature			1 - *
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier.

desc	string	O	Category of plan feature e.g. occupation or feature.
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3.36 PlanFeature

Description	The <code>PlanFeature</code> element defines any spatial object on a plan where a <code>Parcel</code> element is not required. Some examples are Features and Occupation. This element can be used to capture closed polygons, lines and points.		
Example	<pre> <LandXML...> ... <PlanFeatures ...> <PlanFeature name="PF1" desc="Driveway"> <CoordGeom ...> <Line ...> <Start ... /> <End ... /> </Line> ... </CoordGeom> </PlanFeature> </PlanFeatures> ... </LandXML> Or <LandXML...> ... <PlanFeatures ...> <PlanFeature name="PF1" desc="Driveway"> <Location .../> </PlanFeature> </PlanFeatures> ... </LandXML> </pre>		
Parent Elements	<code>PlanFeatures</code>		
Child Elements	Cardinality		
<code>CoordGeom</code>	0..1		
<code>Location</code>	0..1		
<code>FieldNote</code>	0 - *		
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier
desc	string	R	Free text description of the element

3.37 Surfaces

Elements that fall under Surfaces are used for 3D plans. **The specification of these elements has not been finalised and is included for future use only.**

Description	The <code>Surfaces</code> element is a container for <code>Surface</code> elements.		
Example	<pre> <LandXML...> ... <Surfaces name="" desc="" oID="" state=""> <Surface ...> <Definition ...> <Pnts> <P .../> </Pnts> <Faces> <F .../> </Faces> </Definition> ... </Surface> ... </Surfaces> ... </LandXML> </pre>		
Parent Elements	LandXML		
Child Elements			Cardinality
<code>Surface</code>			1 - *
Attribute	Type	Required	Description
name	string	O	The name of the collection of surfaces
desc	string	O	The description of the collection of surfaces
state	stateType	O	LandXML state type

3.38 Surface

Description	To be confirmed. The <code>Surface</code> element defines a surface.		
Example	<pre> <LandXML...> ... <Surfaces ...> <Surface name="" desc="" oID="" state=""> <Definition ...> <Pnts> <P .../> </Pnts> <Faces> <F .../> </Faces> </Definition> ... </Surface> ... </Surfaces> ... </LandXML> </pre>		

Parent Elements	Surfaces		
Child Elements			Cardinality
Definition			1 - *
Attribute	Type	Required	Description
name	string	R	The unique name of the surface
desc	string	O	The description of the surface
oldID	string	O	The jurisdictional identifier of the surface
state	stateType	O	LandXML state type

3.39 Definition

Description	To be confirmed. The Definition element contains the elements that define all or part of the parent Surface element.		
Example	<pre> <LandXML...> ... <Surfaces ...> <Surface> <Definition surfType="Wall" area2DSurf="123" area3dSurf="234" elevMax="2" elevMin="2"> <Pnts> <P .../> </Pnts> <Faces> <F .../> </Faces> </Definition> ... </Surface> ... </Surfaces> ... </LandXML> </pre>		
Parent Elements	Surface		
Child Elements			Cardinality
Pnts			1 - *
Faces			1 - *
Attribute	Type	Required	Description
surfType	surfTypeEnum	R	The surface type, e.g. TIN or Grid.
area2DSurf	double	O	The area of the 2D surface
area3DSurf	double	O	The area of the 3D surface
elevMax	double	O	The maximum elevation in the surface
elevMin	double	O	The minimum elevation in the surface

3.40 Pnts

Description	To be confirmed. The collection of points that defined the surface. The "P" point id values are unique per surface.		
Example	<pre> <LandXML...> ... <Surfaces ...> <Surface> <Definition ...> <Pnts> <P .../> <P .../> </Pnts> <Faces> <F .../> </Faces> </Definition> ... </Surface> ... </Surfaces> ... </LandXML> </pre>		
Parent Elements	Definition		
Child Elements		Cardinality	
P		1 - *	
Attribute	Type	Required	Description
			None

3.41 Faces

Description	To be confirmed. The collection of faces that define the surface.		
Example	<pre> <LandXML...> ... <Surfaces ...> <Surface> <Definition ...> <Pnts> <P .../> </Pnts> <Faces> <F .../> </Faces> </Definition> ... </Surface> ... </Surfaces> ... </LandXML> </pre>		
Parent Elements	Definition		
Child Elements		Cardinality	
F		1 - *	
Attribute	Type	Required	Description
desc	string	O	Optional description
name	string	O	Unique ePlan identifier.
state	string	O	For amendment purpose. LandXML enumeration.

3.42 P

Description	To be confirmed. A 3D surface point containing an id attribute and a space delimited northing, easting and elevation values.		
Example	<pre> <LandXML...> ... <Surfaces ...> <Surface> <Definition ...> <Pnts> <P id="XYZ">N₀ E₀ H₀ N₁ E₁ H₁ ... N_n E_n H_n</P> <P .../> </Pnts> <Faces> <F .../> </Faces> </Definition> </Surface> </Surfaces> ... </LandXML> </pre>		
Element Content	As for CgPoint		
Parent Elements	Pnts		
Child Elements		Cardinality	
None			
Attribute	Type	Required	Description
id	positiveInteger	R	Used by surface faces as a reference to the point

3.43 F

Description	To be confirmed. A surface face. It contains a space delimited list of references to P elements that define the face: for 3 a TIN or 4 for a grid surface.		
Example	<pre> <LandXML...> ... <Surfaces ...> <Surface> <Definition ...> <Pnts> <P .../> </Pnts> <Faces> <F>ID₀ ID₁ ID₂</F> ... </Faces> </Definition> </Surface> ... </Surfaces> ... </LandXML> </pre>		
Element Content	A space delimited list of P element id attribute values (P@id). 3 for a TIN or 4 for a grid.		
Parent Elements	Faces		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
i	integer	O	To be confirmed
n	FaceType	O	To be confirmed
b	positiveInteger	O	To be confirmed

3.44 Survey

Description	The Survey element contains the survey components of the ePlan.		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader .../> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	LandXML		

Child Elements			Cardinality
SurveyHeader			1
ObservationGroup			1
InstrumentSetup			1 - *
Attribute	Type	Required	Description
			None

3.45 SurveyHeader

Description	The <code>SurveyHeader</code> element contains administrative information about the survey.	
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader name="PS123456" desc="Plan of lot 1 on PS123456" jurisdiction="Victoria" surveyorFirm="Reeds Consulting" surveyorReference="2314jfxd" surveyFormat="Standard" type="surveyed" surveyStatus="Lodged" documentStatus="Signed" fieldNoteFlag="N" fieldNoteReference="" fieldReport="" communityTitleSchemeNo="" communityTitleSchemeName="" submissionDate="21/12/2010" > <HeadOfPower .../> <PurposeOfSurvey .../> <AdministrativeDate.../> <AdministrativeArea .../> <Annotation .../> <Personnel .../> <SurveyorCertificate .../> <CoordinateSystem .../> <FieldNote .../> </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>	
Parent Elements	Survey	
Child Elements		Cardinality

HeadOfPower			1 - *
PurposeOfSurvey			1 - *
AdministrativeDate			0 - *
AdministrativeArea			0 - *
Annotation			0 - *
Personnel			0 - *
SurveyorCertificate			0 - *
FieldNote			0 - *
Attribute	Type	Required	Description
name	string	R	The identifier of this ePlan file.
desc	string	O	Optional description of the plan.
jurisdiction	jurisdictionType	R	The jurisdiction this plan was created for.
surveyorFirm	string	O	The name of the surveying firm that lodged this file.
surveyorReference	string	O	A space for the surveying firms internal reference ID.
surveyFormat	surveyFormatType	O	Format of the survey. e.g. <i>Standard</i> , <i>multilevel</i> , <i>strata</i>
type	surveyType	O	The plan type. e.g. <i>compiled</i> , <i>computed</i> , <i>surveyed</i>
surveyStatus	surveyStatusType	O	Status of the survey
documentStatus	documentStatusType	O	Status of the survey document
fieldNoteFlag	boolean	O	A flag used to indicate whether field notes have been attached as a separate file.
fieldNoteReference	string	O	The reference ID for the attached field notes documents.
fieldReport	string	O	Field report information captured in the ePlan file if necessary.
communityTitleSchemeNo	int	O	If an Owners Corporation or Body Corporate applies to this plan, the ID is specified here. Note: if the jurisdiction requires multiple OCs per plan, see § 1.3 <i>References - 2 ICSM, ePlan Protocol – LandXML Structural Requirements, version 1.0, 15 October, 2010, section 2.1.7.6.1</i>
communityTitleSchemeName	string	O	If an Owners Corporation or Body Corporate applies to this plan, the name is specified here.
submissionDate	date	O	Date the plan was submitted.

3.46 HeadOfPower

Description	The <code>HeadOfPower</code> specifies the authority that gives the approver the power to approve the plan and information contained. Generally this relates to an Act of parliament or Regulation. Multiple <code>HeadOfPower</code> values can be specified if required where multiple Acts or Regulation documents apply to the plan.		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <HeadOfPower name="Survey Act 2003"/> ... </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	SurveyHeader		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
name	headOfPowerType	R	Enumerated head of power value.

3.47 PurposeOfSurvey

Description	The <code>PurposeOfSurvey</code> element describes the purpose of the survey. Multiple purpose values are permitted as per jurisdictional requirements.		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <PurposeOfSurvey name="Subdivision"/> <PurposeOfSurvey name="Creation of Easement"/> ... </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	SurveyHeader		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
name	purpSurvType	R	Enumerated survey purpose field

3.48 AdministrativeDate

Description	The <code>AdministrativeDate</code> element captures a list of relevant administrative dates used in the jurisdictions plan lodgement process.		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <AdministrativeDate adminDateType="Deposited" adminDate="2010-01-01" /> ... </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	SurveyHeader		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
adminDateType	adminDateTypeType	R	A jurisdictional list of date types
adminDate	date	R	The date value

3.49 Annotation

Description	The <code>Annotation</code> element is used in conjunction with the jurisdictional annotations schema (see § 1.3 References - 3 ICSM, ePlan Protocol – Schema Architecture, version 2.0, 19 October, 2010,)		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <Annotation type="" name="" desc=""pclRef="" /> ... </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	SurveyHeader		
Child Elements			Cardinality
None			

Attribute	Type	Required	Description
type	annotationType	R	This is a category of annotation and is a defined list per jurisdiction. An Annotation could be based on the plan as a general statement or specific to a parcel or number of parcels, e.g. a Compilation Certificate or Area of New Road statement. The full text of an annotation is usually defined by jurisdictional regulations and guidelines. The type field is used to manage the validation process for the annotation.
name	string	R	This is the unique name of the Annotation and is used for tracking the reference and amendments.
desc	string	R	The actual text of the statement e.g. Total area of new road 5.123ha. This description may be required in a specific format as set out in regulations.
pclRef	parcelNameRefs	CR	A list of one or more space separated Parcel@name attributes. Required if the annotation refers to a parcel, the parcel must be defined in the CIF. The pclRefs attribute allows referencing action statements to one or more parcels. A conditional field as some annotations do not refer to parcels, e.g. "Marks set at all new corners" or an annotation describing a Non-Statutory Easement.

3.50 Personnel

Description	The <code>Personnel</code> element captures information about the personnel who participated in the survey and the surveyor who endorsed the survey.		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <Personnel name="" role="" regType="" regNumber="" /> </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	<code>SurveyHeader</code>		
Child Elements	Cardinality		
None			
Attribute	Type	Required	Description
name	string	R	Full name of the surveyor as registered.
role	surveyorRoleType	R	The role the surveyor played in the survey.
regType	registrationType	R	Level of registration.
regNumber	string	R	Surveyor's board registration number

3.51 SurveyorCertificate

Description	The <code>SurveyorCertificate</code> element is used in conjunction with the jurisdictional certificates schema (see § 1.3 References - 3 ICSM, <i>ePlan Protocol – Schema Architecture, version 2.0, 19 October, 2010</i> ,). The text contained in <code>textCertificate</code> should conform to the layout specified in the jurisdiction's certificates schema.		
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <SurveyorCertificate name="" certificateType="" textCertificate="" surveyDate="" /> </SurveyHeader> <ObservationGroup .../> <InstrumentSetup .../> </Survey> ... </LandXML> </pre>		
Parent Elements	<code>SurveyHeader</code>		
Child Elements			Cardinality
None			
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier.
certificateType	string (certificateTypeType)	R	The ID of the certificate type in the certificates schema that this certificate conforms to
textCertificate	string	R	The textual certificate information
surveyDate	date	O	The date the survey was completed if applicable.

3.52 FieldNote

Description	Notes are added as content of the <code>FieldNote</code> element. Plain text or any valid XML structure may be placed inside this element. It is the responsibility of the jurisdiction to supply XML schemas or DTDs for the XML content of this element.
Example	<pre> <LandXML...> ... <Survey> <SurveyHeader ...> <FieldNote>This is a field note.</FieldNote> </SurveyHeader> ... </Survey> ... </LandXML> </pre>
Element Content	Free text or any valid XML structure representing the field note information.

Parent Elements	SurveyHeader		
	PlanFeature		
	ReducedObservation		
	ReducedArcObservation		
	RedHorizontalPosition		
	RedVerticalObservation		
Child Elements			Cardinality
None (If custom XML is used, child elements of the custom XML will be shown.)			
Attribute	Type	Required	Description
			None

3.53 ObservationGroup

Description	The <code>ObservationGroup</code> element is a container element for all types of observation elements.		
Example	<pre> <LandXML...> ... <Survey> <ObservationGroup id="OG-1"> <ReducedObservation.../> <ReducedArcObservation.../> ... </ObservationGroup> ... </Survey> ... </LandXML> </pre>		
Parent Elements	Survey		
Child Elements			Cardinality
ReducedObservation			0 - *
ReducedArcObservation			0 - *
RedHorizontalPosition			0 - *
RedVerticalObservation			0 - *
Attribute	Type	Required	Description
id	ID	R	As LandXML allows multiple observation groups, each observation group has an "id". For ePlan files it is expected that there will be only one observation group per file.

3.54 ReducedObservation

Description	The <code>ReducedObservation</code> element contains a reduced horizontal measurement. This is usually using a bearing and distance but may be an angle measurement. The measurement is related to <code>CgPoint</code> elements using references to <code>InstrumentSetup</code> elements for the <code>setupID</code> and <code>targetSetupID</code> attributes. See § 3.58 <code>InstrumentSetup</code> for details.
Example	<pre> <LandXML...> ... <Survey> <ObservationGroup> <ReducedObservation name="RO1" oID="123" desc="" purpose="normal" state="" coordGeomRefs="" setupID="IS-1" targetSetupID="IS-2" targetSetup2ID="IS-3" azimuth="" horizDistance="" MSLDistance="" spherDistance="" vertDistance="" slopeDistance="" zenithAngle="" equipmentUsed="" azimuthAccuracy="" distanceAccuracy="" angleAccuracy="" date="" distanceType="" azimuthType="" angleType="" adoptedAzimuthSurvey="" adoptedDistanceSurvey="" adoptedAngleSurvey="" azimuthAccClass="" distanceAccClass="" angleAccClass="" azimuthAdoptionFactor="" distanceAdoptionFactor="" /> ... </ObservationGroup> ... </Survey> ... </LandXML> </pre>
Parent Elements	<code>ObservationGroup</code>

Child Elements			Cardinality
FieldNote			0 - *
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier.
olD	string	O	Internal identifier for the Jurisdiction.
desc	string (purposeType)	O	Optional description. Also used as a secondary jurisdictionally defined purpose. See 1.3 References ref. 2. This will be deprecated in a future release of LandXML
purpose	purposeType	O	LandXML list of purpose values. Describes the purpose of this observation in reference to the whole survey. Values include normal, check, backsight, foresight, traverse, etc. See LandXML Schema for complete list.
state	stateType	O	LandXML state type.
coordGeomRefs	coordGeomName Refs	O	A space delimited list of the CoordGeom name values this measurement is used in
setupID	IDREF	R	A reference to the InstrumentSetup id that this measurement is made from
targetSetupID	IDREF	R	A reference to the InstrumentSetup id that this measurement is made to
targetSetup2ID	IDREF	O	A reference to a second InstrumentSetup id that this measurement is made to for an angle observation
azimuth	direction	O	Bearing
horizDistance	double	O	Horizontal distance
MSLDistance	string	O	Mean sea level distance
spherDistance	string	O	Spheroid distance
vertDistance	double	O	Vertical distance is used to measure between the top and bottom surfaces of a volume if the faces are vertical. A vertical distance does not require a bearing.
slopeDistance	double	O	The Slope Distance used specifically for the definition of sloping volumetric parcels
horizAngle	angle	O	For angle measurements.
zenithAngle	zenithAngle	O	The zenith angle for the slope distance
equipmentUsed	equipmentType	O	The type of survey technology used to calculate the measurement

azimuthAccuracy	double	O	Accuracy of the bearing
distanceAccuracy	double	O	Accuracy of the distance
angleAccuracy	double	O	Accuracy of the angle (if applicable)
date	date	O	The date the measurement was taken
distanceType	observationType	O	The distance type
azimuthType	observationType	O	Azimuth type
angleType	observationType	O	Angle type
adoptedAzimuthSurvey	string	O	If the observation is adopted from a previous survey, the identifier of the survey it was adopted from
adoptedDistanceSurvey	string	O	If the observation is adopted from a previous survey, the identifier of the survey it was adopted from
adoptedAngleSurvey	string	O	If the observation is adopted from a previous survey, the identifier of the survey it was adopted from
azimuthAccClass	string (horzClassType)	O	Accuracy class of the bearing
distanceAccClass	string (horzClassType)	O	Accuracy class of the distance
angleAccClass	string (horzClassType)	O	Accuracy class of the angle
azimuthAdoptionFactor	double	O	If the observation is adopted from a previous survey, the angle used to bring it onto the datum of this survey (a.k.a swing factor)
distanceAdoptionFactor	double	O	If the observation is adopted from a previous survey, the distance factor used to bring it onto the datum of this survey or to convert ground measurement to grid for observations between control marks

3.55 ReducedArcObservation

Description	The <code>ReducedArcObservation</code> element contains a horizontal arc measurement.		
Example	<pre> <LandXML...> ... <Survey> <ObservationGroup> <ReducedArcObservation name="" oID="" desc="" purpose="" state="" coordGeomRefs="" setupID="" targetSetupID="" chordAzumith="" radius="" length="" rot="" equipmentUsed="" arcAzimuthAccuracy="" arcLengthAccuracy="" date="" arcType="" adoptedSurvey="" azimuthAccClass="" lengthAccClass="" azimuthAdoptionFactor="" lengthAdoptionFactor="" /> ... </ObservationGroup> ... </Survey> ... </LandXML> </pre>		
Parent Elements	<code>ObservationGroup</code>		
Child Elements			Cardinality
<code>FieldNote</code>			0 - *
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier
oID	string	O	Internal identifier for the Jurisdiction.
desc	string (purposeType)	O	Optional description. Also used as a secondary jurisdictionally defined purpose. See 1.3 References ref. 2. This will be deprecated in a future release of LandXML

purpose	purposeType	O	LandXML list of purpose values. Describes the purpose of this observation in reference to the whole survey. Values include normal, check, backsight, foresight, traverse, etc. See LandXML Schema for complete list.
state	stateType	O	LandXML state type.
coordGeomRefs	coordGeomNameRefs	O	A space delimited list of the CoordGeomName values this measurement is used in
setupID	IDREF	R	A reference to the InstrumentSetup id that this measurement is made from
targetSetupID	IDREF	R	A reference to the InstrumentSetup id that this measurement is made to
chordAzimuth	direction	R	The bearing of the arc chord
radius	double	R	Radius of the arc
length	double	R	Length of the arc
rot	clockwise	R	Direction of rotation from the start to the end
equipmentUsed	equipmentType	O	The type of survey technology for the measurement
arcAzimuthAccuracy	double	O	Accuracy of the arc azimuth
arcLengthAccuracy	double	O	Accuracy of the arc length
date	date	O	The date the measurement was taken
arcType	string (observationType)	O	Arc type
adoptedSurvey	string	O	If the observation is adopted from a previous survey, the identifier of the survey it was adopted from
azimuthAccClass	string (horzClassType)	O	Accuracy class of the arc bearing
lengthAccClass	string (horzClassType)	O	Accuracy class of the arc length
azimuthAdoptionFactor	double	O	If the observation is adopted from a previous survey, the angle used to bring it onto the datum of this survey (a.k.a swing factor)
lengthAdoptionFactor	double	O	If the observation is adopted from a previous survey, the distance factor used to bring it onto the datum of this survey

3.56 RedHorizontalPosition

Description	The <code>RedHorizontalPosition</code> element contains horizontal measurement information for a point on the ground. This element is used to capture survey and geodetic control information.		
Example	<pre> <LandXML...> ... <Survey> <ObservationGroup> <ReducedHorizontalPosition name="RHP-1" oID="123456" desc="" purpose="normal" state="new" date="" coordGeomRefs="CG-1-PS123456 CG-3-PS123" setupID="IS-1" equipmentUsed="" horizontalDatum="" horizontalAdjustment="" latitude="" longitude="" horizontalFix="" currencyDate="" positionalUncertainty="" localUncertainty="" class="" order="" /> ... </ObservationGroup> ... </Survey> ... </LandXML> </pre>		
Parent Elements	<code>ObservationGroup</code>		
Child Elements	Cardinality		
<code>FieldNote</code>	0 - *		
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier.
oID	string	O	Internal identifier for the Jurisdiction.
desc	string	O	Optional description.
purpose	purposeType	O	LandXML list of purpose values. Describes the purpose of this observation in reference to the whole survey. Values include normal, check, backsight, foresight, traverse, etc. See LandXML Schema for complete list.
state	stateType	O	LandXML state type
date	date	O	The date the current measurement value was instated.

setupID	IDREF	R	A reference to the InstrumentSetup id that this measurement is based off.
equipmentUsed	equipmentType	O	The type of survey technology used to calculate the measurement.
horizontalDatum	string (horzDatumType)	R	The horizontal datum for this measurement.
horizontalAdjustment	string	O	The name of the adjustment (e.g. the project) used to derive the measurement.
latitude	string	R	Official (undistorted) latitude value.
longitude	string	R	Official (undistorted) longitude value.
horizontalFix	string (horzFixType)	R	The method used to determine position of the mark. Specified by jurisdictions' Survey Control Databases. Alternatively, a description on how the position of the mark was determined (e.g. scaled from map, GPS etc).
currencyDate	string	O	The date that the coordinates were retrieved from the source database. If these were new coordinates then the currency date would be the date of the survey.
positionalUncertainty	double	O	The positional accuracy in relation to other measurements.
localUncertainty	double	O	The precision of the measurement
class	string (horzClassType)	O	
order	string (horzOrderType)	O	

3.57 RedVerticalObservation

Description	The <code>RedVerticalObservation</code> element contains the vertical measurement information for a position on the ground. This element is used for vertical survey and geodetic control information.		
Example	<pre> <LandXML...> ... <Survey> <ObservationGroup> <RedVerticalObservation name="RVO-1" oID="" desc="" purpose="" state="" date="" fieldNote="" setupID="" height="" verticalDatum="" verticalAdjustment="" localUncertainty="" positionalUncertainty="" originMark="" class="" order="" verticalFix="" geosphoid="" gsDatum="" gsModel="" gsMethod="" /> ... </ObservationGroup> ... </Survey> ... </LandXML> </pre>		
Parent	ObservationGroup		
Child elements			Cardinality
<code>FieldNote</code>			0 - *
Attribute	Type	Required	Description
name	string	R	Unique ePlan identifier
oID	string	O	Internal identifier for the Jurisdiction.
desc	string	O	Optional description
purpose	purposeType	O	LandXML list of purpose values. Describes the purpose of this observation in reference to the whole survey. Values include normal, check, backsight, foresight, traverse, etc. See LandXML Schema for complete list.
state	string (stateType)	O	LandXML state type.
date	date	O	The date the current measurement value was instated.

setupID	IDREF	R	A reference to the <code>InstrumentSetup id</code> that this measurement is based off.
height	double	R	The reduced level value for this point. Units are based on the unit specified for <code>linearUnit</code> in the <code>Units</code> element.
equipmentUsed	equipmentType	O	The type of survey technology used to calculate the measurement.
verticalDatum	string (vertDatumType)	R	The vertical datum for this measurement
verticalAdjustment	string	O	The name of the adjustment (e.g. the project) used to derive the measurement.
localUncertainty	double	O	The precision of the measurement
positionalUncertainty	double	O	The positional accuracy in relation to other measurements.
originMark	string	O	The name or ID of the control mark the measurement was taken from.
class	string (vertClassType)	O	
order	string (vertOrderType)	O	
verticalFix	string (vertFixType)	O	The method used to determine the height level.
geosphoid	double	O	The geoid spheroid separation value used to determine the orthometric height from the ellipsoid height.
gsDatum	string(horzDatumType)	O	The geoid datum used.
gsModel	string(gsModelType)	O	The geoid model used to determine the separation.
gsMethod	string (gsMethodType)	O	The method used to determine the geoid spheroid separation from the model.

3.58 InstrumentSetup

Description	The <code>InstrumentSetup</code> element links observation setup points to a <code>CgPoint</code> . This is purely a structural requirement of LandXML to link observation start and end points to a physical location. See the example box for an explanation of this structure. See section 2.3 of LandXML Structural Requirements for detailed description on use.		
Example	<pre> <LandXML...> ... <Survey> <InstrumentSetup id="IS-1-PS123456" stationName="0" instrumentHeight="0"> <InstrumentPoint pntRef="1-PS123456" /> </InstrumentSetup> <InstrumentSetup id="IS-2-PS123456" stationName="0" instrumentHeight="0"> <InstrumentPoint pntRef="2-PS123456" /> </InstrumentSetup> ... <ObservationGroup> <ReducedObservation setupID="IS-1-PS123456" targetSetupID="IS-2-PS123456" ... /> ... </ObservationGroup> ... </Survey> ... <CgPoints> <CgPoint name="1-PS123456" ...>1.1 2.2</CgPoint> <CgPoint name="2-PS123456" ...>2.2 1.1</CgPoint> </CgPoints> ... </LandXML> </pre>		
Parent Elements	Survey		
Child Elements		Cardinality	
<code>InstrumentPoint</code>		1	
Attribute	Type	Required	Description
id	ID	R	Unique ePlan identifier
stationName	string	R	Required by LandXML but optional for ePlan. Can be ignored if not needed.
instrumentHeight	double	R	Required by LandXML but optional for ePlan. Can be ignored if not needed.

3.59 InstrumentPoint

Description	The <code>InstrumentPoint</code> element contains the reference to the <code>CgPoint</code> for the <code>InstrumentSetup</code> .		
Example	See example for <code>InstrumentSetup</code>		
Parent Elements	<code>InstrumentSetup</code>		
Child Elements		Cardinality	
None			
Attribute	Type	Required	Description
pntRef	pointNameRef	R	Reference to the <code>CgPoint</code> for this <code>InstrumentPoint</code> .

3.60 Location

Description	The <code>Location</code> element contains the reference to the <code>CgPoint</code> for the <code>PlanFeature</code> .		
Example	See example for <code>PlanFeature</code>		
Parent Elements	<code>PlanFeature</code>		
Child Elements		Cardinality	
None			
Attribute	Type	Required	Description
pntRef	pointNameRef	R	Reference to the <code>CgPoint</code> for this <code>Location</code> .

Appendix A Attribute Type Definitions

The following appendix outlines all the LandXML type definitions used by the ePlan Protocol. This includes enumerated types.

A.1 Primitive Data Types

The following are primitive data type definitions used by the CIF. They are defined by the XML standard (see <http://www.w3.org/TR/xmlschema-0/#CreatDt>).

Type	Description
anySimpleType	Highest level of simple type. Can store any simple type.
anyURI	Uniform Resource Identifier
boolean	True or False
date	ISO8601 date format (e.g. YYYY-MM-DD)
double	A double precision floating point number
IDREF	A reference to the ID of another element
int	An integer
positiveInteger	A positive integer value
string	An extended sequence of characters
time	ISO8601 time format (e.g. hh:mm:ss)

A.2 LandXML Enumerated Types

The following types are defined in LandXML with an enumerated list of valid values (see § 1.3 References, item 4).

Type	Description
angularType	Angular values expressed in "decimal dd.mm.ss" units have the numeric format e.g. "45.3025" representing 45 degrees 30 minutes and 25 seconds. Both the minutes and seconds must be two characters with a numeric range between 00 and 60.
clockwise	Defines direction. Clockwise (cw) or anticlockwise (ccw).
metArea	Valid metric units of measure for area.
metLinear	Valid metric units of measure for length.
metPressure	Valid metric units of measure for pressure.
metTemperature	Valid metric units of measure for temperature.
metVolume	Valid metric units of measure for area volume.
parcelStateType	This is an extension of the LandXML state type, but is specific to parcels
purposeType	Used by many of the Survey elements
stateType	Survey state of the element
surfTypeEnum	TIN is the acronym for "triangulated irregular network", a surface comprised of 3 point faces. grid is a surface comprised of 4 point faces.

surveyType	This enumeration indicates whether the survey was actually performed in the field, compiled from a series of existing surveys, or simply computed using known observations and maths
survPntType	Survey point type.

A.3 Jurisdiction Based Enumerated Types

The following types are defined as types in LandXML for the purpose of being extended with jurisdictionally defined enumeration lists. Source files are available from (URL to be confirmed). Refer to documentation on jurisdictionally defined schemas for details on how to use the lists with LandXML (URL to be confirmed).

Type	Description
addressPointTypeType	This is a string to define the type of Geocode that the address point is for example centroid of parcel, Access Point etc. This will be a jurisdictionally based list.
addressTypeType	This Type is to define a jurisdictional specific list of address types such a primary address, alias, secondary, historical etc.
adminAreaTypeType	This is a jurisdictionally specific list of types and may include parish, town, local government, locality etc
adminDateTypeType	This is the name of the admin date type for the Survey
annotationType	An Annotation will be a specific type within a jurisdiction.
documentStatusType	This field identifies the legal status for this document, for example it is the legal record of survey, if was data captured from historical data etc. This is used to determine processing of the record
equipmentType	This gives a list of equipment used for the observation this list of equipment is used to estimate the accuracy of the observation.
flatTypeType	To define a Jurisdictional specific list of address living unit types for addressing
floorLevelTypeType	To define a jurisdictionally specific list of floor level types for example, Lower Ground Floor
headOfPowerType	Details the legislation or regulation under which the survey was conducted, for example the Land Title Act 2003 This list will be jurisdictionally specific.
jurisdictionType	This is the name of the jurisdiction in which the Survey Lies (i.e. which state)
monumentCondition	This gives a list of allowable local conditions defined by regulation can be defined by the jurisdiction.
monumentState	This is a list of states for a monument each jurisdiction may have a list defined by regulation.
monumentType	This is a list of allowable monument types that can be used or identified for a survey, i.e. peg, spike, pillar etc. Local custom will define this list.
observationType	This is a list of defined observation types, different jurisdictions may have a list defined by regulation can be defined by the jurisdiction.
parcelClass	This is a list of parcel classes which may be jurisdictionally specific defined by regulation and legislation.

parcelFormat	Parcel Format describes how the parcel is described , i.e. Standard (2D), Volumetric (3D)
purpSurvType	This is a jurisdictionally based list of purposes of Survey and can be jurisdictionally specific for example Subdivision, Identification (re-peg), Amalgamation (Consolidation) etc
registrationType	This is a jurisdictionally based list of classes of registration for a surveyor. This allows validation of the surveyor's role in the survey for legal traceability.
roadNameSuffixType	to Allow a list of specific road suffixes to be specified, i.e. east, upper etc (e.g. Fred Street East)
roadNameTypeType	to define a jurisdictionally specific list of Road name types such a street, road, avenue etc.
roadTypeType	To define if the road is a public or private road.
surveyFormatType	Describes the format of the survey and is a jurisdictionally specific list for example a stand format survey, Building Format Survey.
surveyorRoleType	This is a jurisdictionally based list of roles that a surveyor can undertake within a survey for example field hand, authorising surveyor, and technician.
surveyStatusType	Defines the status of this version of the file and will be a jurisdictionally specific list, for example "Survey Record Only", "Suitable for Registration" etc.
useOfParcelType	Describes what the parcel is used for. This would be a jurisdictionally specific list.

A.4 Custom Jurisdiction Based Enumerated Types

The following are types not defined under the LandXML schema but are used in place of the existing data type for specific attributes where ePlan CIFs require an enumerated list of values. These types are included in the jurisdictionally defined schemas but do not map directly to a LandXML type.

Type	Used with (XPath)
certificateTypeType	<code>SurveyorCertificate@certificateType</code>
ellipsoidNameType	<code>CoordinateSystem@ellipsoidName</code>
gsMethodType	<code>RedVerticalObservation@gsMethod</code>
gsModelType	<code>RedVerticalObservation@gsModel</code>
horzClassType	<code>ReducedObservation@azimuthAccClass</code> <code>ReducedObservation@distanceAccClass</code> <code>ReducedObservation@angleAccClass</code> <code>ReducedArcObservation@azimuthAccClass</code> <code>ReducedArcObservation@lengthAccClass</code> <code>RedHorizontalPosition@class</code>
horzDatumType	<code>CoordinateSystem@horizontalDatum</code> <code>RedHorizontalPosition@horizontalDatum</code> <code>RedVerticalObservation@gsDatum</code>
horzFixType	<code>RedHorizontalPosition@horizontalFix</code>

horzOrderType	RedHorizontalPosition@order
parcelTypeType	Parcel@parcelType
purposeType	ReducedObservation@desc ReducedArcObservation@desc
stateType	RedVerticalObservation@state
surveyBgDatumType	CoordinateSystem@datum
vertClassType	RedVerticalObservation@class
vertDatumType	CoordinateSystem@verticalDatum RedVerticalObservation@verticalDatum
vertFixType	RedVerticalObservation@verticalFix
vertOrderType	RedVerticalObservation@order

A.5 Other Defined Types

The following are types defined by the LandXML schema and used in an ePlan CIF. They are containers for a primitive data type and are not extended by the jurisdictional schemas.

Type	Description
coordGeomNameRefs	A list of reference names values referring to one or more <code>CoordGeom@name</code> attributes.
direction	Represents a normalized angular value that indicates a horizontal direction, expressed in the specified Direction units. Assume 0 degrees = north
FaceType	A list of integers used for the Face element of Surface.
latLongAngle	Latitude/Longitude coordinate angular values expressed in <code>latLongAngularUnit</code> . Latitude (range -90 to +90) positive values for the northern hemisphere, negative indicate the southern. Longitude (range -180 to +180) positive values are to the east of the prime meridian, negative values are to the west. Values expressed in "decimal dd.mm.ss" units have the numeric format "45.3025" representing 45 degrees 30 minutes and 25 seconds. Both the minutes and seconds must be two characters with a numeric range between 00 to 60.
parcelNameRef	A reference name value referring to <code>Parcel@name</code> attribute.
parcelNameRefs	A list of reference names values referring to one or more <code>Parcel@name</code> attributes.
pointNameRef	A list of reference names values referring to one or more <code>PointType</code> derived name attributes.
zenithAngle	Represents zenith angles with the 0 origin as straight up and measured in a clockwise direction in the specified Angular units.
zoneNumberType	Integer from 1 - 99