**OGC 15-121 Comments and Responses to the**

***OGC 14-116 OGC Draft LandInfra Conceptual Model* 2015 RFC**

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**Introduction**

The Open Geospatial Consortium issued a Request for Comment (RFC) on *OGC 14-116 OGC Draft LandInfra Conceptual Model* in January, 2015. Four sets of comments were received: Geoforum Denmark, Finland, IGN, and Sweden.

Throughout 2015, the OGC Land and Infrastructure Standards Working Group (LandInfraSWG) rewrote 14-116, making significant changes to the presentation as well as the content. The comments received from the original RFC in January, 2015 were considered in this rewrite. Those comments along with the SWG responses is the subject of this OGC 15-121 document. Part 1 contains a list of the comments, each with a short description followed by the SWG response. Part 2 provides the comments in full as they were submitted to the OGC.

The new, resultant candidate standard, *OGC 15-111 OGC® Land and Infrastructure Conceptual Model Standard (LandInfra)* has been posted to Pending Documents as: <https://portal.opengeospatial.org/files/?artifact_id=66772&version=1> .

An Executive Summary of 15-111 has also been posted as *OGC 16-000 LandInfra Executive Summary*:

<https://portal.opengeospatial.org/files/?artifact_id=66859&version=1> .

An RFC is expected to be announced in January, 2016 for the 15-111 candidate standard. The LandInfraSWG wishes to thank the initial RFC comment submitters, hopes that we have resolved your comments to your satisfaction, and looks forward to any new comments you might have in response to the forthcoming RFC.

**Part 1. Comment/Response Summary**

Short comment descriptions derived from submitted comments are listed with unique ids added. See original comment documents for full comment (included as Part 2, below).

Responses have been provided. Clause references are to the candidate standard LandInfra v1.0, OGC 15-111, available on Pending Documents.

**Denmark (Geoforum)**

D-1

Concepts dataset and document need specification.

Accept. Done. All references to dataset and document have been clarified. (pxs)

D-2

Further specification of TargetPoint is needed.

Accept. Done. (gruh)

D-3

As regards Survey, responsible person(s) should be specified.

Accept. Done. Class 7.8.1.1 Survey includes +surveyor: Professional

D-4

Relations to ISO 19152:2012 LADM need further elaboration and motivation.

Accept. Done in text and Annex D.2

D-5

The standard ought to be more explicit concerning CRS.

Accept. OGC Topic 2 has been added and CS\_CRS is now the LandInfra dataset crs designation.

D-6

It may be considered whether the proposed standard should include references to the GeoNames Ontology.

Mostly reject. GeoNames Ontology is not mentioned in text. However, a user may introduce such references through the Property extension to Feature

D-7

Existing standards are not mentioned in the opening section.

Accept. Done. Cf. also Annex F Bibliography

**Finland**

F-1

The scope and the relations/boundaries to the other standards (CityGML, IFC) is unclear.

Accept. Done. See 1.1

F-2

No description for 'wet' infrastructure and the other facilities (barriers, lighting, cable networks, etc.). Also urban street and particular rail structures.

Accept. Done. Element type list is a code list, so it is user extensible.

F-3

What would be the exact relationship between the Road class in OGC and the equivalent in IFC?

Accept. Done. bSI is still working on IFCRoad. We tried to be compatible with what they have been discussing.

F-4

There should be a mechanism to assign exact classification (coding) to the Alignment (or other elements, surface, CrossSectionSegment etc).

Accept. Done. Element (7.3.1.5) has id, inherited down to Alignment. Cross Sections have been redone and do include names.

F-5

There should also be a possibility to group those StringLines e.g. according to the surface they belong to.

Accept. Done. Set class added to uniformly group lots of classes, including StringLines. (pxs)

F-6

The dimensions quoted in the text should be also shown in the pictures of cross sections.

Accept. Done. All new comprehensive diagrams for CrossSections. (pxs)

F-7

There should be possibility to refer a specific StringLine (or geometry line) eg. curb line from the CrossSectionSegment.

Accept. Done. CrossSections now have CrossSectionPoints that will provide this capability. (pxs)

F-8

Design Templates (pavement class, pavement thickness, subgrade load capacity class etc) are relevant in data transfer between design programs.

Rejected. Done. Though it was agreed that this is necessary, it was decided to delay this as part of a RoadDesign Requirements Class for the next version of the standard. (pxs)

**IGN**

I-1

Need for proper terminology understanding throughout this specification.

Accept. Done. Also O&M was added (gruh)

I-2

Articulation between LandInfra Model and InfraGML implementation is not clear in the document.

Accept. Done. This has now been clarified. (pxs)

I-3

Suppress identification of version and author of each diagram in this document.

Accept. Done. (pxs)

I-4

Explain potential links with existing OGC standards (CityGML or IndoorGML).

Accept. Done.

I-5

Provide definition and description (as a feature catalog for example, or in tables) for classes, attributes, relations, ...

Accept. Done. This has been added for all classes. (pxs)

I-6

No conformance class defined.

Accept. Done. (Annex A)

I-7

LandInfra as a conceptual model and should only use non encoding standards (19103 for basic types, 19107 for geometry/topology, ...).

Accept. Done. And we went a step further to use OGC Abstract Specifications instead of ISO 191nn standards when appropriate. (pxs)

I-8

Provide specification for class ID.

Accept. Done as part of Core Requirements Class to be usable elsewhere as needed. (pxs)

I-9

Clarify what in Class diagram in 6.2 is part of the model, and what is opened to extensions, coordination with CityGML…

Accept. Done. Color coding should help.

I-10

Re-align RawObservations and Equipment in 6.7.1 and 6.7.2 with Sensor specifications already available in ISO TS 19130, TS19130-2 and 19159-1.

Accept. Done. (gruh)

I-11

Consider the provision of terrain as Grid.Terrain.

TIN has been used. We would welcome a grid alternative contribution.

**Sweden**

S-1

The scope declaration is very unclear.

Accept. Done. Rewritten.

S-2

Clarify the name to be "Infrastructure Geography Markup Language (InfraGML) Encoding Standard".

Accept. But this is now the Conceptual Model standard so the new name is OGC® Land and Infrastructure Conceptual Model Standard (LandInfra). (pxs)

S-3

Make sure that eventual issues with duplication/redundancy and reuse are dealt with.

???

S-4

The Reference list needs updating.

Accept. Done. Normative References and (informative) Bibliography have been updated

S-5

The terms/definitions needs updating.

Accept. Done.

S-6

Make sure that the class and package naming is consistent, e.g. "RoadProjectPart", "Road ProjectPart"

Accept. Done. (pxs)

S-7

Classes and attributes needs definitions.

Accept. Done. (pxs)

S-8

Multiplicities at both ends of relations are needed to fully understand the semantics.

Reject. Convention is to only do this in the direction of navigability. (pxs)

S-9

Be explicit about abstractness of classes.

Accept. Done. Italicized Class names indicate abstractness of the class in accordance with UML standard. (pxs)

S-10

Re-visit the division approaches in "Project" vs "Facility".

Accept. Done. Totally revised. (pxs)

S-11

Use of a class or datatype such as "Classifier" instead of CharacterString.

Accept. Done where appropriate/possible.

S-12

Re-visit and define Facility and Project sub-classes.

Accept. Done. Totally revised. (pxs)

S-13

If the structure for Project/ProjectPart equals the corresponding structure in ifcProject, this should be mentioned explicitly.

Accept. Done. Totally revised. (pxs)

S-14

Must a RoadProjectPart::Road be associated with exactly one Facility even if the Facility does not yet exist?

Yes. It is the Facility that is being created by the Project. (pxs)

S-15

A generic element should be added to clarify that there are elements which are not bound to a specific type of project/facility.

FacilityPart can have any number of Elements but the model does not say that every Element must be part of a FacilityPart. However it is not clear when this might happen, as we have an “Other” type of Facility. We have Elements under LandFeature now. Otherwise, what would be an example that is still within scope? (pxs)

S-16

Clarify the difference between a Facility::RoadElement and a RoadProjectPart::RoadElement.

Accept. Done. Totally revised. (pxs)

S-17

"If the Road ProjectPart is for only part of a Road FacilityPart, the part can be defined by a start and end linearly referenced location." is not backed up by any corresponding UML in the figure.

Accept. Done. LinearlyReferencedLocations are now (optionally) part of any kind of Feature. (pxs)

S-18

Use the exact names of standard classes, e.g. GM\_Clothoid, GM\_LineString etc.

Reject. Done. Text added to explain the correspondence and justification (19107 revision) (pxs)

S-19

Clothoid is a type of spiral and should be a subtype thereof.

Theoretically yes, but a distinction is made in SQL/MM because of the constructor parameters.

S-20

An instantiation example might be needed to explain the use of the various elements for horizontal and vertical alignments.

To be addressed.

S-21

Clarify if StringLine is an alternative way of representing a design or if it is just something that can be derived from a sequence of crossections.

Accept (the former). Done. We have adopted your exact wording. (pxs)

S-22

6.6.3 Superelevation clause should have an example for rail (compare LandXML/Cant).

Accept. Done. Cant now in Rail. Road Super moved to the next version. (pxs)

S-23

Specify the interpolation method between crossections (linear vs. cubic parabolas).

Accept. Statement added that linear interpolation is assumed. (pxs)

S-24

fullSuperelevationRate is redundant since it needs to be described in the crossections.

Deferred. Super moved to the next version. (pxs)

S-25

Superelevation crossection redundant with road crossection; reference template crossection segments instead.

Deferred. Super moved to the next version. (pxs)

S-26

Explain TerrainLayer.extent.

Accept. Done. Totally revised. (pxs)

S-27

The terrain class could also refer to some classified material type.

Accept. Done. Totally revised. (pxs)

S-28

In TerrainSurface case, the material is assumed to be valid down to the level where some other TerrainSurface is defined.

Accept. Done. (pxs)

S-29

Explicitly state that this specification excludes the relationships with topological network models, e.g. for tracks and switches.

Accept. Done.

S-30

Survey is a large and inconsistent area; reconsider the scope.

Accept. Done. Some parts are now green (future).

S-31

Add figure numbering and figure texts.

Accept. Done. (pxs)

S-32

Add reference for ISO 19152.

Accept. Done.

S-33

Observations are standardized in ISO 19156:2011 which should then be referenced.

Accept. Done. (gruh)

S-34

Page 29 below the figure. “…see Section 13, …”. Change to “… see Section 12, ...”

S-35

Page 35 second last paragraph. ”Because the Alignment is the linear element, and its lrm value is…” Change to. ”Because the Alignment is the linear element, and its LRM value is…”

Reject. lrm is the attribute name (pxs)

S-36

Add descriptions of "grid" to LandParcel or Terrain sections Chapter 6.8 and 6.9.

TIN has been used. We would welcome a grid alternative contribution.

S-37

Add a subchapter ”Geometry Types – Gridded Surface”.

TIN has been used. We would welcome a grid alternative contribution.

**Part 2. Original comments, as submitted**

**Denmark (Geoforum) - D**

PART A

1. Evaluator:

Geoforum Denmark

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2. Submission: [OpenGIS Project Document Number, Name]

OGC Draft LandInfra Conceptual Model (14-116)

3.

Geoforum Denmark is an NGO, the Danish Association for Geographic Information.

Geoforum Denmark welcomes the OGC Draft LandInfra Conceptual Model, as it contributes towards further development of relations between families of existing standards, GML, ISO, and BIM, and specifically addresses the insufficiently covered areas of Infrastructure and Surveying. The presented conceptual models provide an advantageous base for the following comments, which mainly relate to the Survey and Land Parcel parts of the proposal.

PART B

1. Requirement: [General, #]

General

2. Implementation Specification Section number: [General, #]

General

3. Criticality: [Major, Minor, Editorial, etc.]

Major: Concepts concerning \_dataset\_ and \_document\_ need specification

4. Comments/justifications for changes: [Comments]

The wording ‘A LandInfra file/document may contain..’ is applied five times, namely in the introduction part of sections 6.2, 6.3, 6.7, 6.8, and 6.9. It is thus beyond doubt that file/document is a central issue within the scope of the draft. However, a definition of the wording was not found, nor specifically mentioned in any of the packages. Moreover, file and document are hardly the same, as file may refer to a dataset, typically on a physical media, while document may refer to information endorsed by a person or company. The ISO 19152:2012 Land Administration Domain Model (LADM) specifies the concept LA\_SpatialSource.

Whatever concepts and definitions are chosen for the proposed standard, they should be mentioned, perhaps in the Core Package.

PART B

1. Requirement: [General, #]

Section 6.7 Survey

2. Implementation Specification Section number: [General, #]

Section 6.7 Survey

3. Criticality: [Major, Minor, Editorial, etc.]

Major: Further specification of TargetPoint is needed

4. Comments/justifications for changes: [Comments]

Section 6.7 Survey presents a clear and rational presentation of surveying activities: Equipment + observations + setup + corrections -> Results. This basic structure is indeed to be maintained. Unfortunately, however, a TargetPoint definition is not explicitly specified in the draft. This issue is addressed, e.g. p. 54: 'The observed property may be any property associated with the type of the feature of interest', and in the Annex, A.2.1 Notes states, 'Additionally .., target definitions and .. could be written in different ways'.

Correct identification of the TargetPoint is a precondition of relevant measurement results, whether the task is to measure the location of a geographical feature or to mark out a project element. The conceptual models thus should specify relations between Observations og Element, and the basic statement (p. 54) should better read: what observation(s) to what target(s)/feature(s) of interest made by which equipment(s) from what setup(s) delivered the survey result(s).

PART B

1. Requirement: [General, #]

Section 6.7 Surveying

2. Implementation Specification Section number: [General, #]

Section 6.7 Surveying

3. Criticality: [Major, Minor, Editorial, etc.]

Major: As regards Survey, responsible person(s) should be specified

4. Comments/justifications for changes: [Comments]

The standard sets the goal to collect all relevant information concerning the surveying task. In addition to observations, thus sensor calibrations etc, should be reported in a standardized way, cf. A.2.1; A.2.3: Goal: It should be possible to hold all the field work in an InfraGML document that could be used as a fieldbook.

From the point of view of quality management, it seems necessary to record also the person(s), who performs measurements and computations, and to allow for the specification of the dataset for which they are responsible. This concern supplements the suggestion above on specification of the concepts dataset and document. ISO 19152:2012 LADM similarly states: A spatial source should be associated to one or more [1..\*] parties (i.e. as a minimum the party playing the role of author of the spatial source, the surveyor, should be specified).

PART B

1. Requirement: [General, #]

General

2. Implementation Specification Section number: [General, #]

General

3. Criticality: [Major, Minor, Editorial, etc.]

Major: Relations to ISO 19152:2012 LADM need further elaboration and motivation

4. Comments/justifications for changes: [Comments]

The ISO 19152:2012 LADM contains elements which editors consider not relevant for the proposed standard. Section 6.9 on Land Parcels minimizes the content to LandParcel – ParcelUnit and – BoundingElement. The proposed structure appears convincing. However, as appears from the notes above, more LADM concepts seem relevant. Moreover, the term \_LandParcel\_ does not convey that the corresponding concept refer to a unit of property, often consisting of several \_ParcelUnits\_

A thorough investigation of relations between the existing LADM and the proposed seems warranted.

PART B

1. Requirement: [General, #]

General

2. Implementation Specification Section number: [General, #]

General

3. Criticality: [Major, Minor, Editorial, etc.]

Editorial:

a. The standard ought to be more explicit concerning CRS.

b. It may be considered whether the proposed standard should include references to the GeoNames Ontology.

c. Existing standards are not mentioned in the opening section

4. Comments/justifications for changes: [Comments]

The draft mentions in section 6.5.1. Coordinate Reference System (CRS): 'These are typically x and y in a Cartesian local engineering system'. However, the proposed standard includes GNSS-observations, which presupposes a global reference system. Moreover, in Denmark the surveying practise is to present survey results with reference to national reference systems. The standard thus ought to be more explicit concerning CRS. For example, ISO 19152:2012 LADM refers to ISO 19111:2007, Geographic Information — Spatial referencing by coordinates. An enumeration of the mostly used reference systems would allow for a precise motivation of corrections applied, cf. Observations::3Dtransformations.

The existing GeoNames Ontology makes it possible to add geospatial semantic information to the World Wide Web, cf. http://www.geonames.org/ontology/documentation.html

It may be considered whether the proposed standard should include references to this ontology. Such link would probably increase the value of publicly available survey documents.

ISO 19152:2012 LADM and other existing standards are missing in the opening section

Equipment::Calibration mentions calibrationTime: DateTime, but not responsible party. (p. 60)

-- END --

**Finland – F**

PART A

1. Evaluator:

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2. Submission: [OpenGIS Project Document 14-116, OGC\_Draft\_LandInfra\_Conceptual\_Model]

PART B

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major, #6

4. Comments/justifications for changes:

The scope and the relations/boundaries to the other standards (CityGML, IFC) is unclear. What are the roles of InfraGML, CityGML and IFC in life cycle of infrastructure (esp. in detailed design and construction)?

PART B

1. Requirement: The other facilities of infrastructure

2. Implementation Specification Section number: General, #6

3. Criticality: Major

4. Comments/justifications for changes:

In the document the road structure is defined in detail but there is no description for 'wet' infrastructure and the other facilities (barriers, ligthning, cabel networks etc). Also urban street and particular rail structures need more attention.

PART B

1. Requirement: InfraGML Road Class <> IFC Road Class

2. Implementation Specification Section number: #6.3.1.1

3. Criticality: Major

4. Comments/justifications for changes:

What would be the exact relationship between the Road class in OGC and the equivalent in IFC? In this conceptual model there is a quite accurate and deep description of road, while in bSI the corresponding activities on IFC Road model are only starting. How can the efforts in OGC and bSI be synchronized also in the future to harmonize conceptual models also beyond alignment definition?

PART B

1. Requirement: Coding system

2. Implementation Specification Section number: #6.5, 6.6.1

3. Criticality: Major

4. Comments/justifications for changes:

"To clarify where along the Road the Alignment is defined, a name and description must be specified". Typically, name and description attributes are use different ways: as a user defined name/label, as a code or classification or as id. A user defined name and description are not reliable enough to specify the role of the alignment, there should be a mechanism to assign exact classification (coding) to the Alignment (or other elements, surface, CrossSectionSegment etc).

PART B

1. Requirement: Stringline model

2. Implementation Specification Section number: #6.6

3. Criticality: Major

4. Comments/justifications for changes:

As "StringLines can be used to specify longitudinal geometries at various Road cross section points", there should also be a possibility to group those StringLines e.g. according to the surface they belong to.

PART B

1. Requirement: CrossSection pictures

2. Implementation Specification Section number: #6.6.2

3. Criticality: Editorial

4. Comments/justifications for changes:

The dimensions quoted in the text should be also shown in the pictures of cross sections.

PART B

1. Requirement: SurfaceSegment reference to StringLine

2. Implementation Specification Section number: #6.6.4

3. Criticality: Major/Question

4. Comments/justifications for changes:

There should be possibility to refer a specific StringLine (or geometry line) eg. curb line from the CrossSectionSegment.

PART B

1. Requirement: Design Templates

2. Implementation Specification Section number: #6.6.5

3. Criticality: Major

4. Comments/justifications for changes:

Design Templates carry important information in intelligent exchanges. Templates do not only define rules for cut/fill situations. There are also a lot of other attributes (pavement class, pavement thickness, subgrade load capacity class etc) relevant in data transfer between design programs. The parametric information is maybe more important than separate cross sections.

**IGN - I**

Part A to be completed once. Iterate Part B as needed.

PART A

1. Evaluator:

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2. Submission: [OpenGIS Project Document 14-116, OGC\_Draft\_LandInfra\_Conceptual\_Model]

PART B

1. Requirement: General

2. Implementation Specification Section number: #4

3. Criticality: Major

4. Comments/justifications for changes: Need for proper terminology understanding throughout this specification. Alignment does not seem to be the only term / concept specified in this document. Elements of definition of these terms occur at the beginning of each Package, however not ensuring an accurate definition (nor its clear identification).Add terms for ensuring proper terminology understanding throughout this specification, for the follwoing terms: Facility, Project, Road, Survey, Terrain, Land Parcels, InteriorOrientation and other Sensor and orientation parameters

PART B

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Minor

4. Comments/justifications for changes: Articulation between LandInfra Model and InfraGML implementation is not clear in the document (document title is LandInfra conceptual model, abtract and scope describe InfraGML, ...).

PART B

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Editorial

4. Comments/justifications for changes: Suppress identification of version and author of each diagram in this document, as it does not conform OGC P&P.

PART B

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: The document does not expalain potential links with existing OGC standards (CityGML or IndoorGML). Same features (Building, Roads, Rails, ....) are described. From users perstective, it would be nice to have a comprehensive view of use cases and relationhsips between all these OGC standards.

PART B

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: UML classes are provided but no description or defintions for classses and attributes. It's the difficult to undestand the underlying semantic. Provide deifition and description (as a feature catalog for example, or in tables) for classes, attributes, relations, ...

PART B

1. Requirement: #2

2. Implementation Specification Section number: #2

3. Criticality: Major

4. Comments/justifications for changes: No conformance class defined. Conformance classes helps developpers to know what would be the minimum implementation of a standard.

PART B

1. Requirement: #6

2. Implementation Specification Section number: #6, package Dependencies

3. Criticality: Major

4. Comments/justifications for changes: Package dependencies digram shows dependencies with "encoding" standards (ie GML). LandInfra is a conceptual model and should only use non encoding standards (19103 for basic types, 19107 for geometry/topology, ...). It would be difficult to define other encoding than GML.

PART B

1. Requirement: #6.1

2. Implementation Specification Section number: #6.1 diagramm Class LandInfra

3. Criticality: Minor

4. Comments/justifications for changes: Provide specification for class ID ;Consider specifying this class, or provide the reason why it is not specified in this document.

PART B

1. Requirement: #6.2

2. Implementation Specification Section number: #6.2 diagramm Class Facility

3. Criticality: Editorial, with technical impact

4. Comments/justifications for changes: The text and corresponding Class diagram in 6.2 are not consistent with §1 Scope. some clarification would be welcome on what is part of the model, and what is opened to extensions, coordination with CityGML ...Though it is understandable that the editor(s) wish(es) to provide a global view going beyond this specification, a clear view must be provided by this standard on what is IN and OUT (which may be in further works). The current state of this texte in 6.2 here appears unclear and ambiguous.

PART B

1. Requirement: #6.7.1

2. Implementation Specification Section number: #6.7.1/6.7.2 Class diagrams for RawObservations and Equipment

3. Criticality: Major

4. Comments/justifications for changes: [Comments] The Class diagrams for RawObservations and Equipment in 6.7.1 and 6.7.2 seem to redesign Sensor / Capture/Acquisition/Orientation and Calibration specifications already available in ISO TS 19130, TS19130-2 and 19159-1. In addition to this, the terminology and description (or reference) does not appear to be provided in a way to ensure interoperable implementations.Consider to re-use ISO TC211 works on these topics (sensor and acquistion / geopositioning information and calibration).

In any case, provide sufficient definitions or references ensure interoperability of implementations.

PART B

1. Requirement: #6.8

2. Implementation Specification Section number: #6.8 (text and TerrainMain Diagram)

3. Criticality: Major

4. Comments/justifications for changes: Consider the provision of terrain as Grid.Terrain is often provided as Grids (DTM).Is n't it of interest to handle this type of Terrain description?

**Sweden – S**

PART A

1. Evaluators:

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2. Submission: OpenGIS Project Document 14-116, OGC\_Draft\_LandInfra\_Conceptual\_Model

PART B#0

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: The scope declaration is very unclear. This makes it difficult to have distinct comments on if parts are missing or have been defined in the wrong way. One example is that the specification includes both facilities and terrain but not what happens when the two are combined (cut/fill etc). We recommend that future work on the level where, planning, design, building, operations and maintenance processes are included, will be developed in alignment with corresponding work within BuildingSMART, e.g. ifc Roads. Our comments below therefore primarily concerns the alignment and superelevation parts.

PART B#1

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Editorial

4. Comments/justifications for changes: There is some confusion regarding the name and scope of the document. The name is "OGC LandInfra Draft Conceptual Model" while the scope states that "The scope of InfraGML is…"

Compared with the cousin CityGML where the name is "OGC City Geography Markup Language (CityGML) Encoding standard". Still CityGML consists both of a UML conceptual schema and an associated encoding.

We propose to already at this stage clarify the name and scope to align with the CityGML approach. Starting with the name, that would mean "Infrastructure Geography Markup Language (InfraGML) Encoding Standard". This would clarify that the goal is an encoding standard which also includes a conceptual model supporting infrastructure.

PART B#2

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: There are some rather generic packages within this draft which could support also other applications, e.g. land parcel, survey and terrain. For example does CityGML also contain a Digital Terrain Model (DTM). A proposal is to make sure that eventual issues with duplication/redundancy and reuse are dealt with.

PART B#3

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Editorial

4. Comments/justifications for changes: The Reference list and terms/definitions need updating.

PART B#4

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Editorial

4. Comments/justifications for changes: Make sure that the class and package naming is consistent. For example is the package "RoadProjectPart" sometimes named "Road ProjectPart" (with a space).

PART B#5

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: Classes and attributes needs definitions. Also multiplicities at both ends of relations are needed to fully understand the semantics. Also be explicit about abstractness of classes.

PART B#6

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: We have difficulties in understanding the approach with the division in "Project" vs "Facility". Is there really a need to do this division at class level? Doesn't this require a designed road to change class when becoming built? Furthermore there is a mandatory relationship from "RoadProjectPart::Road" to "Facility::Road" which requires the project to always reference a facility. What does this association represent if a new road is being designed?

Figure - Page 15 and Figure - Page 17 shows that the subdivision in different types of FacilityPart and ProjectPart have duplicated inheritance structures. This indicates that we are really considering the same basic concepts regardless of if we are coming from a Facility or from a Project.

The only discriminator between Facility and Project seems to be related to Lifecyle stage.

There are other ways to manage lifecycle stages such as ISO 10303-239 (Product Lifecycle Support) which could be considered. If not, a better explanation of the concepts are needed combined with examples of how to use the concepts in real cases at different stages of the lifecycle.

PART B#7

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Major

4. Comments/justifications for changes: In some places, e.g. RoadElement.roadElementType and CrossectionSegment.name, classification occurs through the use of a CharacterString which implies "hand-made" classification. We see that this type of classification might occur outside of this specification. However, the use of a class or datatype such as "Classifier" instead of CharacterString would perhaps make it clearer that the intention is to refer to a "trusted classification source", e.g. a Feature Catalogue (ISO 19110), bsDD or a Semantic Web repository.

PART B#8

1. Requirement: section 6.2 and 6.3

2. Implementation Specification Section number: “6.2 and 6.3”

3. Criticality: Major

4. Comments/justifications for changes: Figure - Page 15 and Figure - Page 17: Is there enough evidence to make these subdivisions at this stage? Each subclass needs to be defined and discriminated from its siblings. For example drainage is often a vital part of both road and rail facilities. What is the difference between drainage and waste water? Also, there are types of elements that can be shared between both e.g. road and rail, e.g. substructure/superstructure. This needs to be adressed and clarified.

PART B#9

1. Requirement: section 6.3.1.1

2. Implementation Specification Section number: 6.3.1.1

3. Criticality: Major

4. Comments/justifications for changes: If the structure for Project/ProjectPart equals the corresponding structure in ifcProject, this should be mentioned explicitly. We would urge harmonization also at this level.

PART B#10

1. Requirement: section 6.3.1.1

2. Implementation Specification Section number: 6.3.1.1

3. Criticality: Major

4. Comments/justifications for changes: The multiplicity 1 at the Facility::Road end indicates that a RoadProjectPart::Road must be associated with exactly one Facility. Is that also the case when the Facility does not yet exist? Clarify.

PART B#11

1. Requirement: section 6.4

2. Implementation Specification Section number: 6.4

3. Criticality: Major

4. Comments/justifications for changes: Figure p. 20: A generic element should be added to clarify that there are elements which are not bound to a specific type of project/facility. What is the fundamental difference between a Facility::RoadElement and a RoadProjectPart::RoadElement? Clarify.

PART B#12

1. Requirement: section 6.3.1.1

2. Implementation Specification Section number: 6.3.1.1

3. Criticality: Major

4. Comments/justifications for changes: The statement "If the Road ProjectPart is for only part of a Road FacilityPart, the part can be defined by a start and end linearly referenced location." is not backed up by any corresponding UML in the figure. Add this or clarify.

PART B#13

1. Requirement: section 6.5.1

2. Implementation Specification Section number: 6.5.1

3. Criticality: Major

4. Comments/justifications for changes: - Figure p. 23: Use the exact names of standard classes, e.g. GM\_Clothoid, GM\_LineString etc. Furthermore, a Clothoid is a type of spiral and should be a subtype thereof.

PART B#14

1. Requirement: section 6.5.1/6.5.2

2. Implementation Specification Section number: 6.5.1/6.5.2

3. Criticality: Minor

4. Comments/justifications for changes: An instantiation example might be needed to explain the use of the various elements for horizontal and vertical alignments. Since the horizontal elements exist in ISO 19107 and not explained here it might be unclear for some how to use them.

PART B#15

1. Requirement: section 6.6.4

2. Implementation Specification Section number: 6.6.4

3. Criticality: Major

4. Comments/justifications for changes: It is unclear if StringLine is an alternative way of representing a design or if it is just something that can be derived from a sequence of crossections. Please make an explicit statement regarding the intended use for this class.

PART B#16

1. Requirement: section 6.6.3

2. Implementation Specification Section number: 6.6.3

3. Criticality: Major

4. Comments/justifications for changes: From our point of view, this clause should have an example for rail (compare LandXML/Cant).

PART B#17

1. Requirement: section 6.6.3

2. Implementation Specification Section number: 6.6.3

3. Criticality: Major

4. Comments/justifications for changes: We interpret the document that a linear interpolation between crossections for superelevation should be used. In some cases for rail applications, a sequence of two cubic parabolas are used instead (se enclosed figure 1). It should be possible to specify the used interpolation method between crossections.

PART B#18

1. Requirement: section 6.6.3

2. Implementation Specification Section number: 6.6.3

3. Criticality: Major

4. Comments/justifications for changes: Page 44 - Figure. Why does the superelevationEvent need an attribute for fullSuperelevationRate. Isn't this redundant since it needs to be described in the crossections as well?

PART B#19

1. Requirement: section 6.6.3

2. Implementation Specification Section number: 6.6.3

3. Criticality: Major

4. Comments/justifications for changes: Page 44 - Figure. Isn't there a risk with redundancies when parts of the crossection are described again (both here and in the crossections for a road)? An alternate way would be to reference template crossection segments.

PART B#20

1. Requirement: section 6.8

2. Implementation Specification Section number: 6.8

3. Criticality: Major

4. Comments/justifications for changes: - Figure p. 63: Explain the role of the attribute extent. Am I supposed to perform a boolean operation between a solid and the extent for a SolidLayer to achieve the actual extent of a SolidLayer?

PART B#21

1. Requirement: section 6.8

2. Implementation Specification Section number: 6.8

3. Criticality: Major

4. Comments/justifications for changes: The terrain class could also refer to some classified material type in the same fashion as is done in the crossection. Also it could be made clear that in the TerrainSurface case, the material is assumed to be valid down to the level where some other TerrainSurface is defined.

PART B#22

1. Requirement: section 6.5.1

2. Implementation Specification Section number: 6.5.1

3. Criticality: Major

4. Comments/justifications for changes: Page 24, If this specification excludes the relationships with topological network models, e.g. for tracks and switches, this should be explicitly stated in the document.

PART B#25

1. Requirement: section 6.7

2. Implementation Specification Section number: 6.7

3. Criticality: Major

4. Comments/justifications for changes: The chapter covers a large and inconsistent area. It seems difficult to make a general model that will be used in practice for all kind of survey data. Maybe the scope is too wide.

PART B#26

1. Requirement: General

2. Implementation Specification Section number: General

3. Criticality: Editorial

4. Comments/justifications for changes: Figure numbering and figure texts are missing in the entire document. Add figure numbering and figure texts.

PART B#27

1. Requirement: section 3

2. Implementation Specification Section number: 3

3. Criticality: Major

4. Comments/justifications for changes: ISO 19152 is not mentioned though chapter 6.9 refers to it – “The Land Parcels package is modeled after a subset of ISO 19152:2012 …”. Add reference to ISO 19152. Also observations are standardized in ISO 19156:2011 which should then be referenced.

PART B#28

1. Requirement: section 6.5.4

2. Implementation Specification Section number: 6.5.4

3. Criticality: Editorial

4. Comments/justifications for changes: Page 29 below the figure. “…see Section 13, …”. Change to “… see Section 12, ...”.

PART B#29

1. Requirement: section 6.6.1

2. Implementation Specification Section number: 6.6.1

3. Criticality: Editorial

4. Comments/justifications for changes: Page 35 second last paragraph. ”Because the Alignment is the linear element, and its lrm value is…” Change to. ”Because the Alignment is the linear element, and its LRM value is…”

PART B#30

1. Requirement: section 6.7.3

2. Implementation Specification Section number: 6.7.3

3. Criticality: Major

4. Comments/justifications for changes: Page 61. ”Surfaces and areas are written in the LandParcel or Terrain sections.” (i.e. reference to Chapter 6.8 and 6.9) A common way to present a surface in a SurveyResult is as a "grid" - but nothing about "grid" is written in Chapter 6.8 and 6.9? Add descriptions of "grid" in Chapter 6.8 and 6.9

PART B#31

1. Requirement: section 6.11

2. Implementation Specification Section number: 6.11

3. Criticality: Major

4. Comments/justifications for changes: ”Grid” (see comment on 6.7.3, PART B#30). Add a subchapter ”Geometry Types – Gridded Surface”