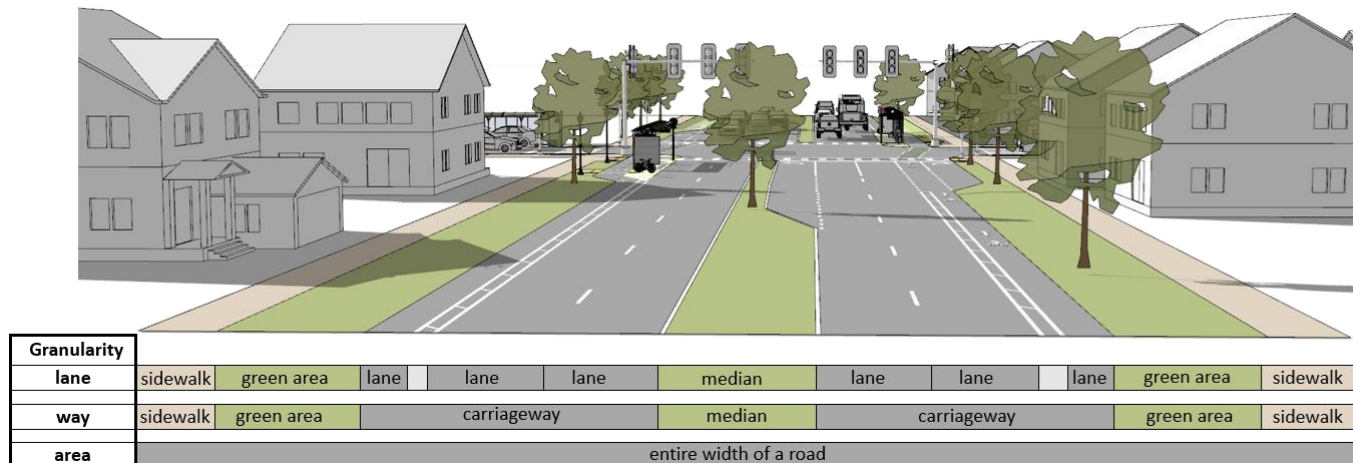# CityGML 3.0 Transportation Module
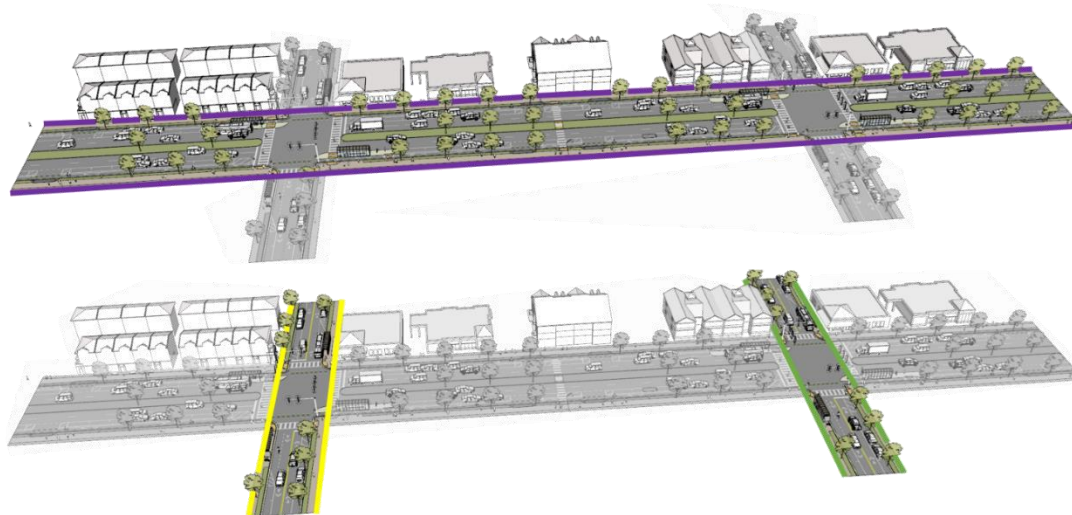
Roads – Modelling Examples

Three levels of granularity

► In **granularity 'area'** the entire width of a **Road** is modelled with one single object.

► In **granularity 'way'** individual objects are modelled per surface function (or traffic type). This means one object per carriageway is used.

► In **granularity 'lane'** each individual lane (including driving lanes for vehicles) are modelled separately.

Granularity											
lane	sidewalk	green area	lane		lane	lane	median	lane	lane	lane	green area	sidewalk
way	sidewalk	green area	carriageway				median	carriageway			green area	sidewalk
area	entire width of a road											

Representation of Roads

▶ A **Road** is a transportation space used by vehicles, bicycles and/or pedestrians.

▶ Usually **Roads** should be distinguished by individual names.

▶ **Roads** consist of individual **Sections** and **Intersections**.

▶ Multiple **Roads** can share the same **Intersection**.

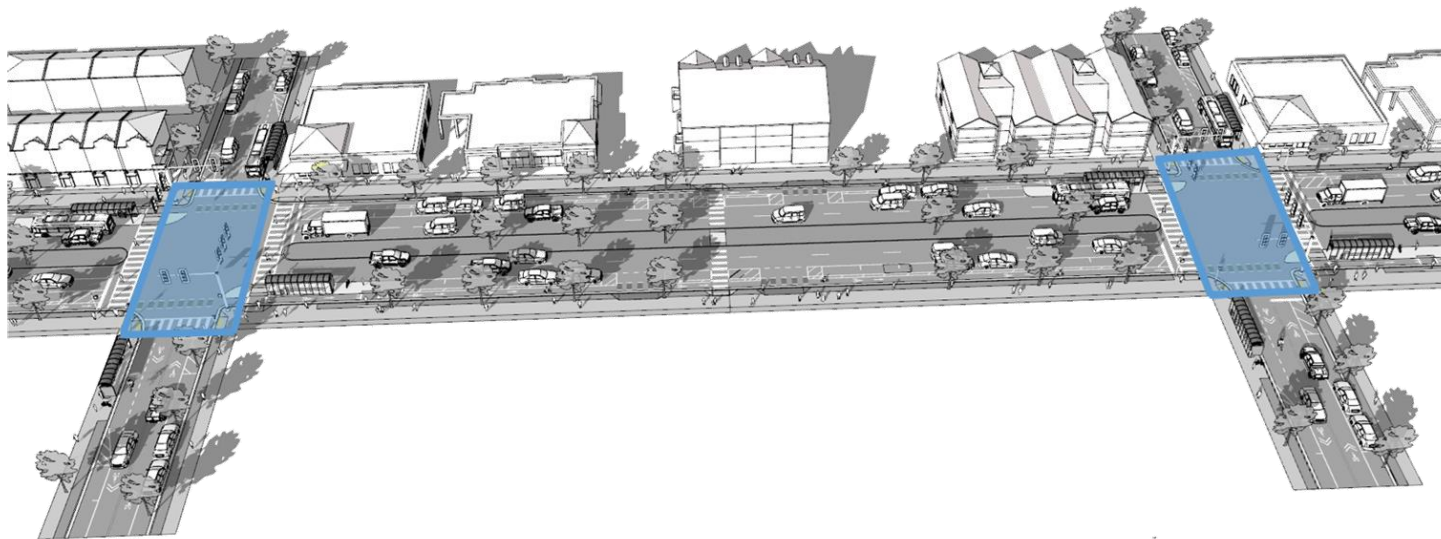# Segmenting road networks into Sections and Intersections

Segmenting road networks into Sections and Intersections

- **Roads** can consist of several **Sections**

- A **Section** is a transportation segment that can clearly be assigned to one **Road** (or **Railway, Track, Waterway**) object.

- **Sections** should cover the entire width of a **Road** and thus directly correspond to the representation of transportation objects in **granularity 'area'.**
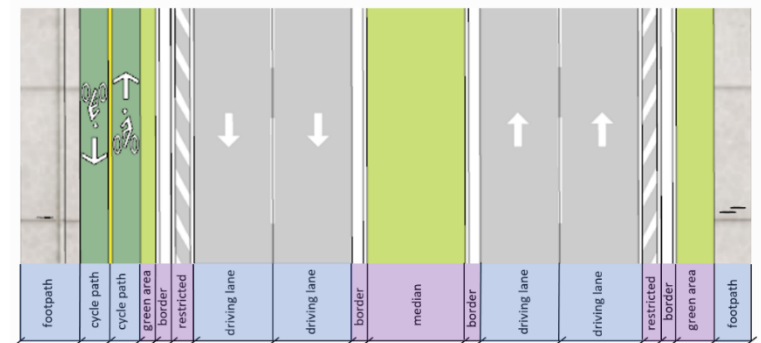
Segmenting road networks into Sections and Intersections

► An **Intersection** is a transportation space that is a shared segment of multiple **Roads** or other transportation objects such as **Railways** (e.g. a crossing of two **Roads** or a level crossing of a **Road** and a **Railway**).

► The link of an **Intersection** to multiple **Roads** can be explicitly modelled (using **XLinks**)

TrafficAreas and AuxiliaryTrafficAreas

► A **TrafficArea** is the ground surface of a **TrafficSpace** upon which traffic actually takes place.

► **AuxiliaryTrafficAreas** are describing further elements of the **Road**, like kerbstones, raised medians, and green areas not intended for direct traffic usage.

► **Example: Section** with two carriageways segmented into **TrafficAreas** and **AuxiliaryTrafficAreas**

Individual Section with one carriageway

Reality

Section

TrafficAreas and
AuxiliaryTrafficAreas


```xml
<core:cityObjectMember>
    <tran:Road gml:id="UUID_Little_Lonsdale_Street">
        <gml:name>Little_Lonsdale_Street</gml:name>
        <tran:section>
            <tran:Section gml:id="UUID_20044">
                <tran:trafficSpace>
                    <tran:TrafficSpace gml:id="UUID_TS_id_4c95049e-1b96-4a39-b678-29ce209cddb5">
                        <core:boundary>
                            <tran:TrafficArea gml:id="UUID_TA_0bd21839-0ced-4660-8c21-75dbf633ec7a">
                                <core:lod2MultiSurface>
                                    <gml:MultiSurface srsName="EPSG:32755" srsDimension="3">
                                        <!Geometry definition>
                                    </gml:MultiSurface>
                                </core:lod2MultiSurface>
                                <tran:function>2</tran:function>
                                <tran:surfaceMaterial>3</tran:surfaceMaterial>
                                <!Additional attributes such as area in sqm, etc.>
                            </tran:TrafficArea>
                        </core:boundary>
                        <tran:granularity>way</tran:granularity>
                    </tran:TrafficSpace>
                </tran:trafficSpace>
                <!Additional (Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
    </tran:Road>
</core:cityObjectMember>
```

Individual Section with two carriageways

Reality

Section

TrafficAreas and
AuxiliaryTrafficAreas


```xml
<core:cityObjectMember>
    <tran:Road gml:id="UUID_Lygon_Street">
        <gml:name>Lygon_Street</gml:name>
        <tran:section>
            <tran:Section gml:id="UUID_20522">
                <tran:trafficSpace>
                    <tran:TrafficSpace gml:id="UUID_TS_id_5c249b72-82c3-47ef-9be3-e3de6340c6cd">
                        <core:boundary>
                            <tran:TrafficArea gml:id="UUID_TA_72cc6ac7-caf4-439b-b08a-707c5dd3f506">
                                <core:lod2MultiSurface>
                                    <gml:MultiSurface srsName="EPSG:32755" srsDimension="3">
                                        <!Geometry definition>
                                    </gml:MultiSurface>
                                </core:lod2MultiSurface>
                                <tran:function>2</tran:function>
                                <tran:surfaceMaterial>3</tran:surfaceMaterial>
                                <!Additional attributes such as area in sqm, surface material, etc.>
                            </tran:TrafficArea>
                        </core:boundary>
                        <tran:granularity>way</tran:granularity>
                    </tran:TrafficSpace>
                </tran:trafficSpace>
                <tran:trafficSpace>
                    <tran:TrafficSpace gml:id="UUID_TS_id_cdbf9131-027f-425f-a355-f605d04a4f84">
                        <core:boundary>
                            <tran:TrafficArea gml:id="UUID_TA_ae280a29-8d9a-49c0-bf74-ffea469290d6">
                                <core:lod2MultiSurface>
                                    <gml:MultiSurface srsName="EPSG:32755" srsDimension="3">
                                        <!Geometry definition>
                                    </gml:MultiSurface>
                                </core:lod2MultiSurface>
                                <tran:function>2</tran:function>
                                <tran:surfaceMaterial>3</tran:surfaceMaterial>
                                <!Additional attributes such as area in sqm, etc.>
                            </tran:TrafficArea>
                        </core:boundary>
                        <tran:granularity>way</tran:granularity>
                    </tran:TrafficSpace>
                </tran:trafficSpace>
                <!Additional (Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
    </tran:Road>
</core:cityObjectMember>
```

3-way Intersection

Reality

Sections with Intersection

TrafficAreas and AuxiliaryTrafficAreas

```xml
<core:cityObjectMember>
    <tran:Road gml:id="UUID_Queensberry_Street">
        <gml:name>Queensberry_Street</gml:name>
        <tran:section>
            <tran:Section gml:id="UUID_22497">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:intersection xlink:href="#UUID_20555"/>
    </tran:Road>
</core:cityObjectMember>
<core:cityObjectMember>
    <tran:Road gml:id="UUID_Rathdowne_Street">
        <gml:name>Rathdowne_Street</gml:name>
        <tran:section>
            <tran:Section gml:id="UUID_20554">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:section>
            <tran:Section gml:id="UUID_20556">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:intersection>
            <tran:Intersection gml:id="UUID_20555">
            <gml:name>Queensberry_Street</gml:name>
            <gml:name>Rathdowne_Street</gml:name>
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Intersection>
        </tran:intersection>
    </tran:Road>
</core:cityObjectMember>
```
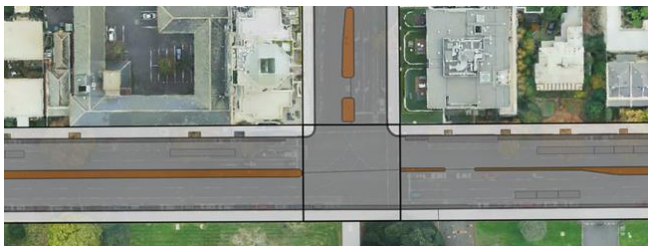
4-way Intersection / or small roundabout

Reality

Sections
with
Intersection

TrafficAreas
and
Auxiliary-
TrafficAreas


```xml
<core:cityObjectMember>
    <tran:Road gml:id="UUID_Queensberry_Street">
        <gml:name>Queensberry_Street</gml:name>
        <tran:section>
            <tran:Section gml:id="UUID_22497">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:section>
            <tran:Section gml:id="UUID_22498">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:intersection xlink:href="#UUID_20542"/>
    </tran:Road>
</core:cityObjectMember>
<core:cityObjectMember>
    <tran:Road gml:id="UUID_Drummond_Street">
        <gml:name>Drummond_Street</gml:name>
        <tran:section>
            <tran:Section gml:id="UUID_20544">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:section>
            <tran:Section gml:id="UUID_20542">
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Section>
        </tran:section>
        <tran:intersection>
            <tran:Intersection gml:id="UUID_20543">
            <gml:name>Queensberry_Street</gml:name>
            <gml:name>Drummond_Street</gml:name>
                <!(Auxiliary)TrafficSpaces with corresponding (Auxiliary)TrafficAreas>
            </tran:Intersection>
        </tran:intersection>
    </tran:Road>
</core:cityObjectMember>
```