

SERVICE DESCRIPTION

TN-ITS Rosatte – web service for road safety data

Version 0.6 - Draft



Dokumenttitel	Version	Datum
Service description – TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

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Document title: TN-ITS Rosatte – web service for road safety data

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Version: 0.6

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Dokumenttitel	Version	Datum
Service description: TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

Overview

Service name:	TN-ITS Rosatte
Service owner:	Swedish Transport Administration
Service custodian:	Jenny Rassmus
Fee:	No fee is charged for access or use
License:	Creative Commons Attribution 3.0 Unported (CC BY 3.0) ¹
Target users:	Road navigation map producers, ITS-application developers, ITS-application providers
Point of contact:	geografisk.information@trafikverket.se

Service functions and content

Purpose

TN-ITS road safety data from the Swedish Transport Administration (STA) are provided for an automatic and timely exchange of safety attributes between the STA and potential users of such data. This document specifies the web service that provides daily incremental updates of selected safety related data from the Swedish National Road Database (NVDB) according to the ROSATTE specification.

The web service provides the user with a list of datasets and a possibility to download these datasets as a GML stream according to the ROSATTE GML schema²

A road safety feature in this context is a feature or an attribute in a digital road database which describes the content of a traffic regulation. To be useful, each safety attribute along a road must be paired by the description of its location. The location may be a point or a linear location.

CHANNELS

The service is a REST-based web service available through the STA web interface. Metadata describing the service is available in the Swedish national geodata portal³.

¹ <http://www.creativecommons.org/licenses/by/3.0/>

² <http://tn-its.eu/docs/rosatte/ROSATTE-D31-Specification-of-data-exchange-methods-v16.pdf>

³ <https://www.geodata.se/GeodataExplorer/>

Dokumenttitel	Version	Datum
Service description – TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

Data content

The road safety data feature types provided are speed limit, restrictions in height, weight and width, forbidden driving direction, road name and road number. Time and/or vehicle conditions are included when those are applied. The table below lists the types of road safety feature types available in the service. A detailed description of the road safety feature types will be available in the TN-ITS Rosatte data product specification⁴.

Road safety feature type	Safety feature property value	Possible conditions	NVDB mapping
SpeedLimit	MaximumSpeedLimit	TimeCondition (ValidityPeriod) VehicleCondition (VehicleType) Condition will be added to the feature when the NVDB attribute <i>Avvikande hastighet</i> is present.	Feature type: <i>Hastighetsgräns</i> Feature attribute: <i>Högsta tillåtna hastighet</i> <i>Avvikande hastighet/</i> <ul style="list-style-type: none"> • <i>Högsta tillåtna hastighet</i> • <i>Gäller inte/endast fordon</i> • <i>Fordonstyp</i> • <i>Tidsintervall</i> I some cases <i>Fordonstyp</i> and <i>Tidsintervall</i> are partially translated.
RestrictionsForVehicles	MaximumWeightPerSingleAxle	TimeCondition (ValidityPeriod) Condition will be added to the feature when the NVDB attribute <i>Tidsintervall</i> is present.	Feature type: <i>Begränsat axel – boggtryck</i> Feature attribute: <i>Högsta tillåtna tryck</i> <i>Typ av tryck</i> where <i>Typ av tryck = axeltryck</i> <i>Tidsintervall</i>
	MaximumHeight	-	Feature type: <i>Höjdhinder</i> Feature attribute: <i>Fri höjd</i> If the attribute <i>Fri höjd</i> is missing in NVDB, the Safety feature property value will also be NULL.
	MaximumLadenWeight	TimeCondition (ValidityPeriod) Condition will be added to the feature when the NVDB attribute <i>Tidsintervall</i> is present.	Feature type: <i>Begränsad bruttovikt</i> Feature attribute: <i>Högsta tillåtna bruttovikt</i> <i>Tidsintervall</i>

⁴ To be written or added in a future version of this document (eg Appendix)

Dokumenttitel	Version	Datum
Service description: TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

Road safety feature type	Safety feature property value	Possible conditions	NVDB mapping
	MaximumWidth	TimeCondition (ValidityPeriod) VehicleCondition (VehicleType) Condition will be added to the feature when the NVDB attribute <i>Tidsintervall</i> and/or <i>Gäller inte fordon/trafikant</i> is present.	Feature type: <i>Begränsad fordonsbredd</i> Feature attribute: <i>Högsta tillåtna fordonsbredd</i> <i>Tidsintervall</i> <i>Gäller inte fordon/trafikant</i> I some cases <i>Fordonstyp</i> and <i>Tidsintervall</i> are partially translated.
NoEntry	-	TimeCondition (ValidityPeriod) Condition will be added to the feature when the NVDB attribute <i>Tidsintervall</i> is present.	Feature type: <i>Förbjuden färdriktning</i> Feature attribute: <i>Tidsintervall</i>
RoadName ⁵	RoadName	-	Feature type: <i>Gatunamn</i> Feature attribute: <i>Namn</i>
RoadNumber ⁶	RoadNumber Value construction: {"E" ""} + <i>Huvudnummer</i> + <i>Undernummer</i> value	-	Feature type: <i>Vägnummer</i> Feature attribute: <i>Huvudnummer</i> <i>Undernummer</i> <i>Europaväg</i>

The location of the safety features or attributes is defined by three separate methods: OpenLR, linear referencing and the safety feature geometry. Further information on this topic is given in the technical chapter.

The service is providing different types of updates in road data safety features. The update types are listed in the table below. All update types require the use of permanent object identifiers by which safety features can be unambiguously identified. A permanent object identifier is an identifier which is unique within the scope of and follows a safety feature during its entire lifetime.

⁵ This safety feature type was added for the EULF Transportation pilot, it is an extension of D3.1 - Specification of data exchange methods from the Rosatte project, also called the ROSATTE specification.

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Dokumenttitel	Version	Datum
Service description – TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

Update type	Description
Add	a new safety feature is inserted at the referenced location, without affecting any existing safety feature
Modify	modifies the attributes of an existing safety feature referenced by an object identifier
Remove	removes the existing safety feature referenced by an object identifier

Explanation of when add, modify and remove occurs and some examples will be added in the final version of this document.

Technical information

The TN-ITS Rosatte web service publishes a REST-based interface according to the Rosatte specification for downloading data.

Accessing the service

BaseURL	https://app.trafikverket.se/RosatteDownload/download/
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Service request

Implemented request	Response	Parameters
queryDatasets	XML dataset with a list of all available datasets on the server. By using the parameter <i>lastValidDatasetId</i> the response will list all datasets available after a specified dataset.	lastValidDatasetId=<dataSetID>
readDataSet	GML dataset with changed road safety features	dataSetID=<dataSetID>

Task to perform	Request
Query datasets	https://app.trafikverket.se/RosatteDownload/download/queryDatasets
Query datasets created after the specified dataset	<a href="https://app.trafikverket.se/RosatteDownload/download/queryDatasets?lastValidDatasetId=<dataSetID>">https://app.trafikverket.se/RosatteDownload/download/queryDatasets?lastValidDatasetId=<dataSetID>
Read dataset	<a href="https://app.trafikverket.se/rosattedownload/download/readDataSet?dataSetID=<dataSetID>">https://app.trafikverket.se/rosattedownload/download/readDataSet?dataSetID=<dataSetID>

Service response

Dokumenttitel	Version	Datum
Service description: TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

RESPONS FROM QUERYDATASET

The respons from a queryDataset request is a list of dataset references in the form of a complete URL by which the dataset can be downloaded. Normally one dataset is produced per workday but in exceptional cases there can be more or less files produced.

```
<?xml version="1.0" encoding="UTF-8"?>
- <rst:ROSATTERestDatasetRefList
  xmlns:rst="http://www.ertico.com/en/subprojects/rosatte/rst"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xlink="http://www.w3.org/1999/xlink">
  <rst:ROSATTERestDatasetRef
    xlink:href="https://app.trafikverket.se/rosattedownload/download/readDataSet?
    dataSetID=1uShiYqi%2fEe120s9P1ga7AAAAPSDsVBAAAAHedL1UE%3d"/>
  <rst:ROSATTERestDatasetRef
    xlink:href="https://app.trafikverket.se/rosattedownload/download/readDataSet?
    dataSetID=1uShiYqi%2fEe120s9P1ga7AAAAGjrS9VBAAA%2f39N1UE%3d"/>
  <rst:ROSATTERestDatasetRef
    xlink:href="https://app.trafikverket.se/rosattedownload/download/readDataSet?
    dataSetID=1uShiYqi%2fEe120s9P1ga7AAAADiDtVBAAAA3YNN1UE%3d"/>
  <rst:ROSATTERestDatasetRef
    xlink:href="https://app.trafikverket.se/rosattedownload/download/readDataSet?
    dataSetID=1uShiYqi%2fEe120s9P1ga7AAAAN2DTdVBAAAAIdN1UE%3d"/>
  <rst:ROSATTERestDatasetRef
    xlink:href="https://app.trafikverket.se/rosattedownload/download/readDataSet?
    dataSetID=1uShiYqi%2fEe120s9P1ga7AAAAPBvTtVBAAAAkHNQ1UE%3d"/>
```

Figure 1. The first part of a respons from a queryDatasets request. 5 datasets are listed in the picture.

One method to view a file (GML) with a daily incremental updates simply paste the value of `rst:ROSATTERestDatasetRef xlink:href` into a web browser.

RESPONSE FROM READ DATASET

Safety feature identification

Each safety feature that has been subject to an update and delivered in a dataset is indicated by the element `gml:featureMember`.

```
<gml:featureMember>
  <rst:GenericSafetyFeature gml:id="ica923856-6870-4254-9813-54c475a9e091">
    <rst:id>
      <rst:SafetyFeatureId>
        <rst:providerId>SE.TrV.NVDB</rst:providerId>
        <rst:id>{011d21e1-cb94-4179-b463-5b35b8cffb18}</rst:id>
      </rst:SafetyFeatureId>
    </rst:id>
    .
    .
  </rst:GenericSafetyFeature>
</gml:featureMember>
```

Figur 2. Elements for identification in a safety feature element.

The table below gives an explanation to the safety feature identifier elements in the service.

XML element	Explanation
<code>rst:GenericSafetyFeature gml:id</code>	The element contains a local id created as the safety feature is written to the gml file. The id is not relevant for a consumer of the TN-ITS service.
<code>rst:SafetyFeatureId</code>	The element contains two elements, <code>rst:providerId</code> and <code>rst:id</code> , which in combination uniquely identifies a safety feature.

Dokumenttitel	Version	Datum
Service description – TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

XML element	Explanation
<code>rst:providerId</code>	The element identifies the data provider.
<code>rst:id</code>	The element is an identifier (GUID) for the safety feature in the TN-ITS service, it can be used to match features across different dataset. However, this identifier is not stable over different instances of the service.

Safety feature location referencing

A safety feature can be located by three different methods: linear referencing, OpenLR™ and feature geometry. All three are always provided for a safety feature update.

```

<rst:locationReference>
  <rst:INSPIRELinearLocation gml:id="id2fded34-06be-4f04-9f6d-fdf5a3bf6e03">
    <net:SimpleLinearReference>
      <net:element xlink:href="SE.TrV.NVDB:LinkSequence:11157:223246"/>
      <net:applicableDirection>inOppositeDirection</net:applicableDirection>
      <net:fromPosition uom="meter">0</net:fromPosition>
      <net:toPosition uom="meter">32.2255071798423</net:toPosition>
    </net:SimpleLinearReference>
  </rst:INSPIRELinearLocation>
</rst:locationReference>
<rst:locationReference>
  <rst:OpenLRLocationString gml:id="i390f062e-5584-4ddd-87b8-9dc142fee460">
    <rst:base64String>CwoAYS007jv3Af9kAAU7SJg=</rst:base64String>
    <rst:OpenLRBinaryVersion>1.4</rst:OpenLRBinaryVersion>
  </rst:OpenLRLocationString>
</rst:locationReference>
.
.
.
<rst:encodedGeometry>
  <gml:LineString gml:id="i06bc4766-608b-4d5c-bd7a-1c1fd268f663" srsDimension="2">
    <gml:posList>14.0630185879975 63.3633033100731 14.0636474628046 63.3632405862271</gml:posList>
  </gml:LineString>
</rst:encodedGeometry>

```

Figur 3: Location reference elements in a safety feature element

OpenLR™ is a method for location referencing which allows communication of location between systems which have dissimilar maps. OpenLR™ is a royalty-free technology and open Industry Standard⁷.

OpenLR™ uses the model of “location reference points” (LRPs). Each LRP is a combination of building blocks. The building blocks are *Coordinate pair*, *Functional Road Class (FRC)*, *Form of way*, *Bearing*, *Distance to next LR-point*, *Lowest FRC to next LR-point*, *Radius*, *Number of columns/rows* and *Offsets*.

NVDB is based on the principles of linear referencing and dynamic segmentation. This means that the basic road network (links and nodes) is segmented based only on the occurrence of junctions. The junctions represent a topological choice on the chosen level of representation (road or carriageway). Feature types are connected as events along the linear elements (road links) in the topological network using linear referencing mechanisms. That means that the segmentations for network, speed limits, road names, Functional Road Class and other attributes are independent and may therefore differ from each other. In

⁷ <http://www.openlr.org/>

Dokumenttitel Service description: TN-ITS Rosatte – web service for road safety data	Version 0.6	Datum 2016-08-15
--	-----------------------	----------------------------

order to achieve a dataset which is suitable for OpenLR™ encoding in a straightforward manner, a dataset is created and maintained where all segments are homogeneous with regards to all considered type of events (feature types attributes). The figure below explains the principles for that process.

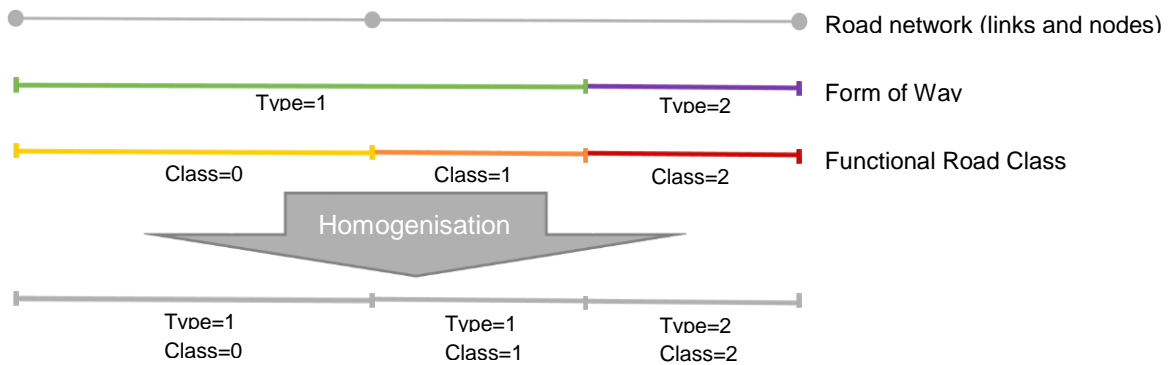


Figure 1 - Principles for dynamic segmentation

An infinite number of events (feature types and attributes) may be added to the process.

The resulting dataset contains a road network with segments which are topologically connected by nodes in every junction, road end and also where segments have been created due to attribute value changes (these segments are connected by pseudo-nodes). Each element contains the geometry and has all the necessary attributes which are relevant in order to encode OpenLR™ location references. This dataset is maintained and updated prior to every generation of TN-ITS updates in order to have an up-to-date basis for location reference encoding.

OpenLR™ data preparation	NVDB mapping												
Functional Road Class (FRC)	Feature type: <i>Funktionell vägklass (FVK)</i> Feature attribute: <i>Klass</i> <table border="1"> <thead> <tr> <th>FVK</th> <th>FRC</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>0</td> </tr> <tr> <td>2-3</td> <td>1</td> </tr> <tr> <td>4-5</td> <td>2</td> </tr> <tr> <td>6</td> <td>3</td> </tr> <tr> <td>7-9</td> <td>4</td> </tr> </tbody> </table>	FVK	FRC	1-2	0	2-3	1	4-5	2	6	3	7-9	4
FVK	FRC												
1-2	0												
2-3	1												
4-5	2												
6	3												
7-9	4												
Form of way (FW)	There is no corresponding feature class to Form of Way in NVDB. Feature type/attributes: <i>Motorväg/-</i> <i>Vägnummer/Länkröll</i> <i>Cirkulationsplats/-</i> <table border="1"> <thead> <tr> <th>Form of Way</th> <th>NVDB feature type/attributes</th> </tr> </thead> <tbody> <tr> <td>Motorway</td> <td><i>Cirkulationsplats</i></td> </tr> <tr> <td>Multiple carriageway</td> <td><i>Vägnummer/Länkröll=syskon fram</i> <i>Vägnummer/Länkröll=syskon bak</i></td> </tr> <tr> <td>Single carriageway</td> <td><i>Vägnummer/Länkröll=normal</i> <i>Motorväg, Vägnummer and</i> <i>Cirkulationsplats is NULL</i></td> </tr> </tbody> </table>	Form of Way	NVDB feature type/attributes	Motorway	<i>Cirkulationsplats</i>	Multiple carriageway	<i>Vägnummer/Länkröll=syskon fram</i> <i>Vägnummer/Länkröll=syskon bak</i>	Single carriageway	<i>Vägnummer/Länkröll=normal</i> <i>Motorväg, Vägnummer and</i> <i>Cirkulationsplats is NULL</i>				
Form of Way	NVDB feature type/attributes												
Motorway	<i>Cirkulationsplats</i>												
Multiple carriageway	<i>Vägnummer/Länkröll=syskon fram</i> <i>Vägnummer/Länkröll=syskon bak</i>												
Single carriageway	<i>Vägnummer/Länkröll=normal</i> <i>Motorväg, Vägnummer and</i> <i>Cirkulationsplats is NULL</i>												

Dokumenttitel Service description – TN-ITS Rosatte – web service for road safety data	Version 0.6	Datum 2016-08-15
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OpenLR™ data preparation	NVDB mapping	
	Roundabout	<i>Cirkulationsplats</i>
	Slip road	<i>Vägnummer/Länkroll=gren</i>
Driving direction	Feature type/attributes: <i>Förbjuden färdriktning/Direction</i> <i>Cirkulationsplats/Direction</i> <i>Gågata/-</i>	
	Driving direction	NVDB feature type/attributes
	Aligned	<i>Cirkulationsplats/Direction=Med</i> <i>Förbjuden färdriktning/Direction=Mot</i>
	Reverse	<i>Cirkulationsplats/Direction=Mot</i> <i>Förbjuden färdriktning/Direction=Med</i>
	Both	<i>Förbjuden färdriktning/Direction=Med och Mot</i>
	None	<i>Gågata</i> <i>Cirkulationsplats/Direction=Med och Mot</i> <i>Förbjuden färdriktning and Cirkulationsplats is NULL</i>

XML element	Explanation
Location of a safety feature by reference to INSPIRE	
<i>rst:INSPIRELinearLocation gml:id</i>	The element is created as the INSPIRELinearLocation is written to the xml file. The id is not relevant for a consumer of the TN-ITS service. Value: GUID
<i>net:element xlink:href</i>	The element contains a reference to the LinkSequence to which the safety feature is connected in the Swedish National Road Database (NVDB). A part of this id can be reused to request LinkSequence features, or other features connected to the same LinkSequence, from the Swedish INSPIRE TN Road web feature service. Example value (id to be reused is underlined): SE.TrV.NVDB:LinkSequence:<u>11157:223246</u>
<i>net:applicableDirection</i>	Indicates the direction in which the safety feature is valid in relation to the direction of the LinkSequence. Valid values: <i>indirection/inOppositeDirection/bothDirections</i>
<i>net:fromPosition</i>	Linjär referens i meter. Företeelsen börjar 0 meter in på referenslänken. Omräkning till meter sker i exporten och beräknas utifrån det relativa avstånd som finns i NVDB. Attribute <i>uom</i> indicates the unit of measure
<i>net:toPosition</i>	Attribute <i>uom</i> indicates the unit of measure
Location of a safety feature by reference to OpenLR	
<i>st:OpenLRLocationString gml:id</i>	The element is created as the OpenLRLocationString is written to the xml file. The id is not relevant for a consumer of the TN-ITS service. Value: GUID
<i>rst:base64String</i>	Example value: CwoAYS007jv3Af9kAAU7SJg
<i>rst:OpenLRBinaryVersion</i>	1.4

Dokumenttitel Service description: TN-ITS Rosatte – web service for road safety data	Version 0.6	Datum 2016-08-15
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Location of a safety feature by reference to feature geometry	
gml:LineString gml:id	The element is created as the geometry is written to the xml file. The id is not relevant for a consumer of the TN-ITS service. Value: GUID Attribute srsDimension indicates if the coordinates given are 2- or 3-dimensional
gml:posList	Separators Reference system for coordinates: WGS84/EPG:4326 14.0630185879975 63.3633033100731 14.0636474628046 63.3632405862271

Safety feature update information

Description of conditional safety features will be added in the final version of this document.

```
<rst:validFrom>2015-03-03</rst:validFrom>
<rst:updateInfo>
  <rst:UpdateInfo>
    <rst:type>Add</rst:type>
  </rst:UpdateInfo>
</rst:updateInfo>
<rst:source>Regulation</rst:source>
<rst:encodedGeometry>
  <gml:LineString gml:id="i06bc4766-608b-4d5c-bd7a-1c1fd268f663" srsDimension="2">
    <gml:posList>14.0630185879975 63.3633033100731 14.0636474628046 63.3632405862271</gml:posList>
  </gml:LineString>
</rst:encodedGeometry>
<rst:type>SpeedLimit</rst:type>
<rst:properties>
  <rst:SafetyFeaturePropertyValue>
    <rst:type>MaximumSpeedLimit</rst:type>
    <rst:propertyValue>
      <gml:measure uom="kmph">70</gml:measure>
    </rst:propertyValue>
  </rst:SafetyFeaturePropertyValue>
</rst:properties>
```

Figur 4: The elements in a safety feature update that contains the updated information.

The table below explains the elements that are involved in the update information.

XML element	Explanation
rst:validFrom	The element indicates the date from which the update is valid in the real world.
rst:UpdateInfo	The element contains information of the type of update needed to represent a safety feature update.
rst:type	The type of update. Values used from enumeration list UpdateType : Add/Modify/Remove
rst:source	Type of source for the safety feature. Values used from enumeration list SafetyFeatureSource: Regulation/Other
Update properties	
rst:properties	Within this element the property values of interest for the safety feature are provided.

Dokumenttitel Service description – TN-ITS Rosatte – web service for road safety data	Version 0.6	Datum 2016-08-15
---	-----------------------	----------------------------

XML element	Explanation
<code>rst:SafetyFeaturePropertyValue</code>	Example: SpeedLimit
<code>rst:type</code>	Example: MaximumSpeedLimit
<code>rst:propertyValue</code>	Example: <code>gml:measure uom="kmph">70</gml:measure</code>
<code>rst:condition</code>	Describes the circumstances when the safety feature is applicable. If not present, the safety feature is unconditional. See Rosatte specification for further description of the content.

Interpreting updates

Guidance on how to interpret updates that may be subject to misunderstanding will be added in the final version of this document. If you have suggestions please share these so we can find good examples.

LARGE AMOUNT OF ROADNAME/ROADNUMBER UPDATES

Description of why the service provides a large amount of road name update although the road name hasn't changed and a suggestion on how to treat those updates will be added in the final version of this document.

Dokumenttitel	Version	Datum
Service description: TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

Service quality

Availability:	The service is available at all times under normal conditions.
Service level agreement:	<i>I2/I3: Explanation of the SLA will be added in the final version of this document</i>
Quality declaration:	Not defined
Support:	Users that have questions about accessing or using the service are welcome to contact geografisk.information@trafikverket.se .
Feedback:	Users that have experience or feedback they want to share with STA are welcome to contact geografisk.information@trafikverket.se . Discrepancies in road data safety features can be reported to nvdb-leverans@trafikverket.se .

Changes

Service version	Datum	Förändring
1.5	2016-03-31	Road safety feature types added for the Transportation Pilot: <ul style="list-style-type: none"> • RestrictionForVehicles/MaximumWidth • RestrictionForVehicles/MaximumLadenWeight • RestrictionForVehicles/MaximumWeightPerSingleAxle • RoadName • RoadNumber Linear referencing according to Inspire added.

Document version	Datum	Förändring
0.5	2016-04-22	Draft
0.9	2016-08-xx	

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Service description – TN-ITS Rosatte – web service for road safety data	0.6	2016-08-15

References

Wikström et al. (2009). *D3.1 - Specification of data exchange methods*. ROSATTE project. <http://tn-its.eu/docs/rosatte/ROSATTE-D31-Specification-of-data-exchange-methods-v16.pdf>

INSPIRE Thematic Working Group Transport Networks. (2010). *D2.8.I.7 INSPIRE Data Specification on Transport Networks – Guidelines*. INSPIRE Thematic Working Group Transport Networks. http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_TN_v3.2.pdf

NVDB data product specifications are available in Swedish on www.trafikverket.se/dataproduktspecifikationer-vag/

Swedish national geodata portal: <https://www.geodata.se/GeodataExplorer/>

Creative commons: <http://www.creativecommons.org/licenses/by/3.0/>

OpenLR: <http://www.openlr.org/>

EULF Transportation pilot



TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

Trafikverket/Swedish Transport Administration, Borlänge. Visitors address: Röda vägen 1.
Phone: +46(0)771-921 921, Text phone: +46(0)243- 750 90

www.trafikverket.se