Updated version

RFC Rhine-Alpine Re-Routing Scenarios

Version 2.1
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1 General information

1.1. Introduction

Large incidents like Rastatt show that international measures must be implemented to be able to quickly organize traffic after a major interruption. European Rail Infrastructure Managers (IMs) agreed on international processes described in the "Handbook for International Contingency Management" (https://www.corridor-rhine-alpine.eu/downloads.html). An important new element is an international re-routing overview for the Rail Freight Corridors (RFC) and re-routing scenarios for the concerning routes.

These re-routing scenarios help traffic management and timetabling with the coordination of the deviation of freight trains in the plannable phase (as soon as possible after an incident) in case of larger incidents with an international impact.

This document includes scenarios with the possible re-routing options for all sections with limited re-routing options on RFC Rhine-Alpine.

Railway Undertakings (RUs) are consulted on re-routing overview and re-routing scenarios and asked to give information on restrictions from their point of view. The feedback is not part of this document. The re-routing scenarios shall also serve as a basis for the RU contingency management with the objective to increase possible use of deviation routes.

1.2. Publication and updates

The national IMs are responsible to distribute this document or the contained information with the re-routing scenarios within their own organisation and to the RUs which run on their network. RFC Rhine-Alpine also publishes the document on its website and organises the consultation with RUs.

The re-routing scenarios for RFC Rhine-Alpine are updated every year until the end of November by the corridor organisation together with the IMs of RFC Rhine-Alpine.

1.3. Processes and communication for international disruptions

In case of international disruptions, international processes for incident management and incident communication which shall apply during the plannable phase are described in chapter 4 of the Handbook for International Contingency Management. They do not replace national incident management procedures but complement them in order to facilitate a better international cooperation.

1.4. General requirements

RUs crossing a border must take all national rules into account (see network statement). For example: language requirements for the train drivers, other signalling and power systems.

1.5. Definitions

1.5.1. Definitions of infrastructure parameters

These definitions apply to information given in both re-routing scenarios and re-routing overview (separate excel document)

Term	Definition
Line section	Section of the normal RFC routing
Deviation including route	Section which replaces the normal routing on the deviation route
Passengers	Section used for passenger traffic
Freight	Section used for freight traffic
Traction power	Catenary voltage / In B also a standard thermal locomotive and a standard electric locomotive are given
Train length	Maximum allowed length for a train (in meters, locomotive included)
Line category	e.g. D4, D5… in the sheets for SNCF Réseau and ÖBB this is partly indicated as 22,5t
Number of tracks	Number of tracks on the line section
Gradient	Gradient (in permille) of the line section - most important in Switzerland and Austria
Gauge	e.g. GB, GB1, GC, etc.
Intermodal Freight Code	The information is mostly given with the PC code in standard format, e.g. P/C 70/400; exemptions: RFI uses the codes PC45, PC80 etc, SNCF Réseau uses the codes C45
Signalling	This column is filled out with the version of ETCS (when in use) or the STM e.g. ATB EG, TBL1, SCMT etc.
Speed	This is filled out with either the max speed for a freight train or the maximum speed allowed on the line section (in km/h)
Length of re-routing Option	In km
Weight	The maximum weight (in tons) which can be handled by one locomotive. Often different per direction, e.g. due to gradient, therefore mostly two figures given, for each direction If not otherwise stated the assumed locomotives are: NL: BR 189, BE: Traxx and class 66, DE: DB 185, LU n/a, FR n/a, CH n/a, IT: group A, AU: class 1216.
Miscellaneous	This column is used to give any useful extra information

1.5.2. Explanations regarding the usability indication

In the event of a major incident there can be several possible re-routing options. For the scenarios the usability of these possible routes is indicated in three categories. This can facilitate the process of re-routing.

The categorization is defined in options A, B and C. There is no fixed definition for the degree of usability, but the assessment depends on several aspects regarding capacity, technical and/or organisational restrictions (possibilities and limitations). The classification is based on the expert estimates of experienced train traffic controllers (aimed at re-routing freight trains).

The categories are:

- A: good availability (no major restrictions)
- B: usability is reasonable (with some restrictions)
- C: usability is worst (some major capacity, technical and/or organisational restrictions)

1.5.3. Explanations regarding the capacity indication

Capacity indications which are given in this document are indications of the free capacity on a deviation route in case of an incident. The assessment is related to the traffic volume on RFC Rhine-Alpine and based on the following ranges:

- appr. < 10 trains per day per direction: **extremely limited**
- appr. 10 – 24 trains per day per direction: **limited**
- appr. 25 – 50 trains per day per direction: **good**
- > 50 trains per day per direction: **excellent**

Detailed information regarding the capacity available on a deviation route can only be given in case of an incident. The capacity depends very much on the concrete situation at the time of the incident, for example including the traffic volume at the time of the year/month and the situation regarding temporary capacity restrictions.

1.5.4. Capacity which is taken into account

This re-routing overview can only consider free capacity, so remaining after allocation from yearly timetable and ad hoc capacity (estimations on basis of historical information). This has led to situations that some lines are not shown because there is almost no capacity left and that the mentioned capacity in the table is lower than expected.

For heavily used networks discussions are ongoing between legislators and IMs to get the possibility to withdraw or reschedule already allocated capacity. This possibility which is not part of the existing European legislation, could give IMs the competence to create space to reallocate the capacity in favour of the re-routing of (international) freight trains.

1.6. Traffic volume on RFC Rhine-Alpine

The Rhine-Alpine corridor is connecting the biggest European sea ports with the hinterland, crosses large European metropolitan areas and links big industrial centers, as for example northern Italy. The intermodal market share of rail freight transport is comparatively high, also due to the strong political support in Switzerland for the alpine transit traffic.

RFC Rhine-Alpine is regularly monitoring the number of international freight trains that are crossing border points on the corridor. These figures give an indication on the international traffic on the principal routes of the Rhine-Alpine corridor which would have to be re-routed in case of an international disruption. However, the exact train numbers per day and week differ strongly during the year, between weekdays/weekends and night/day, during holiday periods, etc. The highest volume goes via the border crossing at Basel, with an average of 140-150 trains/day (both directions).

The following table shows the number of trains at the border crossings related to RFC Rhine-Alpine.

	2017
Netherlands / Germany	
Emmerich	24.500
Venlo	12.500
Bad Bentheim	5.850
Belgium /Germany	
Montzen	22.900
Germany / Switzerland	
Basel	51.450
Switzerland / Italy	
Domodossola	25.450
Chiasso	16.000
Pino	4.750

1.7. Structure of the document

The re-routing scenarios are presented as follows: Chapter 2 focusses on the re-routing scenarios for the northern part of RFC Rhine-Alpine, chapter 3 covers re-routing scenarios for middle part and chapter 4 describes the re-routing scenarios on the southern part of RFC Rhine-Alpine. Each part is first introduced with an overview map of the relevant sections with limited re-routing possibilities plus short descriptions of the re-routing options. The overview is followed by detailed descriptions of the main re-routing options for each of these sections, including detailed maps and a description of the re-routing options with characteristics and parameters. A full map including all routes presented in this document as well as a table of all re-routing options is shown in Annex 1 and Annex 2, respectively.

The presented re-routing options focus on freight train re-routing.

1.8. Disclaimer / Limitation of Liability

These re-routing scenarios serve for information only. Although every care has been taken by RFC Rhine-Alpine to ensure the accuracy of the information published, no warranty can be given in respect of the accuracy, reliability, up-to-dateness or completeness of this information. RFC Rhine-Alpine and the involved IMs/AB (allocation body) accept no liability for direct or indirect damages of material or immaterial nature arising from use or non-use of the published information. Moreover, all responsibility for the content of any external sites referred to by this document (links) is declined.

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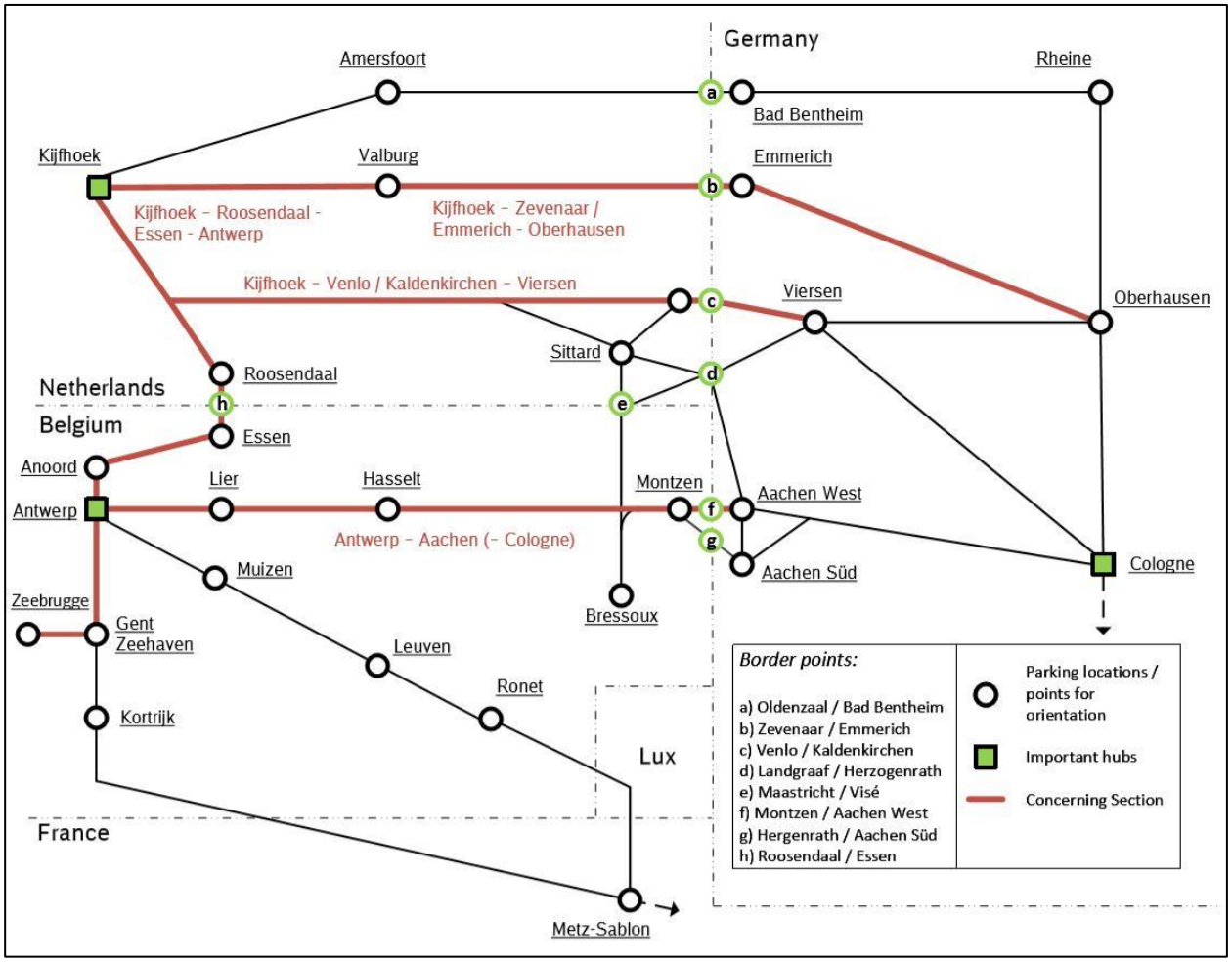
2 Northern Part

2.1. Overview re-routing options northern part

The following sections with limited re-routing possibilities are defined for the northern part of the RFC Rhine–Alpine.



Some re-routing options can be used for various sections.

On the northern part of RFC Rhine-Alpine the following routes can be used for rail freight operations. All of these routes can be used as re-routing options, depending on the line section where an incident happens.

Section ID	Route
NL-DE-1	Kijfhoek – Zevenaar / Emmerich – Oberhausen
NL-DE-2	Kijfhoek – Venlo / Kaldenkirchen – Viersen
NL-DE-3	Kijfhoek – Oldenzaal / Bad Bentheim – Rheine
NL-BE-DE-1	Kijfhoek – Roosendaal / Essen – Aachen West – Cologne
NL-BE-DE-2	Kijfhoek – Sittard – Maastricht / Visé – Bressoux – Aachen West
NL-BE-LU-FR-1	Kijfhoek – Roosendaal/Essen – Antwerp – Luxemburg – FR

NL-BE-FR-1	Kijfhoek – Roosendaal / Essen – Antwerp – Kortrijk – FR
NL-BE-DE-3	Cologne – Aachen Rothe Erde – Aachen Süd – Hergenrath – Montzen – Roosendaal – Kijfhoek
BE-DE-1	Zeebrugge / Antwerp – Aachen West – Cologne
BE-NL-DE-1	Antwerp –Roosendaal / Essen – Kijfhoek – Emmerich – Oberhausen
BE-NL-DE-2	Antwerp – Roosendaal / Essen – Venlo / Kaldenkirchen – Viersen
BE-DE-3	Antwerp – Montzen – Hergenrath – Aachen Süd – Aachen Rothe Erde – Cologne
BE-NL-DE-3	Antwerp – Roosendaal / Essen – Maastrich / Visé – Bressoux – Aachen West
BE-FR-1	Antwerp – Kortrijk – FR
BE-LU-FR-1	Antwerp – Luxemburg – FR

NL-DE-1: Kijfhoek – Zevenaar / Emmerich – Oberhausen

The route Kijfhoek – Zevenaar / Emmerich – Oberhausen (Betuweroute) is between Kijfhoek and the Dutch/German border the main freight rail connection between Rotterdam and Germany. It is a double track freight line which is equipped with ETCS and 25kV. Between the Dutch /German border and Oberhausen this is a double mixed track (for freight and passenger trains) with PZB signalling and 15 kV.

NL-DE-2: Kijfhoek – Venlo / Kaldenkirchen – Viersen

For the Netherlands, this is the second main freight route to Germany. It is a double mixed track (passenger and freight trains) with ATB signalling and 1,5 kV electricity. Between Kaldenkirchen and Viersen Gbf it is a single track, with PZB and 15 kV. The tracks between Roosendaal and Venlo and Kijfhoek and Venlo are suitable for 740 m trains. However, the maximum train length is determined by the length of the tracks at the Venlo border station. (±650 m).

NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim – Rheine

In the Netherlands, this is mainly a double mixed track (passenger and freight trains) with ATB signalling and 1,5 kV electricity. Trains can run via Weesp – Amersfoort – Oldenzaal – Bad Bentheim or via the Betuweroute (Meteren – Elst) – Deventer (change headway) – Oldenzaal – Bad Bentheim. Between Bad Bentheim and Rheine it is also a double mixed track with PZB and 15 kV.

Train length is normally 590 m, but longer trains could run with the consent of DB Netz. ProRail takes care for the coordination with DB Netz.

NL-BE-DE-1: Kijfhoek – Roosendaal / Essen – Aachen West – Cologne

This is a double mixed (passenger and freight trains) track. In the Netherlands it has ATB signalling and 1,5 kV electricity. In Belgium (as from Roosendaal) it has TBL1 signalling and 3 kV electricity. Electric trains can run through the power change installation.

NL-BE-DE-2: Kijfhoek – Sittard – Maastricht / Visé – Bressoux – Aachen West

For the Netherlands, this route mainly follows the Brabantroute (second main freight line) and from Eindhoven it goes via Sittard to Maastricht. It is a double mixed (passenger and freight trains) track with ATB signalling and 1,5 kV electricity on the Dutch network. From Eijsden into Belgium the route has TBL1 signalling and 3 kV electricity. Electric powered trains can run through the power change installation.

NL-BE-LU-FR-1: Kijfhoek – Roosendaal / Essen – Antwerp – Luxemburg – FR

This is the main route from the Netherlands to and from Belgium. Between Kijfhoek – Roosendaal it is a double mixed (passenger and freight trains) track with ATB signalling and 1,5 kV electricity. In Belgium until Roosendaal the route has TBL1 signalling and 3 kV electricity. In Belgium the route is via Antwerp – Muizen – Leuven – Namur until the French border at Aubange. That route has TBL1 and 3 kV. In France the route goes via Woippy / Metz – Strasbourg – Mulhouse to Basel. In France the tracks have 25 kV electricity and KVB signalling.

NL-BE-FR-1: Kijfhoek – Roosendaal / Essen – Antwerp – Kortrijk – FR

Between Kijfhoek – Roosendaal it is a double mixed (passenger and freight trains) track with ATB signalling and 1,5 kV electricity. In Belgium until Roosendaal the route has TBL1 signalling and 3 kV electricity. In Belgium the route goes via Antwerp – Kortrijk to France. In France the route is via Lille – Metz – Strasbourg – Basel. In France the tracks have 25 kV electricity and KVB signalling.

NL-BE-DE-3: Cologne – Aachen Rothe Erde – Aachen Süd – Hergenrath – Montzen – Roosendaal – Kijfhoek

This re-routing option is only usable for the direction Germany to Belgium / Netherlands because the infrastructure cannot facilitate the other direction.

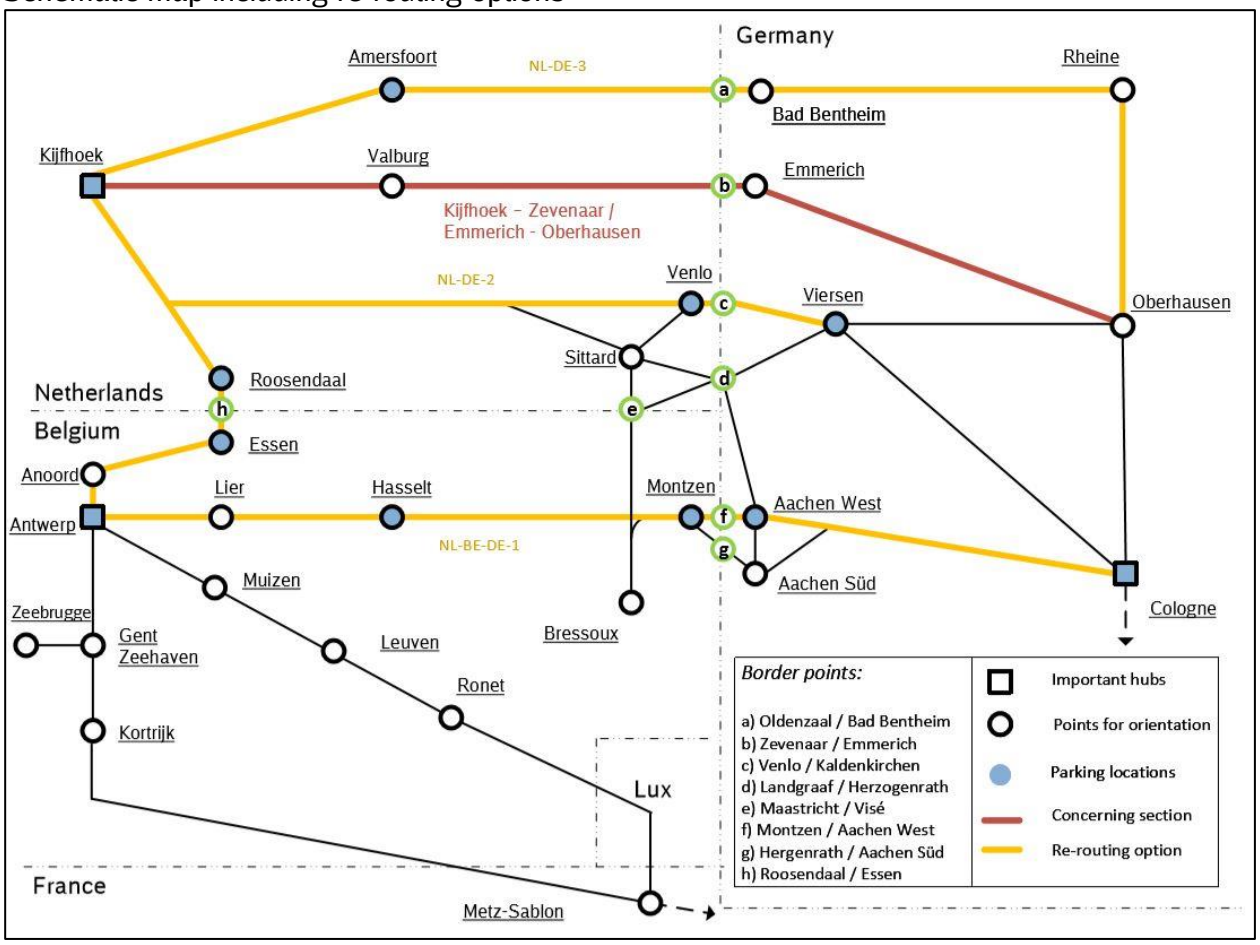
BE-DE-1: Zeebrugge / Antwerp – Aachen West – Cologne

This is the so called *Montzenroute*. It is a very important route for hinterland traffic of the big ports in Belgium. The route starts in Zeebrugge / Antwerp and follows Lier, Hasselt and goes via Montzen to Aachen West. The whole route is electrified with 15 kV 16,7 Hz in Germany and 3 kV in Belgium. The whole route is double track. Between Glons and Aachen the route is freight traffic only. Depending on the type of locomotive, for this stretch (but only direction Germany – Belgium) very heavy trains may need an additional pushing locomotive due to gradient conditions.

2.2. Re-routing scenario for section Kijfhoek – Zevenaar / Emmerich – Oberhausen

2.2.1. General description

Schematic map including re-routing options



When the route Kijfhoek – Zevenaar / Emmerich – Oberhausen is blocked re-routing options are:

Section ID	Usability	Route
NL-DE-2	A	Kijfhoek – Venlo / Kaldenkirchen – Viersen
NL-DE-3	B	Kijfhoek – Oldenzaal / Bad Bentheim – Rheine
NL-BE-DE-1	B	Kijfhoek – Roosendaal / Essen – Aachen West – Cologne

These routes should normally cover the number of trains that go via the disturbed route Kijfhoek – Zevenaar / Emmerich – Oberhausen. Other routes presented in chapter 2 could also be used but have a “C” rating under usability. They are therefore not included in this scenario description.

2.2.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Kijfhoek – Zevenaar / Emmerich – Oberhausen																
ProRail	Kijfhoek - Zevenaar border	x	x	25 kV AC	740	E5	2	N/A	GC	P/C 80/410	L2 - 2.3.0d	120	112,7	5400 (double traction)		Excellent
DB Netz	Emmerich border - Oberhausen	x	x	AC 15 kV 16,7Hz	690	D4	2	N/A	GA	P/C 80/410	PZB	160	71	3120-3255	Upgrade to 3 tracks	
NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim - Rheine																
ProRail	Kijfhoek - Oldenzaal border	x	x	1.5 kV DC	600	D4	2	N/A	P/C 80/410	P/C 80/410	ATB EG	100	252,2	2100-2400		Good
DB Netz	Bad Bentheim border - Rheine	x	x	AC 15 kV 16,7Hz	590	D4	2	N/A	Upon request	P/C 80/410	PZB	160	30	2350-2590		
NL-DE-2: Kijfhoek - Venlo / Kaldenkirchen - Viersen																
ProRail	Kijfhoek - Venlo border	x	x	1.5 kV DC	±650/740	D4	2, 4 (Boxtel-Eindhoven)	N/A	G2	P/C 80/410	ATB EG	100	147,8	2100-2400		Good
DB Netz	Kaldenkirchen border - Viersen	x	x	AC 15 kV 16,7Hz	740	D4	1	N/A	Upon request	P/C 80/410	PZB	Up to 100	20	2340-2855	one-Track between Kaldenkirchen-Dülken	
NL-BE-DE-1: Kijfhoek - Roosendaal / Essen - Aachen West – Cologne																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Essen border - Montzen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	175,2	2100-1800	From Montzen border to Y. Glons Vmax is 90km / Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
DB Netz	Aachen border - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	< 40‰	Upon request	P/C 80/410	PZB	100	78	1210-2905		Limited

2.2.3. **Parking locations / side tracks & capacity**

NL-DE-2: Kijfhoek – Venlo / Kaldenkrichen – Viersen

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Kijfhoek	>10	max train length 740 meters	
Netherlands	Venlo	10	1 track max train length 690 meters	parking limitations for dangerous goods
			others < 690 meters	
Germany	Viersen	2	1x612m, 1x700m	sometimes head making for directions Oberhausen
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)

NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim – Rheine

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Amersfoort	3	Appr. 700 meters	
Netherlands	Rotterdam Noord Goederen	1	664 meters	Kijfhoek – Bad Bentheim. Sidetrack for overtaking by passenger trains
Germany	Bad Bentheim	no parking places	track for short stop (max 20 minutes)	length limitations of 690 meter, because of stop at border

NL-BE-DE-1: Kijfhoek – Roosendaal / Essen – Aachen West – Cologne

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Kijfhoek	>10	max train length 740 meters	
Netherlands	Roosendaal	4	1 track of 740 meters 3 tracks of <600 meters	
			others < 690 meters	
Belgium	Essen	1	max 650 meters	crowded
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Hasselt	3	max 750 meters	
Belgium	Montzen	7	max 796 meters	
Germany	Aachen West	5	~700m	
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)

2.2.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

NL-DE-2: Kijfhoek – Venlo / Kaldenkrichen – Viersen

- The route between Kaldenkirchen and Viersen is a single track, capacity restrictions can occur.
- For destinations to the North, trains must change direction in Viersen.
- Trains crossing the border at Venlo may not be longer than 650m due to restricted loop sidings in Breyell. In the case of longer trains, a special permit needs to be requested at DB Netz (BZ Duisburg) and at ProRail (LVL-DVL-GD). Special trains for the section Kaldenkirchen – Venlo need to apply at „Servicecenter Sonderfahrplan“ of DB Netz AG in Duisburg. This takes place in coordination with Decentrale Verkeersleiding in Eindhoven.

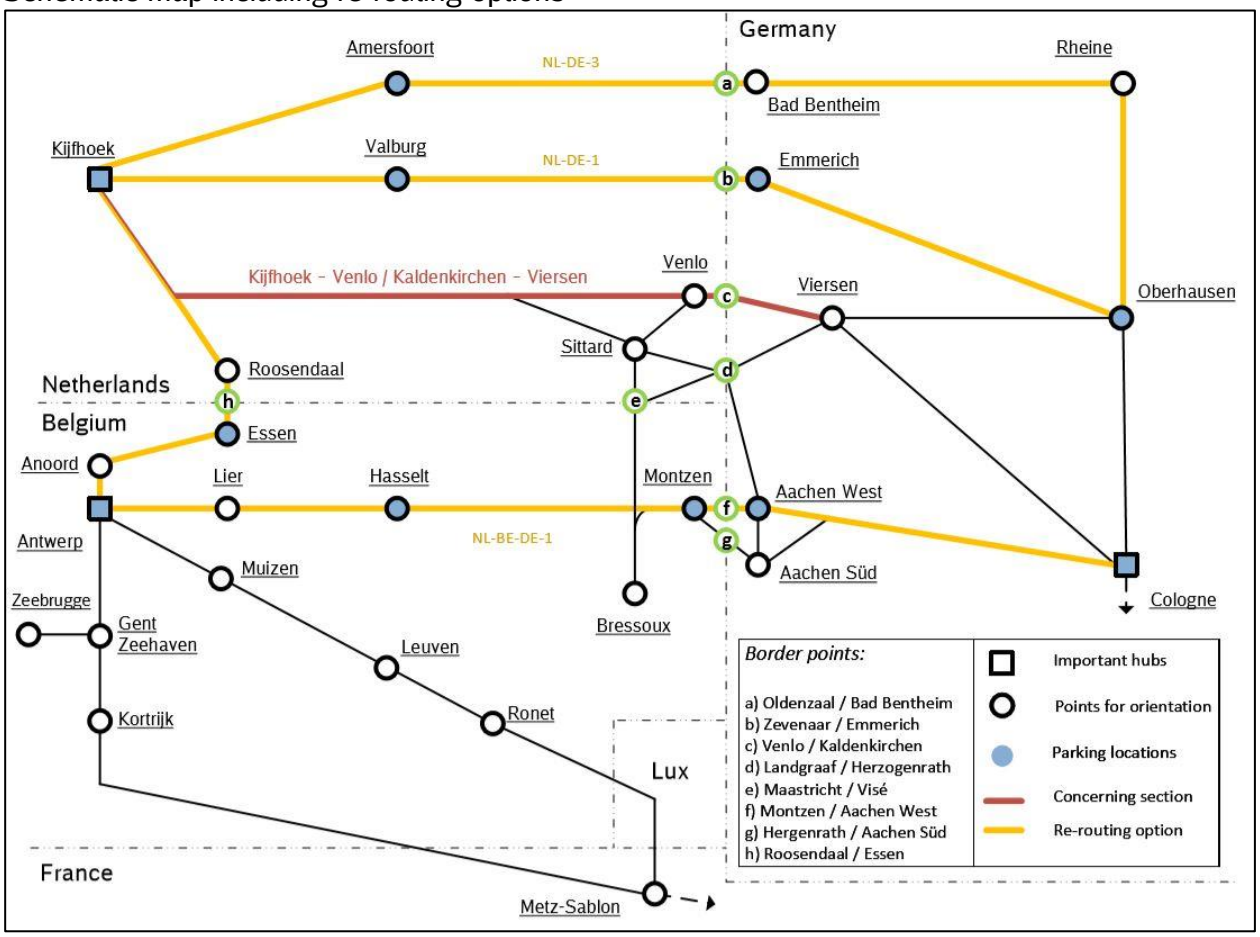
NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim – Rheine

- Trains which run via Kijfhoek – Elst – Deventer – Oldenzaal must change direction in Deventer.
- Trains which run via Kijfhoek – Weesp – Amersfoort – Deventer – Oldenzaal do not have to change direction. Locos must be equipped with 1.5 kV + 25 kV and ATB + ERTMS.
- Trains must often stop at the Dutch / German border, due to system change. Train length is normally 590 m, but longer trains could run with the consent of DB Netz. ProRail takes care for the coordination with DB Netz.

2.3. Re-routing scenario for section Kijfhoek – Venlo / Kaldenkirchen – Viersen

2.3.1. General description

Schematic map including re-routing options



For the Netherlands, the route via Venlo / Kaldenkirchen is the second main freight route to Germany. It is a double mixed track (passenger and freight trains) with ATB signalling and 1,5 kV electricity. Between Kaldenkirchen and Viersen Gbf it is a single track, with PZB and 15 kV.

When this route is blocked the re-routing options are:

Section ID	Usability	Route
NL-DE-1	A	Kijfhoek – Zevenaar / Emmerich – Oberhausen
NL-DE-3	B	Kijfhoek – Oldenzaal / Bad Bentheim – Rheine
NL-BE-DE-1	B	Kijfhoek – Roosendaal / Essen – Aachen West – Cologne

Other routes presented in chapter 2.1. could also be used but have a “C” rating under usability. They are therefore not included in this scenario description.

2.3.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Kijfhoek – Venlo / Kaldenkirchen – Viersen																
ProRail	Kijfhoek - Venlo border	x	x	1.5 kV DC	±650/740	D4	2, 4 (Boxtel-Eindhoven)	N/A	G2	P/C 80/410	ATB EG	100	147,8	2100-2400		Good
DB Netz	Kaldenkirchen border - Viersen	x	x	AC 15 kV 16,7Hz	740	D4	1	N/A	Upon request	P/C 80/410	PZB	Up to 100	20	2340-2855	one-Track between Kaldenkirchen-Dülken	
NL-DE-1: Kijfhoek – Zevenaar / Emmerich - Oberhausen																
ProRail	Kijfhoek - Zevenaar border	x	x	25 kV AC	740	E5	2	N/A	GC	P/C 80/410	L2 - 2.3.0d	120	112,7	5400 (double traction)		Excellent
DB Netz	Emmerich border - Oberhausen	x	x	AC 15 kV 16,7Hz	690	D4	2	N/A	GA	P/C 80/410	PZB	160	71	3120-3255	Upgrade to 3 tracks	
NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim - Rheine																
ProRail	Kijfhoek - Oldenzaal border	x	x	1.5 kV DC	600	D4	2	N/A	G2	P/C 80/410	ATB EG	100	252,2	2100-2400		Good
DB Netz	Bad Bentheim border - Rheine	x	x	AC 15 kV 16,7Hz	590	D4	2	N/A	Upon request	P/C 80/410	PZB	160	30	2350-2590		
NL-BE-DE-1: Kijfhoek - Roosendaal / Essen - Aachen West - Cologne																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Essen border - Montzen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	175,2	2100-1800	From Montzen border to Y. Glons Vmax is 90km / Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
DB Netz	Aachen border - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	< 40‰	Upon request	P/C 80/410	PZB	100	78	1210-2905		Limited

2.3.3. **Parking locations & capacity**

NL-DE-1: Kijfhoek – Zevenaar / Emmerich – Oberhausen

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Kijfhoek	>10	max train length 740 meters	
Netherlands	Valburg	9	5 tracks max train length 740 meters	
			4 tracks < 740 m train length	
Germany	Oberhausen	10	~700m	
Germany	Emmerich	5	< 750 meters	only in direction of Netherlands, otherwise capacity limitations
Germany	Wesel	4	2x410m, 1x507m, 1x630m	
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifelt, Köln Ehrenfeld, Köln Kalk, etc.)

NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim – Rheine

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Amersfoort	3	Appr. 700 meters	
Netherlands	Rotterdam Noord Goederen	1	664 meters	Kijfhoek – Bad Bentheim. Sidetrack for overtaking by passenger trains
Germany	Bad Bentheim	no parking places	track for short stop (max 20 minutes)	length limitations of 690 meter, because of stop at border

NL-BE-DE-1: Kijfhoek – Roosendaal / Essen - Aachen West – Cologne

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Kijfhoek	>10	max train length 740 meters	
Netherlands	Roosendaal	4	1 track of 740 meters 3 tracks of <600 meters	
			others < 690 meters	
Belgium	Essen	1	max 650 meters	crowded
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Hasselt	3	max 750 meters	
Belgium	Montzen	7	max 796 meters	
Germany	Aachen West	5	~700m	

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifelt, Köln Ehrenfeld, Köln Kalk, etc.)

2.3.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

NL-DE-1: Kijfhoek – Zevenaar / Emmerich – Oberhausen

Signalling: on the route Kijfhoek – Emmerich locomotives need to have ETCS (version L2 - 2.3.0d).

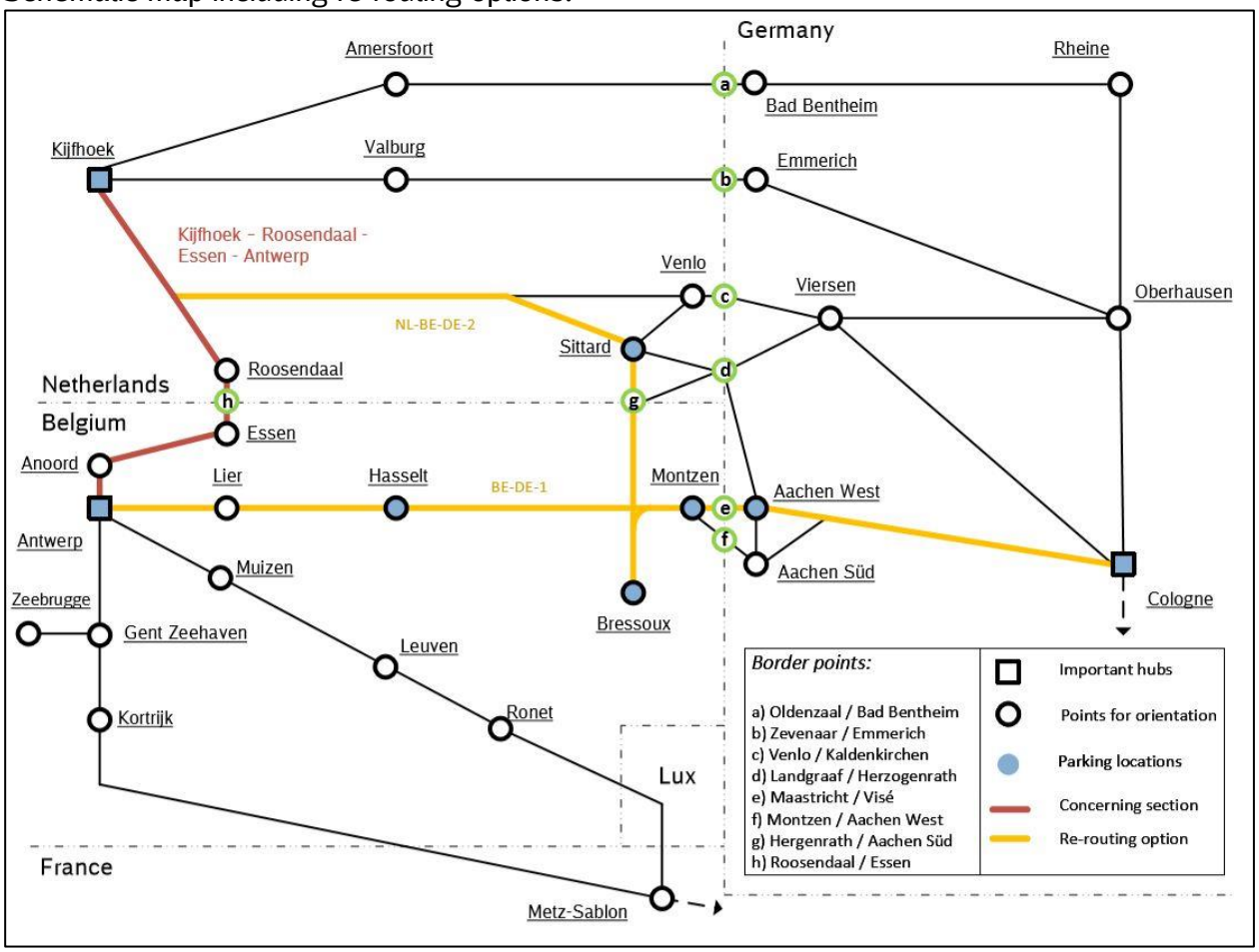
NL-DE-3: Kijfhoek – Oldenzaal / Bad Bentheim – Rheine

- Trains which run via Kijfhoek – Elst – Deventer – Oldenzaal must change direction in Deventer. Locos must be equipped with 1.5 kV + 25 kV and ATB + ERTMS.
- Trains must often stop at the Dutch / German border, due to system change. Train length is normally 590 m, but longer trains could run with the consent of DB Netz. ProRail takes care of the coordination with DB Netz.

2.4. Re-routing scenario for section Kijfhoek – Roosendaal – Essen – Antwerp

2.4.1. General description

Schematic map including re-routing options.



This is a double mixed (passenger and freight trains) track. In the Netherlands it has ATB signalling and 1,5 kV electricity. In Belgium (as from Roosendaal) it has TBL1 signalling and 3 kV electricity.

When this route is blocked the re-routing options are:

Section ID	Usability	Route
NL-BE-DE-2	C	Kijfhoek – Sittard – Maastricht / Visé – Bressoux – Aachen West
BE-DE-1	B	Antwerp – Aachen West – Cologne

2.4.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Kijfhoek - Roosendaal - Essen - Antwerp																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
BE-DE-1: Antwerp - Aachen West – Cologne																
Infrabel	Antwerp - Montzen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	152,2	1800-2000	From Montzen border to Y. Glons Vmax is 90km / Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
DB Netz	Aachen border - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	< 40‰	Upon request	P/C 80/410	PZB	100	78	1210-2905		Limited
NL-BE-DE-2: Kijfhoek – Roermond – Maastricht / Visé – Bressoux – Montzen - Cologne																
ProRail	Kijfhoek - Eindhoven	x	x	1.5 kV DC	±650/740	D4	2, 4 (Boxtel-Eindhoven)	N/A	G2	P/C 80/410	ATB EG	100	93	2100-2400		Excellent
ProRail	Eindhoven - Sittard - Eijsden border	x	x	1.5 kV DC	±630	D4	2	N/A	G2	P/C 80/410	ATB EG	100	110	2100-2400		Limited
Infrabel	Visé border - Bressoux - Montzen border	x	x	3kv	740	D4		N/A	GB	C60-C390/ P60-P380	TBL1	90	56	1800	Y. Berneau to Montzen Border Vmax is 90km / Visé Border to Visé = Off Ten-T	Limited
DB Netz	Aachen border - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	< 40‰	Upon request	P/C 80/410	PZB	100	78	1210-2905		Limited

2.4.3. **Parking locations & capacity**

NL-BE-DE-2: Kijfhoek – Sittard– Maastricht / Visé – Bressoux – Aachen West

Country	Location	Number of tracks	Maximum train length	Restrictions
Netherlands	Kijfhoek	>10	max train length 740 meters	
Netherlands	Sittard	4	max train length 590 - 690 m	
Belgium	Bressoux	7	min 650 - max 850 m	2 tracks necessary for head making
Belgium	Montzen	7	max 796 meters	
Germany	Aachen West	5	>700m	
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)

BE-DE-1: Zeebrugge / Antwerp – Aachen West – Cologne

Country	Location	Number of tracks	Maximum train length	Restrictions
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Hasselt	3	max 750 meters	
Belgium	Montzen	7	max 796 meters	
Germany	Aachen West	5	>700m	
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)

2.4.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

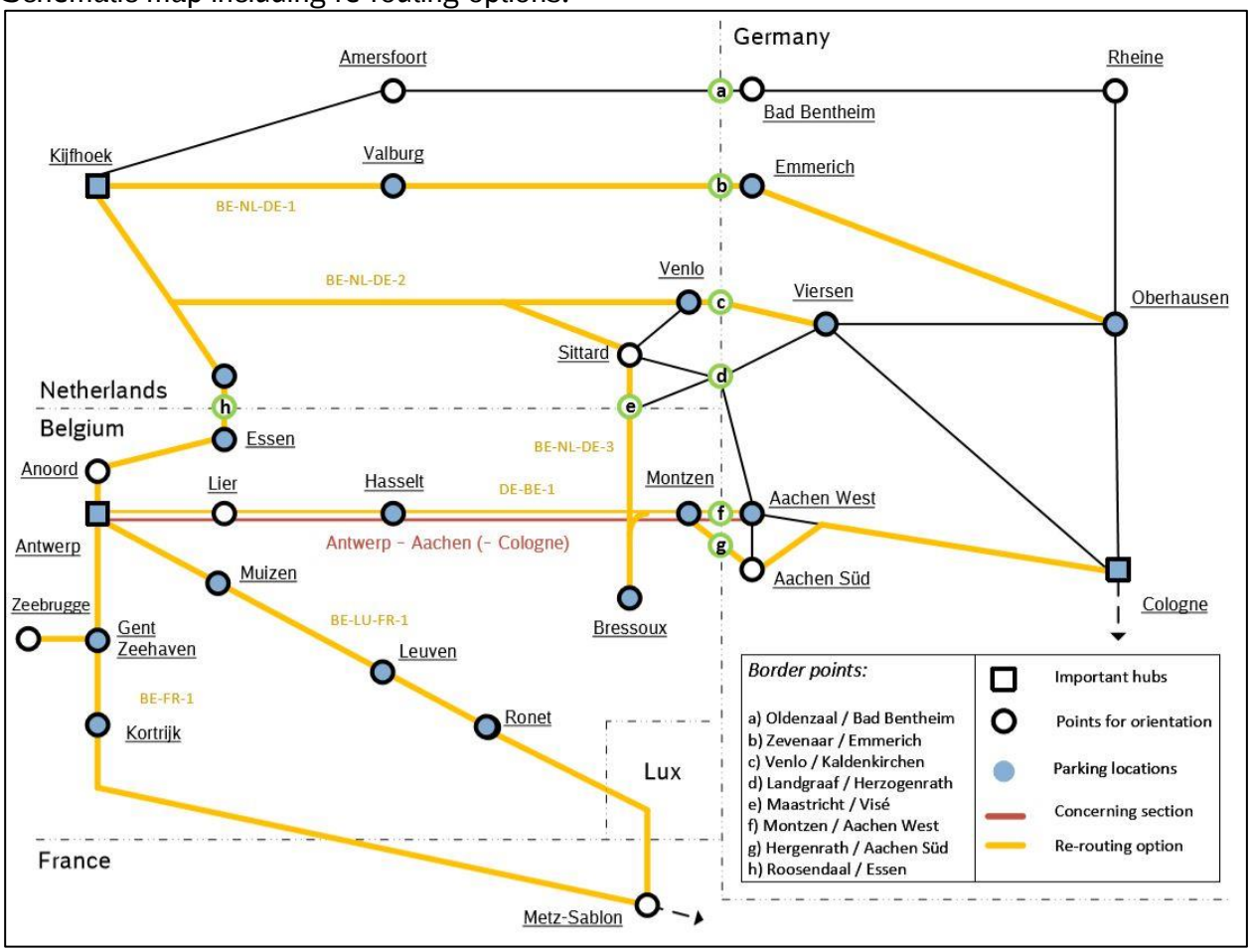
NL-BE-DE-2: Kijfhoek – Sittard – Maastricht / Visé – Bressoux – Aachen West

- Profile limitations: PC30-PC352 between Bressoux and Visé.
- The trains must change directions in Bressoux.
- Language: on parts of the route (to Montzen) the train driver must be able to speak French.

2.5. Re-routing scenario for section Antwerp – Aachen (– Cologne)

2.5.1. General description

Schematic map including re-routing options.



This is a double mixed (passenger and freight trains) with TBL1 signalling and 3 kV electricity.

When this route is blocked the re-routing options are:

Section ID	Usability	Route
BE-NL-DE-2	B	Antwerp – Roosendaal /Essen – Venlo / Kaldenkirchen – Viersen
BE-NL-DE-1		Antwerp –Roosendaal / Essen – Kijfhoek – Emmerich – Oberhausen
BE-NL-DE-3	C	Antwerp – Roosendaal / Essen – Maastricht / Visé – Bressoux – Montzen Border (if incident between Antwerp and Hasselt)
DE-BE-1	C	Cologne – Aachen Rothe Erde - Aachen Süd – Hergenrath - Montzen – Antwerp (if incident between Montzen and Aachen West)
BE-FR-1	C	Antwerp – Kortrijk – FR
BE-LU-FR-1	C	Antwerp – Luxembourg – FR

2.5.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Antwerp – Aachen (– Cologne)																
Infrabel	Antwerp - Montzen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	152,2	1800-2000	From Montzen border to Y. Glons Vmax is 90km / Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
BE-NL-DE-2: Antwerp – Roosendaal /Essen – Venlo / Kaldenkirchen – Viersen																
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
ProRail	Roosendaal border - Venlo border	x	x	1.5 kV DC	±650	D4	2	N/A	G2	P/C 80/410	ATB EG	100	151	2100-2400		Good/Excellent
DB Netz	Kaldenkirchen border - Viersen	x	x	AC 15 kV 16,7Hz	740	D4	1	N/A	Upon request	P/C 80/410	PZB	Up to 100	20	2340-2855	one-Track between Kaldenkirchen-Dülken	
BE-NL-DE-3: Antwerp – Roosendaal / Essen – Maastricht / Visé – Bressoux – Aachen West																
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
ProRail	Roosendaal border - Eindhoven	x	x	1.5 kV DC	±650/740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	89,7	2100-2400		Good/Excellent
ProRail	Eindhoven - Sittard - Eijsden border	x	x	1.5 kV DC	±630	D4	2	N/A	G2	P/C 80/410	ATB EG	100	110	2100-2400		Limited
Infrabel	Visé border - Bressoux - Montzen border	x	x	3kv	740	D4		N/A	GB	C60-C390/ P60-P380	TBL1	90	56	1800	Y. Berneau to Montzen Border Vmax is 90km / Visé Border to Visé = Off Ten-T	Limited
BE-LU-FR-1: Antwerp– Luxembourg – FR																
Infrabel	Antwerp - Ronet - Aubange (border LUX)	x	x	3kv	740	D4	2	N/A	GB	PC 70/400	ETCS L1 FS TBL1	100	283	N-S: 1200 (Diesel), 1600 (Electric) S-N: 900 (Diesel), 1400 (Electric)	Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
CFL	Rodange - Esch-sur-Alsette - Bettembourg		x	25 kV	750	22,5 t	1	15-20‰	GB - C50	Upon request	L1FS Memor 2+	100		D4		Limited
SNCF Réseau	LUX border - Metz-Sablon - Strasbourg - Mulhouse - Saint Louis border	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h		D4		limited - extremely limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
BE-FR-1: Antwerp – Kortrijk – FR																
Infrabel	Antwerp - Kortrijk - Mouscron border (France)	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	186,15	1800-2000		Limited
SNCF Réseau	Border Belgium – Lille – Longuyon – Thionville - Metz	x	x	25kV AC	750	D4	2 or more	N/A	CB1 (Longuyon – Thionville: 3.3 - C22)	C45 (Longuyon – Thionville: 3.3 - C22)	KVB	120-139		D4		
SNCF Réseau	Metz-Sablon - Strasbourg - Mulhouse - Saint Louis border	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h		D4		limited - extremely limited
DE-BE-1: Cologne - Aachen Rothe Erde - Aachen Süd – Hergenrath - Montzen – Antwerp																
DB Netz	Cologne – Aachen Hbf – Aachen Süd (-Hergenrath)	x	x	AC 15 kV 16,7 Hz	400m with E-Traktion, 650m with V-Traktion (or "local border agreement")	D4	2	N/A	Upon request	P/C 80 / 410	PZB	160	77	1: 2905; 2: 835		
Infrabel	Hergenrath border - Antwerp - Essen border	x	x	3kv		D4	2	N/A	GB	P/C 30/352	TBL1	100	188	1200-1800	Between Hergenrath border and Montzen = Off TEN-T	Limited
BE-NL-DE-1: Antwerp –Roosendaal / Essen – Kijfhoek – Emmerich – Oberhausen																
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
ProRail	Kijfhoek - Zevenaar border	x	x	25 kV AC	740	E5	2	N/A	GC	P/C 80/410	L2 - 2.3.0d	120	112,7	5400 (double traction)		Excellent
DB Netz	Emmerich border - Oberhausen	x	x	AC 15 kV 16,7Hz	690	D4	2	N/A	GA	P/C 80/410	PZB	160	71	3120-3255	Upgrade to 3 tracks	

2.5.3. **Parking locations & capacity**

BE-NL-DE-1: Antwerp – Venlo / Kaldenkirchen – Viersen

Country	Location	Number of tracks	Maximum train length	Restrictions
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Essen	1	max 650 meters	crowded
Netherlands	Roosendaal	1	max train length 740 meters	
Netherlands	Roosendaal	3	max train length < 600 meters	
Netherlands	Venlo	10	1 track max train length 690 meters	parking limitations for dangerous goods
			others < 690 meters	
Germany	Viersen	2	1x612m, 1x700m	sometimes head making for directions Oberhausen
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)

BE-NL-DE-3: Antwerp – Kijfhoek – Zevenaar / Emmerich – Oberhausen

Country	Location	Number of tracks	Maximum train length	Restrictions
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Essen	1	max 650 meters	crowded
Netherlands	Roosendaal	1	max train length 740 meters	
Netherlands	Roosendaal	3	max train length < 600 meters	
Netherlands	Kijfhoek	>10	max train length 740 meters	
Netherlands	Valburg	9	5 tracks max train length 740 meters	
			4 tracks < 740 m train length	
Netherlands			others < 690 meters	
Germany	Oberhausen	10	~700m	
Germany	Emmerich	5	< 750 meters	only in direction of Netherlands, otherwise capacity limitations
Germany	Wesel	4	2x410m, 1x507m, 1x630m	
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifelt, Köln Ehrenfeld, Köln Kalk, etc.)

BE-NL-DE-4: Antwerp – Roosendaal / Essen – Maastricht / Visé – Bressoux – Aachen West

Country	Location	Number of tracks	Maximum train length	Restrictions
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Essen	1	max 650 meters	crowded
Netherlands	Roosendaal	1	max train length 740 meters	
Netherlands	Roosendaal	3	max train length < 600 meters	
Netherlands	Sittard	4	max train length 590 - 690 meters	
Belgium	Bressoux	7	min 650 - max 850 m	2 tracks necessary for head making
Belgium	Montzen	7	max 796 meters	
Germany	Aachen West	5	> 700m	
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)

DE-BE-1: Cologne – Aachen Rothe Erde – Aachen Süd – Hergenrath – Montzen – Antwerp

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Cologne	many tracks		various locations, depending on directions (Köln Gremberg, Köln Eifeltor, Köln Ehrenfeld, Köln Kalk, etc.)
Belgium	Hasselt	3	max 750 meters	
Belgium	Montzen	7	max 796 meters	
Belgium	Essen	1	max 650 meters	crowded
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	

BE-FR-1: Antwerp – Kortrijk – FR

Country	Location	Number of tracks	Maximum train length	Restrictions
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Gent Zeehaven	3	max 550 meters	
Belgium	Kortrijk Goederen	1	max 750 meters	last possibility before border

Country	Location	Number of tracks	Maximum train length	Restrictions
France	Aulnoye	>3	max 750 meters	From Monday to Friday
France	Hirson	3	max 750 meters	
France	Lumes	>3	max 850 meters	
France	Sedan	2	max 400 meters	
France	Longuyon	>3	max 550 meters	
France	Thionville	>3	max 650 meters	
France	Lille	3	max 650 meters	Champs de Mars
France	Metz	>3	max 700 meters	Metz Sablon

BE-LU-FR-1: Antwerp – Luxembourg – FR

Country	Location	Number of tracks	Maximum train length	Restrictions
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Gent Zeehaven	3	max 550 meters	
Belgium	Muizen	3	max 700 meters	
Belgium	Leuven	3	max 640 meters	
Belgium	Ronet	5	max 700 meters	
Belgium	Bertrix	2	max 712 meters	Heavily used
Belgium	Athus	3	max 650 meters	
France	Longuyon	>3	max 550 meters	
France	Metz	>3	max 700 meters	Metz Sablon

2.5.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

BE-NL-DE-1: Antwerp – Venlo / Kaldenkirchen – Viersen

- The route between Kaldenkirchen and Viersen is a single track, capacity restrictions can occur.
- For destinations to the north trains must change direction in Viersen.
- Trains crossing the border at Venlo may not be longer than 650m due to restricted loop sidings in Breyell. In the case of longer trains, a special permit needs to be requested at DB Netz (BZ Duisburg) and at ProRail (LVL-DVL-GD). Special trains for the section Kaldenkirchen – Venlo need to apply at „Servicecenter Sonderfahrplan“ of DB Netz AG in Duisburg. This takes place in coordination with Decentrale Verkeersleiding in Eindhoven.

BE-NL-DE-4: Antwerp – Sittard – Maastricht / Visé – Bressoux – Aachen West

- Profile limitations: PC30-PC352 between Bressoux and Visé.
- The trains must change directions in Bressoux.
- Language: on parts of the route (to Montzen) the train driver must be able to speak French.

DE-BE-1: Cologne – Aachen Rothe Erde – Aachen Süd – Hergenrath – Montzen – Antwerp

- Capacity limitations Aachen Süd, just 1 train per hour during night (between 22.00 – 5.00 hours).
- Profile limitations (Belgium, Hergenrath): PC30 – PC 352.

BE-FR-1: Antwerp – Kortrijk – FR

- No dangerous goods allowed in the Kennedy tunnel in Antwerp. Freight trains with dangerous goods will have a deviation route via Antwerp North and the Antigoon tunnel (Liefkenshoek Rail link). Extra travel time is 15 minutes.
- Profile limitations (France): Intermodal Gauge C45.

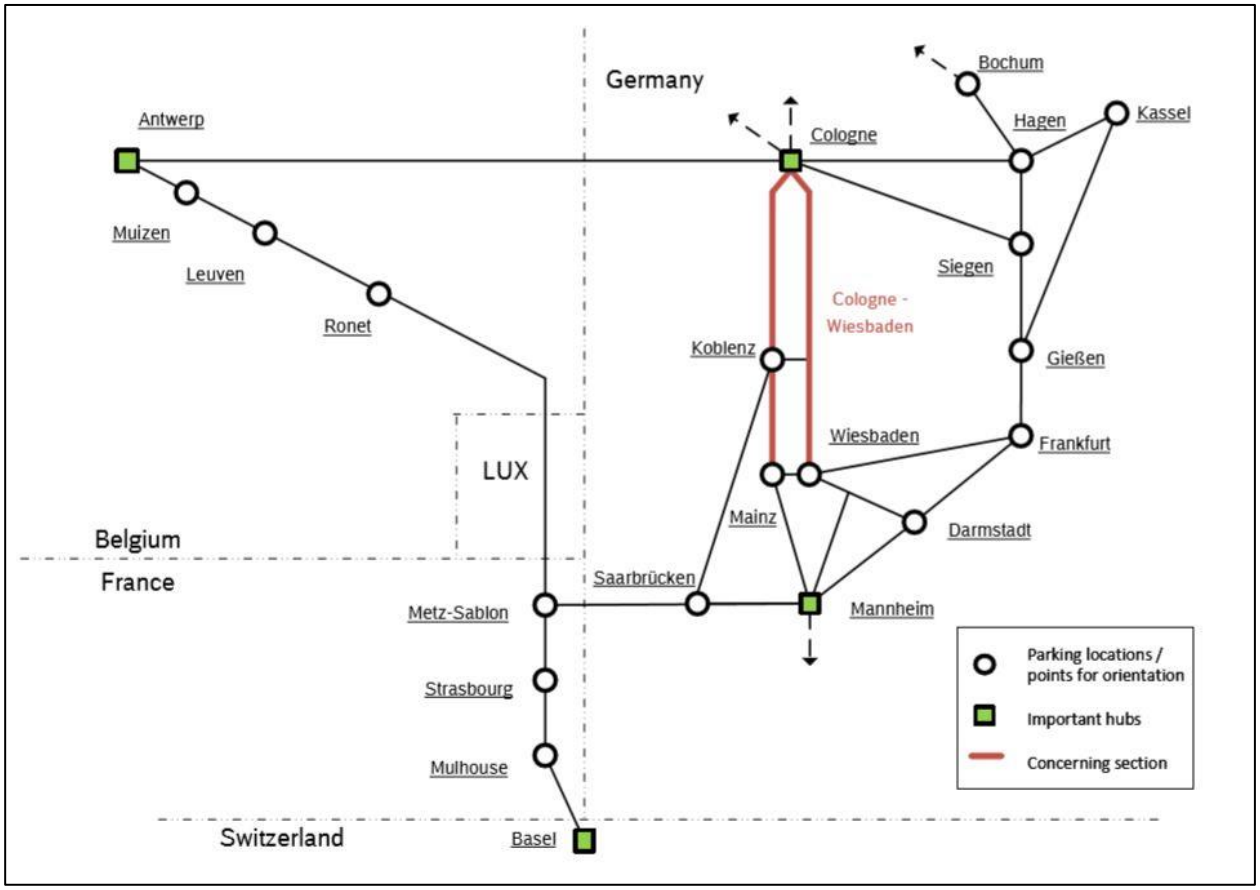
BE-LU-FR-1: Antwerp – Luxemburg – FR

- Weight restriction (Belgium): Cl66 900t Traxx 1400t.
- No dangerous goods allowed in the Kennedy tunnel in Antwerp. Freight trains with dangerous goods will have a deviation route via Antwerp North and the Antigoon tunnel (Liefkenshoek Rail link). Extra travel time is 15 minutes.
- Profile limitations (France): Intermodal Gauge C45.

3 Middle Part

3.1. Overview re-routing options middle part

The following section with limited re-routing options is defined for the middle part of RFC Rhine-Alpine.



Cologne – Mainz / Wiesbaden

The left side of the Rhine river is a main railway line that runs along the Middle Rhine from Cologne via Bonn, Koblenz and Bingen to Mainz.

The right side of the Rhine river is the railway line which runs from Troisdorf via Bonn-Beuel, Unkel, Neuwied, Koblenz-Ehrenbreitstein, Lahnstein and Rüdesheim to Wiesbaden. Both sides are double tracked and electrified continuously.

In Neuwied and Niederlahnstein it is possible to change to the left side of the Rhine river to reach the Koblenz main station. There are two tunnels situated in the section between Lahnstein and Rüdesheim, of which the Loreleytunnel near St. Goarshausen is the more popular one.

Left and right side of the Rhine river are good re-routing options for each other. This scenario assumes that both sides of the Rhine river are distorted/blocked.

DE-3.1 Frankfurt – Gießen – Siegen – Cologne

The complete route is electrified (15kV 16,7Hz) and can be used with the signalling system PZB. There are restrictions to the profile that trains can use on this deviation route, with an intermodal freight code of P/C 390 (P/C 60) which is lower that the main sections. The maximum weight is lower than on the main section in both directions, with a maximum weight of 1615t in the direction N-S and a maximum weight of 1560t in the direction S-N. There are capacity restrictions on part of the track. There are no further restrictions compared to the main sections.

DE-3.2 Frankfurt – Gießen – Kassel – Dortmund – Cologne

The complete route is electrified (15kV 16,7Hz) and can be used with the signalling system PZB. The maximum weight is lower than on the main section in both directions, with a maximum weight of 1620t in the direction N-S and a maximum weight of 1480t in the direction S-N.

DE-3.3 Mannheim – Saarbrücken – Trier – Koblenz – Cologne

The complete route is electrified (15kV 16,7Hz) and can be used with the signalling system PZB. It has a restriction on the intermodal freight code of P/C 400 (P/C 70), which is the same as the left side of the Rhine but lower than the right side of the Rhine. There are also restrictions on the maximum weight, with a maximum weight of 1600t in the direction N-S and 1890t in the direction S-N.

DE-3.4 Frankfurt – Gießen – Siegen – Hagen - Oberhausen

The complete route is electrified (15kV 16,7Hz) and can be used with the signalling system PZB. There are restrictions to the profile that trains can use on this deviation route, with an intermodal freight code of P/C 375 (P/C 45) which is lower than both the main sections and the other re-routing options. The maximum weight is lower than on the main sections in both directions, with a maximum weight of 1400t in the direction N-S and a maximum weight of 1410t in the direction S-N (with a E-Tfz DB 185 as a benchmark).

NL-BE-LU-FR-CH-1: Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel

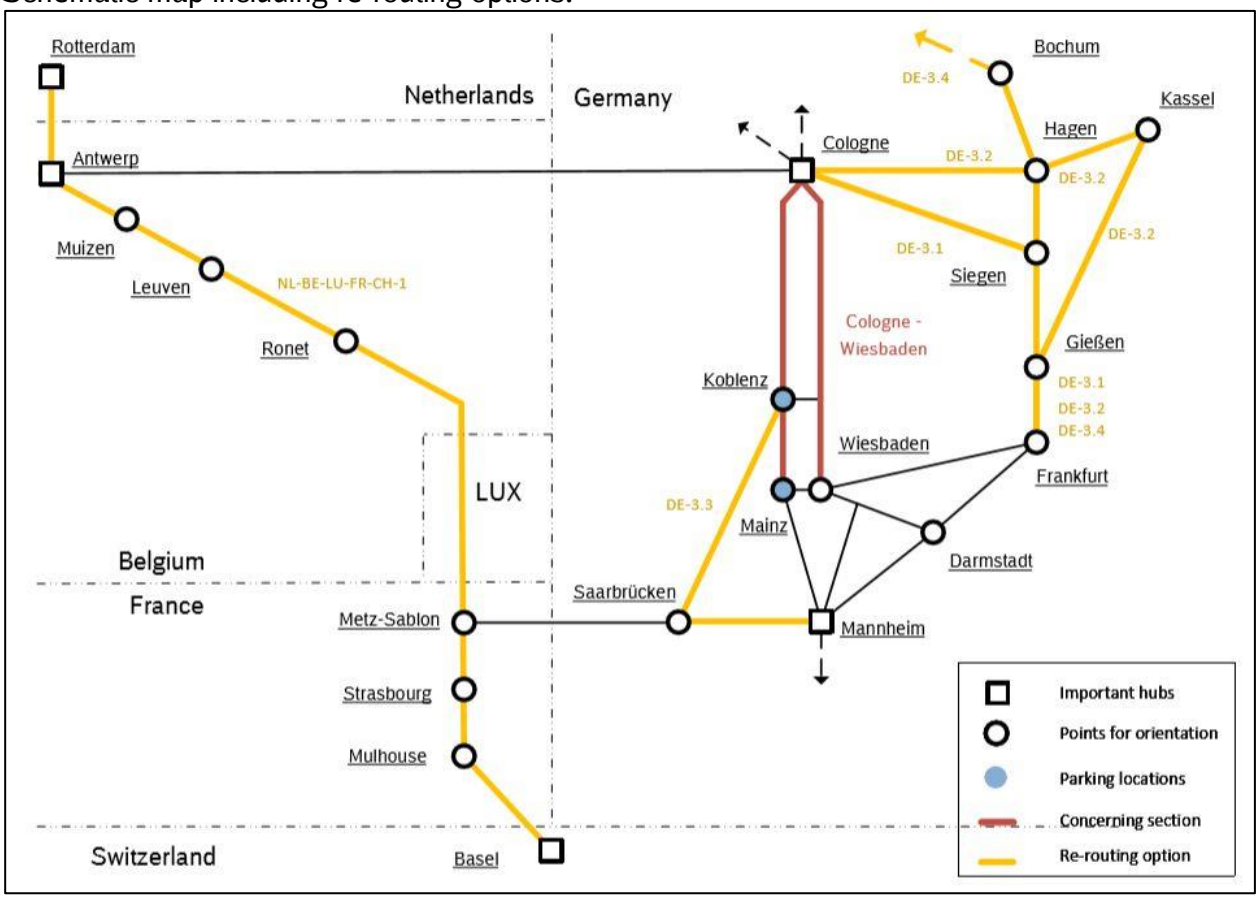
This is an RFC North Sea-Mediterranean main route from the Netherlands via Belgium, Luxembourg and France to Switzerland. Between Kijfhoek – Roosendaal it is a double mixed (passenger and freight trains) track with ATB signalling and 1,5 kV electricity. In Belgium until Roosendaal the route has TBL1 signalling and 3 kV electricity. In Belgium the route is via Antwerp – Muizen – Leuven – Namur until the French border at Aubange. That route has TBL1 and 3 kV. In France the route goes via Woippy / Metz – Strasbourg – Mulhouse to Basel. In France the tracks have 25 kV electricity and KVB signalling.

Between Saint Louis border and Basel Muttenz, the intermodal freight code is given with EBV 1 / C25/344. However, there is an annual AS-eeee-0945 (Extraordinary shipments), in which this track is recorded. According to this, consignments C45 / 353, B45 / 353, WoodTainer and other shipments are possible.

3.2. Re-routing scenario for section Cologne – Mainz / Wiesbaden

3.2.1. General description

Schematic map including re-routing options.



When the section Cologne – Mainz / Wiesbaden is blocked the re-routing options are:

Section ID	Usability	Route
DE-3.1	tbd	Frankfurt – Gießen – Siegen – Cologne
DE-3.2	tbd	Frankfurt – Gießen – Kassel – Dortmund – Cologne
DE-3.3	tbd	Mannheim – Saarbrücken – Trier – Koblenz – Cologne
DE-3.4	tbd	Frankfurt – Gießen – Siegen – Hagen - Oberhausen
NL-BE-LU-FR-CH-1	B	Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel

Regarding Section NL-BE-LU-FR-CH-1 it is also possible to cross from Strasbourg via Kehl to Offenburg.

3.2.2. Parameters of re-routing options including capacity indication

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: left/right Rhine																
DB Netz	Left side Rhine river (Mainz – Cologne)	x	x	AC 15 KV 16,7 Hz	740	D4	2	N/A	Upon request	P/C 70/400	PZB	160	185	N-S:2515t, S-N:2805t (DB-185)		
DB Netz	Right side Rhine river (Wiesbaden – Cologne)	x	x	AC 15 KV 16,7 Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	178	N-S:2790t S-N:2600t (DB-185)		
DE-3.1: Frankfurt – Gießen – Siegen - Cologne																
DB Netz	Frankfurt – Gießen – Siegen - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 70 P/C 390	PZB	160	271	N-S:1615t S-N:1560t		
DE-3.2: Frankfurt – Gießen – Kassel – Dortmund - Cologne																
DB Netz	Frankfurt – Gießen – Kassel – Dortmund - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A		P/C 80/410	PZB	160	551	N-S:1620t S-N:1480t		
DE-3.3: Mannheim – Saarbrücken – Trier – Koblenz - Cologne																
DB Netz	Mannheim – Saarbrücken – Trier – Koblenz - Cologne	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A		P/C 70/400	PZB	120	423	N-S:1600t S-N:1890t (DB 185)		
DE-3.4: Frankfurt – Gießen – Siegen - Hagen - Oberhausen																
DB Netz	Frankfurt - Gießen - Siegen - Hagen - Oberhausen	x	x	AC 15 kV 16,7Hz		D4	2	N/A	Upon request	P/C 45 P/C375	PZB	100-160		N-S: 1410t S-N: 1400t		
NL-BE-LU-FR-CH-1: Rotterdam/Antwerp - Belgium - Luxembourg - France - Basel																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
Infrabel	Antwerp - Ronet - Aubange (border LUX)	x	x	3kv	740	D4	2	N/A	GB	PC 70/400	ETCS L1 FS TBL1	100	283	N-S: 1200 (Diesel), 1600 (Electric) S-N: 900 (Diesel), 1400 (Electric)	Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
CFL	Rodange - Esch-sur-Alsette - Bettembourg		x	25 kV	750	22,5 t	1	15-20‰	GB - C50	Upon request	L1FS Memor 2+	100		D4		Limited
SNCF Réseau	LUX border - Metz-Sablon - Strasbourg - Mulhouse - Saint Louis border	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h		D4		limited - extremely limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited

3.2.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Koblenz-Lützel Mitte	3	~ 600 m	
Germany	Koblenz-Lützel Mitte	1	~ 500 m	
Germany	Mainz-Bischofsheim	3	~ 600 m	
Germany	Mainz-Bischofsheim	1	740 m	
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
Belgium	Antwerp North	appr. 10	max 700 meters	
Belgium	Antwerp Schijnpoort	3	max 776 meters	
Belgium	Gent Zeehaven	3	max 550 meters	
Belgium	Muizen	3	max 700 meters	
Belgium	Leuven	3	max 640 meters	
Belgium	Ronet	5	max 700 meters	
Belgium	Bertrix	2	max 712 meters	Heavily used
Belgium	Athus	3	max 650 meters	
France	Longuyon	>3	max 550 meters	
France	Metz	>3	max 700 meters	Metz Sablon
France	Strasbourg	>3	max 750 meters	Hausbergen (railway modernization)
France	Mulhouse	5	max 750 meters	

Parking capacity outside concerning route section:

- DB Netz region Mitte: 18 trains

3.2.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

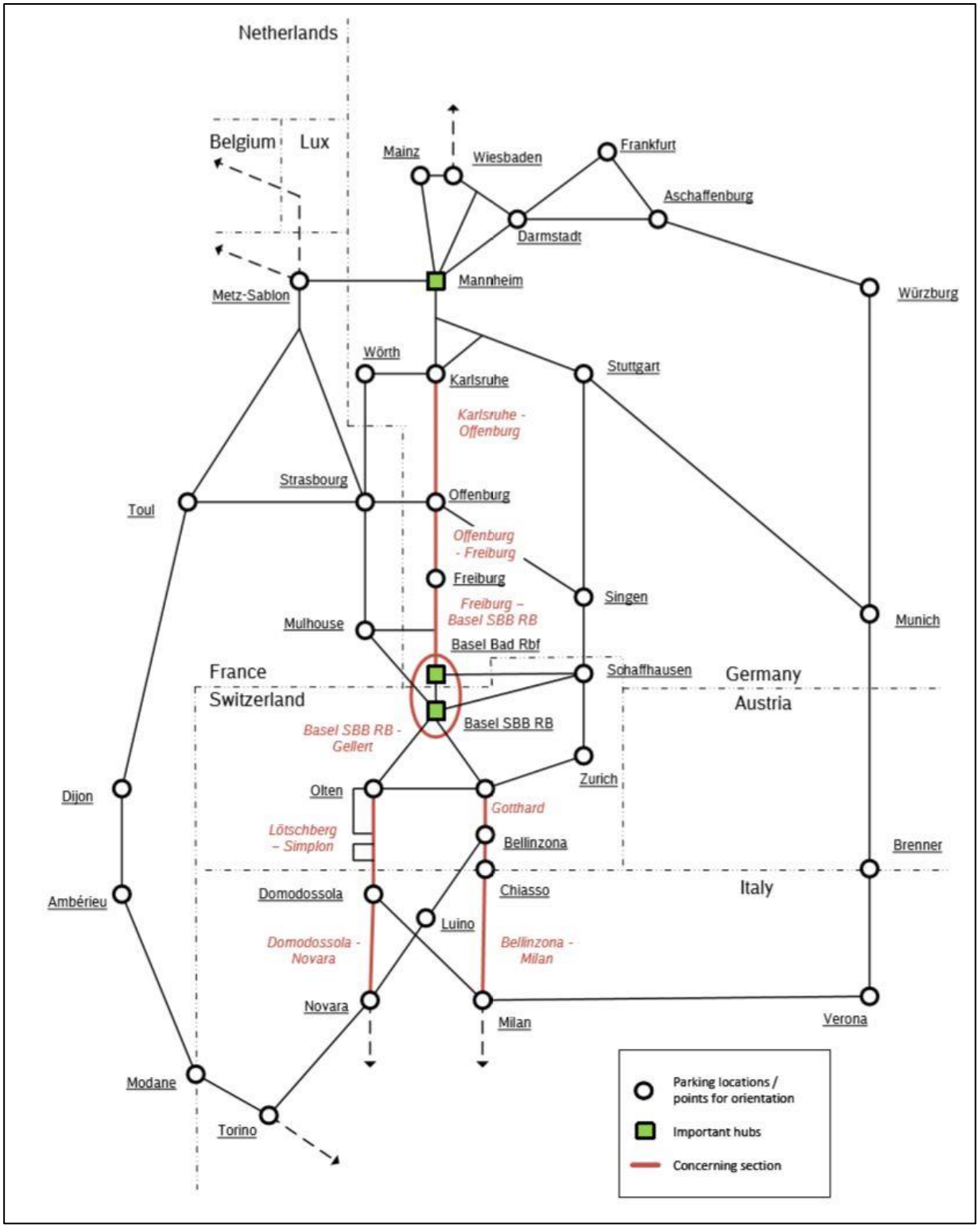
NL-BE-LU-FR-CH-1: Rotterdam / Antwerp – Belgium – Luxemburg – France – Basel

- Weight restriction (Belgium): Cl66 900t Traxx 1400t.
- No dangerous goods allowed in the Kennedy tunnel in Antwerp. Freight trains with dangerous goods will have a deviation route via Antwerp North and the Antigoon tunnel (Liefkenshoek Rail link). Extra travel time is 15 minutes
- Profile limitations (France): Intermodal Gauge C45.

4 Southern Part

4.1. Overview re-routing options southern part

The following sections with limited re-routing options are defined for the southern part of RFC Rhine–Alpine.



Some re-routing options can be used for various sections. In chapter 4.2. the re-routing options per section are shown.

For the southern part of the RFC Rhine-Alpine, the following sections are defined:

Section ID	Route
DE-14	Karlsruhe – Offenburg
DE-CH-IT-1	Offenburg – Freiburg
DE-CH-IT-1	Freiburg – Basel SBB RB
DE-CH-1	Basel SBB RB – Gellert (Rhine bridge)
CH-2	Lötschberg-Simplon *and* Gotthard
IT-1	Domodossola – Novara
IT-2	Bellinzona – Milan

On the southern part of RFC Rhine-Alpine the following routes can be used for rail freight operations. These routes can be used as re-routing options, depending on the line section where an incident happens. Chapter 4.2 below describes scenarios for sections with limited re-routing possibilities.

Section ID	Route
NL-BE-LU-FR-CH-1	Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel
DE-FR-CH-1 (b1) DE-FR -1 (b2)	Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)
DE-CH-2	Mannheim – Stuttgart – Singen – Zurich
DE-FR-CH-2 (d1) DE-FR-2 (d2)	Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)
DE-AT-IT-2	Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-AT-IT-3	Wiesbaden – Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-CH-3	Offenburg – Singen – Zurich
DE-FR-CH-3	Müllheim – Mulhouse – Basel
CH-1	Via Basel SBB passenger station (change of direction)[1]
CH-IT-1	Basel – Gotthard – Bellinzona – Novara
CH-3	Thun - Kandersteg - Brig (Lötschberg Mountain route)
DE-FR-IT-1	Offenburg – Strasbourg – Réding – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
BE-FR-IT-1	Antwerp – Mouscron – Lille – Thionville – Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
BE-FR-LU-IT-1	Antwerp – Ronet – Rodange – Bettembourg - Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
IT-4	Domodossola – Arona – Novara
CH-IT-2	Basel – Domodossola – Milan
CH-IT-3	Bellinzona – Gallarate – Milan

NL-BE-LU-FR-CH-1: Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel

This is the main route from the Netherlands to and from Belgium. Between Kijfhoek – Roosendaal it is a double mixed (passenger and freight trains) track with ATB signalling and 1,5 kV electricity. In Belgium until Roosendaal the route has TBL1 signalling and 3 kV electricity. In Belgium the route is via Antwerp – Muizen – Leuven – Namur until the Luxemburg border at Aubange. That route has TBL1 and 3 kV. In France the route goes via Woippy / Metz – Strasbourg – Mulhouse to Basel. In France the tracks have 25 kV electricity and KVB signalling.

Between Saint Louis border and Basel Muttenz, the intermodal freight code is given with EBV 1 / C25/344. However, there is an annual AS-eeee-0945 (Extraordinary shipments), in which this track is recorded. According to this, consignments C45 / 353, B45 / 353, WoodTainer and other shipments are possible.

DE-FR-CH-1 (b1) / DE-FR -1 (b2): Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)

The part from Wörth to Strasbourg is a French-German railway line in the French region of Grand Est and the German state of Rhineland-Palatinate. It is not electrified and a mixed freight and passenger line. North of Lauterbourg there is only single track. The Strasbourg-Basel line is an electrified double track line. Trains must change direction in Wörth and Hausbergen.

If the incident is between Karlsruhe and Offenburg, trains can be diverted via Strasbourg and then to Offenburg again (b2). The line between Strasbourg and Offenburg is a double-track line.

DE-CH-2: Mannheim – Stuttgart – Singen – Zurich

Between Karlsruhe and Stuttgart in the German state of Baden-Württemberg the double track line is electrified and used by passenger and freight trains (with PZB and 15 kV). The so called Gäubahn (Stuttgart – Singen) is electrified but is between Horb and Hattingen single track. Due to that and the fact that it is used for regional and long-distance passenger services and freight trains, the use of capacity is already very high. An upgrade is planned. The part from Singen to Zurich is electrified but partly one track (Neuhausen-Jestetten, Jestetten-Rafz and Hüntwangen-Eglisau). The Swiss part to Zurich is electrified with 15 kV.

DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)

The whole route is electrified (15 kV and PZB). Between Mannheim and Saarbrücken the line is a part of an international east-west axis which connects the German states Saarland, Rhineland-Palatinate and Baden-Württemberg. The French-German line between Saarbrücken, Forbach (border) and Metz is the connection to the main route Paris-Strasbourg. For the stretch to Offenburg, the Rhine river has to be crossed via Kehl to get back to the Germany. For the stretch to Basel the route follows the Alsace south to Basel. In France, electrification is 25 kV and signalling KVB. Signalling from Saint Louis to Basel SBB RB is KVB/L1LS - 3.4.0.

DE-AT-IT-2: Mannheim - Stuttgart - Munich - Verona (Brenner / Salzburg) – Milan Smistamento

Between Karlsruhe and Stuttgart in the German state of Baden-Württemberg, the double track line is electrified and used by passenger and freight trains (with PZB and 15 kV). Between Augsburg and Munich, there are two parallel double track lines. Then the route follows the Inn valley to Innsbruck where the Brenner mountain line starts. Signalling at the Brenner mountain line is PZB and ETCS level 2. Attention should be paid to restrictions regarding weight (700t) on this section. In Italy the line follows the Etsch valley to Verona. In Italy the route is electrified with 3 kV and SCMT signalling.

DE-AT-IT-3: Wiesbaden – Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento

The complete route is electrified (15kV 16,7Hz) and can be used with the signalling system PZB. The maximum weight is lower than on the main section in both directions, with a maximum weight of 1600t in the direction N-S and a maximum weight of 1910t in the direction S-N (with a E-Tfz DB 185 as a benchmark). There are further possible paths freight traffic can use between Aschaffenburg and Munich.

DE-CH-3: Offenburg – Singen – Zurich

The whole route is electrified with 15 kV 16,7 Hz. Signalling on the German part is PZB, in Switzerland L1LS - 3.4.0 (operable with P44). Between Offenburg and Singen the so called Schwarzwaldbahn passes a mountainous region. Gradient is less than 20‰. The part from Zurich to Schaffhausen is electrified but partly one track (Neuhausen-Jestetten, Jestetten-Rafz and Hüntwangen-Eglisau).

DE-FR-CH-3: Müllheim – Mulhouse – Basel

The route between Müllheim and Mulhouse is single track but electrified (German part with 15 kV 16,7 Hz and PZB signalling, French part with 25 kV and KVB). Between Mulhouse and Basel it is a double track line with 25 kV and KVB signalling. In Switzerland signalling is L1LS - 3.4.0 (operable with P44). As no curve exists on the route from Müllheim to Basel, the deviation route from Müllheim only runs directly to Freiburg. The route from Müllheim to Basel is therefore only feasible with a change of directions.

CH-1: Via Basel SBB passenger station (change direction)[1]

Direction and locomotive must be changed. This process is complicated.

CH-3: Thun - Kandersteg - Brig (Lötschberg Mountain route)

This re-routing option via the Lötschberg mountain line has only one track available for P/C 80/405 on the sections Thun – Frutigen and Brig - Domodossola. It is accessible with an additional locomotive or limited weight.

DE-FR-IT-1: Offenburg – Strasbourg – Réding – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

This re-routing option runs mainly on RFC 2 and RFC 6. Capacity restrictions may occur between Nancy and Strasbourg, especially in the area of Réding. Also, various infrastructure works in France may limit capacity.

BE-FR-IT-1: Antwerp – Mouscron – Lille – Thionville – Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

This re-routing option runs mainly on RFC 2 and RFC 6 and serves as a complete alternative for routes from the Netherlands / Belgium to Italy. Various infrastructure works in France may limit capacity.

[1] Only a re-routing option if incident at Basel SBB RB.

BE-FR-LU-IT-1: Antwerp – Ronet – Rodange – Bettembourg - Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

This re-routing option runs mainly on RFC 2 and RFC 6 and serves as a complete alternative for routes from the Netherlands / Belgium to Italy. Various infrastructure works in France may limit capacity.

CH-IT-1: Basel – Gotthard – Bellinzona – Novara

This re-routing option is not usable for high profile traffic like rolling highway. The extension to high profile is expected to be concluded in 2021. Currently the profile is PC60/384 (Swiss part) and PC45 (Luino – Gallarate – Rho – Milano Rogoredo).

IT-4: Domodossola – Arona – Novara

Signalling is SCMT. Domodossola to Arona is double track. Arona to Novara is single track. The whole route is electrified (3 kV). The maximum train length is 600m and profile limitation is PC45. Max train weight is 700t.

CH-IT-2: Basel – Domodossola – Milan

The signalling of the Swiss network is ETCS L1LS - 3.4.0 (operable with P44) and partly L2 SRS 2.3.0d (Lötschberg Base Tunnel) including the border sections to the stations Domodossola and Luino which are already part of the Italian network. The residual lines in northern Italy are equipped with SCMT, ETCS L1 FS (Radio Infill). ETCS L2 lines are taken into use from mid-2018 on. The maximum train length is 750m (Basel – Domodossola) and 600m (Domodossola – Basel). Profile limitation is P/C 80/405 (Basel – Domodossola) and PC45 (Domodossale – Milan). Max train weigth is 2000t (Basel – Domodossola) and 700t (Domodossola – Milan).

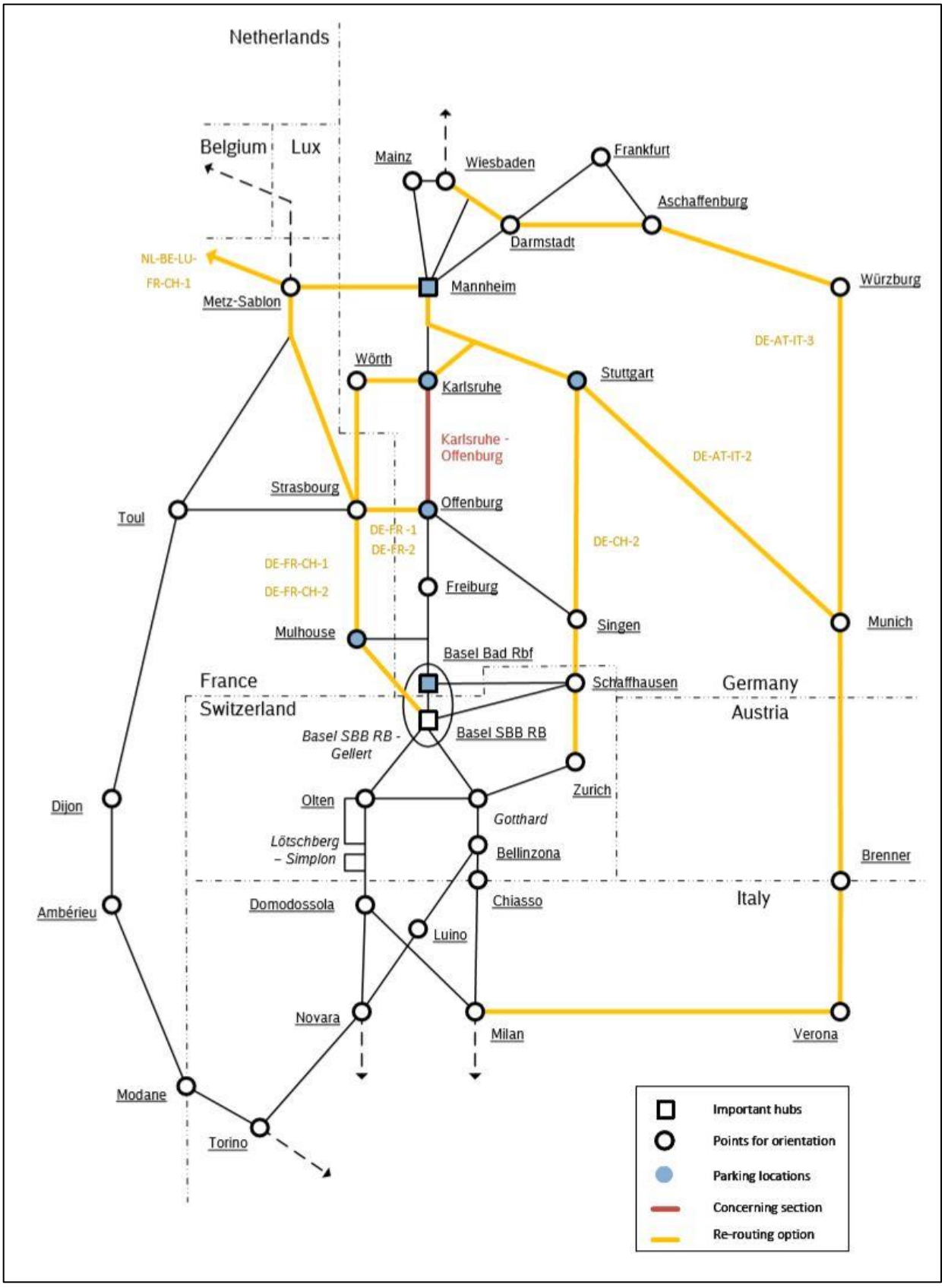
CH-IT-3: Bellinzona – Gallarate – Milan

This is a double track line. The section between Luino – Gallarate is a single-track line. The profile PC45 does not allow high profile traffic like rolling highway. Maximum train length is 600m.

4.2. Re-routing scenario for section Karlsruhe – Offenburg

4.2.1. General description

Schematic map including re-routing options.



When the section Karlsruhe - Offenburg is blocked the re-routing options are:

Section ID	Usability	Route
NL-BE-LU-FR-CH-1	B	Rotterdam / Antwerp – Belgium – Luxemburg – France – Basel
DE-FR-CH-1 (b1) DE-FR -1 (b2)	C	Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)
DE-CH-2	B	Karlsruhe – Stuttgart – Singen – Zurich
DE-FR-CH-2 (d1) DE-FR-2 (d2)	C	Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)
DE-AT-IT-2	B	Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-AT-IT-3	tbd	Wiesbaden – Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento

4.2.2 Parameters of re-routing options including capacity indication

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Karlsruhe - Offenburg																
DB Netz	Karlsruhe - Offenburg	x	x	AC 15 kV 16,7Hz	740	D4	2 to 4	5-10‰	GC	P/C 70/400	PZB LZB (4000 PZB only)	Up to 250	72	2645-2805		
NL-BE-LU-FR-CH-1: Rotterdam/Antwerp - Belgium - Luxemburg - France - Basel																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Essen border - Montzen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	175,2	2100-1800	From Montzen border to Y. Glons Vmax is 90km / Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
Infrabel	Antwerp - Ronet - Aubange (border LUX)	x	x	3kv	740	D4	2	N/A	GB	PC 70/400	ETCS L1 FS TBL1	100	283	N-S: 1200 (Diesel), 1600 (Electric) S-N: 900 (Diesel), 1400 (Electric)	Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
CFL	Rodange - Esch-sur-Alsette - Bettembourg		x	25 kV	750	22,5 t	1	15-20‰	GB - C50	Upon request	L1FS Memor 2+	100		D4		Limited
SNCF Réseau	LUX border - Metz-Sablon - Strasbourg - Mulhouse - Saint Louis border	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h		D4		limited - extremely limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
DE-FR-CH-1 (b1) / DE-FR -1 (b2): Karlsruhe - Wörth - Strasbourg – Basel (b1) / Offenburg (b2)																
DB Netz	Karlsruhe Gbf - Wörth	x	x	AC 15 kV 16,7Hz		D4	2	N/A	GA	P/C 80/410	PZB	120	11	3030-3045 (V-Tfz DB – 232/233)	Karlsruhe <-> France, change of direction in Wörth	
DB Netz	Wörth - Lauterbourg (border)	x	x	Diesel	600	D4	1	N/A	Upon request	P/C 80/410	PZB	100	11	3030-3945 (V-Tfz DB 232/233)	Karlsruhe <-> France, change of direction in Wörth	
SNCF Réseau	Lauterbourg border - Strasbourg	x	x	Diesel	750	D4	2	< 12,5‰	GB1	C45	No speed control system	61-100 km/h	58	D4		Good
SNCF Réseau	Strasbourg - Mulhouse	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	161-220km/h	107	D4		Extremely limited
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
SNCF Réseau	Lauterbourg border - Strasbourg	x	x	Diesel	750	D4	2	< 12,5‰	GB1	C45	No speed control system	61-100 km/h	58	D4		Good
DB Netz	Kehl - Appenweier (Offenburg)	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	14			
DE-CH-2: Mannheim - Stuttgart - Singen - Zurich																
DB Netz	(Mannheim -) Kornwestheim- Singen	x	x	AC 15 kV 16,7Hz	580	D4	1	< 20‰	Upon request	P/C 65/395	PZB	100	276	1245-1640	Change of direction in Singen; partly single track	
DB Netz	Singen - Schaffhausen	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)																
DB Netz	Mannheim - Kaiserslautern - Saarbrücken - Forbach border	x	x	AC 15 kV 16,7 Hz	740	D4	2 to 4	< 20‰	GA	P/C 70/400	PZB	Up to 160	135	1890-1935		
SNCF Réseau	Forbach (border) - Metz	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h	75	D4		Good
SNCF Réseau	Metz - Réding	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h	86	D4		Limited
SNCF Réseau	Réding - Strasbourg	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	68	D4		Limited
SNCF Réseau	Strasbourg - Mulhouse	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	161-220km/h	107	D4		SNCF Réseau
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
SNCF Réseau	Strasbourg-Offenburg	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	No speed control system	101-120km/h	5	D4		Excellent
DB Netz	Kehl - Appenweier (Offenburg)	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	14			
DE-AT-IT-2: Mannheim - Stuttgart - Munich - Verona (Brenner/Salzburg) – Milan SM																
DB Netz	(Mannheim - Mühlacker - Ludwigsburg - Kornwestheim - Ulm - Augsburg Hbf -) München - Rosenheim - Kufstein	x	x	AC 15 kV 16,7Hz	710	D4	2	N/A	Upon request	P/C 80/410	PZB	160	460	930-1385		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited
DE-AT-IT-3: Wiesbaden - Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento																
DB Netz	Aschaffenburg - Gemünden - Würzburg - Ansbach - Donauwörth - Augsburg - München - Kufstein	x	x	AC 15 kV 16,7Hz		D4	2	N/A	Upon request	P/C 80 P/C 410	PZB	Up to 160		N-S: 1600t S-N: 1910t		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited

4.2.3 Parking locations & capacity

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Area Mannheim	6-7	max. 700 meters	
Germany	Karlsruhe	1-2	max. 700 meters	
Germany	Stuttgart	4	max. 700 meters	
Germany	Offenburg	2	ca 700m	
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
France	Metz	>3	max 700 meters	Metz Sablon
France	Strasbourg	>3	max 750 meters	Hausbergen (railway modernization)
Switzerland[2]	N/A	N/A	N/A	N/A

Information on additional parking locations in The Netherlands, Belgium and France is given in the northern part scenarios in chapter 2.

4.2.4 Restrictions

Each re-routing option can have specific restrictions which are commented here.

NL-BE-LU-FR-CH-1: Rotterdam / Antwerp – Belgium – Luxemburg – France – Basel

- Weight restriction (Belgium): Cl66 900t Traxx 1400t.
- No dangerous goods allowed in the Kennedy tunnel in Antwerp. Freight trains with dangerous goods will have a deviation route via Antwerp North and the Antigoon tunnel (Liefkenshoek Rail link). Extra travel time is 15 minutes
- Profile limitations (France): Intermodal Gauge C45.

DE-FR-CH-1 (b1) / DE-FR -1 (b2): Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)

- Track between Wörth and Strasbourg / Hausbergen is not electrified, only diesel traction is possible.
- Single track between Wörth – Lauterbourg: No turnouts on single track line.
- Change of direction in Wörth.
- Night closure of track between 21.00 hours and 6.00 hours.
- Capacity limitations in Wörth (track length and occupancy).
- Limited capacity in Lauterbourg between 6.00 – 21.00 hours due to at grade platform access.
- Profile limitations: Intermodal Gauge C45 (mainly Strasbourg).
- Change of direction in Hausbergen.
- Capacity limitations between 6.00 – 21.00 hours due to Strasbourg passenger station.

[2] In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

- Capacity limitations in Kehl (no change of driver or locomotive).

DE-CH-2: Karlsruhe – Stuttgart – Singen – Zurich

- Partly single track between Stuttgart – Singen and Singen – Zurich.
- Train weight limitations: max. 1200 – 1300t because of gradient and weather / soil conditions.
- Change of direction in Singen.
- Operational limitations because of older rail communication technic.

DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)

- Change of direction in Metz to Woippy.
- Profile limitations: Intermodal Gauge C45 (mainly Strasbourg).
- Capacity limitations in Kehl (no change of driver or locomotive).

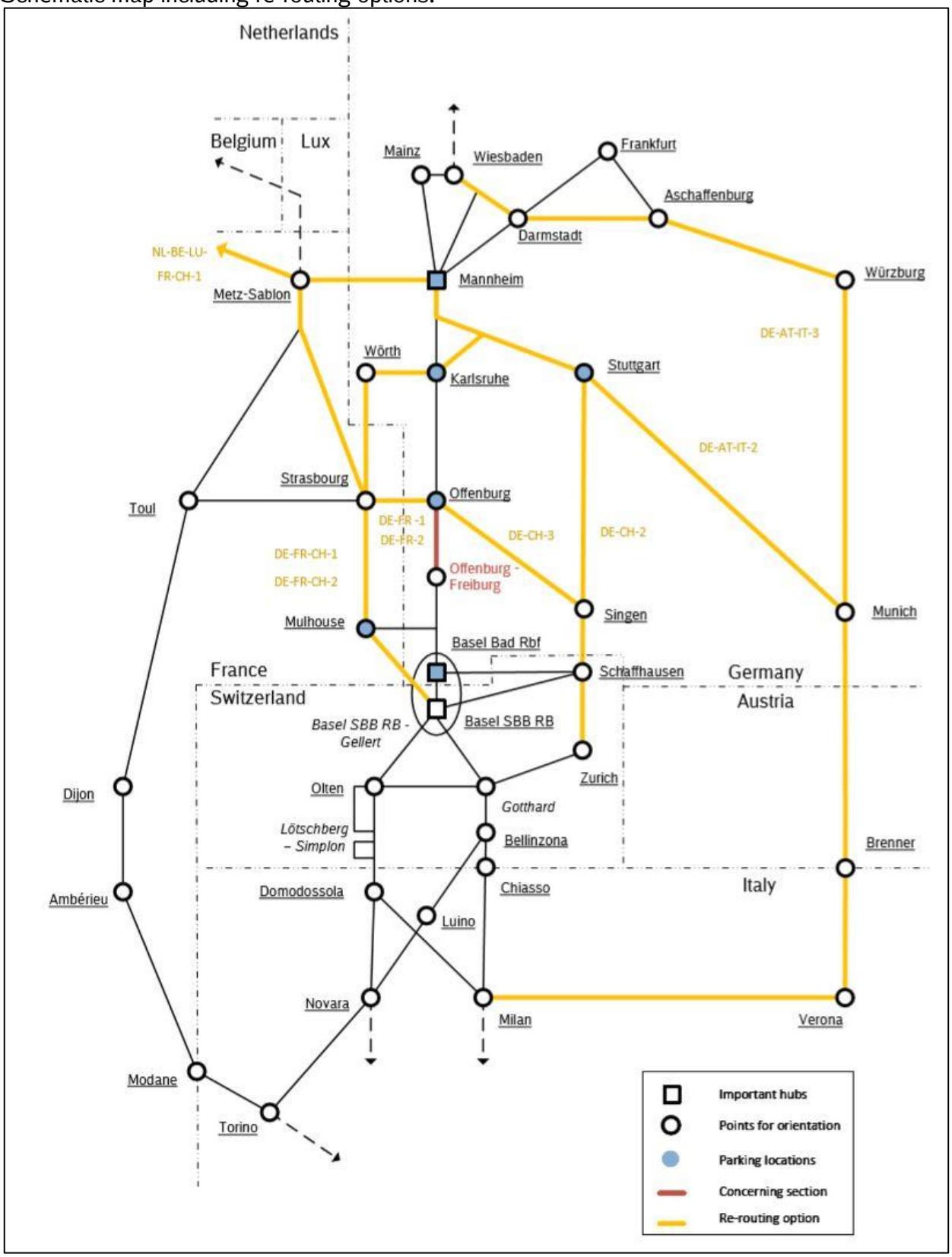
DE-AT-IT-2: Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento

- Train weight limitations near Stuttgart – Ulm (max. 1260t).
- Capacity limitations between Stuttgart – Munich because of many passenger trains.
- 40% less capacity then on main corridor.
- Weight limitations at Brenner border.

4.3. Re-routing scenario for section Offenburg – Freiburg

4.3.1. General description

Schematic map including re-routing options.



When this route is blocked the re-routing options are:

Section ID	Usability	Route
NL-BE-LU-FR-CH-1	B	Rotterdam / Antwerp – Belgium – Luxemburg – France – Basel
DE-FR-CH-1 (b1) DE-FR -1 (b2)	C	Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)
DE-CH-2	B	Karlsruhe – Stuttgart – Singen – Zurich
DE-FR-CH-2 (d1) DE-FR-2 (d2)	C	Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)
DE-AT-IT-2	B	Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-AT-IT-3	tbd	Wiesbaden – Frankfurt – Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-CH-3	B	Offenburg – Singen – Zurich

4.3.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Offenburg - Freiburg																
DB Netz	Offenburg - Freiburg	x	x	AC 15 kV 16,7Hz	690	D4	2	5-10‰	Upon request	P/C 80/410	PZB LZB	160	62	2645-2805		
NL-BE-LU-FR-CH-1: Rotterdam/Antwerp - Belgium - Luxemburg - France - Basel																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
Infrabel	Antwerp - Ronet - Aubange (border LUX)	x	x	3kv	740	D4	2	N/A	GB	PC 70/400	ETCS L1 FS TBL1	100	283	N-S: 1200 (Diesel), 1600 (Electric) S-N: 900 (Diesel), 1400 (Electric)	Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
CFL	Rodange - Esch-sur-Alsette - Bettembourg		x	25 kV	750	22,5 t	1	15-20‰	GB - C50	Upon request	L1FS Memor 2+	100		D4		Limited
SNCF Réseau	LUX border - Metz-Sablon - Strasbourg - Mulhouse - Saint Louis border	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h		D4		limited - extremely limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
DE-FR-CH-1 (b1) / DE-FR -1 (b2): Karlsruhe - Wörth - Strasbourg – Basel (b1) / Offenburg (b2)																
DB Netz	(Karlsruhe Gbf -) Mannheim - Wörth	x	x	AC 15 kV 16,7Hz	600	D4	2	N/A	GA	P/C 80/410	PZB	120	122	3030-3945 (V-Tfz DB 232/233)	Karlsruhe <-> France, change of direction in Wörth	
DB Netz	Wörth - Lauterbourg (border)	x	x	Diesel	600	D4	1	N/A	Upon request	P/C 80/410	PZB	100	11	3030-3945 (V-Tfz DB 232/233)	Karlsruhe <-> France, change of direction in Wörth	
SNCF Réseau	Lauterbourg border - Strasbourg	x	x	Diesel	750	D4	2	< 12,5‰	GB1	C45	No speed control system	61-100 km/h	58	D4		Good
SNCF Réseau	Strasbourg - Mulhouse	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	161-220km/h	107	D4		Extremely limited
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
SNCF Réseau	Lauterbourg border - Strasbourg	x	x	Diesel	750	D4	2	< 12,5‰	GB1	C45	No speed control system	61-100 km/h	58	D4		Good
DB Netz	Kehl - Appenweier (Offenburg)	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	14			
DE-CH-2: Mannheim - Stuttgart - Singen - Zurich																
DB Netz	(Mannheim -) Kornwestheim- Singen	x	x	AC 15 kV 16,7Hz	580	D4	1	< 20‰	Upon request	P/C 65/395	PZB	100	276	1245-1640	Change of direction in Singen; partly single track	
DB Netz	Singen – Schaffhausen (border)	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)																
DB Netz	Mannheim - Kaiserslautern - Saarbrücken - Forbach border	x	x	AC 15 kV 16,7 Hz	740	D4	2 to 4	< 20‰	GA	P/C 70/400	PZB	Up to 160	135	1890-1935		
SNCF Réseau	Forbach (border) - Metz	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h	75	D4		Good
SNCF Réseau	Metz - Réding	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h	86	D4		Limited
SNCF Réseau	Réding - Strasbourg	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	68	D4		Limited
SNCF Réseau	Strasbourg - Mulhouse	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	161-220km/h	107	D4		Extremely limited
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
SNCF Réseau	Strasbourg-Offenburg	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	No speed control system	101-120km/h	5	D4		Excellent
DB Netz	Kehl - Appenweier (Offenburg)	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	14			
DE-AT-IT-2: Mannheim - Stuttgart - Munich - Verona (Brenner/Salzburg) – Milan SM																
DB Netz	(Mannheim - Mühlacker - Ludwigsburg - Kornwestheim - Ulm - Augsburg Hbf -) München - Rosenheim - Kufstein	x	x	AC 15 kV 16,7Hz	710	D4	2	N/A	Upon request	P/C 80/410	PZB	160	460	930-1385		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited
DE-AT-IT-3: Wiesbaden - Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento																
DB Netz	Aschaffenburg - Gemünden - Würzburg - Ansbach - Donauwörth - Augsburg - München - Kufstein	x	x	AC 15 kV 16,7Hz		D4	2	N/A	Upon request	P/C 80 P/C 410	PZB	Up to 160		N-S: 1600t S-N: 1910t		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited
DE-CH-3: Offenburg - Singen - Zurich																
DB Netz	Offenburg - Singen	x	x	AC 15 kV 16,7Hz	580	D4	2	< 40‰	Upon request	P/C 45/375	PZB	Up to 160	150	1060-1230		
DB Netz	Singen - Schaffhausen	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good

4.3.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Area Mannheim	6-7	max. 700 meters	
Germany	Karlsruhe	1-2	max. 700 meters	
Germany	Stuttgart	4	max. 700 meters	
Germany	Offenburg	2	ca 700m	
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
France	Metz	>3	max 700 meters	Metz Sablon
France	Strasbourg	>3	max 750 meters	Hausbergen (railway modernization)
Switzerland[3]	N/A	N/A	N/A	N/A

Information on additional parking locations in The Netherlands, Belgium and France is given in the northern part scenarios in chapter 2.

4.3.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

NL-BE-LU-FR-CH-1: Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel

- Weight restriction (Belgium): Cl66 900t Traxx 1400t.
- No dangerous goods allowed in the Kennedy tunnel in Antwerp. Freight trains with dangerous goods will have a deviation route via Antwerp North and the Antigoon tunnel (Liefkenshoek Rail link). Extra travel time is 15 minutes
- Profile limitations (France): Intermodal Gauge C45.

DE-FR-CH-1 (b1) / DE-FR-1 (b2): Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)

- Track between Wörth and Strasbourg / Hausbergen is not electrified, diesel locomotives are required.
- Single track between Wörth – Lauterbourg: No turnouts on single track line.
- Change of direction in Wörth.
- Night closure of track between 21.00 hours and 6.00 hours.
- Capacity limitations in Wörth (track length and occupancy).
- Limited capacity in Lauterbourg between 6.00 – 21.00 hours due to at grade platform access.
- Profile limitations: Intermodal Gauge C45 (mainly Strasbourg).
- Change of direction in Hausbergen.
- Capacity limitations between 6.00 – 21.00 hours because of Strasbourg passenger station.

[3] In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

- Capacity limitations in Kehl (no change of driver or locomotive).

DE-CH-2: Mannheim – Stuttgart – Singen – Zurich

- Partly single track between Stuttgart – Singen and Singen – Zurich.
- Train weight limitations: max. 1200 – 1300t because of gradient and weather / soil conditions.
- Change of direction in Singen.
- Operational limitations because of older rail communication technique.

DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)

- Change of direction in Metz to Woippy.
- Profile limitations: Intermodal Gauge C45 (mainly Strasbourg).
- Change of direction in Hausbergen.
- Capacity limitations between 6.00 – 21.00 hours because of Strasbourg passenger station.
- Capacity limitations in Kehl (no change of driver or locomotive).

DE-AT-IT-2: Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento

- Train weight limitations near Stuttgart – Ulm (max. 1260t).
- Capacity limitations between Stuttgart – München because of many passenger trains.
- 40% less capacity then on main corridor.
- Weight limitations at Brenner border.

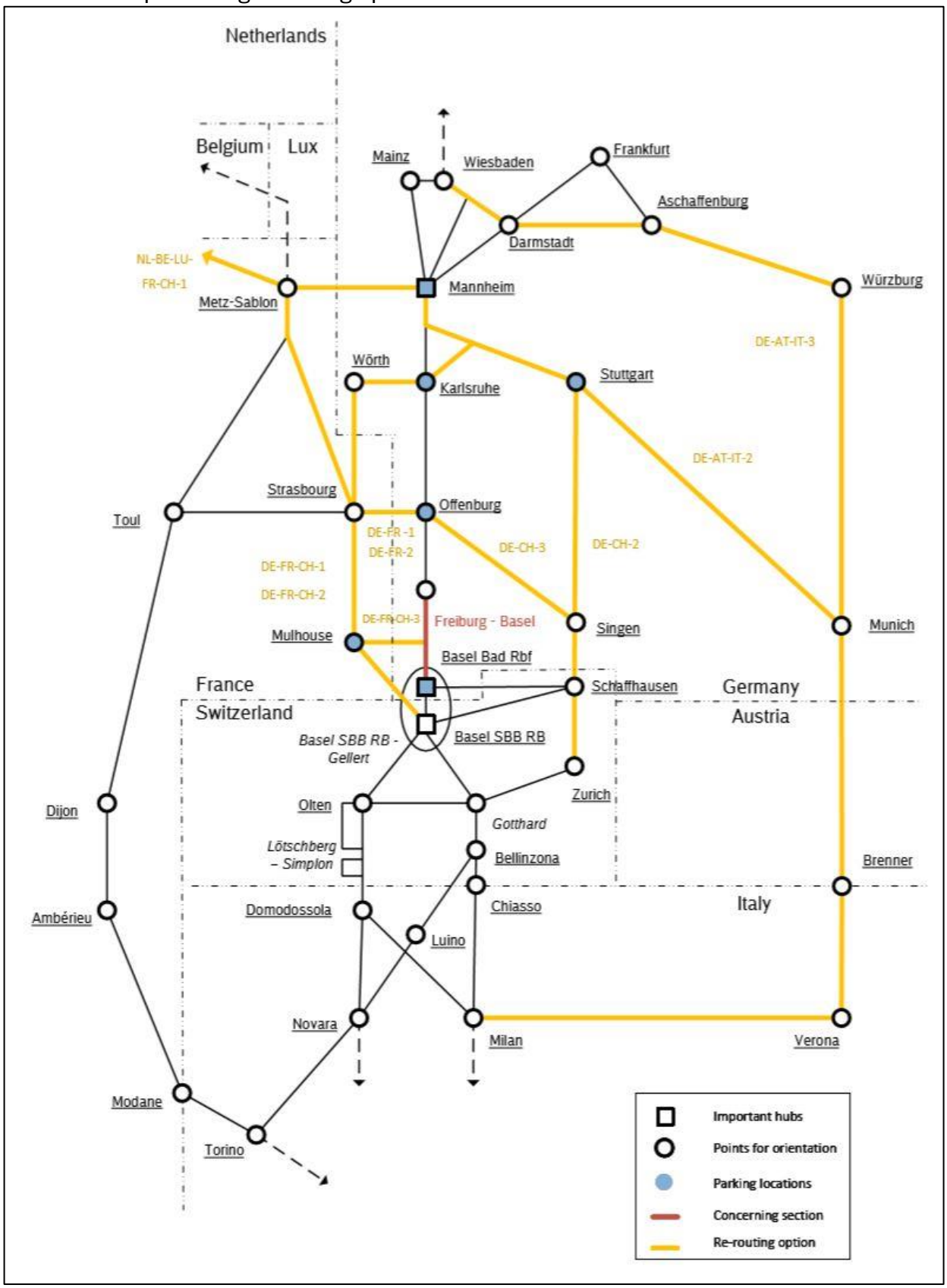
DE-CH-3: Offenburg – Singen – Zurich

- Train weight restrictions (mountainous region): maximum 1060-1230t.
- Profile restrictions P/C 375 (P/C 45)

4.4. Re-routing scenario for section Freiburg – Basel SBB RB

4.4.1. General description

Schematic map including re-routing options.



When this route is blocked the re-routing options are:

Section ID	Usability	Route
NL-BE-LU-FR-CH-1	B	Rotterdam / Antwerp – Belgium – Luxemburg – France – Basel
DE-FR-CH-1 (b1) DE-FR -1 (b2)	C	Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)
DE-CH-2	B	Karlsruhe – Stuttgart – Singen – Zurich
DE-FR-CH-2 (d1) DE-FR-2 (d2)	C	Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)
DE-AT-IT-2	B	Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-AT-IT-3	tbd	Wiesbaden – Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-FR-CH-3	B	Müllheim – Mulhouse – Basel (if incident between Müllheim and Basel)
DE-CH-3	B	Offenburg – Singen – Zurich

4.4.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Freiburg - Basel (Muttenz)																
DB Netz	Freiburg - Basel (border)	x	x	AC 15 kV 16,7Hz	from local border	D4	2	5-10‰	Upon request	P/C 70/400	PZBLZB	160	65	2645-2805		
SBB	Basel (border) – Basel SBB RB	x	x	AC 15 kV 16,7 Hz	750	D4	2	10‰	EBV 03 includes UIC G1	P/C 80/405	L1LS – 3.4.0		5	22,5 t		Good
NL-BE-LU-FR-CH-1: Rotterdam/Antwerp - Belgium - Luxemburg - France - Basel																
ProRail	Kijfhoek - Roosendaal border	x	x	1.5 kV DC	740	D4	2	N/A	G2	P/C 80/410	ATB EG	100	42,7	2100-2400		Good
Infrabel	Antwerp - Essen border	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	23	2200-2470		Limited
Infrabel	Antwerp - Ronet - Aubange (border LUX)	x	x	3kv	740	D4	2	N/A	GB	PC 70/400	ETCS L1 FS TBL1	100	283	N-S: 1200 (Diesel), 1600 (Electric) S-N: 900 (Diesel), 1400 (Electric)	Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
CFL	Rodange - Esch-sur-Alsette - Bettembourg		x	25 kV	750	22,5 t	1	15-20‰	GB - C50	Upon request	L1FS Memor 2+	100		D4		Limited
SNCF Réseau	LUX border - Metz-Sablon - Strasbourg - Mulhouse - Saint Louis border	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h		D4		limited - extremely limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
DE-FR-CH-1 (b1) / DE-FR -1 (b2): Karlsruhe - Wörth - Strasbourg – Basel (b1) / Offenburg (b2)																
DB Netz	(Karlsruhe Gbf -) Mannheim - Wörth	x	x	AC 15 kV 16,7Hz	600	D4	2	N/A	GA	P/C 80/410	PZB	120	122	3030-3945 (V-Tfz DB 232/233)	Karlsruhe <-> France, change of direction in Wörth	
DB Netz	Wörth - Lauterbourg (border)	x	x	Diesel	600	D4	1	N/A	Upon request	P/C 80/410	PZB	100	11	3030-3945 (V-Tfz DB 232/233)	Karlsruhe <-> France, change of direction in Wörth	
SNCF Réseau	Lauterbourg border - Strasbourg	x	x	Diesel	750	D4	2	< 12,5‰	GB1	C45	No speed control system	61-100 km/h	58	D4		Good
SNCF Réseau	Strasbourg - Mulhouse	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	161-220km/h	107	D4		Extremely limited
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
SNCF Réseau	Lauterbourg border - Strasbourg	x	x	Diesel	750	D4	2	< 12,5‰	GB1	C45	No speed control system	61-100 km/h	58	D4		Good
DB Netz	Kehl - Appenweier (Offenburg)	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	14			
DE-CH-2: Mannheim - Stuttgart - Singen - Zurich																
DB Netz	(Mannheim -) Kornwestheim- Singen	x	x	AC 15 kV 16,7Hz	580	D4	1	< 20‰	Upon request	P/C 65/395	PZB	100	276	1245-1640	Change of direction in Singen; partly single track	
DB Netz	Singen – Schaffhausen (border)	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)																
DB Netz	Mannheim - Kaiserslautern - Saarbrücken - Forbach border	x	x	AC 15 kV 16,7 Hz	740	D4	2 to 4	< 20‰	GA	P/C 70/400	PZB	Up to 160	135	1890-1935		
SNCF Réseau	Forbach (border) - Metz	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h	75	D4		Good
SNCF Réseau	Metz - Réding	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	121-160 km/h	86	D4		Limited
SNCF Réseau	Réding - Strasbourg	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	68	D4		Limited
SNCF Réseau	Strasbourg - Mulhouse	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	KVB	161-220km/h	107	D4		Extremely limited
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
SNCF Réseau	Strasbourg-Offenburg	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	No speed control system	101-120km/h	5	D4		Excellent
DB Netz	Kehl - Appenweier (Offenburg)	x	x	AC 15 kV 16,7Hz	740	D4	2	N/A	Upon request	P/C 80/410	PZB	160	14			
DE-AT-IT-2: Mannheim - Stuttgart - Munich - Verona (Brenner/Salzburg) – Milan Sm																
DB Netz	(Mannheim - Mühlacker - Ludwigsburg - Kornwestheim - Ulm - Augsburg Hbf -) München - Rosenheim - Kufstein	x	x	AC 15 kV 16,7Hz	710	D4	2	N/A	Upon request	P/C 80/410	PZB	160	460	930-1385		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited
DE-AT-IT-3: Wiesbaden - Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento																
DB Netz	Aschaffenburg - Gemünden - Würzburg - Ansbach - Donauwörth - Augsburg - München - Kufstein	x	x	AC 15 kV 16,7Hz		D4	2	N/A	Upon request	P/C 80 P/C 410	PZB	Up to 160		N-S: 1600t S-N: 1910t		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited
DE-CH-3: Offenburg - Singen - Zurich																
DB Netz	Offenburg - Singen	x	x	AC 15 kV 16,7Hz	580	D4	2	< 40‰	Upon request	P/C 45/375	PZB	Up to 160	150	1060-1230		
DB Netz	Singen - Schaffhausen	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good
DE-FR-CH-3: Müllheim - Mulhouse -Basel																
DB Netz	Müllheim - Neuenburg (Rhine bridge)	x	x	AC 15 kV 16,7Hz	446m by traincrossing, 740m by free passage	D4	1	N/A	GA	P/C 80/410	PZB	Up to 100	5	3190-3965	Only direction north	
SNCF Réseau	Neuenburg - Mulhouse	x	x	25kv AC	750	D4	1	< 12,5‰	GB1	C45	KVB	61-100 km/h	19	D4		Excellent
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited

4.4.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Area Mannheim	6-7	max. 700 meters	
Germany	Karlsruhe	1-2	max. 700 meters	
Germany	Stuttgart	4	max. 700 meters	
Germany	Offenburg	2	ca 700m	
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
France	Metz	>3	max 700 meters	Metz Sablon
France	Strasbourg	>3	max 750 meters	Hausbergen (railway modernization)
Switzerland[4]	N/A	N/A	N/A	N/A

Information on additional parking locations in The Netherlands, Belgium and France is given in the northern part scenarios in chapter 2.

4.4.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

NL-BE-LU-FR-CH-1: Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel

- Weight restriction (Belgium): Cl66 900t Traxx 1400t.
- No dangerous goods allowed in the Kennedy tunnel in Antwerp. Freight trains with dangerous goods will have a deviation route via Antwerp North and the Antigoon tunnel (Liefkenshoek Rail link). Extra travel time is 15 minutes.
- Profile limitations (France): Intermodal Gauge C45.

DE-FR-CH-1 (b1) / DE-FR-1 (b2): Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)

- Track between Wörth and Strasbourg / Hausbergen is not electrified, diesel locomotives are required.
- Single track between Wörth – Lauterbourg: No turnouts on single track line.
- Change of direction in Wörth.
- Night closure of track between 21.00 hours and 6.00 hours.
- Capacity limitations in Wörth (track length and occupancy).
- Limited capacity in Lauterbourg between 6.00 – 21.00 hours due to at grade platform access.
- Profile limitations: Intermodal Gauge C45 (mainly Strasbourg).
- Change of direction in Hausbergen.
- Capacity limitations between 6.00 – 21.00 hours because of Strasbourg passenger station.

[4] In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

- Capacity limitations in Kehl (no change of driver or locomotive).

DE-CH-2: Mannheim – Stuttgart – Singen – Zurich

- Partly single track between Stuttgart – Singen and Singen – Zurich.
- Train weight limitations: max. 1200 – 1300t because of gradient and weather / soil conditions.
- Change of direction in Singen.
- Operational limitations because of older rail communication technique.

DE-FR-CH-2 (d1) / DE-FR-2 (d2): Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)

- Change of direction in Metz to Woippy.
- Profile limitations: Intermodal Gauge C45 (mainly Strasbourg).
- Change of direction in Hausbergen.
- Capacity limitations between 6.00 – 21.00 hours due to Strasbourg passenger station.
- Capacity limitations in Kehl (no change of driver or locomotive).

DE-AT-IT-2: Mannheim - Stuttgart - Munich - Verona (Brenner / Salzburg) – Milan Smistamento

- Train weight limitations near Stuttgart – Ulm (max. 1260t).
- Capacity limitations between Stuttgart – Munich because of many passenger trains.
- 40% less capacity then on main corridor.
- Weight limitations at Brenner border.

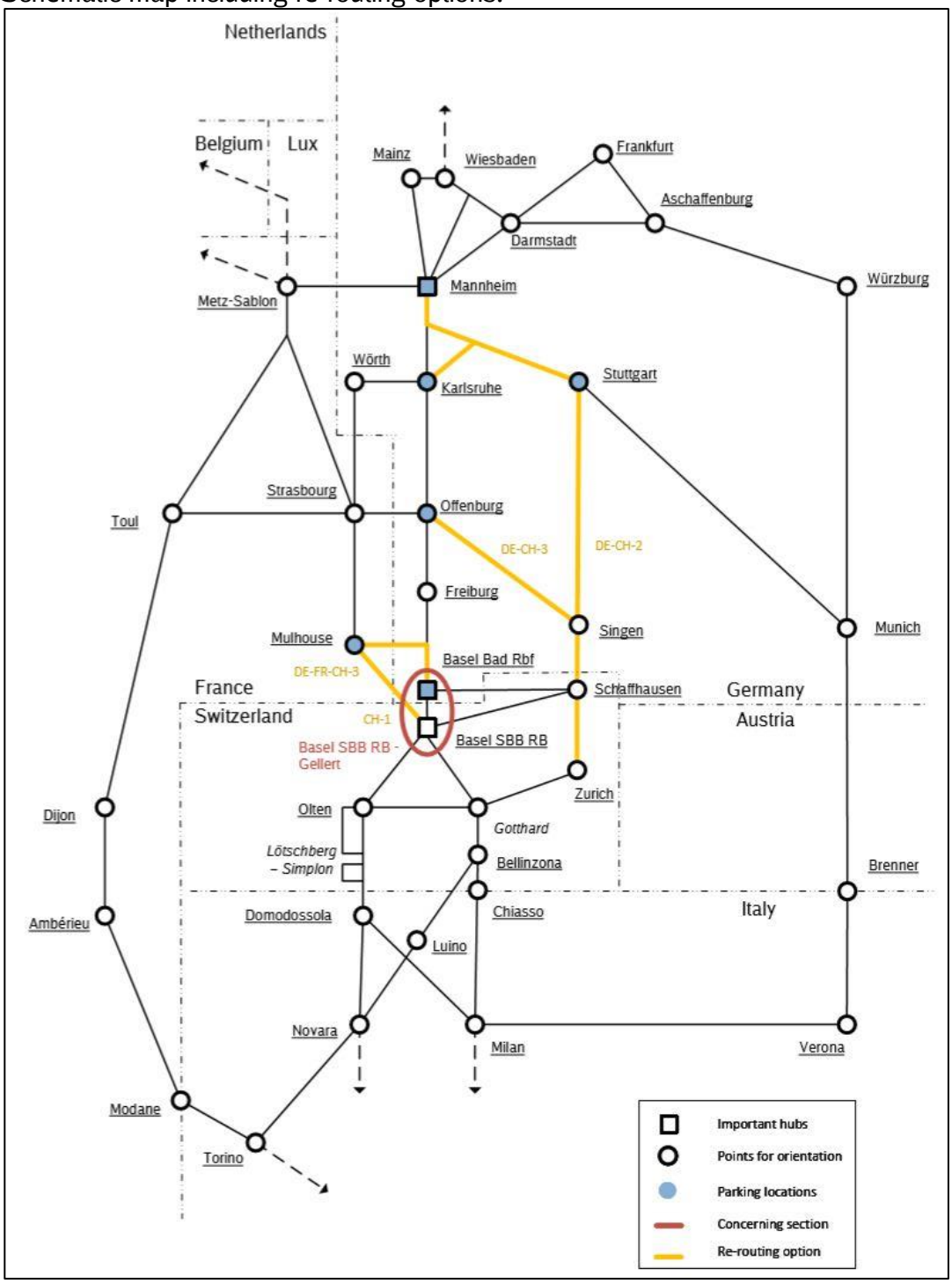
DE-CH-3: Offenburg – Singen – Zurich

- Train weight restrictions (mountainous region): maximum 1060 - 1230t.
- Profile restrictions P/C 375

4.5. Re-routing scenario for section Basel SBB RB – Gellert (Rhine bridge)

4.5.1. General description

Schematic map including re-routing options.



When this route is blocked the re-routing options are:

Section ID	Usability	Route
DE-CH-2	B	Karlsruhe – Stuttgart – Singen – Zurich
DE-CH-3	B	Offenburg – Singen – Zurich
DE-FR-CH-3	B	Müllheim – Mulhouse – Basel
CH-1	B	Via Basel SBB passenger station (change direction)

4.5.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Basel SBB RB – Gellert (Rhine bridge)																
SBB	Basel SBB RB - Gellert (Rhine bridge)	x	x	AC 15 kV 16,7Hz		D4	2	11‰	EBV 3, includes UIC G1	P/C 80/405	L1 LS 3.4.0		5	22,5 t		Limited
DE-CH-2: Mannheim - Stuttgart - Singen - Zurich																
DB Netz	(Mannheim -) Kornwestheim- Singen	x	x	AC 15 kV 16,7Hz	580	D4	1	< 20‰	Upon request	P/C 65/395	PZB	100	276	1245-1640	Change of direction in Singen; partly single track	
DB Netz	Singen – Schaffhausen (border)	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good
DE-CH-3: Offenburg - Singen - Zurich																
DB Netz	Offenburg - Singen	x	x	AC 15 kV 16,7Hz	580	D4	2	< 40‰	Upon request	P/C 45/375	PZB	Up to 160	150	1060-1230		
DB Netz	Singen - Schaffhausen	x	x	AC 15 kV 16,7Hz	580	D4	2	N/A	Upon request	P/C 70/400	PZB	160	20	1: 3130t 2: 2275t		
SBB	Schaffhausen (border) - Zurich Oerlikon	x	x	AC 15 kV 16,7Hz	750	D4	2	10‰	EBV 2, includes UIC G1	P/C 60/384	L1 LS 3.4.0	100	52	22,5 t	Some part one track only	Good
DE-FR-CH-3: Müllheim - Mulhouse -Basel																
DB Netz	Müllheim - Neuenburg (Rhine bridge)	x	x	AC 15 kV 16,7Hz	446m by traincrossing, 740m by free passage	D4	1	N/A	GA	P/C 80/410	PZB	Up to 100	5	3190-3965	Only direction north	
SNCF Réseau	Neuenburg - Mulhouse	x	x	25kv AC	750	D4	1	< 12,5‰	GB1	C45	KVB	61-100 km/h	19	D4		Excellent
SNCF Réseau	Mulhouse - Saint Louis (border)	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	28	D4		Limited
SBB	Saint Louis border – Basel RB Muttenz	x	x	25kV / 15 kV AC	750	D4	2	7‰		EBV 1 / C25/344, C45 / 353, B45 / 353,	KVB L1LS - 3.4.0	100	9	2000		Limited
CH-1: Via Basel SBB passenger station (change direction)																
SBB	Basel SBB passenger station	x	x	AC 15 kV 16,7 Hz	600	D4	2	11‰	EBV 3, includes UIC G1	P/C 80/405	L1 LS 3.4.0		5	22,5 t		Extremely limited

4.5.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Area Mannheim	6-7	max. 700 meters	
Germany	Karlsruhe	1-2	max. 700 meters	
Germany	Stuttgart	4	max. 700 meters	
Germany	Offenburg	2	ca 700m	
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
Switzerland[5]	N/A	N/A	N/A	N/A

4.5.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

DE-CH-2: Karlsruhe – Stuttgart – Singen – Zurich

- Partly single track between Stuttgart – Singen and Singen – Zurich.
- Train weight limitations: max. 1200 – 1300t because of gradient and weather / soil conditions.
- Change of direction in Singen.
- Operational limitations because of older rail communication technic.

DE-CH-3: Offenburg – Singen – Zurich

- Train weight restrictions (mountainous region): maximum 1060-1230t.
- Profile restrictions P/C 375 (P/C 45)

DE-FR-CH-3: Müllheim – Mulhouse – Basel

As no curve exists on the route from Müllheim to Basel, the deviation route from Müllheim only runs directly to Freiburg. The route from Müllheim to Basel is therefore only feasible with a change of directions.

CH-1: Via Basel SBB passenger station (change direction)

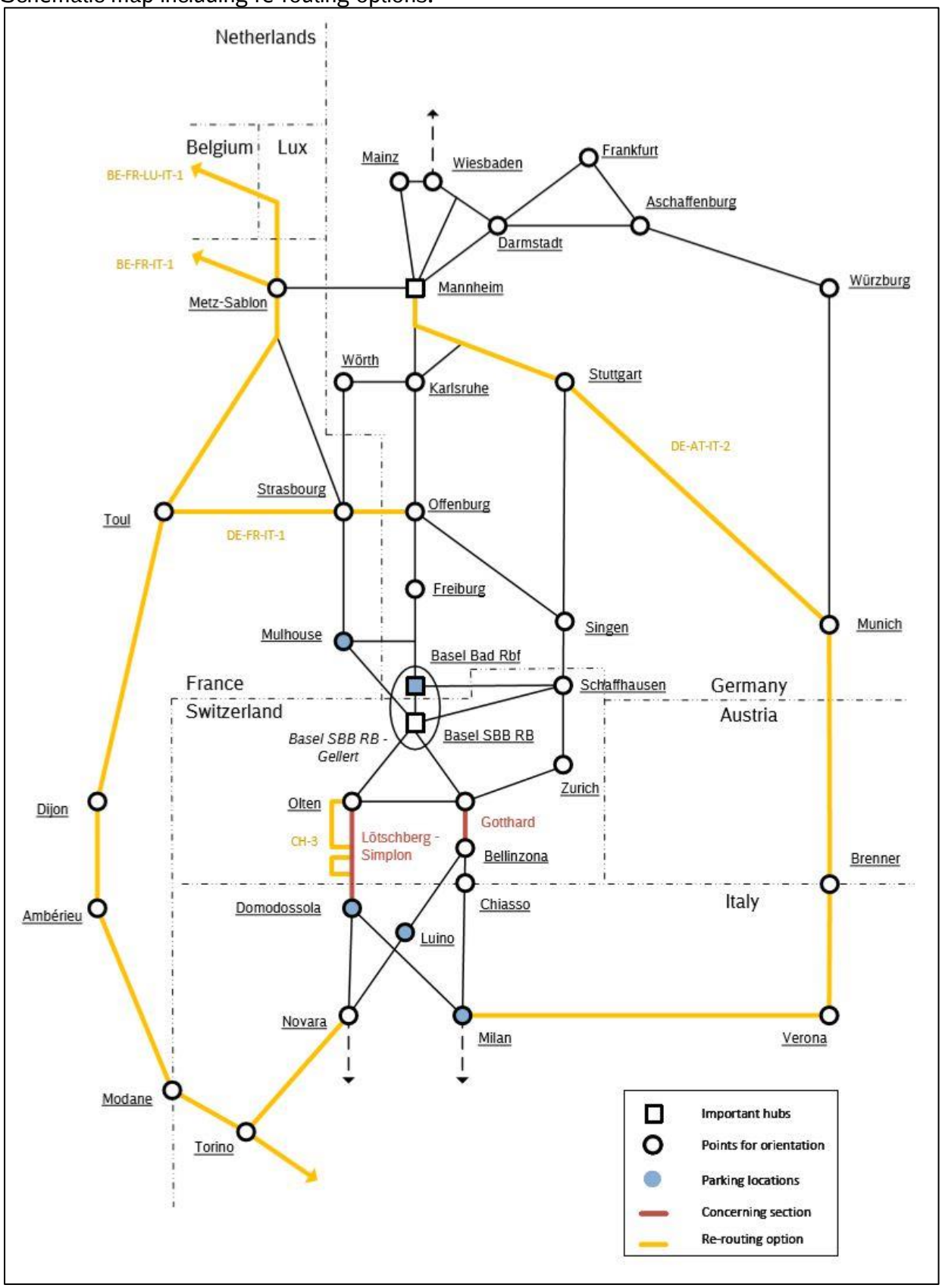
Change of direction and change of locomotive. Very complicated process.

[5] In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

4.6. Re-routing scenario for section Lötschberg-Simplon and Gotthard

4.6.1. General description

Schematic map including re-routing options.



The Lötschberg-Simplon line and the Gotthard line form two redundant systems in the international railway traffic. If one system is blocked, the other axis takes over – according to the principle of rest capacity. In case of a blocking of Lötschberg base tunnel, the Lötschberg mountain line serves as a direct deviation. However, Gotthard mountain line is no longer recommended for freight trains. The coordination in the border crossing to Italy takes place in close coordination between SBB and RFI. If both axes are blocked at the same time or if available capacity is too little for the traffic, the Brenner-Corridor is used for re-routing. Also re-routing via France (spacious by-pass of the Alpine transit Switzerland) could be an option.

Section ID	Usability	Route
CH-3	tbd	Thun - Kandersteg - Brig (Lötschberg Mountain route)
DE-AT-IT-2	B	Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-FR-IT-1	tbd	Offenburg – Strasbourg – Réding – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
BE-FR-IT-1	tbd	Antwerp – Mouscron – Lille – Thionville – Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
BE-FR-LU-IT-1	tbd	Antwerp – Ronet – Rodange – Bettembourg - Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

4.6.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train Length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Lötschberg-Simplon *and* Gotthard																
SBB	Gotthard: Basel SBB RB - Brugg - Altdorf	x	x	750m	750	D4	2	12‰	EBV 1, includes UIC G1	P/C 60/384 - P/C 80/408 in 12/2020	L1LS - 3.4.0	100	114	1600		Limited
SBB	Gotthard Base Tunnel (Altdorf - Bellinzona)	x	x	AC 15 kV 16,7 Hz	750	D4	2	16‰	EBV 4	P/C 60/384 - P/C 99/429 in 12/2020	L1LS - 3.4.0 (only Base tunnel L2 2.3.0d)	100-120	106	1600		Limited
SBB	Bellinzona - Luino	x	x	15 kV AC	620 - 750 in 12/2020	D4	1	11‰	EBV 1, includes UIC G1	P/C 60/384 - P/C 80/408 in 12/2020	L1LS - 3.4.0	100	40	1600	no changing locomotives in Luino, single track in Italy to Milano with extra time in Italy	Limited
SBB	Basel - Olten VL - Thun (->Lötschberg)	x	x	AC 15 kV 16,7 Hz	750	D4	2	20‰	EBV 03 includes UIC G1	P/C 80/405	L1 LS 3.4.0	100	129	22.5 t	Gradient via Burgdorf only 12‰	Limited
BLS	Lötschberg/Simplon: Thun-Spiez-Reichenbach-(LBT)-Brig (Base tunnel)	x	x	AC 15 kV 16,7 Hz	750	D4	2	15‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0 (only Base tunnel L2 2.3.0d)	100	62	1300t (EN) / max 2150t (ZH)		Limited
SBB/RFI	Domodossola II - Brig	x	x	AC 15 kV 16,7 Hz	750	D4	2	25‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0	100	46	700t / max 1450t (ZH)		Limited
CH-3: Thun - Kandersteg - Brig (Lötschberg Mountain route)																
SBB	Basel - Olten VL - Thun (->Lötschberg)	x	x	AC 15 kV 16,7 Hz	750	D4	2	20‰	EBV 03 includes UIC G1	P/C 80/405	L1 LS 3.4.0	100	129	22.5 t	Gradient via Burgdorf only 12‰	Limited
BLS	Lötschberg/Simplon: Thun - Kandersteg - Brig (Mountain route)	x	x	AC 15 kV 16,7 Hz	750	D4	2	27‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0	100	74	700t (EN) / max 1400t (ZH)	Double Track. Partially only one track for P/C 80/405	Limited
SBB/RFI	Domodossola II - Brig	x	x	AC 15 kV 16,7 Hz	750	D4	2	25‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0	100	46	700t / max 1450t (ZH)		Limited
DE-AT-IT-2: Mannheim - Stuttgart - Munich - Verona (Brenner/Salzburg) – Milan SM																
DB Netz	(Mannheim - Mühlacker - Ludwigsburg - Kornwestheim - Ulm - Augsburg Hbf -) München - Rosenheim - Kufstein	x	x	AC 15 kV 16,7Hz	710	D4	2	N/A	Upon request	P/C 80/410	PZB	160	460	930-1385		
ÖBB	Kufstein - Wörgl - Hall i. T. - Innsbruck - Brenner	x	x	15 kV 16,7 Hz	600	22,5t (8,0t/m)	2	0‰-30‰	GA, G1 und G2	P/C 80/410	PZB, ETCS 2	130		700 t (one loco 1216)		
RFI	Brenner – Verona – Milano SM	x	x	3 KV	600 ;(625 Verona-Milano)	D4L	2	20‰-25‰ for , Brennero - Bivio/P.C. S. Massimo 5‰-10‰ for Verona	upon request	PC/80	SCMT	100	371	1600		Extremely limited
DE-FR-IT-1: Offenburg – Strasbourg – Réding – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria																
SNCF Réseau	Strasbourg-Offenburg	x	x	25kv AC	750	D4	2	< 12,5‰	GB1	C45	No speed control system	101-120km/h	5	D4		Excellent
SNCF Réseau	Réding - Strasbourg	x	x	25kv AC	750	D4	2	< 12,5‰	GB	C45	KVB	121-160 km/h	68	D4		Limited
SNCF Réseau	Réding - Frouard	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	92,53	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Frouard - Toul	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	27,67	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Toul - Is-sur-Tille	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	191,02	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Is-sur-Tille - Modane/Bardonecchia	x	x	1,5 kv DC	750	D4	2	5-10% / upon request	GB1	upon request	KVB	120	363,42	D4	Capacity limited due to various infrastructure works in France	
RFI	Modane/Bardonecchia - Torino S. Paolo	x	x	3 kv DC	600	D4	2	0-15‰ / 0-30‰	GB1	P/C 45/364	SCMIT	> 100 km/h	89,96	D4		
RFI	Torino S. Paolo - Ponte Tanaro Alessandria	x	x	3 kv DC	525	D4	2	0-5‰ / 10-15‰	A	P/C 32/351	SCMIT	125 / 140 km/h	89,92	D4		Good
RFI	Torino S. Paolo - Novara	x	x	3 kv DC	600	D4	2	10-15‰ / 0-5‰	GB	P/C 80/410	SCMIT	> 100 km/h	98,38	D4		

IM	Line section	Usage		Traction power	Train Length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
BE-FR-IT-1: Antwerp – Mouscron – Lille – Thionville – Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria																
Infrabel	Antwerp - Kortrijk - Mouscron border (France)	x	x	3kv	740	D4	2	N/A	GB	P/C 70/400	TBL1	100	186,15	1800-2000		Limited
SNCF Réseau	Border Belgium – Lille – Longuyon – Thionville - Metz	x	x	25kV AC	750	D4	2 or more	N/A	CB1 (Longuyon – Thionville: 3.3 - C22)	C45 (Longuyon – Thionville: 3.3 - C22)	KVB	120-139		D4		
SNCF Réseau	Metz Sablon - Frouard	x	x	25 kV	850	D4	2	5-10%	GB1	Upon request	KVB	140	47,25	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Réding - Frouard	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	92,53	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Frouard - Toul	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	27,67	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Toul - Is-sur-Tille	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	191,02	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Is-sur-Tille - Modane/Bardonecchia	x	x	1,5 kv DC	750	D4	2	5-10% / upon request	GB1	upon request	KVB	120	363,42	D4	Capacity limited due to various infrastructure works in France	
RFI	Modane/Bardonecchia - Torino S. Paolo	x	x	3 kv DC	600	D4	2	0-15‰ / 0-30‰	GB1	P/C 45/364	SCMIT	> 100 km/h	89,96	D4		
RFI	Torino S. Paolo - Ponte Tanaro Alessandria	x	x	3 kv DC	525	D4	2	0-5‰ / 10-15‰	A	P/C 32/351	SCMIT	125 / 140 km/h	89,92	D4		Good
RFI	Torino S. Paolo - Novara	x	x	3 kv DC	600	D4	2	10-15‰ / 0-5‰	GB	P/C 80/410	SCMIT	> 100 km/h	98,38	D4		
BE-FR-LU-IT-1: Antwerp – Ronet – Rodange – Bettembourg - Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria																
Infrabel	Antwerp - Ronet - Aubange (border LUX)	x	x	3kv	740	D4	2	N/A	GB	PC 70/400	ETCS L1 FS TBL1	100	283	N-S: 1200 (Diesel), 1600 (Electric) S-N: 900 (Diesel), 1400 (Electric)	Between Antwerpen Luchtbal and Lier = comprehensive network	Limited
CFL	Rodange - Esch-sur-Alsette - Bettembourg		x	25 kV	750	22,5 t	1	15-20‰	GB - C50	Upon request	L1FS Memor 2+	100		D4		Limited
SNCF Réseau	LUX border - Metz-Sablon	x	x	25 kV	850	D4	2	5-10%	GB1	Upon request	ETCS L1, KVB	140	51,8	D4	Capacity limited due to various infrastructure works in France	limited
SNCF Réseau	Metz Sablon - Frouard	x	x	25 kV	850	D4	2	5-10%	GB1	Upon request	KVB	140	47,25	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Réding - Frouard	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	92,53	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Frouard - Toul	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	27,67	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Toul - Is-sur-Tille	x	x	25kv AC	850	D4	2	5-10%	GB1	upon request	KVB	140	191,02	D4	Capacity limited due to various infrastructure works in France	
SNCF Réseau	Is-sur-Tille - Modane/Bardonecchia	x	x	1,5 kv DC	750	D4	2	5-10% / upon request	GB1	upon request	KVB	120	363,42	D4	Capacity limited due to various infrastructure works in France	
RFI	Modane/Bardonecchia - Torino S. Paolo	x	x	3 kv DC	600	D4	2	0-15‰ / 0-30‰	GB1	P/C 45/364	SCMIT	> 100 km/h	89,96	D4		
RFI	Torino S. Paolo - Ponte Tanaro Alessandria	x	x	3 kv DC	525	D4	2	0-5‰ / 10-15‰	A	P/C 32/351	SCMIT	125 / 140 km/h	89,92	D4		Good
RFI	Torino S. Paolo - Novara	x	x	3 kv DC	600	D4	2	10-15‰ / 0-5‰	GB	P/C 80/410	SCMIT	> 100 km/h	98,38	D4		

4.6.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
Switzerland[6]	N/A	N/A	N/A	N/A
Italy	Domodossola/Domo II	38	max 650 meters	only 12 tracks multipower (3 kVv /15 kV)
Italy	Luino	5	max 650 meters	
Italy	Novara Boschetto	16	max 950 meters	
Italy	Gallarate	3	max 580 meters	
Italy	Melzo Scalo	3	max 850 meters	
Italy	Brescia Scalo	5	max 680 meters	
Italy	Milan Smistamento	22	max 1.000 meters	

4.6.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

The Gotthard mountain line, which was listed as a re-routing option for the Gotthard route between Erstfeld and Biasca, is not available for rail freight transport anymore due to objects limiting the lauding gauge.

CH-3: Thun - Kandersteg - Brig (Lötschberg Mountain route)

On the Lötschberg route between Frutigen and Brig additional re-routing is possible via the mountain route under specific conditions:

- Limited weight or additional locomotive necessary
- Partially only one track for P/C 80/405 (on sections Thun – Frutigen and Brig – Domodossola)

DE-AT-IT-2: Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento

- Train weight limitations near Stuttgart – Ulm (max. 1385t).
- Capacity limitations between Stuttgart – Munich because of many passenger trains.
- 40% less capacity then on main corridor.
- Weight limitations in Brenner tunnel.

[6] In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

DE-FR-IT-1: Offenburg – Strasbourg – Réding – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

Capacity restrictions may occur between Nancy and Strasbourg, especially in the area of Réding. Also, various infrastructure works in France may limit capacity.

BE-FR-IT-1: Antwerp – Mouscron – Lille – Thionville – Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

Various infrastructure works in France may limit capacity.

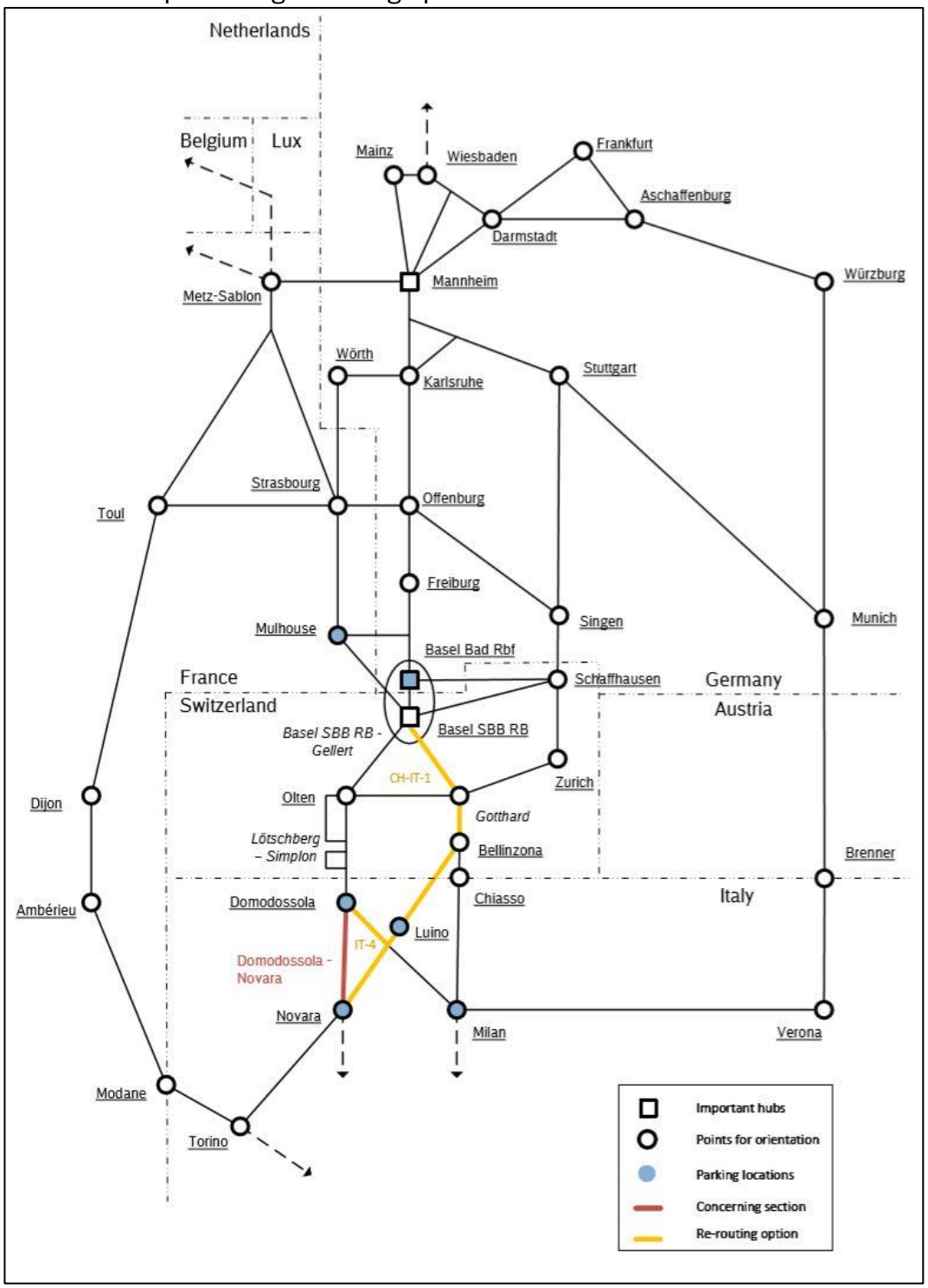
BE-FR-LU-IT-1: Antwerp – Ronet – Rodange – Bettembourg - Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria

Various infrastructure works in France may limit capacity.

4.7. Re-routing scenario for section Domodossola – Novara

4.7.1. General description

Schematic map including re-routing options.



There is no re-routing option for high profile traffic. When this route is blocked the re-routing options are:

Section ID	Usability	Route
CH-IT-1	B	Basel – Gotthard – Bellinzona – Novara
IT-4	B	Domodossola – Arona – Novara

4.7.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train Length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Domodossola - Novara																
RFI	Domodossola - Borgomanero - Novara - Rho - Milano Rogoredo	x	x	3 KV	575	D4L	2	N/A	upon request	P/C80	SCMT	80	146	1600	Domodossola - Borgonamero - Vignale single track . Double the others lines	Extremely limited
CH-IT-1: Basel – Gotthard – Bellinzona – Novara																
SBB	Gotthard: Basel SBB RB - Brugg - Altdorf	x	x	750m	750	D4	2	12‰	EBV 1, includes UIC G1	P/C 60/384 - P/C 80/408 in 12/2020	L1LS - 3.4.0	100	114	1600		Limited
SBB	Gotthard Base Tunnel (Altdorf - Bellinzona)	x	x	AC 15 kV 16,7 Hz	750	D4	2	16‰	EBV 4	P/C 60/384 - P/C 99/429 in 12/2020	L1LS - 3.4.0 (only Base tunnel L2 2.3.0d)	100-120	106	1600		Limited
SBB	Gotthard Mountain route (Altdorf - Bellinzona)	x	x	AC 15 kV 16,7 Hz	620	D4	2	26‰	EBV 1	C25/344	L1LS - 3.4.0	100	116	1600	additional locomotive necessary. Currently no rail freight transit via Gotthard mountain line.	Extremely limited
SBB	Bellinzona - Luino	x	x	15 kV AC	620 - 750 in 12/2020	D4	1	11‰	EBV 1, includes UIC G1	P/C 60/384 - P/C 80/408 in 12/2020	L1LS - 3.4.0	100	40	1600	no changing locomotives in Luino, single track in Italy to Milano with extra time in Italy	Limited
RFI	Luino - Laveno - Sesto Calende - Vignale - Novara	x	x	3 KV	540	D4L	2	N/A	upon request	P/C50	SCMT	100	68	1600	Luino - Laveno - Vignale single track. Double the other sections	Limited
IT-4: Domodossola – Arona – Novara																
RFI	Domodossola - Arona - Novara	x	x	3 KV	510/540	D4L	2 (1:Arona-Vignale and Bivio Toce-Bivio Valee via Domo 2)	N/A	upon request	P/C45	SCMT	100	96	1600		Limited

4.7.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
Switzerland[7]	N/A	N/A	N/A	N/A
Italy	Domodossola/Domo II	38	max 650 meters	only 12 tracks multipower (3 kV/15 kV)
Italy	Luino	5	max 650 meters	
Italy	Novara Boschetto	16	max 950 meters	
Italy	Gallarate	3	max 580 meters	
Italy	Melzo Scalo	3	max 850 meters	
Italy	Brescia Scalo	5	max 680 meters	
Italy	Milan Smistamento	22	max 1.000 meters	

4.7.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

A re-routing option does not exist for high profile traffic like rolling highway.

CH-IT-1: Basel – Gotthard – Bellinzona – Novara

This re-routing option is not usable for high profile traffic like rolling highway. The extension to high profile is expected to be concluded in 2021. Currently the profile is PC60/384 (Swiss part) and PC45 (Luino – Gallarate – Rho – Milano Rogoredo).

IT-4: Domodossola – Arona – Novara

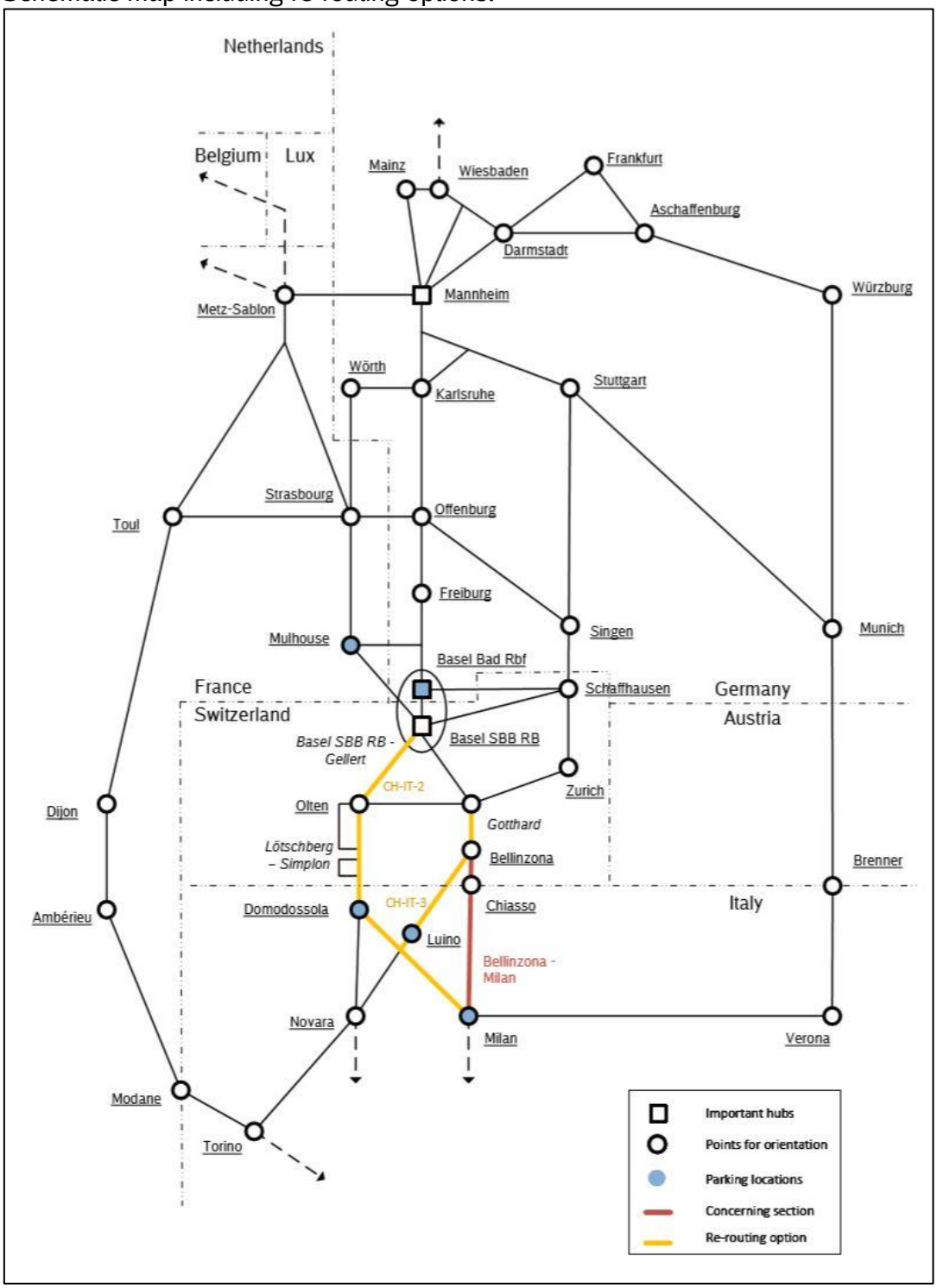
Gauge restrictions: P/C50/370.

[7] In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

4.8. Re-routing scenario for section Bellinzona – Milan

4.8.1. General description

Schematic map including re-routing options.



When this route is blocked the re-routing options are:

Section ID	Usability	Route
CH-IT-2	B	Basel – Domodossola – Milan
CH-IT-3	B	Bellinzona – Gallarate – Milan

4.8.2. **Parameters of re-routing options including capacity indication**

IM	Line section	Usage		Traction power	Train Length	Line category	Number of tracks	Gradient	Gauge	Intermodal freight code	Signalling	Speed	Length of re-routing option	Weight	Miscalleanous	Capacity Indication
		Pass	Frei													
Section: Bellinzona - Milano																
SBB	Bellinzona - Chiasso	x	x	15 kV AC	620 - 750 in 12/2020	D4	2	26‰	EBV 1, includes UIC G1	P/C 60/384 - P/C 80/408 in 12/2020	L1LS - 3.4.0 L2 - 2.3.0d	100	55	1400	extra time in Italy	Limited
RFI	Chiasso - Milano Certosa - Rho - Novara	x	x	3 KV	575 (450 Chiasso -Bivio Rosales via Albate Camerlata)	D4L	2	N/A	upon request	P/C60; (PC/22 Chiasso -Bivio Rosales via Albate Camerlata)	SCMT	100	108	1600		Extremely limited
CH-IT-2: Basel – Domodossola – Milano																
SBB	Basel - Olten VL - Thun (->Lötschberg)	x	x	AC 15 kV 16,7 Hz	750	D4	2	20‰	EBV 03 includes UIC G1	P/C 80/405	L1 LS 3.4.0	100	129	22.5 t	Gradient via Burgdorf only 12‰	Limited
BLS	Lötschberg/Simplon: Thun-Spiez-Reichenbach-(LBT)-Brig (Base tunnel)	x	x	AC 15 kV 16,7 Hz	750	D4	2	15‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0 (only Base tunnel L2 2.3.0d)	100	62	1300t (EN) / max 2150t (ZH)		Limited
BLS	Lötschberg/Simplon: Thun - Kandersteg - Brig (Mountain route)	x	x	AC 15 kV 16,7 Hz	750	D4	2	27‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0	100	74	700t (EN) / max 1400t (ZH)	Double Track. Partially only one track for P/C 80/405	Limited
SBB/RFI	Domodossola II - Brig	x	x	AC 15 kV 16,7 Hz	750	D4	2	25‰	EBV 03 includes UIC G1	P/C 80/405	L1LS - 3.4.0	100	46	700t / max 1450t (ZH)		Limited
RFI	Domodossola - Arona - Sesto Calende - Gallarate - Milano Rogoredo	x	x	3 KV	600 (there are some exception in Rho and Milan area: 550-450m)	D4L	2	N/A	upon request	P/C45	SCMT	100	130	1600		Extremely limited
CH-IT-3: Bellinzona – Gallarate - Milano																
SBB	Bellinzona - Luino	x	x	15 kV AC	620 - 750 in 12/2020	D4	1	11‰	EBV 1, includes UIC G1	P/C 60/384 - P/C 80/408 in 12/2020	L1LS - 3.4.0	100	40	1600	no changing locomotives in Luino, single track in Italy to Milano with extra time in Italy	Limited
RFI	Luino- Gallarate - Rho - Milano Rogoredo	x	x	3 KV	600	D4L	2	N/A	upon request	P/C45	SCMT	100	95	1600	Luino - Gallarate single track. Double the others lines	Extremely limited

4.8.3. **Parking locations & capacity**

Country	Location	Number of tracks	Maximum train length	Restrictions
Germany	Basel Bad. Bf	5	max. 650 meters	capacity very limited
France	Mulhouse	5	max. 750 meters	
Italy	Domodossola/Domo II	38	max 650 meters	only 12 tracks multipower (3 kV/15 kV)
Italy	Luino	5	max 650 meters	
Italy	Novara Boschetto	16	max 950 meters	
Italy	Gallarate	3	max 580 meters	
Italy	Melzo Scalo	3	max 850 meters	
Italy	Brescia Scalo	5	max 680 meters	
Italy	Milan Smistamento	22	max 1.000 meters	

In case of an incident in Switzerland trains running north must park at terminals / tracks in Italy. Parking locations in Switzerland itself are very limited.

4.8.4. **Restrictions**

Each re-routing option can have specific restrictions which are commented here.

CH-IT-2: Basel – Domodossola – Milan

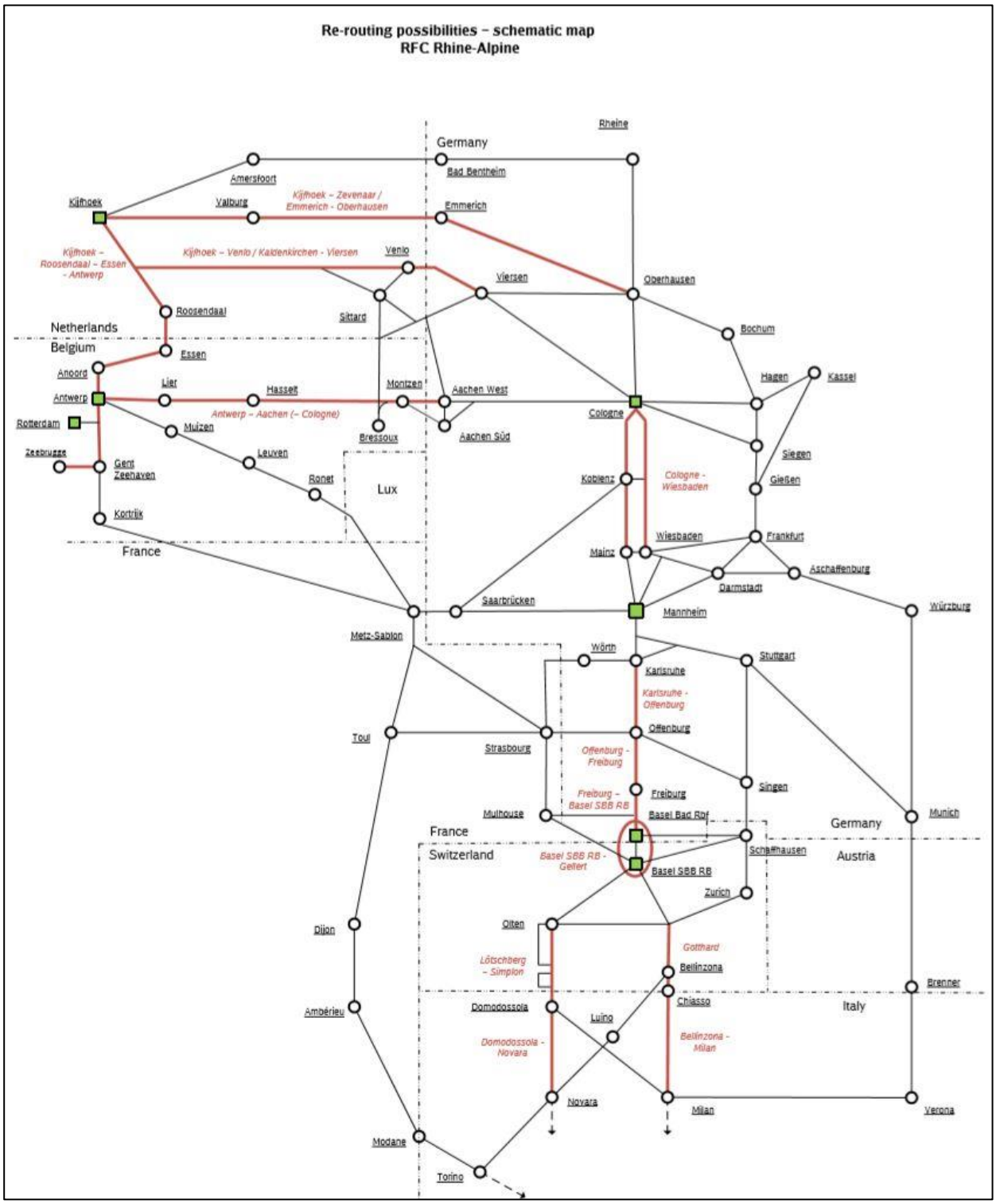
The signalling of the Swiss network is ETCS L1LS - 3.4.0 and partly L2 SRS 2.3.0d including the border sections to the stations Domodossola and Luino which are already part of the Italian network. The residual lines in northern Italy are equipped with SCMT, ETCS L1 FS (Radio Infill). ETCS L2 lines are taken into use from mid-2018 on. The maximum train length is 600m and profile limitation is PC45. Max train weight is 700t.

CH-IT-3: Bellinzona – Gallarate – Milan

This is a double track line. The section between Luino – Gallerate is a single-track line. The profile PC45 does not allow high profile traffic like rolling highway. Maximum train length is 600m.

Annex 1

Overview map of re-routing possibilities for RFC Rhine-Alpine



Annex 2

Overview of re-routing lines on RFC Rhine-Alpine

Section ID	Route
BE-DE-1	Zeebrugge / Antwerp – Aachen West – Cologne
BE-DE-3	Antwerp – Montzen – Hergenrath – Aachen Süd – Aachen Rothe Erde – Cologne
BE-FR-1	Antwerp – Kortrijk – FR
BE-FR-IT-1	Antwerp – Mouscron – Lille – Thionville – Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
BE-FR-LU-IT-1	Antwerp – Ronet – Rodange – Bettembourg - Metz – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
BE-LU-FR-1	Antwerp – Luxemburg – FR
BE-NL-DE-1	Antwerp –Roosendaal / Essen – Kijfhoek – Emmerich – Oberhausen
BE-NL-DE-2	Antwerp – Roosendaal / Essen – Venlo / Kaldenkirchen – Viersen
BE-NL-DE-3	Antwerp – Roosendaal / Essen – Maastrich / Visé – Bressoux – Aachen West
CH-1	Via Basel SBB passenger station (change of direction)[1]
CH-3	Thun - Kandersteg - Brig (Lötschberg Mountain route)
CH-IT-1	Basel – Gotthard – Bellinzona – Novara
CH-IT-2	Basel – Domodossola – Milan
CH-IT-3	Bellinzona – Gallarate – Milan
DE-3.1	Frankfurt – Gießen – Siegen – Cologne
DE-3.2	Frankfurt – Gießen – Kassel – Dortmund – Cologne
DE-3.3	Mannheim – Saarbrücken – Trier – Koblenz – Cologne
DE-3.4	Frankfurt – Gießen – Siegen – Hagen - Oberhausen
DE-AT-IT-2	Mannheim – Stuttgart – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-AT-IT-3	Wiesbaden – Frankfurt - Aschaffenburg – Würzburg – Munich – Verona (Brenner / Salzburg) – Milan Smistamento
DE-BE-1	Cologne – Aachen Rothe Erde - Aachen Süd – Hergenrath - Montzen – Antwerp (if incident between Montzen and Aachen West)
DE-CH-2	Mannheim – Stuttgart – Singen – Zurich
DE-CH-3	Offenburg – Singen – Zurich
DE-FR -1 (b2)	Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)
DE-FR-2 (d2)	Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)
DE-FR-CH-1 (b1)	Karlsruhe – Wörth – Strasbourg – Basel (b1) / Offenburg (b2)
DE-FR-CH-2 (d1)	Mannheim – Metz – Strasbourg – Basel (d1) / Offenburg (d2)
DE-FR-CH-3	Müllheim – Mulhouse – Basel
DE-FR-IT-1	Offenburg – Strasbourg – Réding – Toul – Dijon - Ambérieu – Modane – Torino – Novara / Alessandria
IT-4	Domodossola – Arona – Novara
NL-BE-DE-1	Kijfhoek – Roosendaal / Essen – Aachen West – Cologne
NL-BE-DE-2	Kijfhoek – Sittard – Maastricht / Visé – Bressoux – Aachen West

NL-BE-DE-3	Cologne – Aachen Rothe Erde – Aachen Süd – Hergenrath – Montzen – Roosendaal – Kijfhoek
NL-BE-FR-1	Kijfhoek – Roosendaal / Essen – Antwerp – Kortrijk – FR
NL-BE-LU-FR-1	Kijfhoek – Roosendaal/Essen – Antwerp – Luxemburg – FR
NL-BE-LU-FR-CH-1	Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel
NL-BE-LU-FR-CH-1	Rotterdam / Antwerp – Belgium – Luxembourg – France – Basel
NL-DE-1	Kijfhoek – Zevenaar / Emmerich – Oberhausen
NL-DE-2	Kijfhoek – Venlo / Kaldenkirchen – Viersen
NL-DE-3	Kijfhoek – Oldenzaal / Bad Bentheim – Rheine