



# swisstopo REFRAME plug-in for FME

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## 1 Introduction

REFRAME is a planimetry and/or altimetry transformation software for technical surveying or cadastral surveying applications, with the highest precision requirements.

This product supports the following Swiss reference frames:

- Plane coordinates LV03 (CH1903)
- Plane coordinates LV95 (CH1903+)
- National levelling network LN02 (levelled heights)
- National height network LHN95 (orthometric heights, CHGeo2004)
- Ellipsoidal heights (Bessel)<sup>1</sup>

REFRAME can compute transformation in interactive mode (manual input of coordinates) or file mode (supports several formats like ESRI Shape, Interlis, DXF, swisstopo LTOP, Topobase, Excel CSV, text) and can also be used as batch tool through the command line.

Since version 1.5 (January 2009), this software can also transform the metadata of raster files (World files, GeoTIFF or ECW).

A free REFRAME geoservice is also online since 2007.

For more information about REFRAME desktop software or web service, please refer to our website:

→ <http://www.swisstopo.ch/geosoftware>

And for technical aspects about Swiss reference frames and the new frame LV95:

→ <http://www.swisstopo.ch/lv95>

As explained above, REFRAME supports several file formats, but to allow the transformation of much more file types and also to facilitate the transformation of geodata stored in databases or the integration in processing chains (like an online cartographic desk), swisstopo developed a special

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<sup>1</sup> The CHGEO2004 geoid model has to be purchased and installed separately, see chapter 4.2

version for the FME software. This tool is provided as a plug-in which adds a new manipulator/reprojector in the FME environment.

## 2 Minimal system requirements

- Hardware and operating system: same requirements as for FME software (compatible with 32 and 64-bit OS)
- Software: Safe Software FME (“Feature Manipulation Engine”) Professional Edition (or extended, like ESRI, Intergraph or Oracle editions), Microsoft .NET Framework 4.0 (or further), Microsoft Visual C++ 2010 redistributable package and optionally a PDF file viewer<sup>2</sup> for reading this manual on screen.

On some configurations, both 3.5 and 4.0 versions of Microsoft .NET Framework can be required (on “.NET Framework Initialization Error”).

The REFRAME plug-in has been successfully tested with the versions 2010 to 2013 (2011 to 2013 for x64) of FME, but is not compatible with the versions 2009 and earlier.

## 3 Installation

Swisstopo delivers a standard MSI setup which installs all required files and automatically configures FME. You just have to execute the exe file you find on our website and follow the onscreen indications.

To optimise file size and download time, we didn’t integrate the Microsoft Windows Installer engine, the Microsoft Windows .NET Framework and the Microsoft Visual C++ 2010 redistributable package. If they aren’t already installed on your computer, they will be automatically downloaded<sup>3</sup> and installed.

After the installation’s process, you’ll find a shortcut to a PDF version of this manual in the Windows start menu. If you want to use the REFRAME reprojector, you just have to start FME as you do normally.

Please beware that there are two separate installers for x86 (32-bit) and for x64 (64-bit) versions of FME.

*Note: if you can’t find the REFRAME transformer like described below, it can be because the setup couldn’t find the FME installation directory or because of a file access restriction (e.g. not enough rights). In this case, you can install the plug-in manually:*

1. Copy the file “reframereproject.dll” from the REFRAME plug-in installation directory to the “plugins” FME subfolder (by default: “C:\Program Files\FME\”)
2. Copy ReframeReprojector.fmx” from the REFRAME plug-in installation directory to the “transformers” FME subfolder
3. (Re)start FME

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<sup>2</sup> Adobe Reader can be downloaded free of charge : <http://www.adobe.com/pdf>

<sup>3</sup> They can be obtained through the Windows Update service or downloaded manually : <http://www.microsoft.com/downloads>

## 4 Using the REFRAME transformer in the FME workbench

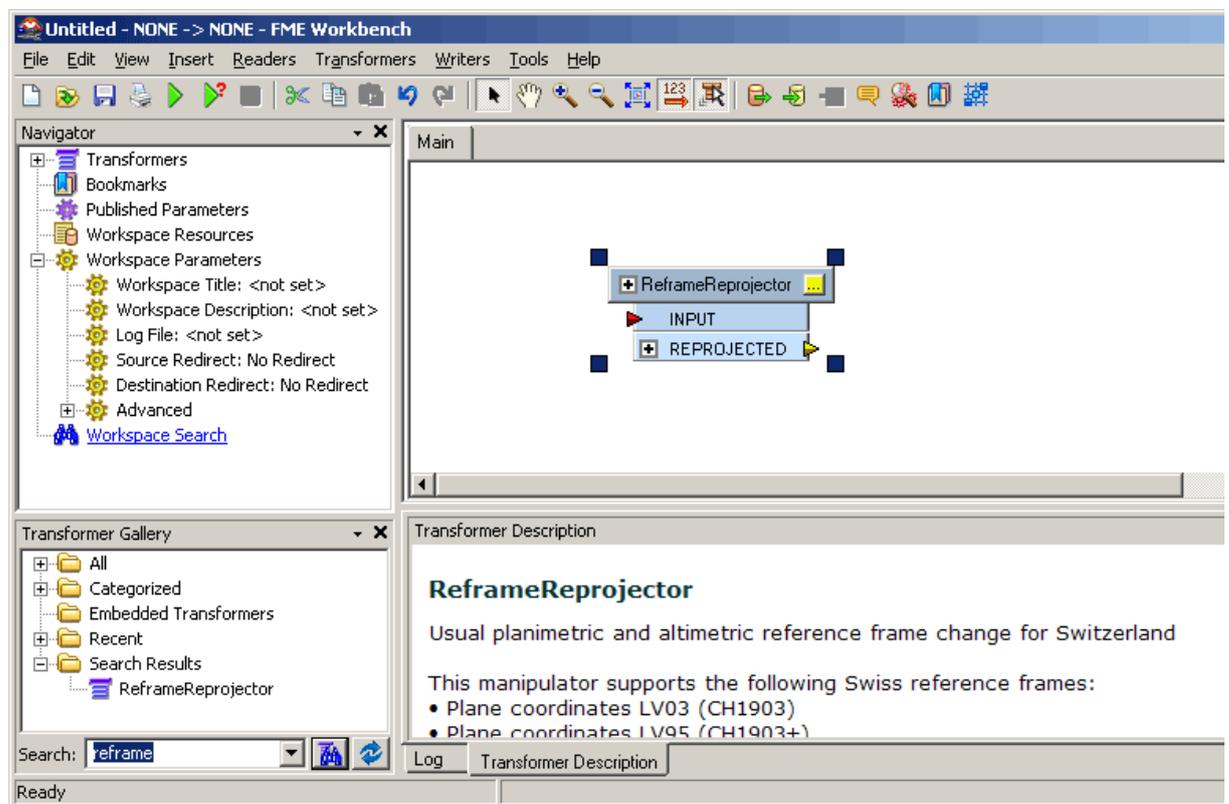
### 4.1 Add a new transformer

The easiest way to add a REFRAME transformer in a workspace is to get it from the “transformers” panel (menu “View – Windows – Transformer Gallery”). You can find it in the “Manipulators” category, with the name “ReframeReprojector”.

The fastest way to get it is to enter “reframe” in the “Search” textbox at the bottom of the panel and press “Enter” (or find button).

You can double-click on the “ReframeReprojector” item or drag and drop it to the Main view, and you are ready to use it!

To integrate a REFRAME transformation in you project, you just have to connect it with input and output data or other transformers, as you do for every FME standard component.

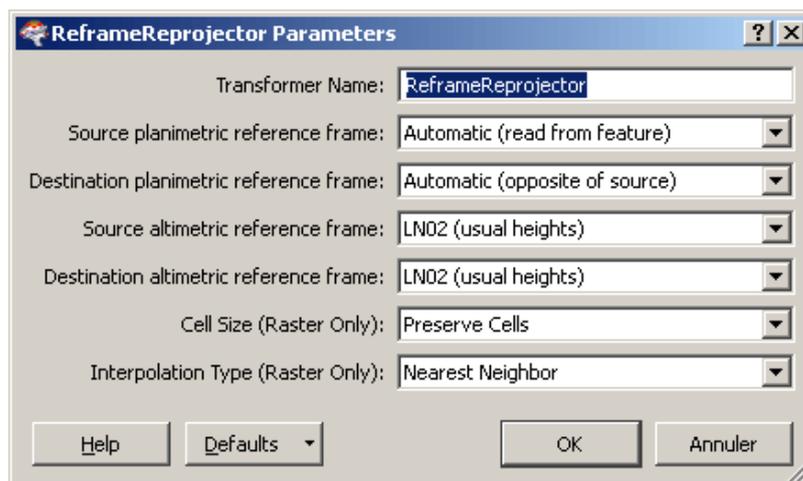


*The REFRAME plug-in is installed as a manipulator named “ReframeReprojector”*

### 4.2 REFRAME parameters

Before starting a computation, you have to define the REFRAME transformer parameters. If you don't do this, the default settings (LV03 to LV95, no altimetric transformation) will be used.

You can access the configuration dialog by clicking on the  button or selecting “Properties...” in the contextual menu. As help, the button stays in yellow as long as you haven't edited the parameters and clicked “OK”.



*The REFRAME transformation parameters*

The REFRAME transformer has 8 processing parameters:

- **Transformer Name:**

The name of the object which will be displayed in the workbench and used in the mapping file (\*.fme). This is a standard FME setting and it doesn't have any influence on the computation.

- **Source planimetric reference frame:**

The planimetric reference frame of your source data. No planimetric transformation will be processed if you let this setting empty (as for destination). Please be careful and ensure yourself that your choice really corresponds to the current source data. Otherwise you will get incorrect results and you won't always be able to see it!

Available choices:

- LV03: Swiss plane coordinates LV03 (CH1903)
- LV95: Swiss plane coordinates LV95 (CH1903+)
- Automatic: Frame determined automatically from the source data (works only if Coordinate System defined)
- Blank: Undefined (= no planimetric transformation)

- **Destination planimetric reference frame:**

The planimetric reference frame of your destination data. No planimetric transformation will be processed if you let this setting empty (as for source).

Available choices are same as for input:

- LV03: Swiss plane coordinates LV03 (CH1903)
- LV95: Swiss plane coordinates LV95 (CH1903+)
- Automatic: Opposite from input frame (LV95 in source is LV03, LV03 if source is LV95)
- Blank: Undefined (= no planimetric transformation)

*Note: the right output coordinate system ("CH1903.LV0\_swisstopo3" or "CH1903Plus\_1.LV95/01") is automatically set in the destination data (metadata added or updated).*

- **Source altimetric reference frame:**

The altimetric reference frame of your source data. No altimetric transformation will be processed if you let this setting empty (as for destination).

This setting cannot be automatically defined or checked, so you have to be careful and ensure yourself that your choice really corresponds to the current source data. Otherwise you will get incorrect results and you won't see anything!

Available choices:

- LN02: National levelling network (levelled heights)
- LHN95: National height network LHN95 (orthometric heights, CHGeo2004)
- BESSEL: Ellipsoidal heights (on Bessel 1841)
- Blank: Undefined (= no altimetric transformation)

*Warning: the REFRAME FME plug-in is free of charge, but the geoid model dataset (CHGeo2004) isn't and costs CHF 600.-. For this reason, you won't be able to transform height to or from ellipsoidal height ("BESSEL") after the standard installation. If you already purchased the CHGeo2004 dataset with other software or with a GNSS receiver, you just*

*need to copy the binary file (\*.grd) into the folder "[FME\_HOME]\plugins\reframe\datasets\".*

*Contact us if you want to purchase the geoid data or need help.*

- **Destination altimetric reference frame:**

The altimetric reference frame of your destination data. No altimetric transformation will be processed if you let this setting empty (as for source).

Available choices are same as for input:

- LN02: National levelling network (levelled heights)
- LHN95: National height network LHN95 (orthometric heights, CHGeo2004)
- BESSEL: Ellipsoidal heights (on Bessel 1841)
- Undefined (= no altimetric transformation)

- **Cell Size:**

This is a standard FME Reprojector setting, only for raster features. Refer to the FME help (Manipulators > Reprojector) for more information.

Available choices:

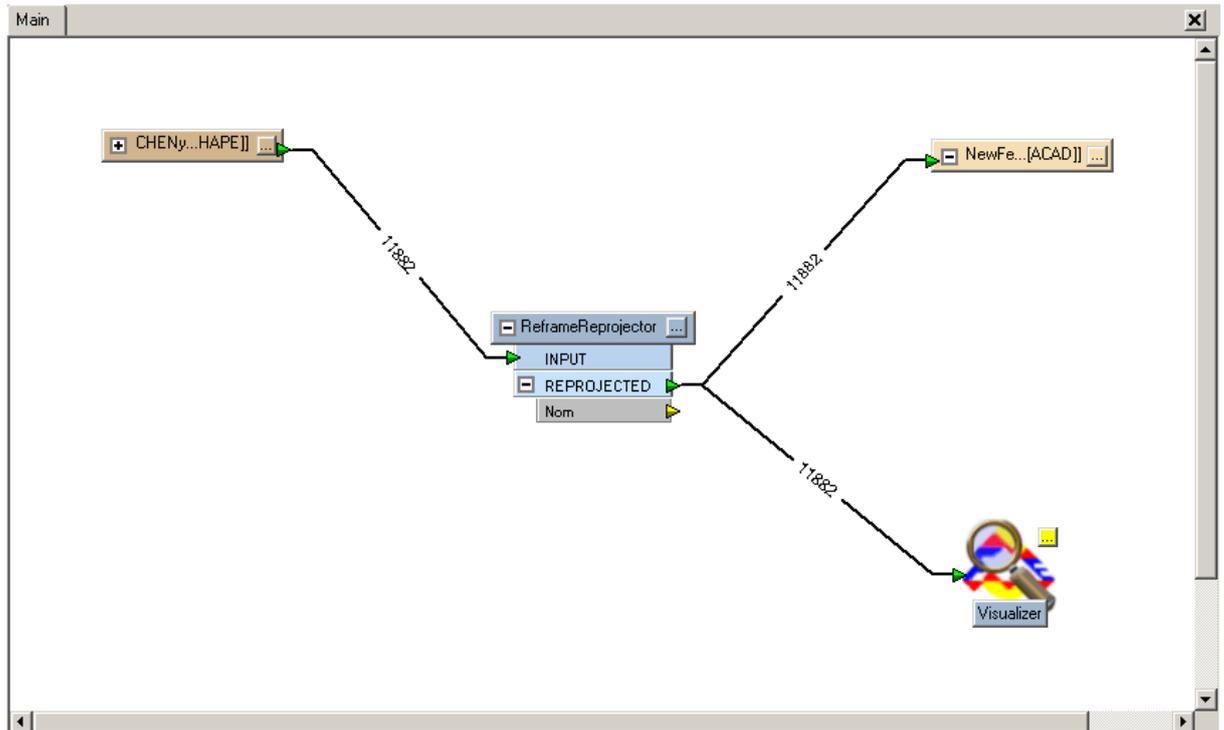
- Stretch Cells: The cell size of the raster will be adjusted to maintain the same number of rows and columns in the reprojected raster as there were in the input raster
- Square Cells: The number of rows and columns as well as the spacing will be changed to maintain approximately the same cell ground area and form square cells where the horizontal and vertical cell sizes are equal
- Preserve Cells: Like Square Cells option, this will change both the number of rows and columns and the spacing to maintain cell ground area, but will also try to preserve the original cell aspect ratio, taking into account any warping caused by the reprojection

- **Interpolation Type:**

This is a standard FME Reprojector setting, only for raster features. Refer to the FME help (Manipulators > Reprojector) for more information.

Available choices:

- Nearest Neighbor: The fastest method but produces the poorest image quality
- Bilinear: Provides a reasonable balance of speed and quality
- Bicubic: Slowest method but produces the best image quality
- Average 4: Has a performance similar to Bilinear and is useful for numeric rasters such as DEMs
- Average 16: Has a performance similar to Bilinear and is useful for numeric rasters such as DEMs



*FME Workbench main view: transformation of an ESRI Shapefile with REFRAME and output as DXF (and view with the FME Universal Viewer)*

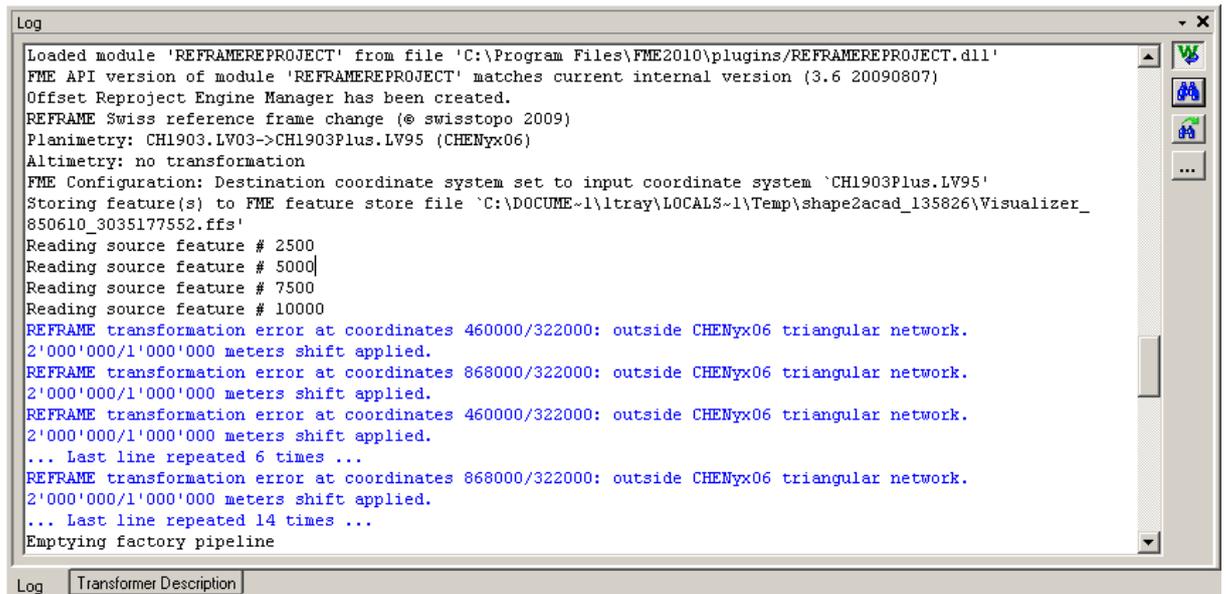
### 4.3 Run the transformation

When the source data, the ReframeReprojector transformer and the destination data are properly configured and connected, you only have to start the transformation by clicking the  button or select “Run Translation” in “File” menu.

You can follow the processing status in the “Log” panel. Some information about the REFRAME transformation will be displayed:

- Plug-in version
- Selected transformation (altimetry and planimetry)
- Coordinate system of the source data
- Optional warning messages
- Number of features transformed

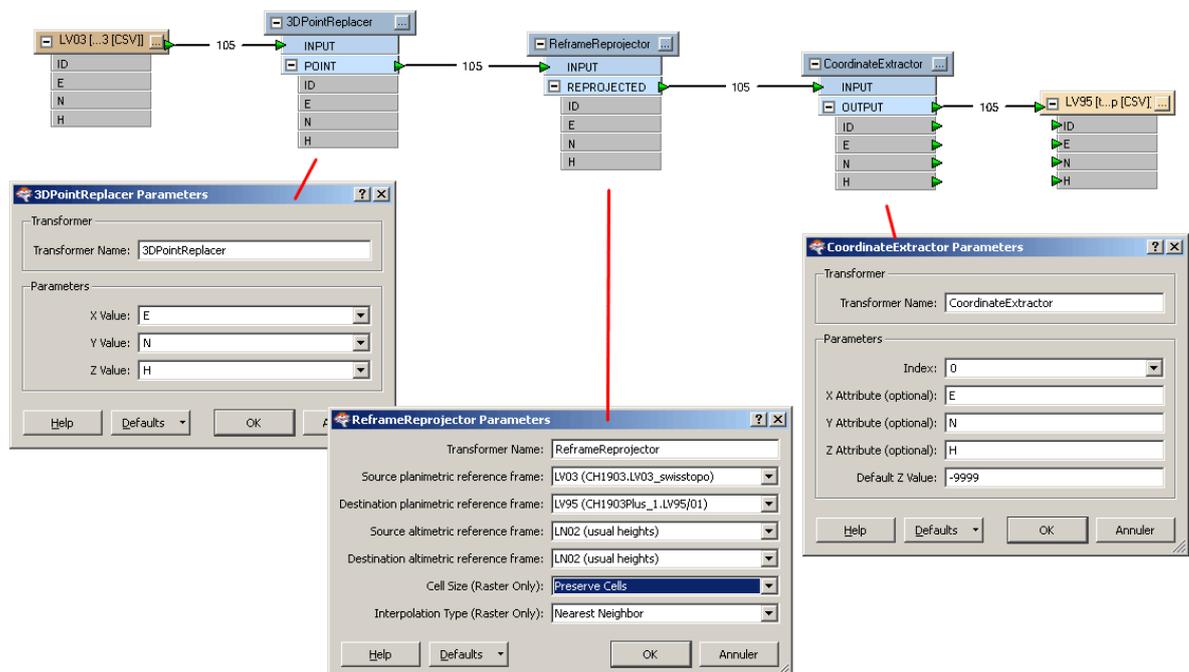
If an input coordinate is outside of a transformation dataset (e.g. CHENyx06 or CHGEO2004) a warning will be displayed, but the processing will be continued. For all fatal exceptions (dataset not found, incorrect setting, etc.) an error message is displayed (“Translation FAILED”) and the procedure is interrupted. If all the processing ends correctly, the message “Translation SUCCEEDED” is displayed.



Some information is added to the Log. Warnings are displayed in blue, fatal errors in red.

#### 4.4 Transform coordinates which are saved as attributes

By default, a REFRAME transformer applies to the geometry of all the features which are found in the source file. It is also possible to transform coordinates that are stored as attributes, e.g. a centroid definition or a label position, or transform a text file without geometry (e.g. CSV text file) using a standard FME manipulator: “2DPointReplacer” or “3DPointReplacer”.



To transform text files or attributes, you can use a “3DPointReplacer” manipulator

With such a component, you can generate a 2D or 3D geometry from 2 or 3 attributes or columns: you just have to connect it to the source data and edit the parameters to define the X, Y and optionally Z values. After that, you connect a “ReframeReprojector” manipulator to the

PointReplacer; the attributes will be automatically recognized as coordinates and transformed according to the REFRAME parameters.

*Note: the PointReplacer generates geometry objects from attributes or text values. If you want to update or create attributes in destination data, or generate a new text file (e.g. CSV), you'll have to convert the geometry back to attributes. This can be done with a "CoordinateExtractor" calculator: it will generate 3 attributes (x/y/z) from the input geometry (point or vertex of a polyline or polygon). Refer to your FME documentation to find more information about "2DPointReplacer", "3DPointReplacer", "CoordinateExtractor" or other calculators or manipulators.*

## 5 Using the REFRAME transformer with the FME Universal Translator

All what can be done in the FME workbench, can also be done in the FME universal translator. The easiest way to see how the "ReframeReprojector" transformer has to be configured in the command file, is to prepare a sample project in the workbench and then save it to a FME Mapping file (\*.fme).

The parameters are the same as in the dialog in the Workbench and have to be set in the following order:

1. Source planimetric frame: "CH1903.LV03\_swisstopo" or "CH1903Plus\_1.LV95/01" or "AUTO"
2. Destination planimetric frame: "CH1903.LV03\_swisstopo" or "CH1903Plus\_1.LV95/01" or "AUTO"
3. Source altimetric frame: "LN02", "LHN95" or "BESSEL"<sup>4</sup>
4. Destination altimetric frame: "LN02", "LHN95" or "BESSEL"
5. Standard FME Reprojector settings: Interpolation Type and Cell Size

Remark: the source and destination Coordinates System parameters must be the concatenation of the planimetric and the altimetric frames, separated by a "|". For example: "LV95|LHN95,LV03|LN02" means a transformation from LV95 to LV03 (planimetry) and LHN95 to LN02 (altimetry).

A REFRAME transformer for a conversion from LV03 to LV95 coordinates, without any height transformation, will look like the following example (in a FME mapping file):

```

FACTORY_DEF * TeeFactory                                     \
    FACTORY_NAME ReframeReprojector                       \
    INPUT FEATURE_TYPE my_reader                           \
    OUTPUT FEATURE_TYPE ReframeReprojector_REPROJECTED     \
    @Reproject(REFRAMEREPROJECT,,,                          \
               CH1903.LV03_swisstopo|LN02,CH1903Plus_1.LV95/01|LHN95, \
               --,NearestNeighbor,PreserveCells)

```

For more information about FME Universal Translator or about the "@Reproject" command, please refer to your FME help and documentation.

<sup>4</sup> "BESSEL" (ellipsoidal) heights can only be processed if you bought and installed the CHGEO2004 geoid model, as explained above (chapter 4.2)