

Mapwel 2010

Build 7.1

User Manual

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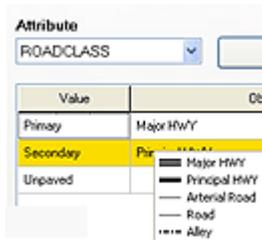
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Mapwel software

Mapwel is mapping software for creation of your own maps and their upload into the GPS unit. Unlike other software tools that work only with tracks and waypoints, Mapwel allows to create complete maps for GPS. [Click here to see supported GPS units.](#)



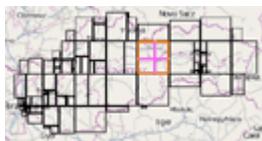
Import of files, files merging

Mapwel supported GPS units require maps in vector format. Therefore, easiest way of how to create map for GPS is to import files in ESRI *.shp, *.gpx or other vector format into Mapwel, merge them together and assign proper type to all map objects. Mapwel also supports import of raster images and their automatic and manual vectorisation.



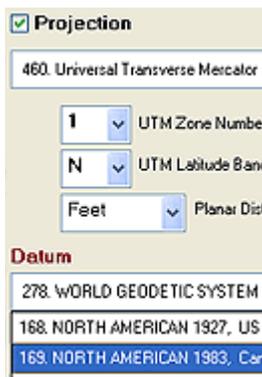
Routable maps with Turn-by-Turn voice navigation

Mapwel supports creation of routable maps (Advanced version only) from OpenStreetMap *.OSM or cGPSmapper *.MP files. This process is fully automatic in most cases. It is also possible to draw routable maps manually or convert data from other sources (ESRI *.shp) to routable map with little effort. Click [here](#) to find out more.



Freeware Maps Download

Mapwel contains special tool for easy download of large freeware mapsets from internet and their conversion to routable format. This tool allows to define mapset parameters and create map tiles automatically. Each map in the set is trimmed and aligned with other maps for seamless navigation from one map to another. [More >>](#)



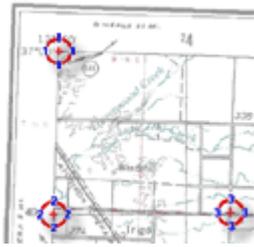
Projections and datums

Imported files in both vector and raster format may use various projections and geographic systems. Mapwel supports hundreds of the commonly used projections (including UTM - Universal Transverse Mercator) and datums. Internal format of map data in Mapwel is WGS84, because this format is also internal format of the GPS units. Although user can select various coordinate systems in GPS, coordinates are always calculated from WGS84 format. Therefore, Mapwel converts all input data into WGS84. Click [here](#) to see list of supported projections.



Autovectorization

If you need to get raster image into GPS with just a few mouse clicks, this is the right tool for you. Mapwel provides Automatic "one-click" vectorisation of raster images (satellite imagery or scanned maps). Garmin units do not allow to load raster image directly into the GPS and use it as a map. Therefore, this function automatically vectorizes raster image and creates vector file compatible with GPS. [More >>](#)



Map Georeferencing

Mapwel provides calibration tool to establish relation between raster image and map coordinate system. Result is a map with Lat/Lon grid parallel to the screen edges and coordinates assigned to left, right, top and bottom edge of the map. Click here to learn [more >>](#)

Mapwel also supports [OziExplorer *.MAP](#) files and [GeoTiff](#) files with included calibration info.



User defined styles

GPS units use basic (pre-defined) and user-defined sets of polygon patterns, line styles and symbol icons. Mapwel provides easy-to-use editor of user styles, which are supported by most of the new Garmin GPS. Click here to find out [more >>](#)



Manual Map Drawing

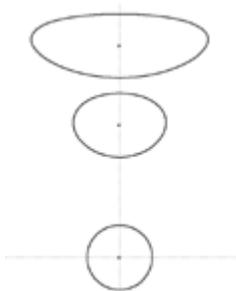
Map can be drawn from the scanned paper chart, aerial photos, satellite images and/or with use of tracks and waypoints imported from your GPS. Tracks and waypoints are automatically converted into the map elements. Mapwel allows to draw map with use of straight lines and curves. When drawn with curves, map can be uploaded into the GPS with chosen precision/data-size ratio. User can apply Contrast, Brightness and Gamma filters to the scanned chart or satellite image to adjust the background for convenient drawing of vector objects on the top. To make drawing of complex objects easier, Mapwel provides Opening in the Area tool.

Tools

Mapwel tools help to manage maps in your GPS, which are normally not accessible, or hard to manipulate because they are all merged into a single file. 'Add maps to other maps in GPS' function allows to add your map to those already present in the GPS memory. 'Delete specific maps in GPS' allows to erase individual maps from your map set. 'Merge IMG files' allows to combines several maps into a single file for use with Nüvi, Zümo, Colorado, Oregon or unit, which memory is directly accessible from Windows.

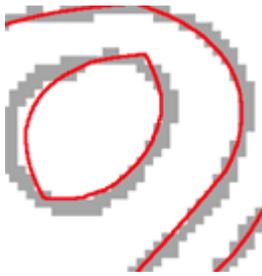
Other Mapwel tools help to create map faster. For example, 'Create Circle around Point' function for aviation maps creates 'circles' of defined radius around all selected points. Very large 'circles' look deformed near poles, because of coordinate system projection. However, real-world distance from center to any point on the "circle" is the same.

Convert [Area to transparent grid cell](#) function creates transparent grid from the polygons. This command converts selected polygons to line objects with label in the centre of each cell. Text is taken from the polygon's "name".



Freehand Tool

Unlike the other Mapwel drawing tools, which are based on the precise manual placement of the nodes, curves and lines, [Freehand tool](#) allows to draw many of the Mapwel objects very fast with a free hand. Strokes are automatically converted into the chosen style. After conversion, strokes can be edited as other vector objects (node by node).



Trace Tool

This is another tool for faster vectorisation of the raster image. It allows to vectorize one object (or set of similar objects) at once, but it cannot vectorize whole map with different types of objects at once. Tracing should be repeated for respective types of objects (filled areas, roads, rivers, etc.). [Trace tool](#) works on images with any common color depth (including True Color and bi-tone) that are sufficiently clean.



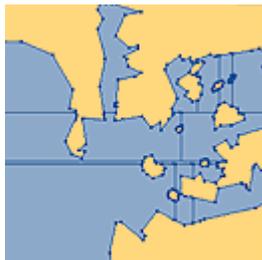
Object Inspector

[Object Inspector](#) box at right side of the main Mapwel window displays information about respective map objects and simplifies the object manipulations. It also allows to select one or several objects in the work space.



Properties of Objects

Each object has adjustable [properties](#) like name, comment (text that is displayed in GPS when cursor stays on top of the object), type, max. zoom level, etc. POI (points of interest) may have address and phone number assigned. It is also possible to define properties of the whole map, like name, copyright text, address format, internal map ID, map draw priority and zoom levels of map layers.



Automatic Object Splitting

GPS rendering engine requires large areas and lines to be split into smaller objects because of the data structures limitations and speed of map rendering. Mapwel splits all objects automatically without loss of the map detail when it uploads map into the GPS. User does not have to bother about the object size or detail limitations. Splitting process runs internally without user even knowing about it.



Map Uploading and Export

Finished map can be saved into Mapwel *.mpw file format, [exported into *.img, *.kml or other supported format](#), or uploaded directly into the GPS. Export of map into other than *.mpw file is supported by Mapwel Advanced version only. Mapwel includes separate MapUpload program for loading *.img files into the GPS. MapUpload also allows to pack several img files into a single executable file to distribute to your friends or customers.

All in One

Creation of map for GPS involves drawing or import of map, conversion of data into GPS native format and upload of data into GPS. Mapwel is the only available software that allows user to do above three steps with a single software tool.

- Use Mapwel WYSIWYG workspace to create complete GPS map with filled areas, all types of lines, map features, cities, exits and points of interest with addresses. Do not limit yourself to just tracks and waypoints. Use Mapwel import capabilities to open existing maps in various formats.
- When converting to GPS native format, Mapwel automatically splits large objects to meet GPS technical requirements and does lot of other automation to make creation of map as easy as possible.
- Upload your map directly into the GPS. Mapwel allows you to add your map to other maps already present in GPS memory. With Advanced version you can even export map into GPS native IMG file.
- Other most important features include: Free map loader (for IMG files from other sources), Delete specific maps in GPS function, UTM projected system and many geographic systems support.

Demo

Mapwel is available for download and testing in FREE demo mode. Click [here](#) to learn about demo restrictions

License Levels

Registered Mapwel software is available in two levels:

- Basic, for single GPS unit. Basic version allows user to upload map only into the GPS with ID that was used for registration. This version is intended for personal use.
- Advanced, for unlimited number of GPS units. Advanced version requires GPS (the one used for registration) to check validity of password only once after installation of Mapwel. Then user may attach any other compatible GPS and upload maps into it. This version is intended for personnel or organizations that own number of GPS units. Advanced version allows to export maps into IMG, KML and MP format and supports batch conversion mode.

Registration (Purchase)

To turn demo version into full version without limit user needs to purchase registration password and enter it into the Mapwel. No additional download is needed. Registration password is derived from the GPS unit ID number. This number is required for registration.

When uploading maps into GPS, Mapwel checks the ID of attached GPS. Therefore, GPS with ID used for registration is needed for uploading maps. Mapwel Advanced (see Advanced version), checks registered GPS only once, after installation.

Get Started

Click [here](#) to learn how to make GPS map with Mapwel.

Limits

Click [here](#) to learn about Mapwel limits

Supported GPS Models

Model
Garmin™ Nüvifone® M20
Garmin™ Mobile® XT
Garmin™ Astro®
Garmin™ Oregon® (all models)
Garmin™ Dakota® (all models)
Garmin™ Colorado® (all models)
Garmin™ Nüvi® and Zümo® (all models)
Garmin™ Edge 605, 705, 800®

Garmin™ iQue M3, M4, M5®
Garmin™ eTrex Summit HC®
Garmin™ eTrex Venture Cx, HC®
Garmin™ eTrex Legend, Legend C, Legend Cx, Legend HCx®
Garmin™ eTrex Vista, Vista C, Vista Cx, Vista HCx®
Garmin™ Rino 120, 130, 520, 530, 520HCx, 530HCx®
Garmin™ GPS V®
Garmin™ GPSMAP 60C, 60CS, 60Cx, 60CSx, 62, 62s, 62st®
Garmin™ GPSMAP 76, 76S, 76C, 76CS, 76Cx, 76CSx, 78, 78s, 78sc®
Garmin™ GPSMAP 176, 176C, 276C, 376C, 378, 478C®
Garmin™ GPSMAP 96, 96C, 196, 296, 396, 496®
Garmin™ Quest, Quest 2®
Garmin™ Street Pilot i2, i3, i5®
Garmin™ Street Pilot c320, c330, c340®
Garmin™ Street Pilot c530, c550, 580®
Garmin™ Street Pilot 2610, 2620, 2650, 2660®

Both serial and USB data transfer is supported.

NOTE: Mapwel is not affiliated with any manufacturers mentioned here. All brand names and product names are trademarks of the respective manufacturers.

Mapwel Registration

Mapwel is available in a free demo version for evaluation purposes.

To turn demo into fully-functioning program, user needs to purchase registration password (unlock code) and insert it into demo main menu / Help / Registration. ID number of GPS is necessary to register. The easiest way of how to get GPS ID in required form is to use Mapwel demo main menu > GPS > Display GPS ID.

Depending on the type of purchased password, Mapwel demo switches to **Basic** or **Advanced** registered mode. More details [here](#).

Sample Map



To test the map into GPS upload and to see how the finished map looks in the Mapwel, use the Mapwel_Island.MPW file in the **MAPWEL/FILES** folder. You can upload this map into GPS without truncation even if you have unregistered version of software.

Note: map elements like areas, lines and symbols appear gradually as you zoom-in the map in GPS. Use the **Setup/Map/Detail** menu in GPS to set detail level.

Mapwel Limits

This chapter is a summary of various limits of mapping with Mapwel software. Some of these limits are imposed by IMG file format (native format of Garmin GPS units), others are result of GPS firmware, Mapwel data structures, licence levels, etc.

Map type

Current version of Mapwel does not support marine maps.

Image size

Maximum image size that current version of Mapwel can handle is 30000 x 30000 pixels. However, such image in raw (uncompressed) form requires large memory space (about 2.7 gigabytes). Moreover, Mapwel needs about 3-4 times more memory to do operations with image. If you need to work with large images, please make sure that your computer has enough memory.

Please note: rotation can increase the size of image. Therefore, rotated image can exceed size limit even if original image fits into the limit

Projections

Current version of Mapwel supports following projections:

- Mercator
- Transverse Mercator
- Universal Transverse Mercator (UTM)

- Lambert Conic Conformal, 1 and 2 standard parallels
- Oblique Mercator and Hotine Oblique Mercator
- Oblique Stereographic
- Albers Equal Area

Autovectorization - user styles

Current version of Mapwel supports max. 86 colors for autovectorization. These colors are represented by user defined styles (polygons, in this case). Assign different **Map Set Data** ([main menu > File > Properties > ID tab](#)) to all your maps if they contain user defined styles. This ensures displaying of map with correct colors in the GPS. GPS uses the same color palette for all maps in a map set. Therefore, maps with different palettes are not displayed correctly if they have the same **Map Set Data**.

Supported GPS units

Click [here](#) to see list of supported units

OziExplorer Files Support

Click [here](#) to learn about limits in OziExplorer files support

IMG file

IMG file can contain single map or it can contain several maps combined into a single file. Current version of Mapwel can produce IMG files of max. 17-30 megabytes size, depending on number of text labels (17 megabytes without text labels). This applies to an IMG file that contains single map. Multiple IMG files can be merged together into a much larger IMG file, which can have hundreds of megabytes or even several gigabytes.

Mapwel can handle 20000 cities in the single map.

Another limiting factor is number of all objects in a single map. The limit is approximately 8 millions of objects. Some objects must be split (automatically) when exported to IMG file, so the number of objects can change during conversion.

Accuracy

Map scope	Accuracy
< 45°	+/-2.4 m
90°	+/-4.8 m
180°	+/-9.6 m

Data format of IMG files restricts accuracy of maps. This restriction is related to the map scope. It means that very large map is represented in GPS with lower accuracy than the small or normal size map. Mapwel automatically converts all map data into the best possible accuracy level.

Demo

Mapwel is available for download and testing in FREE demo mode. Demo is fully functional except the limit on number of objects (map elements) that can be uploaded into the GPS. Therefore, maps uploaded into GPS with demo are incomplete. Demo does not truncate autovectorized maps. However, it stamps text 'Mapwel Demo' to autovectorized maps. Demo version does not support routing. Routable roads are converted to common roads.

Demo version does not truncate maps if they are located in a 'safe test area' S00.5 - N00.5, W000.5 - E000.5 (WGS84). Place your map within these boundaries to test it in the GPS. Routing is supported in the safe test area.

Mapwel licence levels

Registered Mapwel software is available in two levels:

- Basic, for single GPS unit. Basic version allows user to upload map only into the GPS with ID that was

used for registration. This version is intended for personal use. Basic version does not allow to export map into other than *.MPW format.

- Advanced, for unlimited number of GPS units. However, Advanced version requires one GPS (the one used for registration) to check validity of password after installation or re-installation of Mapwel. Then user may attach any other compatible GPS and upload maps into it. User should have registered GPS by hand when upgrading (re-installing) Mapwel. This version is intended for personnel or organizations that own number of GPS units. Advanced version allows to export maps into IMG, KML and MP format and supports batch conversion mode.

Hardware and software requirements

- Windows 98/Me, Windows NT/2000/XP, Windows Vista.
- Minimum hardware requirements: 1 gigabyte RAM, screen resolution 1024x800, True Color display mode

Troubleshooting

How to use Mapwel with Garmin Mobile XT?

- Connect your phone to computer with USB cable. Select 'mass storage' mode on the phone. After a few seconds Mapwel should be able to work with the phone like with any other GPS. Try to read GPS ID with use of Mapwel main menu>GPS>Display GPS ID

How to use Mapwel with Garmin Nuvifone M20?

- Access to various controls used in the following text depends on the Nuvifone operating system version and local settings (language). Therefore, this text does not contain exact step-by-step guide.
- Make sure to set 'Map Detail' in the GPS or Navigation menu of the phone to 'Most'.
- Enable the "Outline Detailed Map" in the same menu.
- Connect your phone to computer with USB cable. Select 'mass storage' mode on the phone. After a few seconds Mapwel should be able to work with the phone like with any other GPS. Try to read GPS ID with use of Mapwel main menu>GPS>Display GPS ID

Map created with Mapwel is not visible on the GPS screen.

- Most GPS (including Garmin Mobile XT) must be restarted after the map upload. Otherwise, map may be not visible.
- If you have problem with [map visibility on GPSmap 276C, please click here](#).
- Some GPS models (like Garmin Mobile XT and Garmin Nuvifone) require to turn on 'Outline Detailed Map' option in Tools/Settings/Map. Otherwise, border of custom map is not visible and this could make the searching for a custom map more difficult.
- Another possible cause of this problem is wrong use of the 'Background Area' polygons. These objects are intended to define irregular shape of the map. GPS displays only objects that are inside of the Background Area (if it is present in the map). Other objects are ignored. If Background Area polygon is wrongly used as a fill of some map object, the whole map is invisible.
- If you custom Mapwel maps are located on the same place as other detailed maps in GPS and they are supposed to be displayed one on top of another, the possible cause of map invisibility can be "Draw Map Priority" parameter. Try to increase "Draw Map Priority" of your Mapwel maps in Mapwel main menu > File > Properties.
- GPS does not display maps with identical ID. If you use your own numbering of maps (Mapwel > File > Properties > ID), each must have a unique internal ID number. Unless you select 'User Defined' option, Mapwel assigns unique ID number to each map automatically.
- If you use user defined polygons or polylines, map may be not visible on GPS if it does not support user defined styles. In such case objects in you map are displayed in blue, yellow or other colors which are not visible on the map background. In some cases this problem can be solved by upgrading the GPS firmware. Please visit Garmin web site to find instructions on how to upgrade firmware.
- Invisibility of map can be caused by wrong map coordinates. If south-north or west-east map scope is too small, map can be invisible. Please make sure that your map is has least 0.001 degree in both directions.
- Sometimes user selects wrong coordinate system when importing map and it is positioned on a wrong place when compared to the real-world location, therefore. Consequently, map uploaded to GPS cannot be found on expected real-world location and it seems like map is not visible on the GPS. In fact, map is visible on other place because it is misplaced. Please check if coordinates of the map displayed by Mapwel match the expected real-world coordinates.

I use custom colors, symbols and fill patterns in my maps and some of them are displayed in weird colors in the GPS

- Assign different Map Set Data ([main menu > File > Properties > ID tab](#)) to all your maps if they contain user defined styles. This ensures displaying of map with correct colors in the GPS. GPS uses the same color palette for all maps in a map set. Therefore, maps with different palettes are not displayed correctly if they have the same Map Set Data.

My custom map completely covers the underlying maps. Is it possible to make them show through my map?

- Yes, it is possible. Use Mapwel main menu > Edit > Preferences to turn on the 'Transparent map' option. Then load the map into the GPS.

Map in GPS is displayed in other colors than those that are visible in Mapwel

- Map in GPS native format can contain two types of objects: 1. basic, 2. user defined. Objects of basic type have no color information stored with them. GPS displays them in its own pre-defined colors. User defined objects have their own color and style assigned by user (Mapwel main menu > Objects > User Defined Styles). Therefore, you have to use objects from the second category if you want GPS to display them in your own colors. Moreover, Mapwel allows to draw map objects in the work area in any color to make creation of map easier. These 'work' colors, however, are not transferred to GPS. To see how the map will look like in the GPS, please use 'Color' tab at bottom part of the main Mapwel screen.

My auto-vectorized map is displayed as a large colored squares and details appear only when I zoom in to 120 m

- The most detailed layer of auto-vectorized maps is supposed to appear at higher zoom levels as well. Check 'Map Detail' setting in your GPS. It should be set to 'Most'.

Map looks good in Mapwel, but after loading to GPS the polylines and/or polygons become distorted and look like zig-zag line

- The finest coordinate grid used in native map format has approximately 2.5 m spacing. If polylines and polygons in your map contain large number of very small elements, their coordinates are rounded (some up and some down) when exported to GPS map format, creating a zig-zag effect. The work around is to make elements of polylines and polygons longer.

I try to load map from Mapwel to GPS, but following error message appears: Windows - No Disk Exception Processing Message c000013 Parameters 75b6bf7c 4 75b6bf7c 75b6bf7c

- This error message is supposed to pop-up when there is USB device (GPS, printer, etc.) with a card slot connected to the computer and there is a false plastic card inserted instead of normal memory card. Try to disconnect such devices.

Auto-vectorized raster map is displayed in GPS as a large blue square and there are no details visible

- The GPS is probably of old type and its firmware does not support user colors, which are necessary to display auto-vectorized maps. In most cases upgrade of the unit firmware solves the problem. Please visit Garmin web site to find instructions on how to upgrade firmware.

When I import tracks from GPS to Mapwel the long tracks seem to be truncated

- Some GPS units handle tracks in a two different way:
 1. ACTIVE LOG tracks are exported in full detail.
 2. Saved tracks are limited to 500 points each.
- Mapwel does not affect the number of points in the imported track, the truncation is done by GPS when exporting 'saved' track.

I have loaded a map into a Garmin Nuvi and when I search on a poi I created

it is not listed. How do I access the custom poi's I created?

- Points from Mapwel map are searchable on Nuvi and similar GPS units only when cursor position (vehicle) is near (several hundred kilometers or less) the map and points are real POIs (Points of Interest, i.e. not Map Features). Map Feature points can be converted to POIs with main menu > Convert command.

I have loaded map into a Garmin Nuvi, but it looks empty. No objects are visible.

- If your map contains just points (POIs or Map Features, for example), they appear in Nuvi only at a very close zoom (about 80m). Mapwel allows to set individual zoom level for each object, but Nuvi firmware seems to suppress displaying of points, probably in order to make map cleaner and easier to understand while driving. I would suggest to draw circle with diameter of about 15 meters around each point to allow to find them on the screen. Select all points and use main menu > Convert > Create Circle around Point command.

POIs in my map are not visible on Garmin Nuvi

- Please see above.

Calibration (georeferencing) does not work properly for Universal Transverse Mercator (UTM). Mapwel puts my map on the northern hemisphere, while it is supposed to be on the southern hemisphere.

- The problem is in most cases caused by mistaking of UTM latitude band letter and hemisphere designator. Paper maps use X W V U T S R Q P N letters for bands on the northern hemisphere and M L K J H G F E D C letters for bands on the southern hemisphere. However, UTM northing coordinates are all measured from equator, band letters only help to choose proper map sheet, but they have no influence on the coordinates within the same hemisphere. Therefore, some software programs use only hemisphere designator (N and S) instead of latitude band letters. For example, UTM 55H on the southern hemisphere (H stands for lat. band H) from the paper map can be displayed as 55S (S stands for southern hemisphere) by some software programs. Mapwel uses the lat. band letters, not hemisphere designator. If S is inserted as lat. band letter by mistake, the map is placed on the northern hemisphere. Solution: in such case use any lat. band letter from the proper hemisphere. It doesn't matter which one, because northing coordinates are all measured from the equator. Only hemisphere matters.

Conversion of existing Mapwel map into routable map

Existing map in Mapwel *.MPW format can be converted to routable map so that line objects are converted to routable roads, their intersections are detected, and some parameters crucial for routable objects are set. Please follow these steps to accomplish this task:

- When map is loaded into the work area of Mapwel, you have to select all polylines which are supposed to be roads (main menu > Select > Lines > Roads) and use main menu > Convert > Convert Line to Routable Road function.
- Then use main menu > Routing > Detect Intersections function to mark nodes where roads connect one to another. Now you have map that can be compiled as routable map.
- The next steps you need to do is to mark border nodes, assign [Oneway](#) attribute to respective roads and define turn restrictions in nodes. Even if you do not define these parameters, the map can be compiled and will act as routable map in GPS, but navigation will be not 100% accurate because of the missing information. For example, it will lead you to oneway streets from opposite direction. We do strongly recommend to set at least the [Oneway](#) attribute.
- **Roads Class and Max. Speed** parameters are set automatically during conversion of Lines into Routable Roads. You may need to adjust these approximate [settings](#) for better routing functionality.

Please note: only Advanced version of Mapwel compiles routable map so that it provides turn-by-turn navigation. Basic or unregistered version compiles routable roads as common lines.

How to use IMG file from Mapwel with Mapset Toolkit?

- To make map in IMG format exported from Mapwel compatible with Mapset Toolkit, you have to do the following:
- Use [main menu >File >Properties > Map ID tab to set user defined ID](#) to map. Check 'User Defined' option and insert some 8 digits map ID number. This number must be unique among all maps in GPS. Check the 'Use as a file name' option.
- On the same tab check the 'User Defined' map set data option. Select some Map Family ID and Product ID.
- Uncheck '[User Defined Styles' in the map parameters tab](#) in the same window to avoid merging of user styles file to the main map file. If you want to use user defined styles with your map, export styles into TYP.txt file with use of [main menu > Objects > User Defined Styles > File](#).
- Make sure that map has '[Background Area' object](#) which defines the shape of the map. If there is no such object, draw it manually. It can have irregular shape or it can be just rectangle.
- [Export map into IMG file](#) format.
- Load IMG file to Mapset Toolkit. Load TYP.txt file into respective box. Previous steps were made to ensure compatibility with Mapset Toolkit, which should be achieved at this point.

Tutorials

How to acquire GPS ID number

Use the [main menu > GPS > Display GPS ID](#) command.

Mapwel displays GPS ID in a specific way, with checksum of all previous digits.

For example ID 32043123 is displayed as 32043123_18 where 18 is $3+2+0+4+3+1+2+3$. The checksum helps to avoid typographical errors in GPS ID when purchasing Mapwel licence.

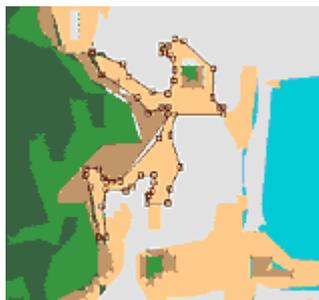
How to load raster image into GPS

Automatic Vectorization

(Sample file in *.IMG format is stored in MAPWEL>FILES folder.)

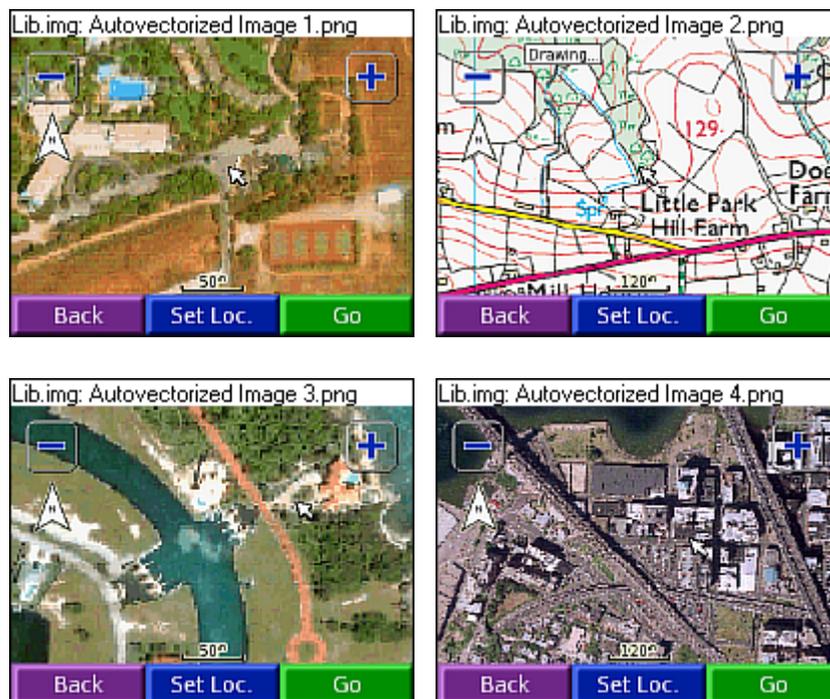
This function can be accessed via [main menu > Image > Automatic Vectorization](#). It allows to create map for GPS from satellite images or scans automatically, within a few minutes. It is intended for use in situation when there are no vector maps available of the area of interest, and drawing of precise vector map is not efficient either because of lack of time or limited use of the map.

In fact, Garmin units do not allow to load raster image into GPS and use it as a map. This function automatically vectorizes raster image and creates vector file compatible with GPS. Autovectorized maps contain thousands of small color spots and are large in size and slow to render on GPS, therefore.



Objects automatically vectorized from raster image.
Map consists of large number of polygons.
Colors are derived from raster and included into "User defined styles"
for optional manual tuning and/or transfer to other map file.

Examples of autovectorized maps in GPS

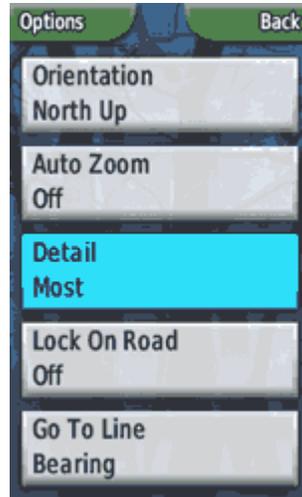


Pros: almost "one-click" process to create ready-to-use GPS map. You can create map like above examples in a few minutes. Auto-vectorized map can be combined with waypoints, tracks, manually drawn objects or other map data (like merged shapefiles, etc.)

Cons: GPS must support user defined styles (most of new units support them). Auto-vectorized map file is larger than normal map file and its rendering in GPS is slower. Auto-vectorized map does not allow to search objects. Objects do not have names, hints and other attributes. In other words, this kind of map is for viewing only.

Technical notes

- Auto-vectorized maps were successfully tested on Colorado, Nuvi, GPSMAP 60CSx, Street Pilot c550.
- Number of auto-vectorized maps can be loaded into GPS at once. Auto-vectorized maps can be exported into IMG format and combined with any other GPS maps. Current version of Mapwel supports max. 86 colors for autovectorization.
- Assign different [Map Set Data](#) to all auto-vectorized maps you create. This ensures displaying of map with correct colors in the GPS. GPS uses the same color palette for all maps in a map set. Therefore, maps with different palettes are not displayed correctly if they have the same **Map Set Data**.
- Warning: you have to set map detail in GPS to 'Most' (default value is 'Normal') to see autovectorized map in full detail. Otherwise, only a large colored squares are visible. Autovectorized map is supposed to be rendered in full detail at zoom 800 m and closer.



Map setup menu with Detail option.

This is screenshot from Colorado 300, but each Garmin GPS has some menu for setting this option. Make sure to set it to 'Most'.

How to use auto-vectorization

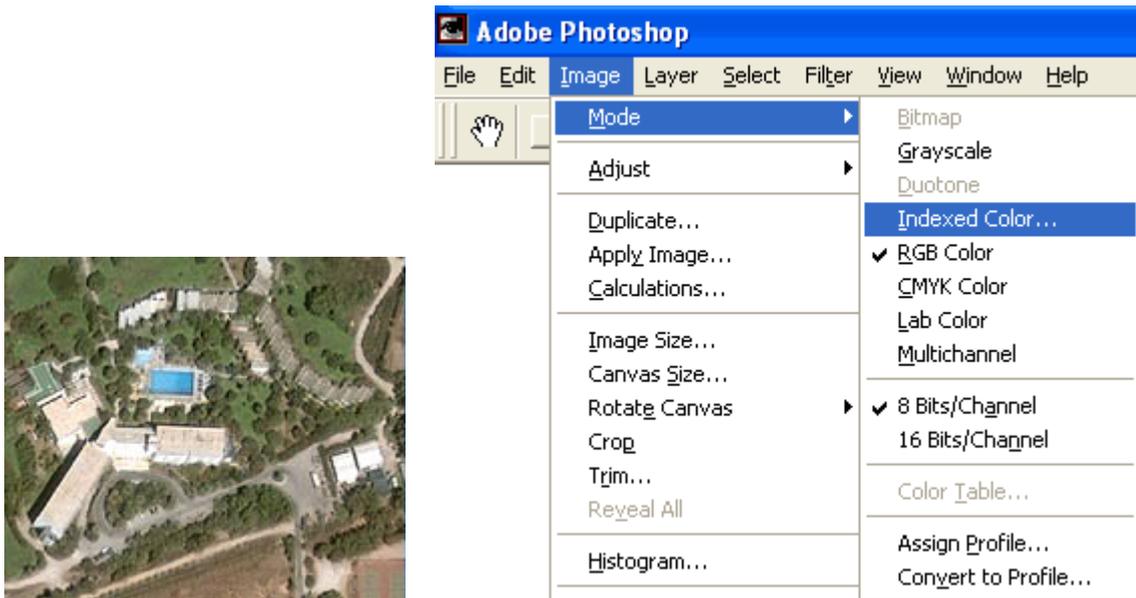
- Use any image editing software to resample and crop raster image. Reduce number of colors to fit into range supported by Mapwel (up to 86). Save image into GIF, PNG or BMP format (do not use JPG because it does not preserve exact color palette).
- Import image into Mapwel. If number of colors exceeds max. allowed number, Mapwel automatically reduces number of colors during autovectorization.
- Calibrate the image. You can skip this step if you import [OziExplorer calibrated image](#) or [GeoTiff](#) image.
- Use [main menu> Image>Automatic Vectorization](#) function to create map.
- Send map from Mapwel to GPS.

How to reduce number of colors in an image

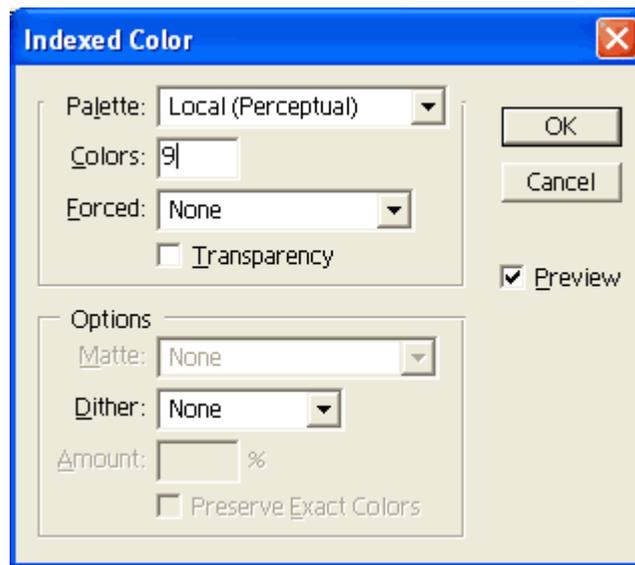
To use image for automatic conversion into vectors, you may need to reduce number of colors. Mapwel reduces number of colors automatically, but you may need to use the same color palette for several images. In such a case, reduce colors manually, save the color palette and use it for other images too. Following short tutorial explains color reduction in Photoshop and in GIMP (free program for image manipulation).

If you have Adobe Photoshop, you can use following approach:

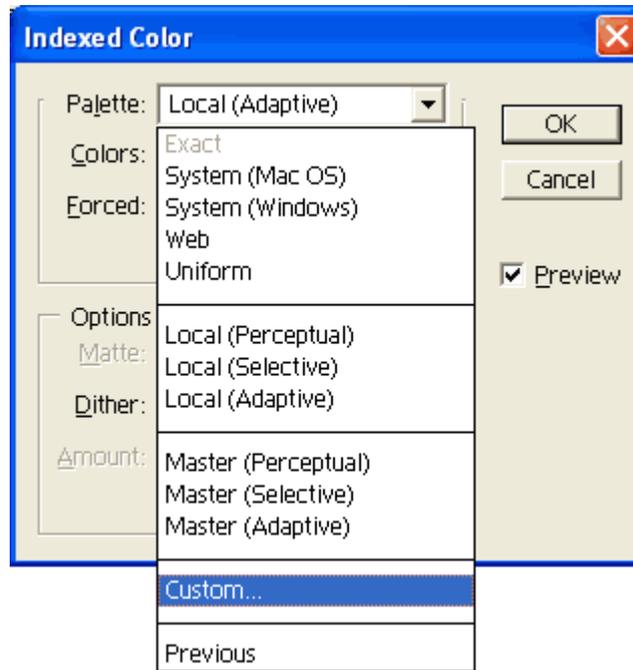
1. Use Photoshop > main menu > Image > Mode > Indexed Color to open window for color reduction.



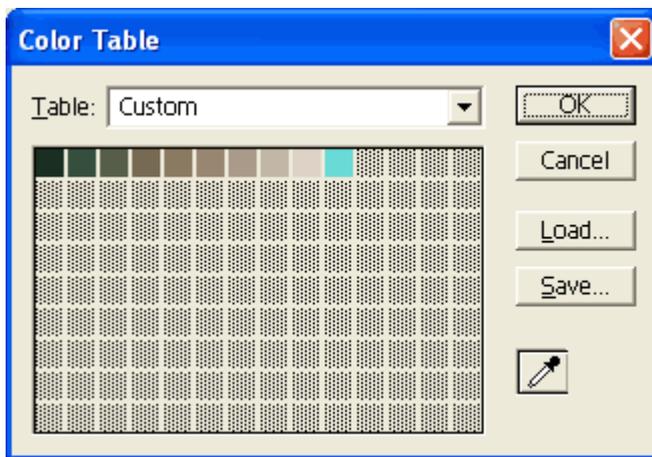
2. Select no dither, no transparency and set required number of colors Select any type of palette that works best for your image.



3. Image with reduced number of colors lacks blue color for pool. We will add it manually. Undo the color reduction and repeat step 1. However, select 'Custom' palette in this case. Please note: in this simple example number of colors is reduced to 9, but Mapwel supports much more colors.



4. Custom palette contains 9 color automatically selected in previous color reduction. Add light blue color as 10th color into palette and click OK. Image now contains 10 colors and light blue is among them. Save image into BMP, GIF or PNG format to avoid colors distortion (do not use JPG format for the same reason).



Color reduction in GIMP

In GIMP, please use 3 simple steps illustrated on below pictures (thanks Greg). GIMP is a free program for image manipulation. Installation files for Windows are available from <http://gimp-win.sourceforge.net>

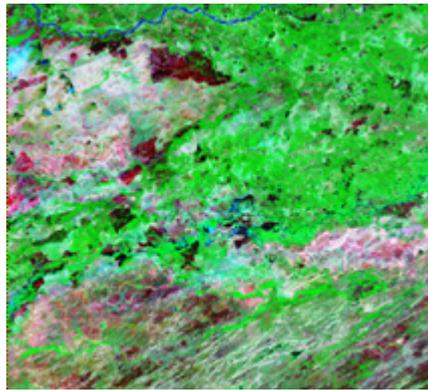
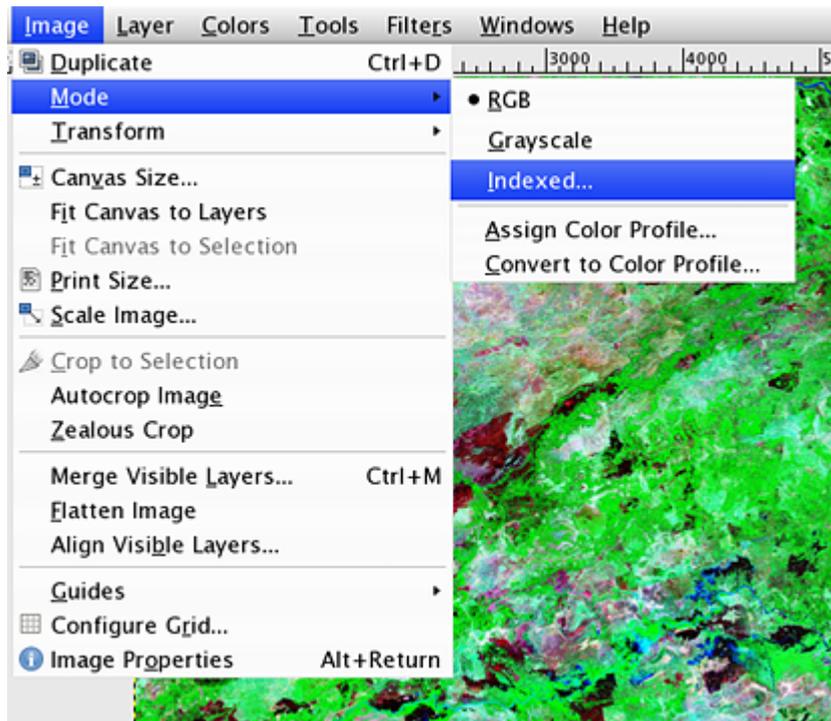
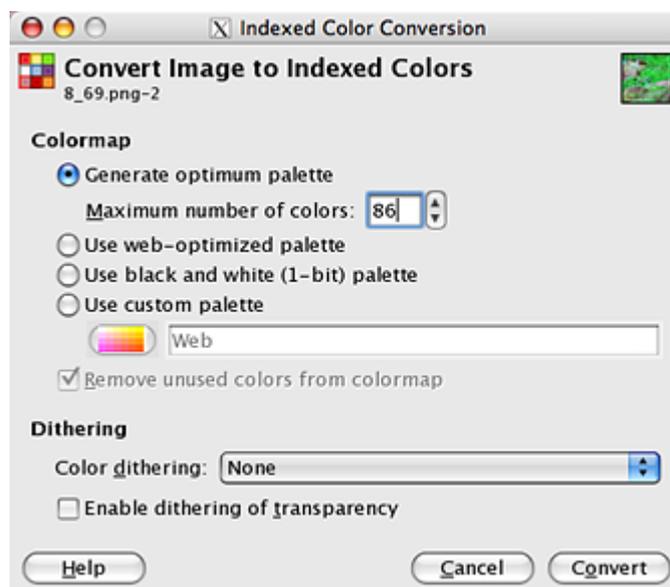


Image with large number of colors.



Select image > mode > indexed to reduce colors.



Choose number of colors.

Sample file in *.IMG format is stored in MAPWEL>FILES folder.

How to make your own map

Garmin GPS units accept only vector data. Therefore, creation of map in Mapwel involves several steps from calibration of raster scan or satellite image to upload of vectorized map to GPS. It is also possible to import vector data from various file formats and sources. Since version 2009, build 6.6, Mapwel supports creation of [routable maps](#) with turn-by-turn navigation.

To get started with drawing of simple map, please click on any below step to see simple example:

1. [Image calibration](#)
2. [Background filters \(colors\)](#)
3. [Drawing/import of objects](#)
4. [Upload of map into GPS](#)

Raster files used in above examples are mw.jpg and mw2.jpg. They can be found in MAPWEL > FILES folder.

Some of these steps are not necessary if your input data are already vectorized and stored in a file format supported by Mapwel (ESRI shapefiles, OSM, GPX, MP, KML, KMZ) or if they are already georeferenced. Please see the following table for steps needed when working from a specific data source:

	Working from scan, aerial or satellite image (raster image)	Working from georeferenced image (OziExplorer or GeoTiff file)	Working from vector file (ESRI shapefiles, MP, OSM, GPX files)
Image calibration	✓		
Background filters	optional	optional	
Drawing of objects	✓	✓	optional
Upload of map into GPS	✓	✓	✓

Only the most frequently used methods are shown in above table. Each of them can be combined with use of your own tracks and waypoints imported from GPS, map files in OSM or GPX format downloaded from internet, etc.

There are several ways how to create vector objects for the map

- Manual [drawing of objects](#)
- Automatic [vectorization of whole raster image](#)
- Automatic [tracing of objects from raster image](#)
- [Freehand drawing](#) with mouse or tablet
- Import of [tracks and waypoints from GPS](#)
- Use of [ESRI shapefiles](#)
- Use of [OpenStreetMap *.OSM files](#)
- Merging of other Mapwel files or other compatible files (*.MP, *.OSM, *.GPX, *.KML, *.KMZ, etc.)

Routable maps (maps with spoken turn-by-turn navigation)

- [Conversion of existing map into routable map](#)
- [Manual drawing \(vectorization\) of routable roads](#)
- Import from [OpenStreetMap *.OSM or cGPSmapper *.MP file](#)

- Import from [ESRI shapefiles](#)

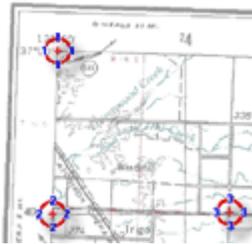
Options to manage maps in your GPS

- [Erase specific map](#) in GPS
- Add map to maps already present in GPS

In case of problems with map uploading or displaying on GPS, please [click here](#).

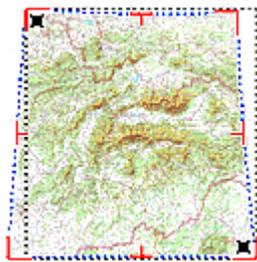
Raster Image Calibration and Georeferencing

Mapwel provides calibration tools to establish relation between raster image and map coordinate system. Result is a map with Lat/Lon grid in WGS 84 parallel to the screen edges and coordinates assigned to left, right, top and bottom edge of the map. In some cases, distorted image (scan) or image representing map with unknown projection must be edited with special non-linear tools prior to calibration.



Calibration

transforms raster image and vector data drawn on top of the image to the Lat/Lon grid parallel to the screen edges. This method uses an affine linear transformation and least squares method and will work with maps which are rotated or skewed. The Lat/Lon grid of the image must be linear (straight lines) to allow linear transformation to the grid parallel to screen edges. Even images with a non-linear Lat/Lon grid can be calibrated with this tool, if the grid non-linearity is caused by projection (like UTM, for example). In such a case, map usually contains linear Easting/Northing grid and non-linear Lat/Lon grid. [Calibrate map](#) with use of the Easting/Northing grid and Mapwel recalculates image so that the Lat/Lon grid becomes linear.



Optional linear and non-linear raster image editing

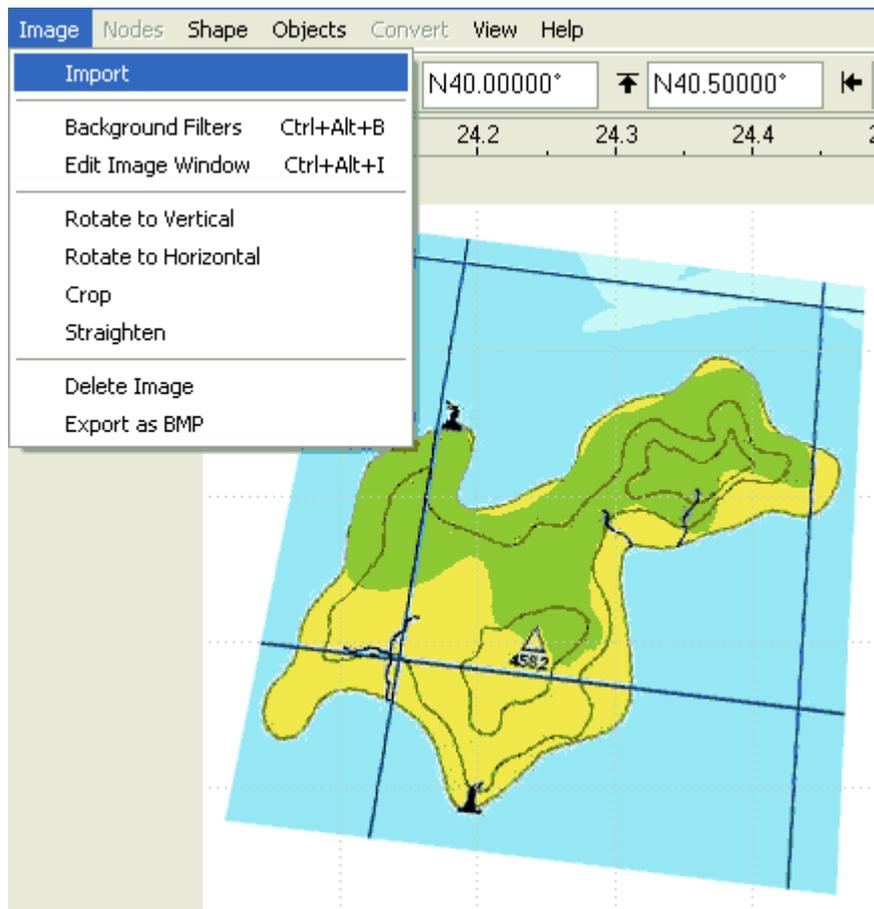
involves separate transformation of raster image into rectangular grid. If image (typically distorted scan or map with unknown projection) is curved in a way that direct calibration cannot be used, it can be edited with tools for [rotation](#), [move](#), [cropping](#) and non-linear [straightening](#). The goal is to achieve linear Lat/Lon grid. Then the image can be [calibrated](#). If calibrated image does not match the tracks and waypoints imported from GPS, non-linear [morphing](#) can be used to stretch image locally to proper position. Use of the non-linear editing tools is not recommended and should be avoided whenever it is possible, because it can lead to wrong georeferencing.

Image Editing

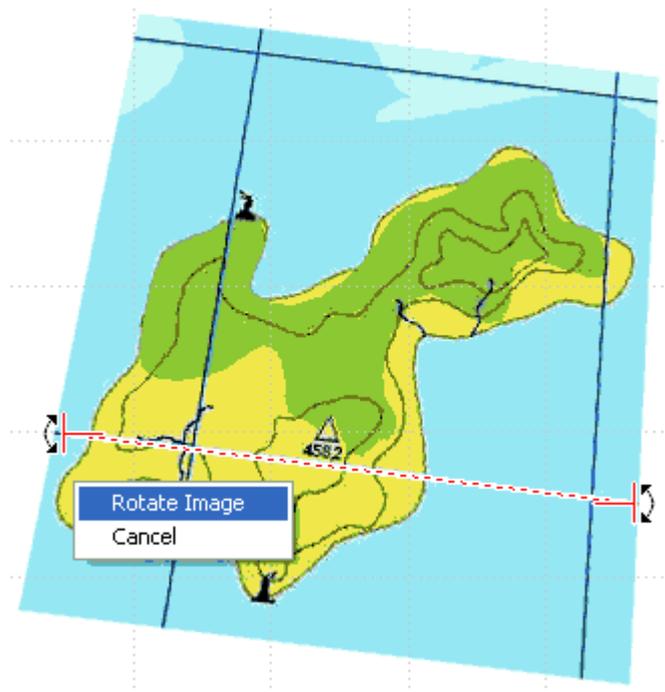
Mapwel provides several tools for image editing. This chapter deals with image rotation, cropping and straightening. Editing of raster image is an alternative approach to calibration. [Click here for more image editing and calibration tools](#).

To rotate, straighten and crop image use following approach:

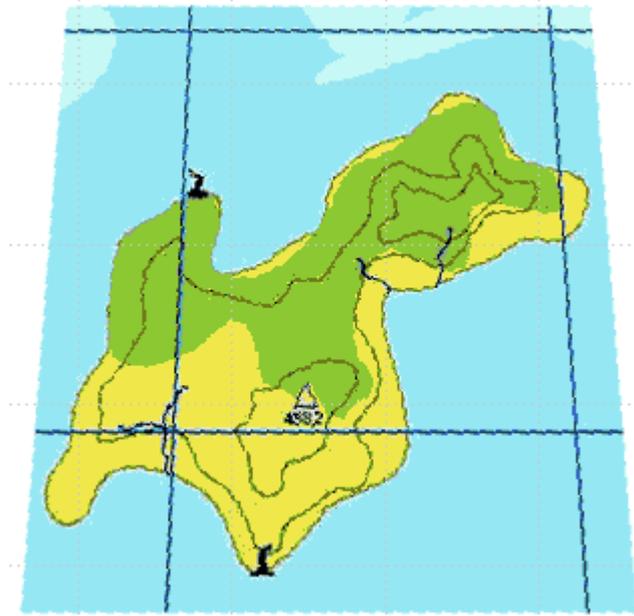
1. Use [main menu > Image > Import](#) function to place image into the work area background. Scanned photo is usually rotated and distorted.



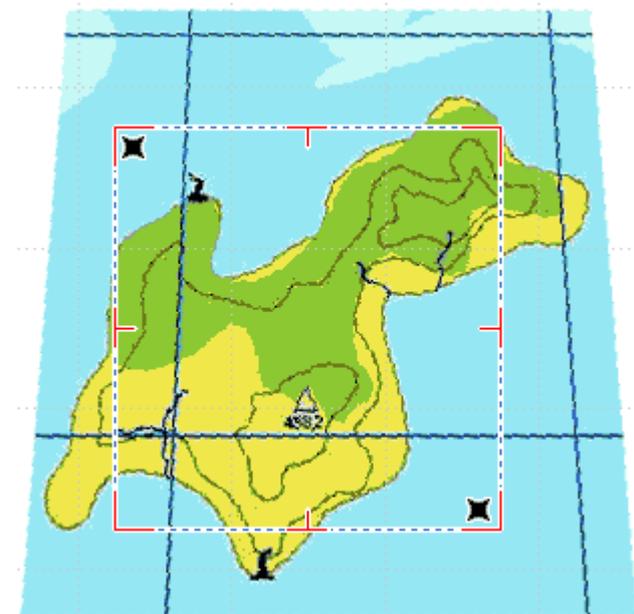
2. Use [main menu > Image > Rotate to Horizontal](#) function to rotate the image. Place the rotation marks on a line that is supposed to be horizontal. Then click right mouse button and choose Rotate Image command from the pop-up menu.



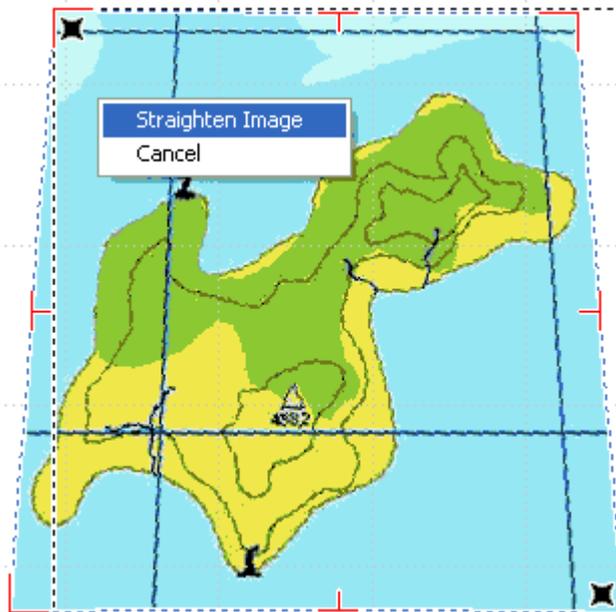
3. Image is rotated so that marked grid line is horizontal now.



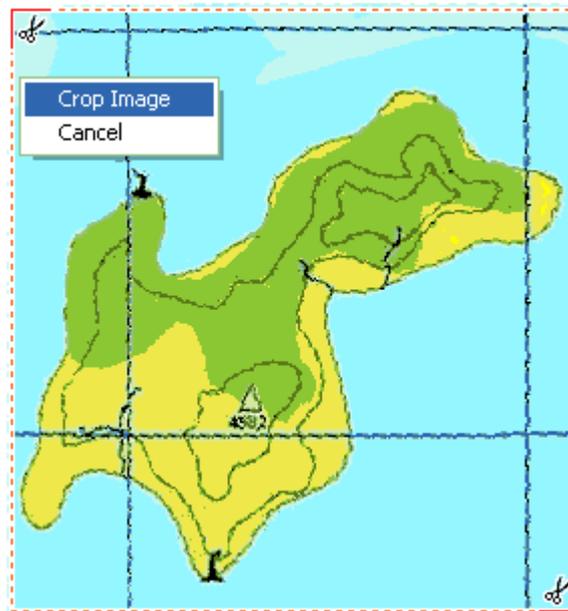
4. Use the [main menu > Image > Straighten](#) function to compensate the image deformity. The tool that appears in the work area has two main marks (left top and bottom right corner) and 6 additional marks.



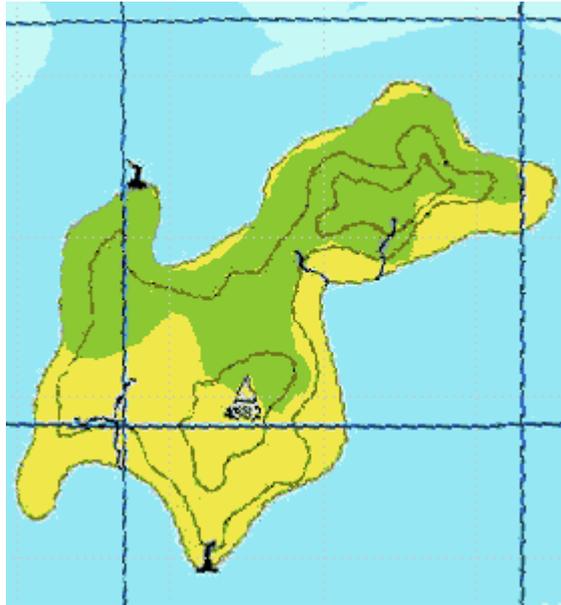
5. Place two main marks on map corners first. Then move the rest of marks to a corresponding spots on the map edge. The black dashed rectangle indicates how the map will be straighten. Click right mouse button and then choose Straighten Image command from the pop-up menu.



6. Use [main menu > Image > Crop](#) function to eliminate the empty space around the map. Place the crop marks and then click right mouse button to access the pop-up menu. Click on Crop Image item.

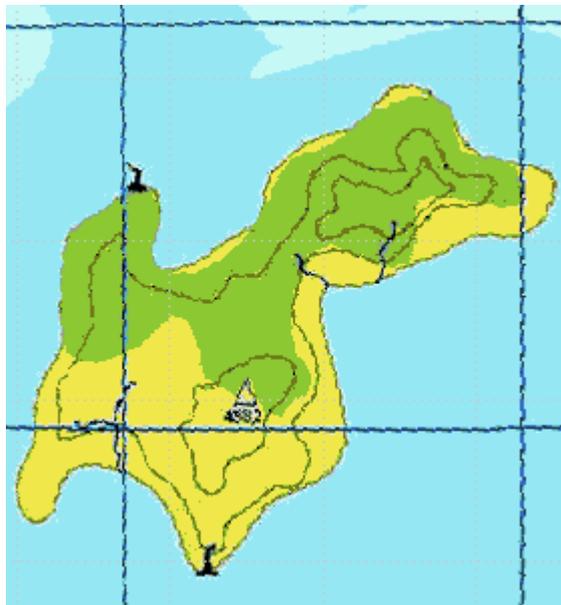


7. Adjustment of image is finished.

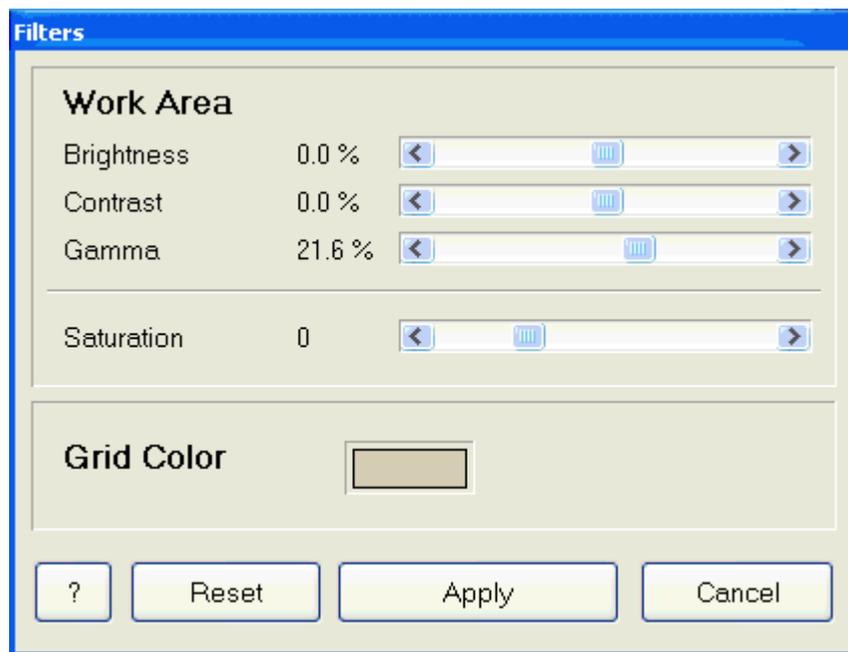


Background Filters (Colors)

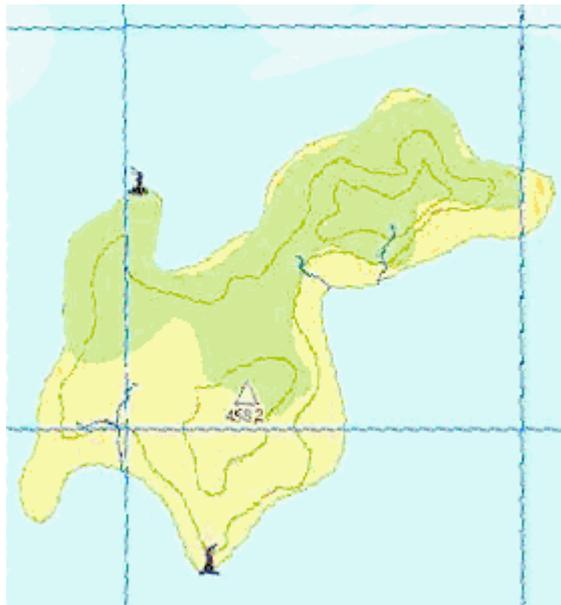
When using imported image as a template for map drawing, it can be useful to make it brighter, darker or less saturated to allow objects drawn on the top to be more visible and thus make the work more comfortable.



Use the [main menu > Image > Background Filters](#) window to adjust brightness or colors saturation. In this case the **Gamma** parameter was adjusted to make image brighter.



Background image is much brighter, while all detail is still visible.



Drawing of Objects

Vector data from which the GPS map is made include:

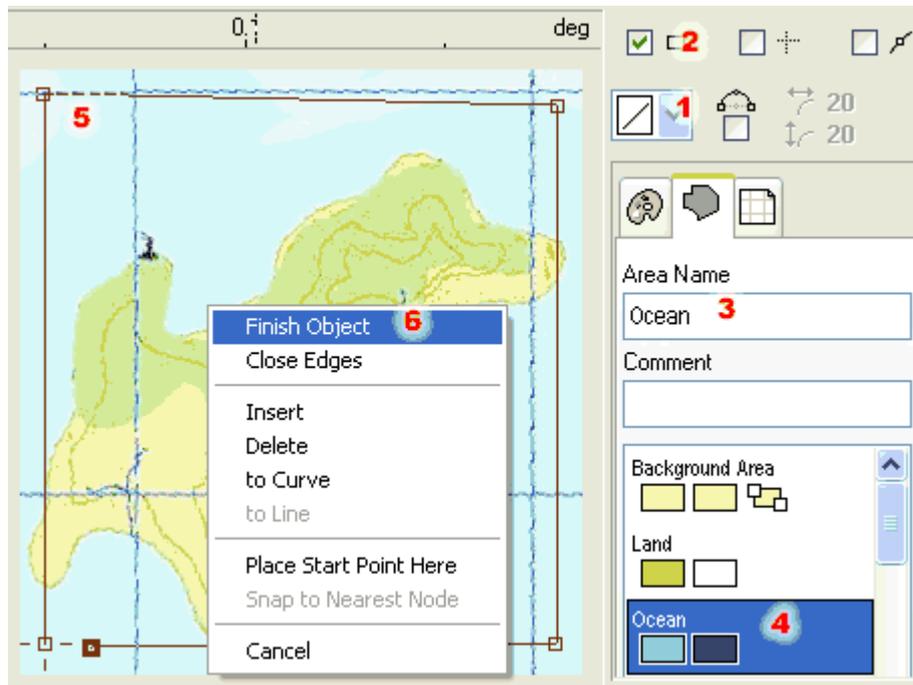
- Areas (polygons)
- Lines (polylines)
- Points (Points of Interest, Cities, Exits, Map Features)

Some area types (Park) are always displayed beneath others, regardless on their creation order. Therefore, it is necessary to ensure that no other area covers them.

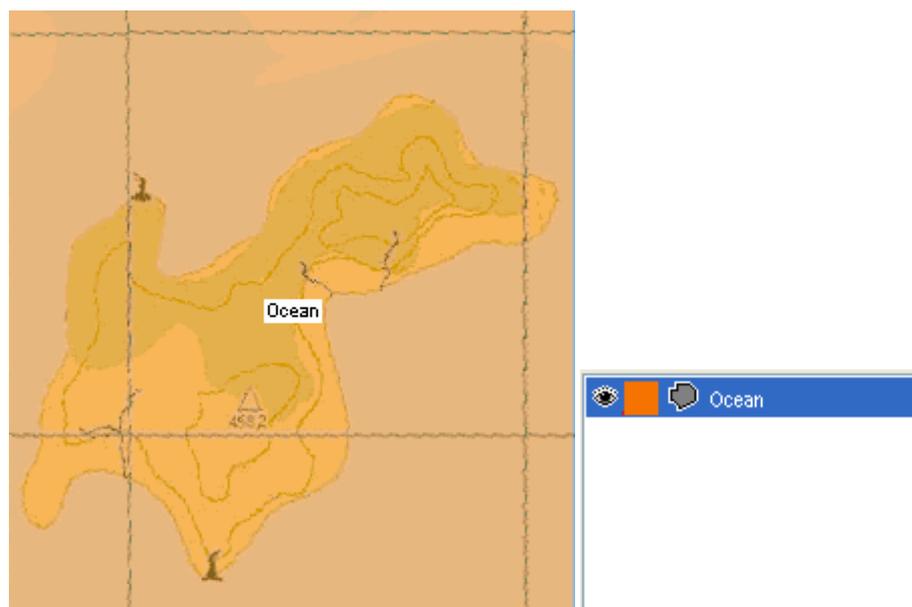
Areas should overlap each other a bit to avoid of displaying a small gap between the areas in GPS.

1. Areas

Let's draw the ocean area first. As the map is supposed to be rectangular in this case, the edges of ocean area should lie exactly on the Work Area edges. Select the **Area tool**  and place the first node somewhere near the bottom left corner of the Work Area. Set the edge type to straight lines (control 1). Check the 'Snap to Work Area Edges' option (2). Set the object parameters name (3) and type (4). Draw the ocean object by clicking left mouse button on the Work Area. Select each of the nodes (5) and move it towards the Work Area corner. As the 'Snap' option is ON, the nodes will be snapped to the corners automatically. Then click the right mouse button and choose the **Finish Object** command from the pop-up menu.



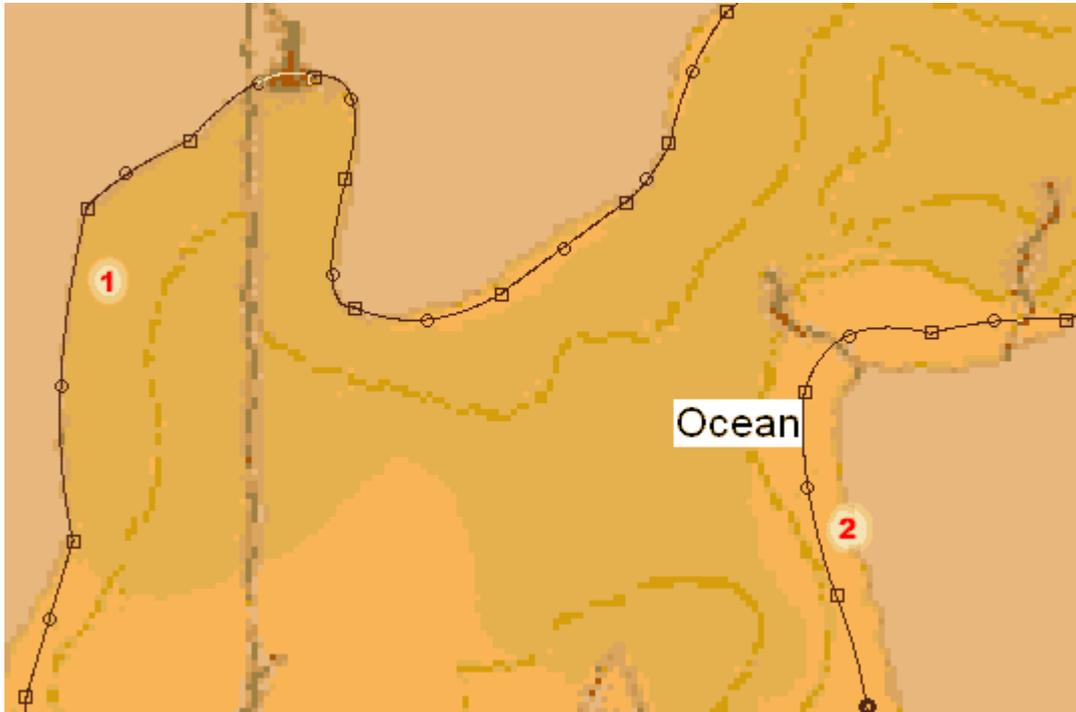
The ocean area now covers whole map. It is of an orange color, because this color was set in the Palette. Note that new object is displayed in the [Object Inspector window](#) as a small icon.



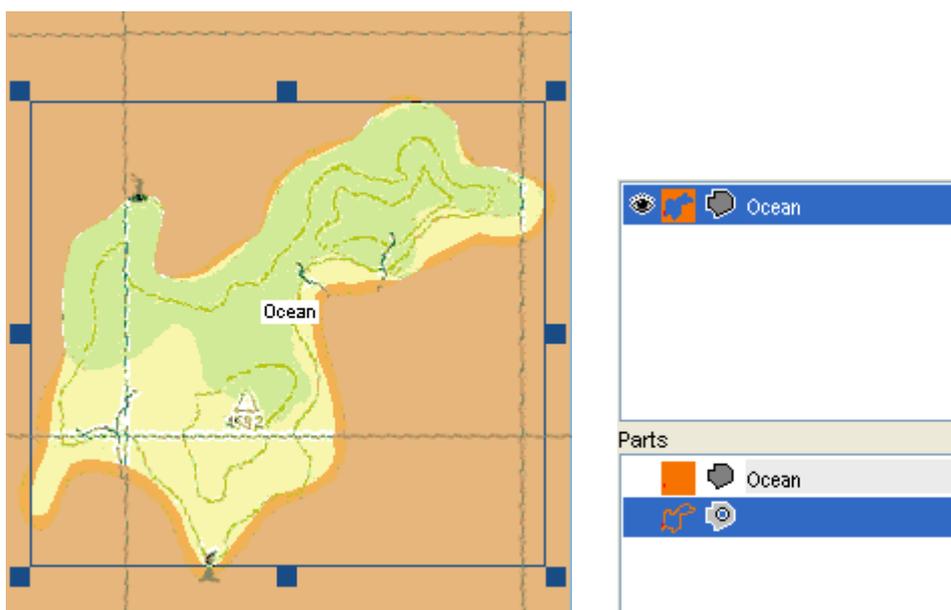
Now we will draw an opening for the ocean area to create a hole for the forest object to show through. Select the **Opening tool**  and draw the hole. After placing the first node, change the edge type to curves. The future forest object should overlap the ocean and land objects (because forest is displayed beneath all other

objects), while the ocean object should overlap the land (because land will be on top of other areas). This is the reason why the opening is drawn on the edge of the forest (1) and why it overlaps the land (2). See below animated example on how to draw area or opening with curves.

Animated image.

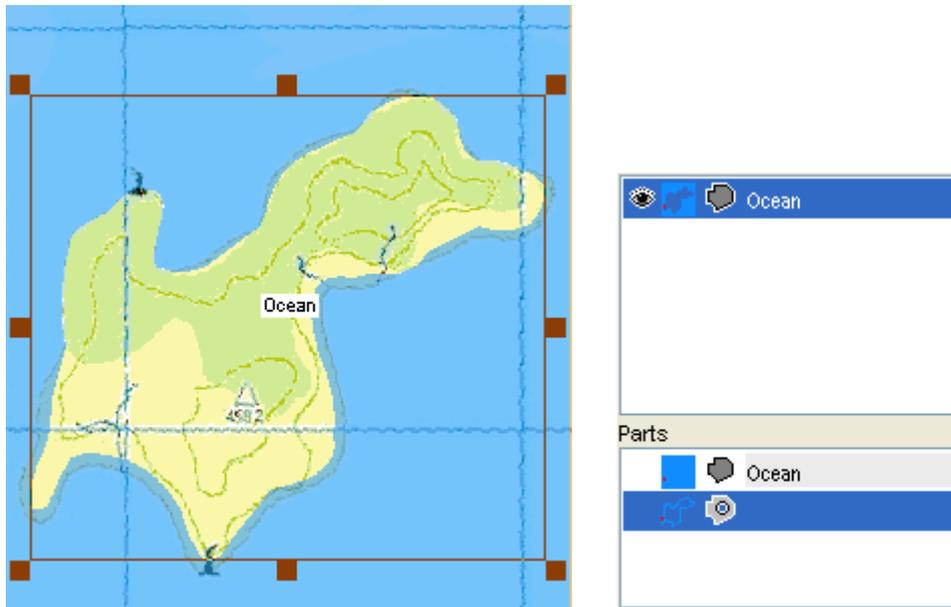


Now there is the opening in the ocean object. Note that combined ocean+opening object is displayed in the object inspector window. Separate parts are displayed in the Parts window to allow user to select and manipulate them.

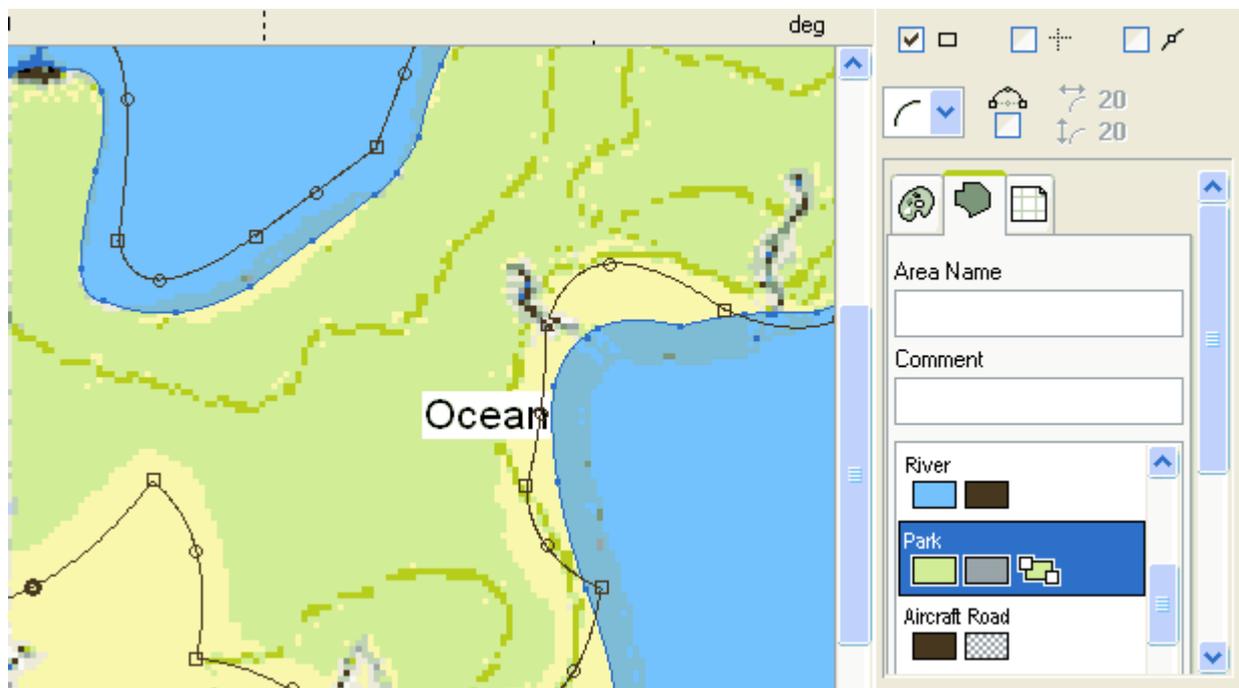


To change color of the ocean object, press left mouse button on the color in the Palette and draw color to object icon in the Object Inspector or to the selected object in the Work Area. Then release the button.

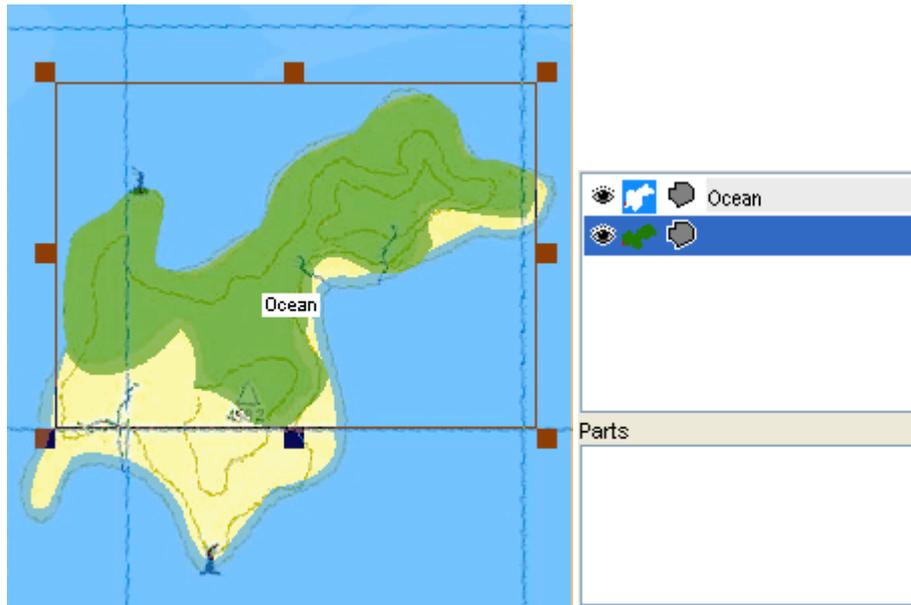
Another way is to click right mouse button on selected object and choose Color command from the pop-up menu to access the color dialog window.



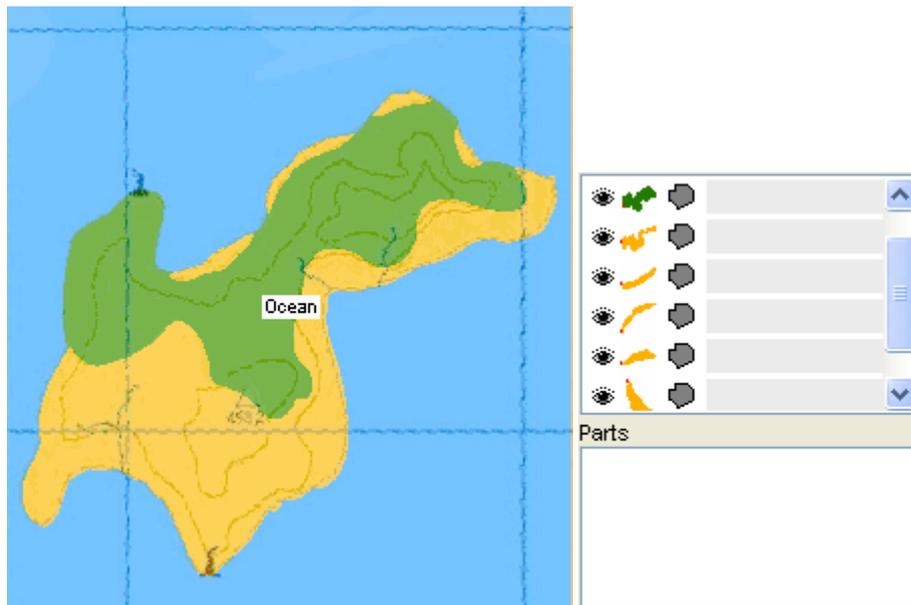
Now we will draw the second area - forest. Select the Area tool and draw the forest object with use of curves. Note that forest should overlap all other areas (ocean and land), because it is displayed beneath them. While drawing the forest, set the area type to Park. Note the 3rd icon in the Park item which indicates that this object is displayed beneath others.



The forest area is finished. Now there are two objects in the Object Inspector window.



We will draw the 3rd type of area - land. Use the same approach as with the forest with a single difference - the land area is on top of others and therefore you do not have to make overlays. There are 5 land areas in this example.

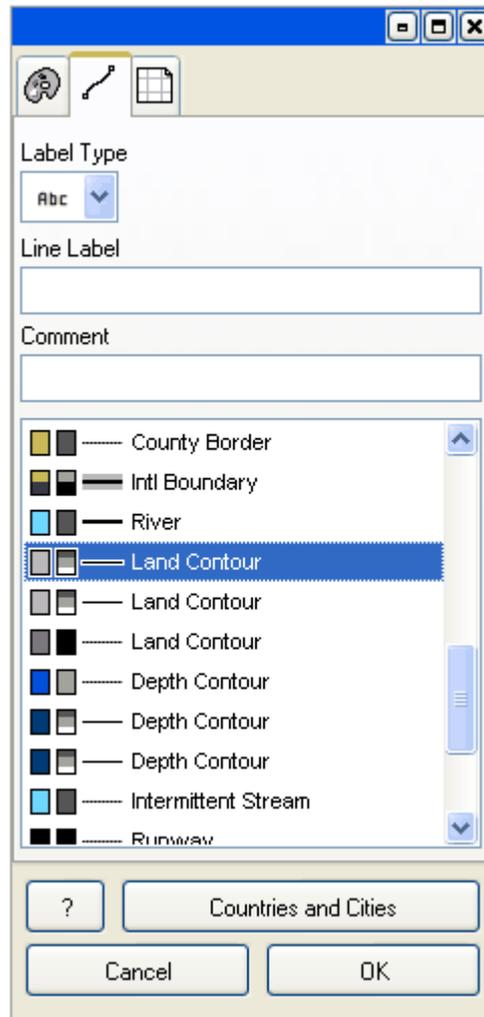


2. Lines

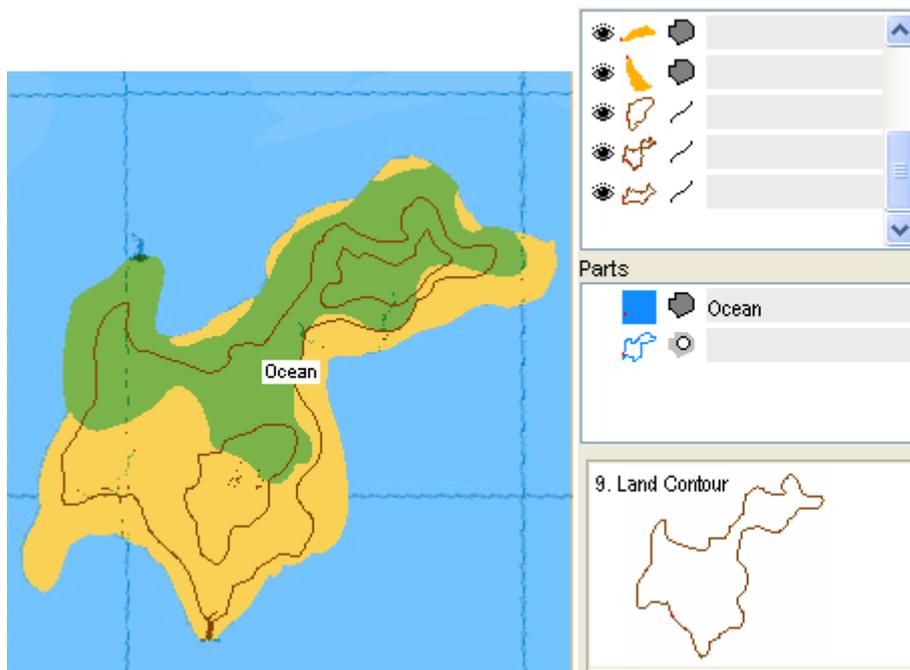
Now we will draw the lines (land contours).  Select the Line tool and draw all contours one-by-one with use of the curves. See below animated example on how to draw line objects.

Animated image.

When lines are finished, select them all and click right mouse button on selection to access the pop-up menu. Choose Properties to open [Properties window](#) and set Land Contour line type.

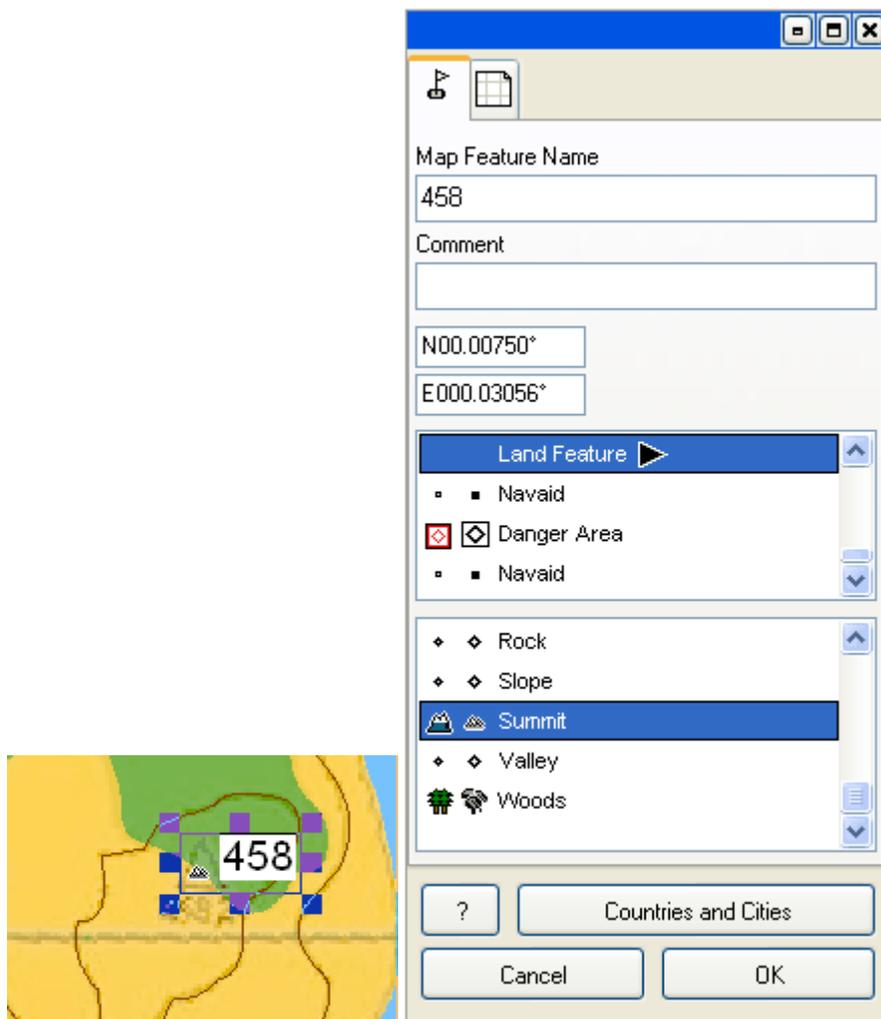


The map looks like this now. Note that when you move cursor over the object icon in the Object Inspector window, enlarged object icon and its description is displayed in the zoom window.

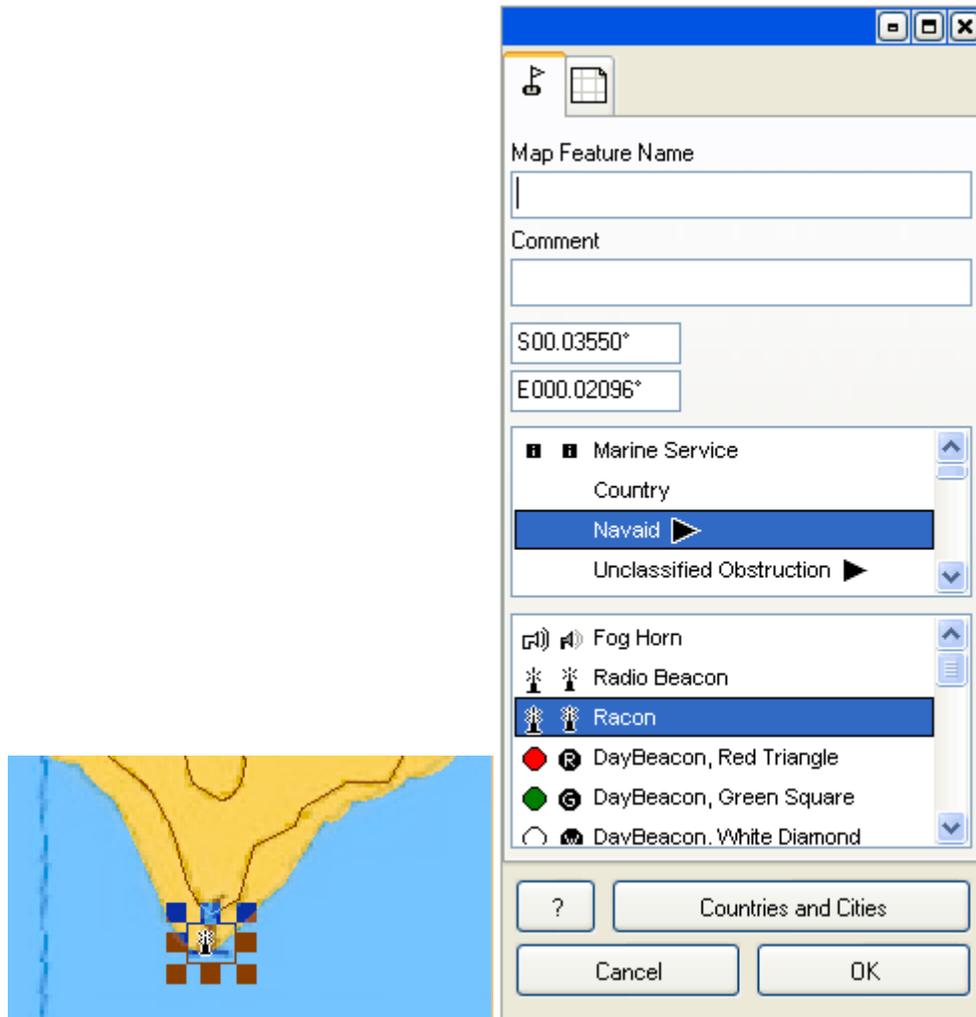


3. Symbols

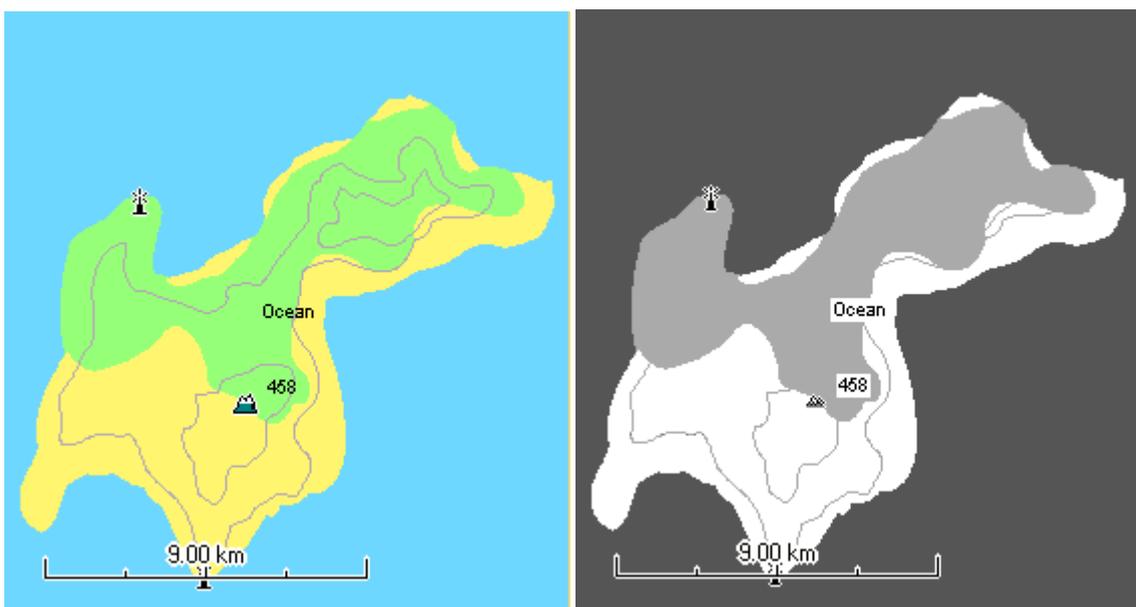
Select the **Map Feature tool**  and click on the respective spot on the map to place the symbol. Default type of map feature is Summit, therefore only the object name should be changed, in the case. Select the object and click right mouse button to access the pop-up menu. Choose **Properties** and set the object's name in the [Properties window](#).



Now make the rest of symbols in the map. They are Map Features objects too. Select the Navaid>Racon type in the [Properties window](#) after object is finished.



Duplicate the Racon symbol and place it on the proper spot on the map. This simple example map is finished now. To check how it will look like in the color or monochrome display GPS click on 'Color' or 'Grey Scale' tabs in the bottom left corner of the Mapwel. You can switch between the tabs anytime during the map creation.

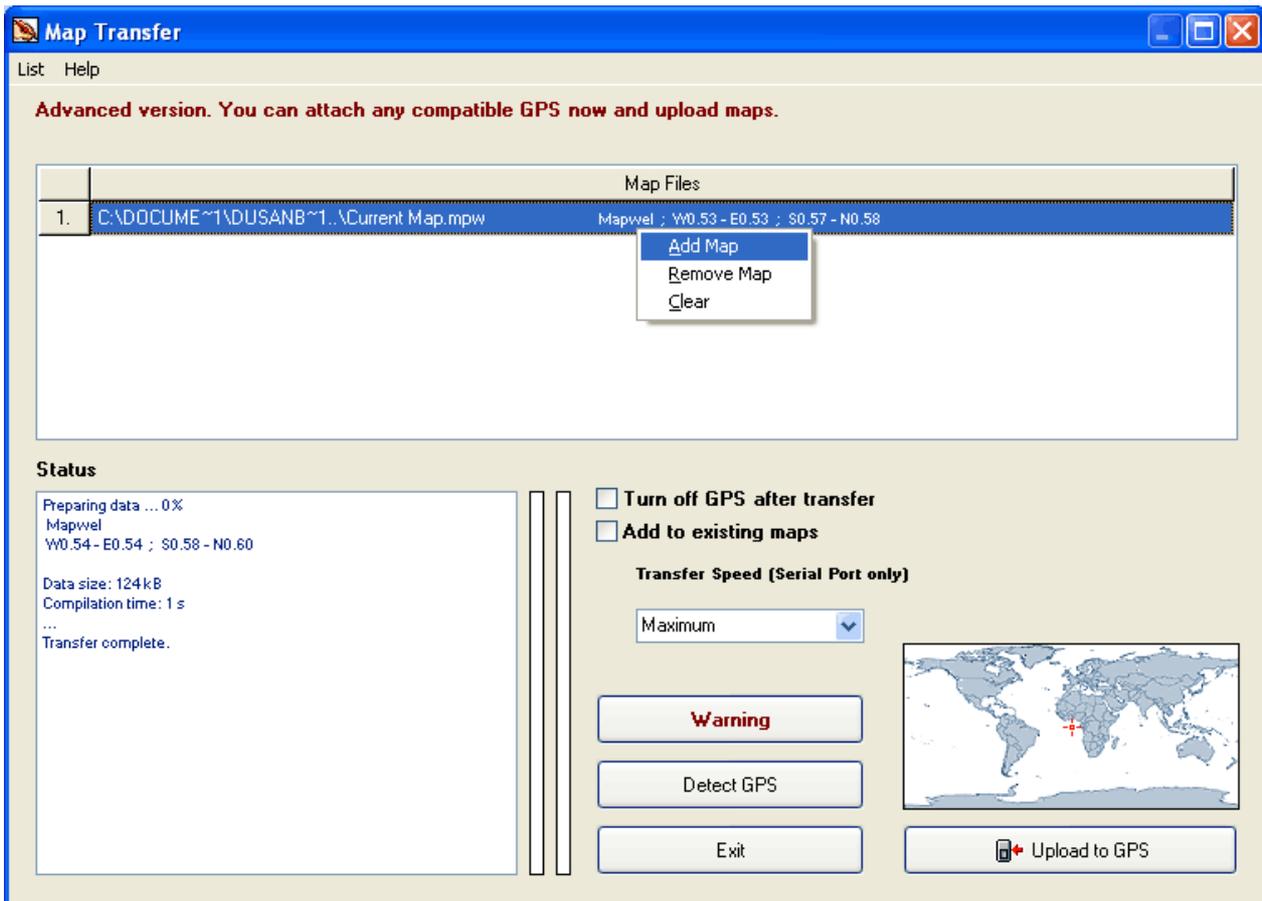


Upload of Map into GPS

This function can be accessed via [main menu > File > Upload Map to GPS](#).

User can upload one or several maps into the GPS unit. Mapwel uses unique GPS ID set by GPS manufacturer to check the registration before the map upload. Therefore, user is prompted to attach the GPS that was used for purchase of registration password.

If Mapwel is in [Advanced](#) version, user can disconnect the registration GPS and attach any compatible GPS for map upload. Basic Mapwel version allows user to upload only to single GPS unit. Unregistered Mapwel allows user to upload map to any compatible GPS, but map is truncated.



If you want to transfer several maps into the GPS at once, add maps to the map list. Use the main menu or pop-up menu (accessible with right mouse button click on the list) to manage the list items.

Geographic location of files transferred to GPS is plotted on the world map, for reference.

Current Map denotes map currently open in the Mapwel. Add to existing maps option allows to add your map to maps already loaded in the GPS.

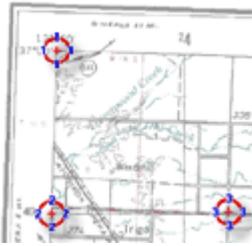
Important: if your GPS is connected to PC via serial port, please make certain that Serial Data Format in Setup / Interfaces in the GPS is set to "GARMIN".

The map should only be uploaded to the unit for which it is intended. If this map is uploaded to a GPS unit other than it is designed for, it will render the unit inoperative. Do not operate the GPS unit during the transfer! Click [here](#) to see list of supported GPS models.

In case of problems with map uploading or displaying on GPS, please click [here](#).

Raster Image Calibration and Georeferencing

Mapwel provides calibration tools to establish relation between raster image and map coordinate system. Result is a map with Lat/Lon grid in WGS 84 parallel to the screen edges and coordinates assigned to left, right, top and bottom edge of the map. In some cases, distorted image (scan) or image representing map with unknown projection must be edited with special non-linear tools prior to calibration.



Calibration

transforms raster image and vector data drawn on top of the image to the Lat/Lon grid parallel to the screen edges. This method uses an affine linear transformation and least squares method and will work with maps which are rotated or skewed. The Lat/Lon grid of the image must be linear (straight lines) to allow linear transformation to the grid parallel to screen edges. Even images with a non-linear Lat/Lon grid can be calibrated with this tool, if the grid non-linearity is caused by projection (like UTM, for example). In such a case, map usually contains linear Easting/Northing grid and non-linear Lat/Lon grid. [Calibrate map](#) with use of the Easting/Northing grid and Mapwel recalculates image so that the Lat/Lon grid becomes linear.



Optional linear and non-linear raster image editing

involves separate transformation of raster image into rectangular grid. If image (typically distorted scan or map with unknown projection) is curved in a way that direct calibration cannot be used, it can be edited with tools for [rotation](#), [move](#), [cropping](#) and non-linear [straightening](#). The goal is to achieve linear Lat/Lon grid. Then the image can be [calibrated](#). If calibrated image does not match the tracks and waypoints imported from GPS, non-linear [morphing](#) can be used to stretch image locally to proper position. Use of the non-linear editing tools is not recommended and should be avoided whenever it is possible, because it can lead to wrong georeferencing.

How to Calibrate Image

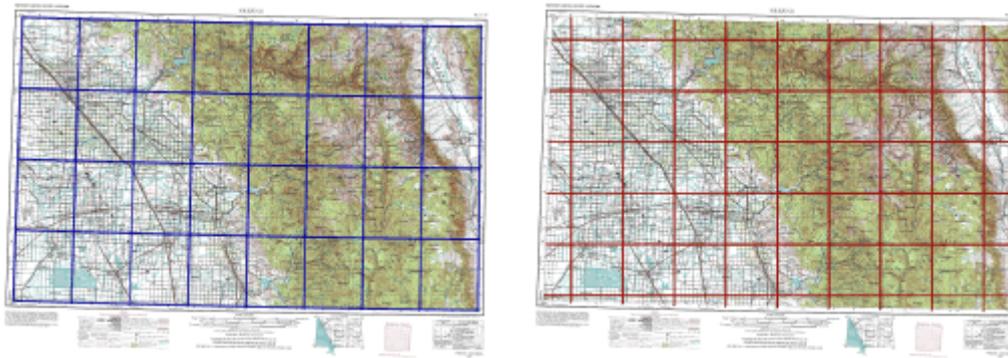
Click [here](#) for more image editing and calibration tools.

This tool is available via **main menu > Image > Calibration**. It allows to transform raster image and vector data drawn on top of the image to the Lat/Lon grid parallel to the screen edges. This method uses an affine linear transformation and will work with maps which are rotated or skewed. The Lat/Lon grid of the image must be linear (straight lines) to allow linear transformation to the grid parallel to screen edges. Even images with a non-linear Lat/Lon grid can be calibrated with this tool, if the grid non-linearity is caused by projection (like UTM, for example). In such a case, map usually contains linear Easting/Northing grid and non-linear Lat/Lon grid. Map should be calibrated with use of the Easting/Northing grid and Mapwel recalculates images so that the Lat/Lon grid becomes linear.

Click [here](#) to see list of supported map projections.

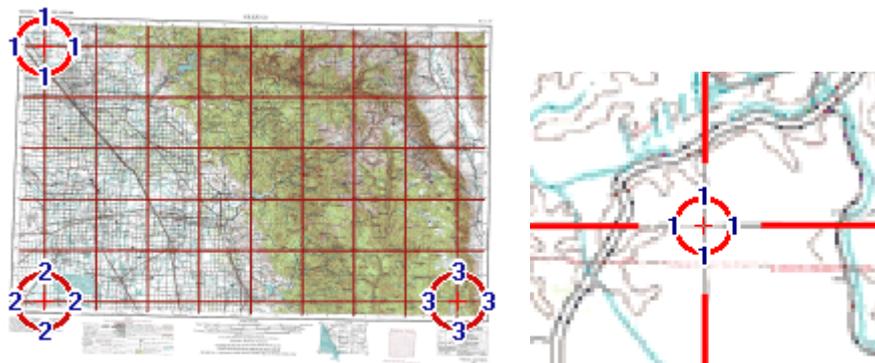
Image with projection and grid lines

Below map is in UTM coordinates and has 2 grids: Lat/Lon grid (highlighted with blue color), which is curved because of the projection, and Easting/Northing grid (highlighted with red color), which is linear. Calibration and conversion from UTM to Lat/Lon will make the Lat/Lon grid linear and parallel with the screen edges.



Left: non-linear Lat/Lon grid. Right: linear UTM grid.

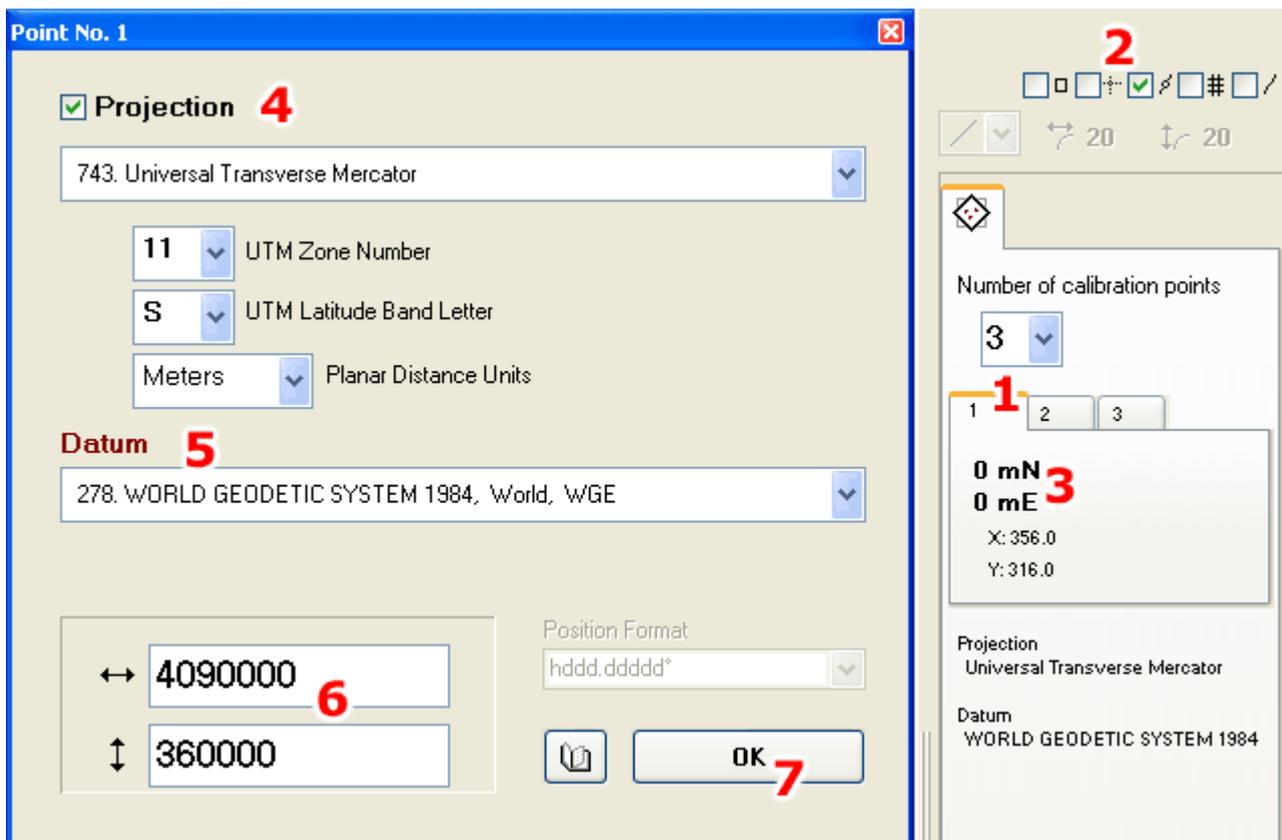
Use main menu > Image > Calibration to start the calibration tool. We will use 3 points with UTM coordinates to calibrate the image. As the grid lines are drawn on the map, the easiest way is to position calibration points on intersections of the grid lines. Current version of Mapwel allows to use up to 6 calibration points. While 3 points are necessary to define affine transformation matrix, 4th, 5th and 6th points overdetermine the system and can help to increase accuracy of calibration.



Left: image with calibration points positioned on intersections of grid lines. Right: detail.

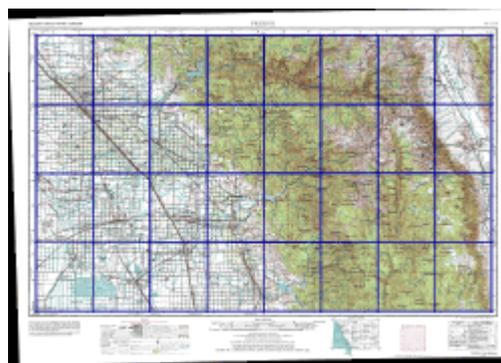
Panel at the right side of the Mapwel screen contains calibration controls. They should be used in the following way:

- Select any calibration point by clicking on the respective tab (1). Selected point is highlighted in the work area and automatically scrolled into center of the screen (if there is enough space to scroll). Number of calibration points is defined in combo box above the tabs.
- It is possible to use any of the snap node options to snap calibration points to nodes, objects, etc. It is often convenient to snap calibration points to waypoints or guide lines placed on the map.
- Define geographical position of each calibration point by clicking on the coordinates (3) and typing exact coordinate values into boxes (6) in window that appears. Select projection (4), if any, and Datum (5). In this case, coordinates are defined as easting and northing, in meters. Click OK button (7) to close the coordinates window.



Left: Window for entering point coordinates in various systems. Right: panel with calibration controls.

When geographical position of all calibration points is defined, click **Apply** button at top of the Mapwel screen, or use right mouse button click to invoke pop-up menu in the work area. Then select **Apply** command from the pop-up menu. Image is calibrated so that Lat/Lon grid becomes linear (see blue grid on the below image) and coordinates of the map are derived from the geographical position of the calibration points. Below map coordinates are in WGS84.



Calibrated image.

Overall map coordinates in WGS84, derived from the calibration points

Notes

- When using 2 points calibration, the points can be placed anywhere on the map, but the best precision is achieved when 2 points are as far one from the other as possible. Points cannot be placed on the vertical

- or horizontal line, i.e. they cannot have any coordinate identical.
- When using 3 points calibration, the points can be placed anywhere on the map, but the best precision is achieved when 3 points are as far one from the other as possible. Points cannot be placed on the same straight line in any direction.
- 4,5 and 6 points calibration uses the same method as 3 points calibration, but transformation data are calculated as best match for all points, so it can provide better precision than 3 points case.
- All calibration points must be specified the same coordinate system, i.e. do not change projection and/or datum when entering next point. However, if map is projected, calibration points can have different grid codes, i.e. they can span several grid cells.
- If image does not contain grid lines, it is recommended to use some distinctive points like crossroads. Their coordinates can be easily found with Google Earth, for example. Another way is to measure coordinates of these points with GPS.
- Map without projection is calibrated in the same way as above map, but "Projection" option should be disabled. Coordinates are entered in Lat/Lon form.
- When converting UTM coordinates to Lat/Lon, **Latitude Band Letter** affects only selection of the hemisphere (north and south). Therefore, you may get the same Lat/Lon coordinates with different UTM Latitude Band Letters.

Import of ESRI Shape Files

ESRI Shape Files are vector files that contain geographical data and optional attributes. Shape files can support point, line and area features. Each layer is stored separately. An ESRI shape file consists of main file (.SHP), an index file (.SHX) and attributes dBASE table (.DBF).

Use the [main menu / File / Open or Merge](#) function to import an ESRI shape file and convert it into the Mapwel map. Then you can upload it into the GPS unit or export into other format (Advanced version only).

As the shape files are primarily not designed to use with GPS units and attributes of objects are specified by user, Mapwel cannot assign the shape file attributes (data) to the map object properties like Name, Comment, Type, etc. automatically. User is prompted to assign available shape file data to the map objects.



Because layers are stored in a separate shape files, it is necessary to **Merge** (with use of main menu>File>Merge command) all shape files to create complete map in Mapwel. Mapwel stores whole map in a single MPW file.

Loading of each SHP file involves following steps:

1. **Coordinate System.** Selection of projection and datum used for representation of geographical data in SHP file.
2. **Types.** Assignment of SHP attributes to types (like polyline type) used by Mapwel and Garmin GPS.

3. **Enumerated Parameters.** Assignment of SHP attributes to object parameters with limited number of allowed values (like "Oneway" road parameter) in Mapwel.
4. **Parameters.** Assignment of other SHP attributes representing name, comment, street name, phone number and other data to Mapwel data structures.
5. **Format.** Formatting of object name, comment. Selection of elevation units, etc.

Only the first step (selection of coordinate system) is obligatory. Next steps are optional, but they are useful to transfer information from attributes in a shapefile to objects in Mapwel. This helps to reduce or completely eliminate editing of map in Mapwel.

Step 1 - Selection of projection and datum

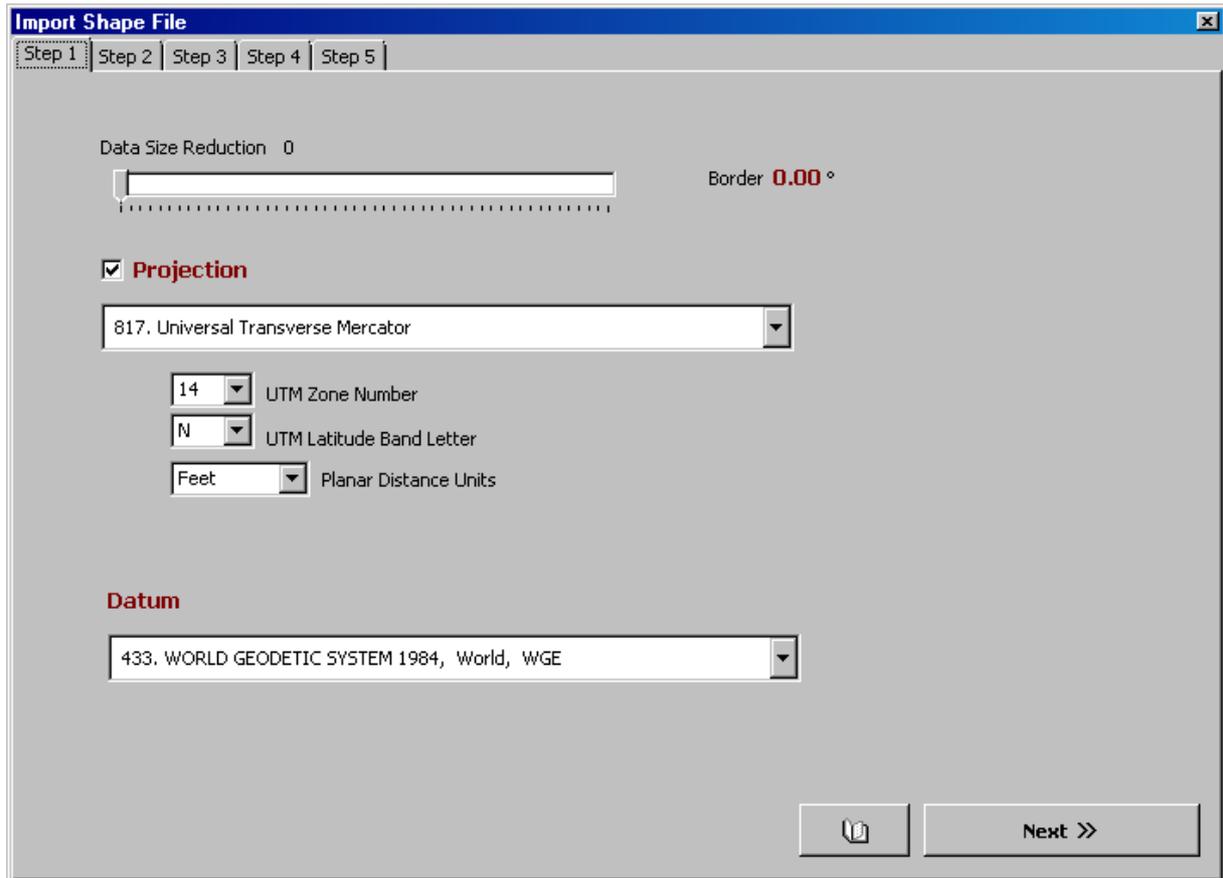
Use the first tab in the SHP open file dialog to select coordinate system of the SHP file. This is the most important step in loading of the shapefile. You have to know coordinate system of the SHP file. If chosen coordinate system is not the right one, map will be imported improperly. This information is often stored in *.PRJ text file enclosed to the shapefiles. If *.PRJ file is in the same folder as *.SHP file and has the same name, Mapwel tries to read the georeference data automatically.

UTM Zone Number, **UTM Latitude Band Letter** and **Planar Distance Units** are controls for definition of additional information for UTM system. UTM Latitude band letter affects only selection of the hemisphere (northern or southern) when converting coordinates from UTM to Lat/Lon. Therefore, you can obtain the same Lat/Lon coordinates for various band letters.

Use **Data Size Reduction** control to decrease the number of imported vertices (in case of area and line objects). If imported data contain too many vertices, displaying of map on the GPS can be very slow. In such a case, reduce the size of imported data to speed-up the map displaying. Reduction of vertices decreases also precision of the map elements definition. The highest available accuracy of the map elements uploaded into the Garmin GPS is approximately ± 1.2 m. Accuracy of imported data should be lower or equal to this value to optimize the speed of map displaying and data size.

Border is an empty space added around the map. Imported map may be clipped to bounding rectangle of all objects. Set Border to non-zero value if you need to add empty space around the map. Click left or right mouse button on the value to increase/decrease it, or click on 'Border' label to set value by keyboard.

Click the **Next>>** button when you are finished with selection of coordinate system and data size reduction.



To learn about custom (user-defined) projections, [click here](#) please.

Step 2 - Assignment of attributes to Mapwel types

If any of the SHP file attributes defines the type of objects, you can use this tab to create attribute-to-Mapwel type conversion table.

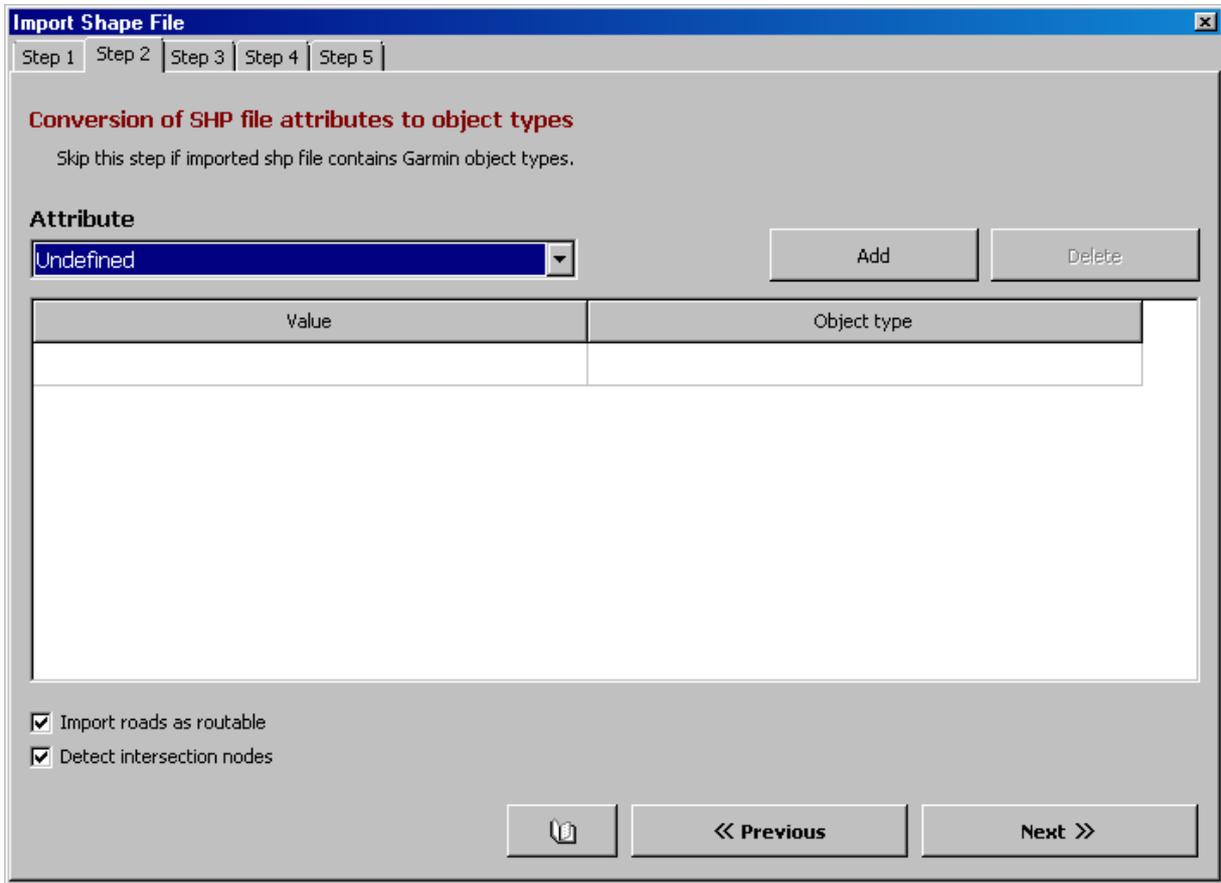
Mapwel cannot recognize meaning of SHP attributes automatically, as they may contain any type of information. Definition of conversion table allows user to assign proper type to imported objects.

You can skip this step if:

- there is no attribute that defines type of objects
- some attribute already contains Garmin object types
- you do not wish to assign type to objects.

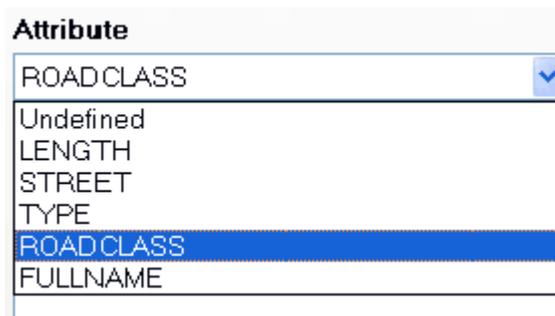
Use **Import roads as routable** option to convert polylines that represent roads to **Routable road** objects in Mapwel. Other polylines (like rivers, power line, etc.) are converted to common **Line** object. It is possible to make such conversion later in the work area of Mapwel as well. However, next tabs allow to assign parameters essential for routing only when this option is checked.

If **Detect intersection nodes** option is checked, program will automatically detect and mark intersections of routable roads. These intersection nodes are essential for compilation of routable map. Detection of intersection nodes can be done also later, with use of [main menu > Routing > Detect Intersections](#) command.

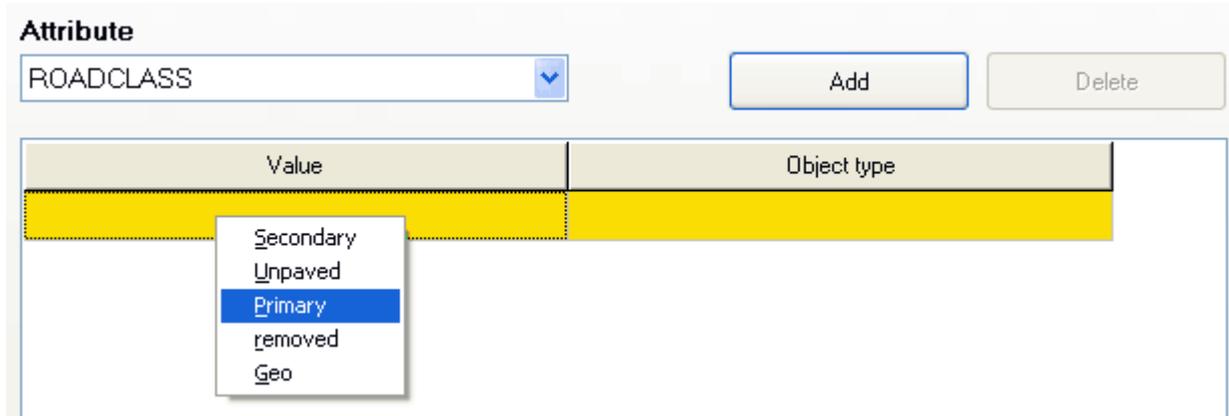


Follow these steps to create conversion table:

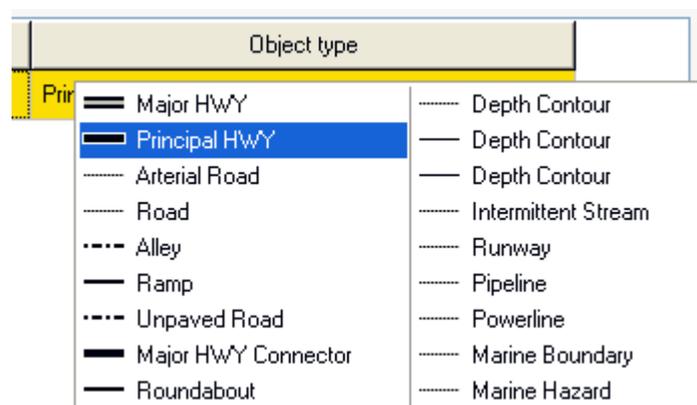
A) Select attribute that defines the object types.



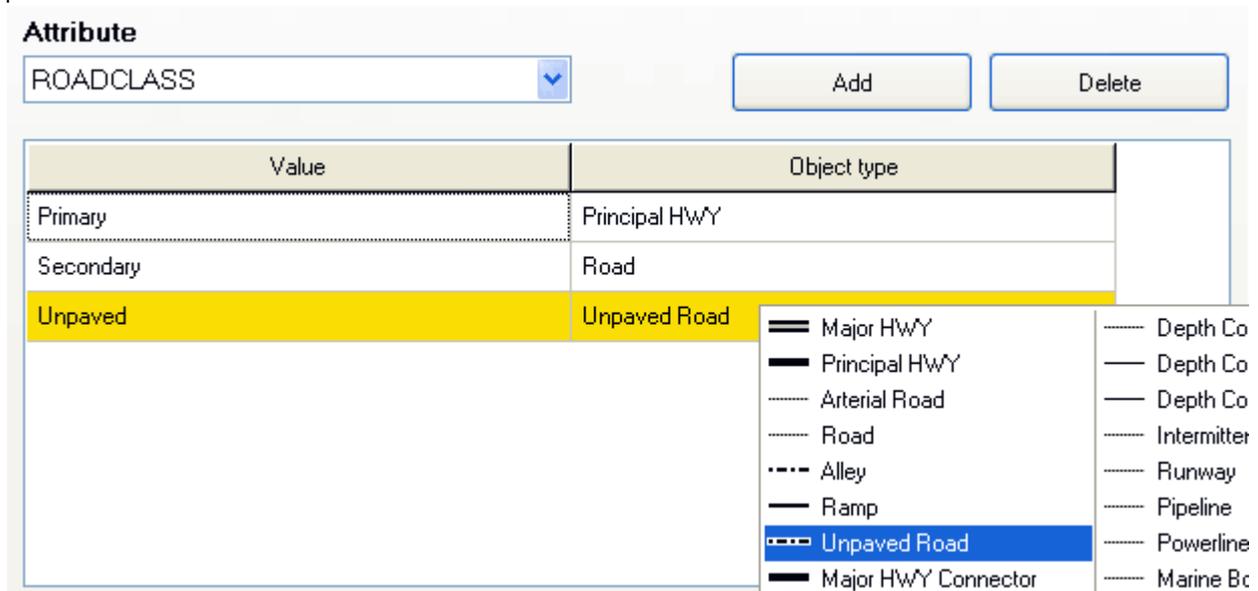
B) Click on the first line of the first column in conversion table. Select attribute value from the pop-up menu that appears.



C) Click on the second column in the same line. Select type of object from the pop-up menu. This type will be assigned to all imported objects that have attribute ROADCLASS set to value Primary



D) Use Add button to create as many items in the table as necessary. Define all attribute value - object type pairs.



When finished, click on the Next >> button.

Step 3 - Assignment of attributes to Mapwel types

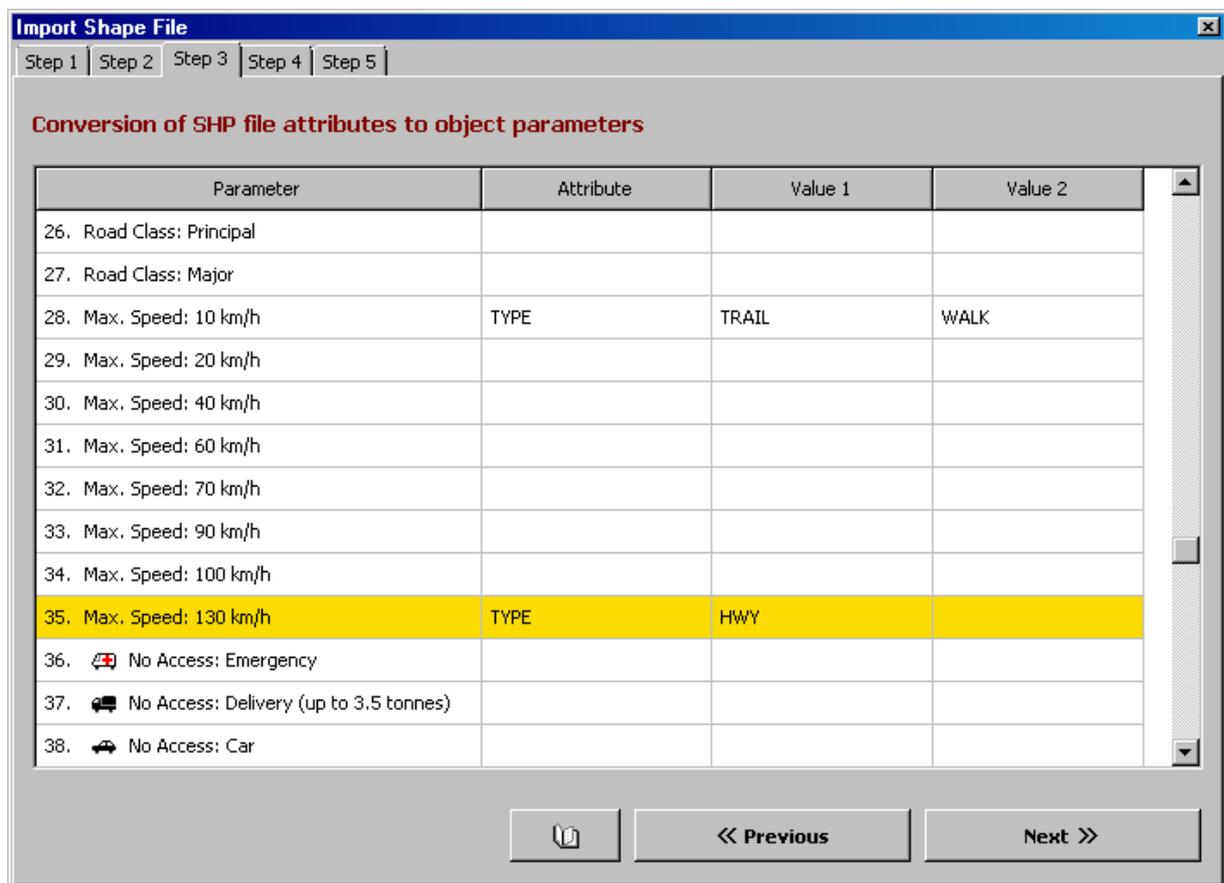
You can use this tab to create 'attribute value-to-Mapwel parameter value' conversion table. This table

contains only parameters with finite number of possible values, for example 'Oneway' parameter, which can be only TRUE (checked) or FALSE (unchecked). Shapefile attribute value is mapped to the Mapwel parameter value.

The first column contains such parameters and all their possible values, for example: Max. Speed:10 km/h, Max. Speed: 20 km/h, etc. It is not possible to edit this column. However, user can select shapefile attribute into the next column and its value to 3rd or 4th column. In below example **Max. Speed** is set to **130 km/h** in Mapwel for all objects that have **TYPE** attribute set to **HWY** in the shapefile.

Selection of attribute or its value is easy: just click on respective table cell and select required item from the pop-up menu that appears. You should define the attribute first and the value(s) next, because values list is generated according to selected attribute. It is not necessary to fill-in all cells in the table. Set only those lines of table that you need to.

Shapefile can contain any attributes with any values and this table allows to map them onto parameters of individual objects in Mapwel. There are two columns (Value 1 and Value 2) of attribute values for case that you need to map two attribute values to the same Mapwel parameter value. For example, you may need to map TYPE: TRAIL and TYPE: WALK from shapefile to the same Mapwel parameter value Max. Speed: 10 km/h. Note: speed levels are set to km/h or mi/h according to units selected in [main menu > Edit > Preferences](#)



Step 4 - Assignment of other SHP attributes to Mapwel data structures

The fourth tab allows to assign attributes with virtually infinite number of values (like text labels, for example) to Mapwel object.

Import Shape File

Step 1 | Step 2 | Step 3 | **Step 4** | Step 5

Assign shape file data to map objects

Line

Name: STREET
 Comment: FULLNAME
 Type*: ROADCLASS

Left Side **

Start Number: FRADDL
 End Number: TOADDL

Right Side **

Start Number: FRADDR
 End Number: TOADDR

Any field can be left "Undefined"
 * Use "Type" when imported file contains Garmin object types.
 ** Valid only for Routable Roads

Previous Next

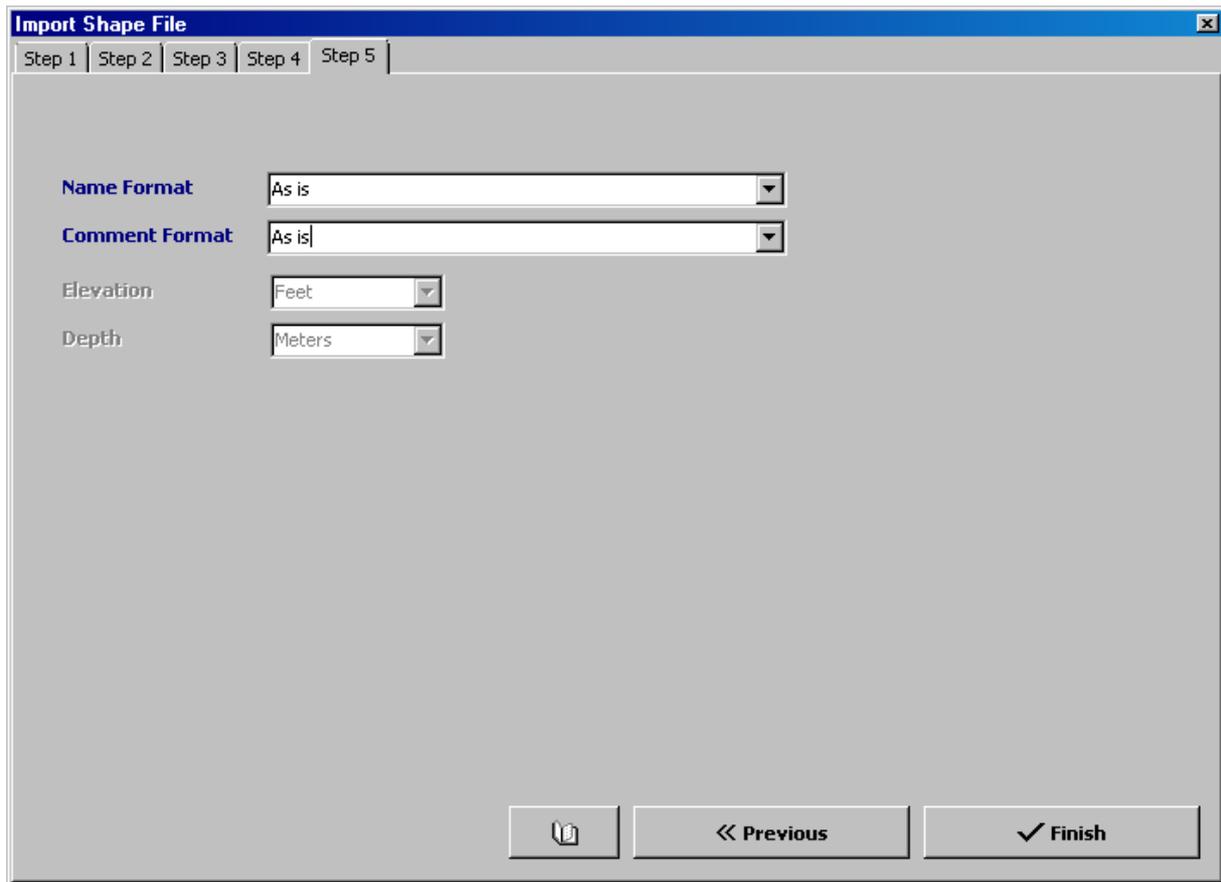
If there are attributes, which define the name, comment or other Mapwel-compatible data like street name or phone number, use this tab to assign them to the respective Mapwel variables.

If imported file has an attribute that conforms the Garmin polygon, polyline and point indexing system, assign this attribute to the **Type** variable. This condition is usually satisfied by shape files originally created for GPSmapper software.

If type conversion table was defined in **Step 2**, **Type** is automatically set to the respective attribute.

Left Side and **Right Side** controls allow to define house numbering along the street for the Routable Road objects. Type of numbering (None, Even, Odd or All) can be set on the previous tab.

Step 5 - Fields formatting



Click the **Finish** button when the last step is finished.

In this case, imported map has four types of lines: 3 types as defined in the Step 2 and the 4th (default) type for rest of the lines, which were left with the undefined type.



OpenStreetMap (*.osm) file format support

OSM files are great free-of-charge source of detailed maps. They are available at <http://www.openstreetmap.org/index.html>.

"OpenStreetMap creates and provides free geographic data such as street maps to anyone who wants them. The project was started because most maps you think of as free actually have legal or technical restrictions on their use, holding back people from using them in creative, productive, or unexpected ways."

Mapwel allows to upload OSM files into the Garmin GPS units with just a few clicks of mouse, preserving as much of visual similarity as possible. OSM files specification includes number of polygons, lines and icons. Most of them are not supported by Garmin basic set of objects. However, Mapwel contains library of special pre-defined styles to render OSM maps on Garmin GPS correctly.

Mapwel imports OSM file so that roads are automatically converted to [routable roads](#) with turn-by-turn voice

navigation.

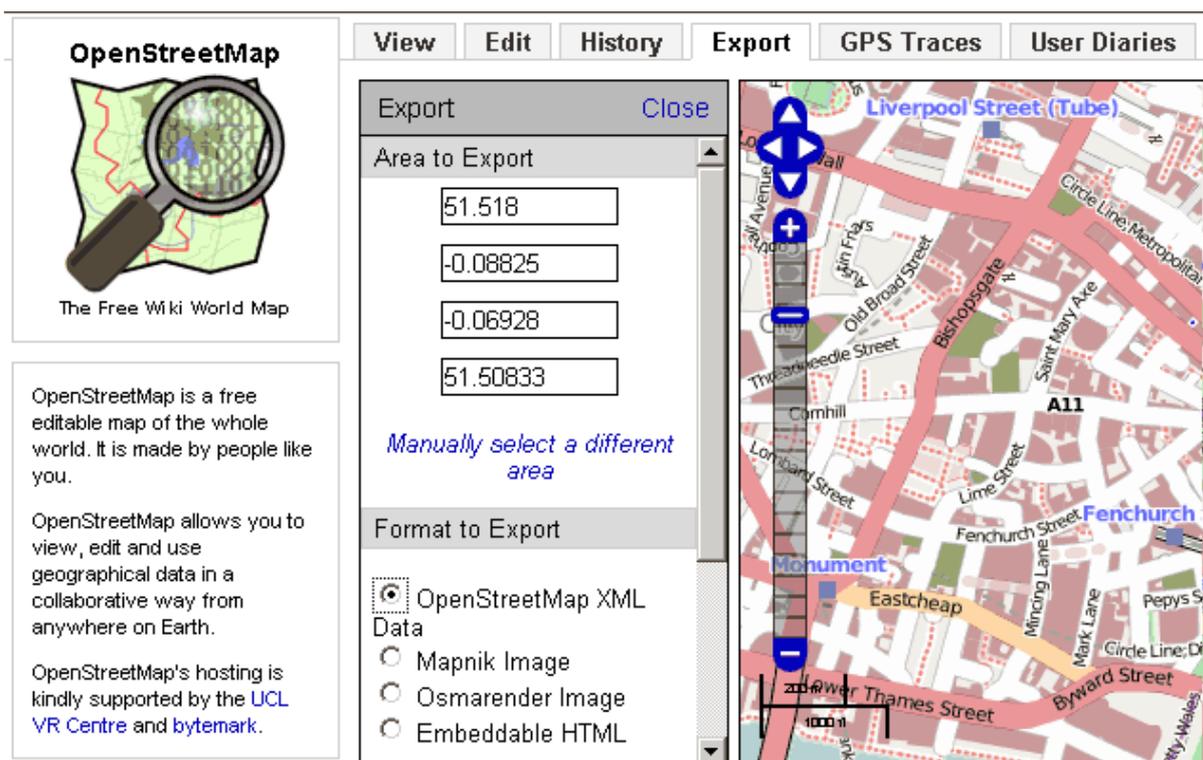
There are two special road types: Roundabout and Ramp for which GPS generates a special navigation instructions. Mapwel identifies these road types automatically when importing map from [OSM file](#). It is also possible to convert road to any of these types manually with use of the Properties window.

The steps needed to get OSM map into Garmin GPS are simple:

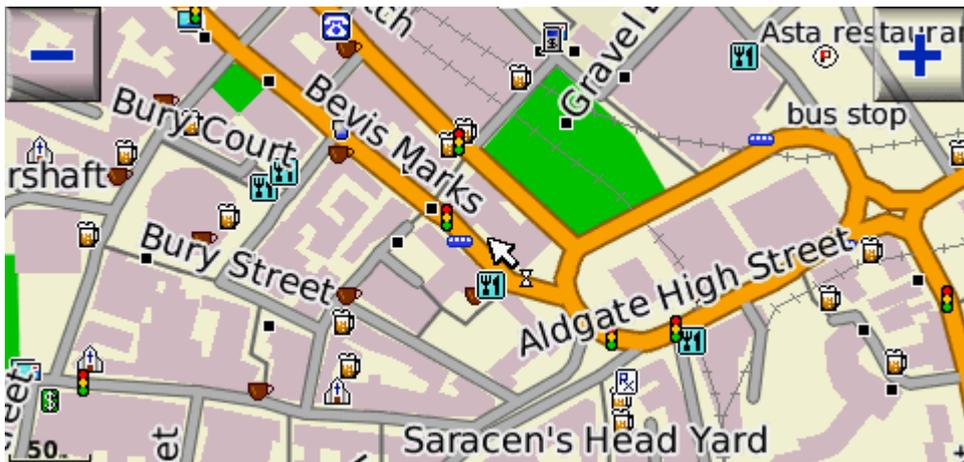
- Download OSM file of respective area from <http://www.openstreetmap.org/index.html>
- Open OSM file in Mapwel. If you want to combine several OSM files, use Merge function for rest of the files.
- Click 'Upload map to GPS' button in Mapwel to load map to the GPS unit.

Please note: above instructions refer to download of individual OSM files of small size. For automated download of large map sets please use [main menu >Tools > Download Free Maps](#) command.

To download OSM file from <http://www.openstreetmap.org/index.html>, browse area of interest and click on the Export tab (see below image). Then select 'OpenStreetMap XML Data' option from the left panel. Then click Export button. Store *.osm file into any folder of your computer.



Open *.osm file in Mapwel. You can edit it, combine with other vector maps, waypoints, tracks, etc. When finished, upload map to GPS with use of 'Upload map to GPS' button. Map in GPS looks like below examples. Please note: your GPS must support user-defined styles. All new Garmin GPS support them. If you have older GPS, you may need to upgrade its firmware to render map correctly.



OpenStreetMap on Garmin GPS. Compiled and uploaded with Mapwel. Some colors and icons are from Mapwel pre-defined styles.

Download Free Maps (OpenStreetMap files)

This tool is accessible via main menu > Tools > Download Free Maps command. It allows to download large freeware maps and converts them into routable files for GPS with just few clicks of mouse. **Please note: this tool works only if your computer is connected to internet. Routing is supported only by Advanced version of Mapwel.** This tool is supposed to be used with Advanced version of Mapwel. Maps downloaded with unregistered or Basic version of Mapwel are usable in GPS, but they are marked with 'Trial Map' labels and they are not routable.

[OpenStreetMap OSM files](#) can be downloaded individually from respective www address. Mapwel allows conversion of these files into routable maps for Garmin GPS units. However, downloading and processing of large number of maps can be very time-demanding process, because each map must be cropped and aligned with other maps to ensure seamless navigation. Following tool allows to select large area on the world map, split it into individual maps and convert all maps as a map set for Garmin GPS.

To prevent confusion when using terms "map" and "map set" frequently, this tool uses term "tile" for individual map and "set" for set of map.

Set

Internal data structure of map file and GPS rendering engine limit the size of individual maps (tiles). Therefore, large maps are always composed of smaller maps. These small maps are organized into so called "sets". Maps in the set share the same color palette, user-defined icons and few other parameters.

How to Construct Set of Tiles

Your map set can contain one or multiple tile. Each tile in the set must have its own bounding rectangle (current version supports only tiles of rectangular shape). Press SHIFT key and draw rectangle to define the tile boundary manually. There are several ways of how to create set of multiple tiles. However, the first step common to all of them is to define the Set data - for example the name, family, copyright, the storage folder, characters encoding, etc. If your language uses special characters (other than used in English language), make sure to select proper characters encoding, because routines for automatic labeling of map tiles use this setting. Methods for tiles creation are:

1. The easiest method is to draw one large rectangle (covering for example whole state or country) and use Automatic Split command from the pop-up menu that appears when you right-click on map in the list. This command splits large rectangle into number of small rectangles according to density of population. It also assigns names to most rectangles (names are taken from included cities, suburbs and villages). If there are any rectangles located outside the area of interest (outside the country), you can select and delete them (to reduce amount of downloaded data) or leave them as they are.

2. More advanced (recommended) method is to use Lasso to draw irregular shape that includes the area of interest. Then use Lasso>Generate Tiles command from the pop-up menu to create rectangular tiles that cover selected area. Tiles generation is adaptive, like in approach 1. The difference is that you do not need to delete tiles outside the area of interest. The lasso polygon does not need to be drawn very precisely. Usually, you need to draw polygon with only few lines. Following pictures illustrate this method:


Draw polygon with lasso tool. Area of interest must lay inside of the polygon.
Polygon does not need to be very detailed.


Use pop-up menu > Lasso > Generate Tiles command.


Tiles cover the polygon area and they are generated according to density of population (higher density=smaller tiles).

3. Another method is to draw one or several large rectangles and split them manually by setting the split point and use of **Split Vertically** or **Split Horizontally** command.

4. The most laborious method is to draw all small rectangles manually. Setting of appropriate grid can help to align individual rectangles one to the another.

You can combine any of above methods to create such coverage of area of interest as needed.

Controls Layout



- 1 Controls are organized to several tabs, according to their meaning. Use the "Set" tab to define parameters of whole map set like name, draw order, etc.
- 2 Controls on "Connection" tab allows to change internet addresses where program searches services needed for maps downloading. Unless these services change their location, you do not need to modify these data.

- 3 Main menu allows to access commands for work with map set and individual tiles. Most of these commands are also accessible via pop-up menu.
- 4 Area of individual tile (map) can be defined by depressing the SHIFT key and drawing rectangular bounding box.
- 5 Drawing of the tile bounding box respects the grid selected from this combo box. The grid helps to align individual tiles one to another seamlessly. Grid lines are visible on the map preview if you zoom-in sufficiently.
- 6 Bounding coordinates of selected tile are displayed on this panel. Clicking left and right mouse button on coordinate moves respective edge of tile. This can be used to adjust the size of the tile. Each move of the tile edge is aligned to actually selected grid. You can change grid size anytime to adjust step of the movement.
- 7 List of tiles in the set. When download starts, this panel displays download log instead.
- 8 The tile that is too large for processing is displayed with red color. You have to split such tile either manually or automatically until it is small enough.
- 9 Tiles achieved by automatic splitting of large tile. Program splits parent tile according to density of population and names the new tiles automatically. You can use **Rename** command to change name of each tile, if needed. These names appear in the map list of GPS.
- 10 Selected tile. Cross of magenta color marks the split lines. If you decide to split selected tile manually, then the parent tile splits along the split lines. To change position of the split lines, depress the ALT key and click inside of selected tile. Split lines are aligned to selected grid.
- 11 Coordinates of the split lines. Click on these coordinates moves split lines within the tile, using the grid lines distance as a step for movement.
- 12 Lasso marker can be used to define area of irregular shape. This area can be turned into tiles or used as a mask for erasure of multiple tiles at once.
- 13 When all tiles are drawn and the set is saved to disc, use **Download** button to start download of the map data. This process can last few seconds or several hours, according to map size and speed of your internet connection.

Set Parameters

The **Set** tab contains all essentials parameters to define set of map. They include traffic side, maps transparency, draw order, family ID., characters encoding (for languages with special characters) etc.

Object Filtering

Data downloaded from OpenStreetMap contain many objects which make map very detailed. However, too much detail can make map large in size and hard to read, especially while driving. '**Include Objects**' box on the **Set** tab contains options to filter some objects from the map. Filtering makes resulting map in GPS smaller and faster to render. Also, map is more legible. Typical objects that you might want to filter are shapes of buildings, or icons like bus stops and road crossings. Option 'address' refers to icons with house numbers and/or street name.

Result

The final result is routable map in GPS, with turn-by-turn voice navigation. However, there are also some other files created as well. Downloaded data are saved in Mapwel's MPW format (one MPW file for each Tile) into chosen folder. This file format allows to edit map data in Mapwel. Optionally, MPW files are compiled into the same number of IMG files compatible with Garmin GPS. This option is turned on by default. When downloading is finished, user is asked whether individual IMG files should be merged together (and upload to GPS right away) or not. If they are merged together, result is one overall IMG file that contains the whole downloaded map set. It doesn't matter whether you upload individual IMG files or single overall IMG file to GPS (individual files are merged together before actual uploading anyway).

Routing (Turn-by-Turn Navigation)



Mapwel supports creation of routable maps with turn-by-turn voice navigation. This feature is available only in the registered Advanced version of Mapwel.

Routable map uses special type of polylines called routable roads. To

create such polyline use the tool with  icon. This tool is intended for manual drawing of the roads. However, the easiest way of how to make a routable map is to convert vector map in [OpenStreetMap \(*.OSM\)](#) or cGPSmapper (*.MP) file format to the routable IMG file, which is compatible with Garmin GPS units.

Such conversion is very easy with Mapwel:

1. Open *.OSM or *.MP file with main menu > File > Open command
2. Upload it to GPS or save it to disc with use of main menu > File > Export Map command.
3. There is also Convert OSM or MP file(s) to routable IMG file command available from the main menu > File. This command allows the batch conversion of multiple files at once and merges all resulting maps into a single GMAPSUPP.IMG file.

Nothing else is needed if you create single routable map. If you work with data from ESRI *.shp files, please [click here>>](#)

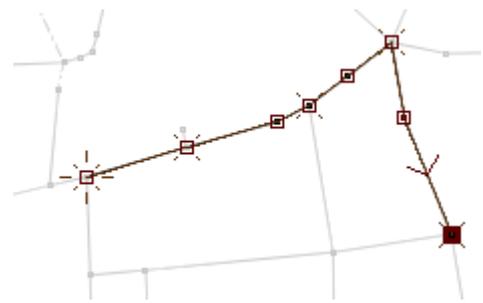


Turn-by-turn navigation with map created by Mapwel from the OpenStreetMap OSM file.

More Options

Intersections

Nodes where roads connect each other must be marked as "Intersections" (red crosses on the right-side image). Otherwise, Mapwel will not include them into the net of routable roads. If you import map from *.OSM or *.MP file, the intersections are detected automatically. If you use other files (like *.KML or *.GPX), you have to mark the intersection nodes. There is a "Detect Intersections" command in the [main menu > Routing](#) that allows to mark all intersections at once. Also, there is a manual method of marking the intersections - in the editing/creation mode use the pop-up menu to mark the selected node. This pop-up menu also allows to define turn restriction at the node (see [Restrictions](#) below)



Border Nodes

To allow GPS to navigate between the separate maps when cursor reaches the border of the actual map, the end nodes of map must be marked with "Border Node" attribute. Use the same pop-up menu as in above case to set the Border attribute of nodes.



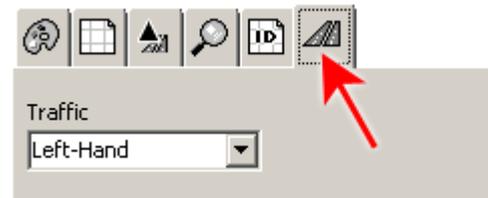
Restrictions

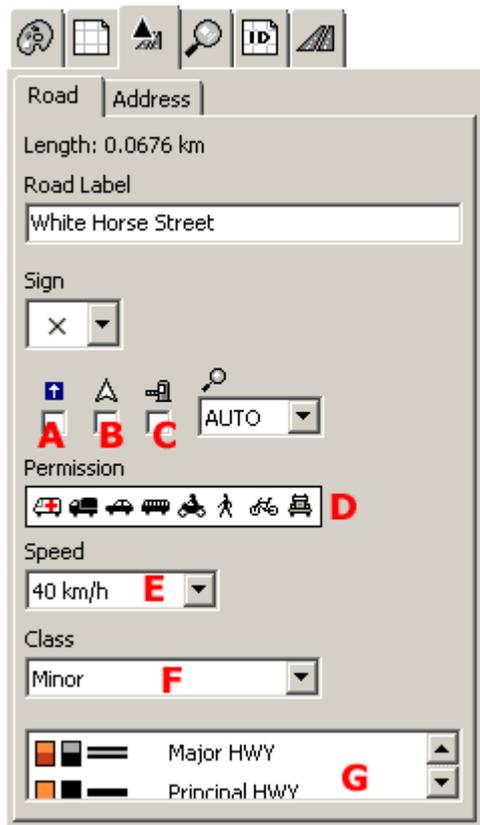
Mapwel allows to define road restrictions (one-way road, toll road, access permission) and node restrictions (left turn, right turn and U turn restriction). These restrictions help the GPS navigation engine to avoid restricted places or directions. Roads with restrictions are displayed in [object inspector](#) with icon or multiple icons indicating the type of restriction (picture at the left).

Road restrictions can be set in the Properties window, because they are valid for whole road object. Node restrictions must be set in the creation/editing mode which allows to access each individual node. Use the pop-up menu to set required restrictions at the selected node.

Note: Roads can be drawn with use of straight line and curve elements. Intersection attribute and node restrictions cannot be defined for the middle point of the curve element.

For correct coding of U turns, Mapwel needs to know the driving side of roads in the respective country (map). Please select the left-hand or right-hand traffic for the map you are working on in the [main menu > File > Properties window](#). Default value is right-hand.





Parameters

Just like any other vector object in Mapwel, road polylines have adjustable parameters that are accessible in the Properties window. The parameters specific for routing purpose are:

A - "oneway" road attribute

B - "show direction" attribute - direction is added to the text label of road when displayed on the GPS

C - "toll road" attribute - toll or fee must be paid to access the road

D - access permission - from left to right: 1. emergency vehicles, 2. delivery vehicles (up to 3.5 tonnes), 3. cars, 4. public service vehicles (bus, taxi), 5. motorcycles, 6. pedestrians, 7. bicycles, 8. trucks, lorries (over 3.5 tonnes)

E - max. speed

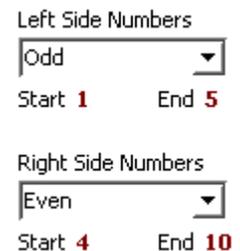
F - road class. Max. speed and road class define the road hierarchy important for the optimum navigation.

G - type of polyline - defines how the road is rendered on the GPS screen.

Street Names and House Numbering

Roads can be assigned with parameters like city, zip code, state and country. GPS uses this information for address searching. It is possible to use different values for the left side and the right side of the road. Also, it is possible to define house numbering along the road to allow GPS navigate to a specific house address.

Use [properties window](#) to access the road parameters and select the "Address" tab. Fill-in the Country, State, City and ZIP Code boxes. If you want to define house numbers or separate data for the right-hand side of the road, check the "House Numbering" checkbox. This will enable access to another tab - "Numbering". Enter the rest of address data into this tab. House numbering allows to use just odd, even or all numbers. Define start and end number and type of numbering for respective side of the road. If there are no houses on respective side of the road, select "None" in the numbers type combo box.



Tips

- OSM files - these files often contain data like building shapes, sport areas, etc. Large number of these objects can slow-down rendering of routable map and make it less legible while driving. If you want to erase such objects from the map, please use **main menu > Select > Areas > Type...** function to select required type of objects (buildings, for example) and then delete them all at once.
- ESRI shapefiles - if you work with data from ESRI *.shp files, please [click here>>](#).
- When roads cross each other at a different height level (bridge or ramp), do not use intersection attribute as the roads are not physically connected on this place. It is recommended to even not put a node on such place to avoid possible automatic detection of intersection by Mapwel.

Limits of the current version

	Export from Mapwel into this format	Import border node attribute	Import multi-segment house numbering	Import single-segment house numbering
OSM file	No	No	No	No
MP file	Yes	Yes	No	Yes

	Import of speed limit	Import of road class	Import access permission	Import oneway attribute	Import turn restrictions
OSM file	Yes	Yes	Yes	Yes	No
MP file	Yes	Yes	Yes	Yes	No

OziExplorer files

Mapwel supports loading of OziExplorer *.MAP files, which are files that contain information for georeferencing of raster image. Link to the raster image is included in the *.MAP file too. Use [main menu > Image > Import OziExplorer Calibrated Image](#) to import this raster image and georeference data. Image is then automatically georeferenced and ready to create map from.

Georeference info in a *.MAP file includes map **projection** (a method of representing the earth's surface on a plane), map **datum** (a reference from which the measurements are made) and 2 or more **calibration points**

Current version of Mapwel supports almost all datums supported by OziExplorer and it supports following projections:

- (UTM) Universal Transverse Mercator
- (ITA1) Italy Grid Zone 1
- (ITA2) Italy Grid Zone 2
- (BNG) British National Grid(IG) Irish Grid
- (SUI) Swiss Grid
- (VICGRID) Victoria Australia
- (VG94) VICGRID94 Victoria Australia
- Lambert Conformal Conic
- Mercator
- Transverse Mercator
- (I) France Zone I
- (II) France Zone II
- (III) France Zone III
- (IV) France Zone IV
- (SG) Swedish Grid
- Albers Equal Area

GeoTiff files

GeoTiff files are raster images in TIFF format with embedded georeference information like tie points, transformation matrix, projection method and parameters, ellipsoid and datum code. Mapwel supports import of GeoTiff images (use [main menu > Image > Import GeoTiff Calibrated Image](#)) and automatically calibrates them with use of the georeference info. Imported data are in raster format and must be vectorized, either [automatically](#) or [manually](#), before sending to GPS.

Current version of Mapwel supports about 50% of all datums defined by GeoTiff specification, including the most frequently used WGS84, WGS72, NAD83 and NAD27. It also supports following projection methods:

- Mercator
- Transverse Mercator
- Universal Transverse Mercator (UTM)
- Lambert Conic Conformal, 1 and 2 standard parallels
- Oblique Mercator and Hotine Oblique Mercator
- Oblique Stereographic
- Albers Equal Area

Exporting maps

This function can be accessed via main menu > File > Export Map. Use this command to save map in format other than Mapwel's native MPW format if you need to process data in other software. Mapwel currently supports data export into Garmin IMG, Google Earth KML and cGPSmapper MP formats.

Mapwel Advanced licence is needed to use export function. It is not available in Mapwel Basic.

Google Earth KML (Keyhole Markup Language) format

Maps exported into this format can be opened in Google Earth and displayed on top of the earth surface. When you create your own map, it is very useful to use this function to check accuracy of the map. If the 'terrain' option in Google Earth is set, map is displayed so that it follows the terrain and it looks like a 3D map.



Map exported from Mapwel in KML format and loaded into Google Earth.

Map contains polygons, polylines and symbols.
POIs are exported with address info (if supplied).



Left: contour lines from Mapwel displayed 3D with 'Terrain' option in Google Earth.
 Right: map from Mapwel displayed on top of the satellite image in Google Earth.

Garmin IMG format

IMG is native binary format of Garmin GPS units. These files can be loaded into GPS with our freeware MapUpload (included with Mapwel installation files) or with 3rd party upload software.

Mapwel (both Basic and Advanced) allows to load maps directly into the GPS. If you prefer to use other uploading method, please note that Garmin GPS units with files 'visible' from PC require all maps to be merged into single IMG files with name GMAPSUPP.IMG. Find out more [here](#).

To define irregular shape of map, use the 'Background Area' polygon object in Mapwel. Please note that map can contain only 1 object of this type and all other object must lie within its boundaries. If 'Background Area' is used, GPS does not display objects outside of this polygon.

IMG File Feature	Availability
Irregular map shape	✓
POI addresses, Country and State info support	✓
User defined zoom levels	✓
User defined polygons, polylines and symbols	✓
User defined copyright text	✓
Locking maps with unlock code	✗
Routing	✓
Marine maps	✗

Custom (User Defined) Projection

Mapwel supports hundreds of projections and datums. If you need to use custom projection, please use following approach:

1. Open Userprj.INI file from your Mapwel>Settings folder in any text editor.

2. Edit parameters in either [USER_DEFINED_Transverse_Mercator] or [USER_DEFINED_Lambert_Conformal_Conic] section, according to the projection method. Then save the edited file. Please note: change only fields at right side of '=', i.e. the key values. Do not change section and key names.
3. When using below window for entering coordinates, check the **Projection** check box and select X_User_Defined_Transverse_Mercator or X_User_Defined_Lambert_Conformal_Conic projection.

Current version of Mapwel supports transverse Mercator and Lambert conformal conic projections. Support for other projections will be added in the future.

How to erase all maps in GPS

Use the [main menu > GPS > Erase Maps is GPS](#) command.

How to erase specific maps in GPS

Use the [main menu > GPS > Erase Specific Maps](#) command to open window with list of maps to be erased. The list is empty when window opens.

Click on Get Map List from GPS button to download list of maps from the GPS.

Click on Get Map List from IMG file button to load list of maps stored in the IMG file on PC. IMG file can contain single map or map set with many maps. Users can build and edit their map set on PC and then load it to multiple GPS units. Use this option to erase specific maps from your map set file on PC, without need to work with GPS. Mark maps to be erased by clicking on the respective line of the Erase column.

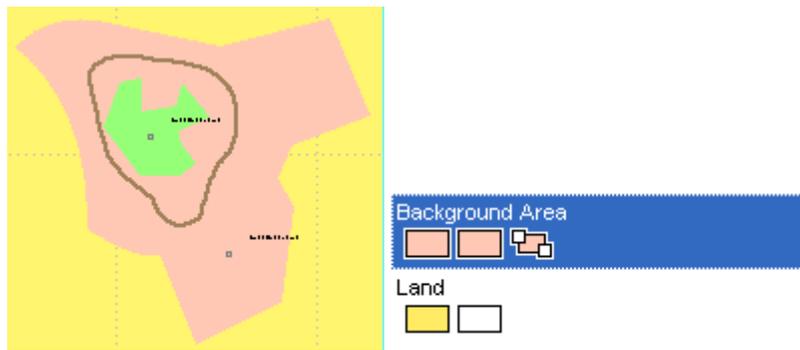
When finished, click on button to perform erasure. All maps marked by X sign will be erased. This operation may last even several minutes.

How to compile multiple maps into IMG format at once

Use the [main menu > Tools > Batch Conversion](#) command.

How to create map of irregular shape

If you want to make map of irregular shape, in order to not cover surrounding areas when displayed on a GPS, place special area of **Background Area** type as a first object in the map. This area is displayed in pink color in both 'Color' and 'Grey Scale' display modes. There must be only one area of this type in the map. If there are more background areas in the map, map will be partially or entirely invisible in the GPS.



How to define your own area, line and symbol styles

Use the [main menu > Objects > User Defined Styles](#) command to launch the editor of above mentioned styles.

How to measure track length

The total length of all selected line objects is displayed in Properties window on the [Line Tab](#).

How to change serial data transfer speed

Use the [main menu > Edit > Preferences](#) command or change the speed in the [Map Transfer](#) window.

Morphing of Image

This tool is intended for use with maps with unknown projection and datum, or with distorted maps. In other cases, please try [direct calibration](#) first.

When drawing vector map with use of scanned paper map and tracks acquired with GPS, you can often encounter the problem of paper map not matching the tracks, even if it was declared as a 'GPS map'. In such case another problem pops-out and this is how to draw the rest of objects as it is not clear how to position them with respect to the measured tracks. If whole image is just shifted, you can use [main menu /Image/Move](#) function to position the image under vector tracks properly. If deviation between image and vector parts is not constant, correction requires more labour.

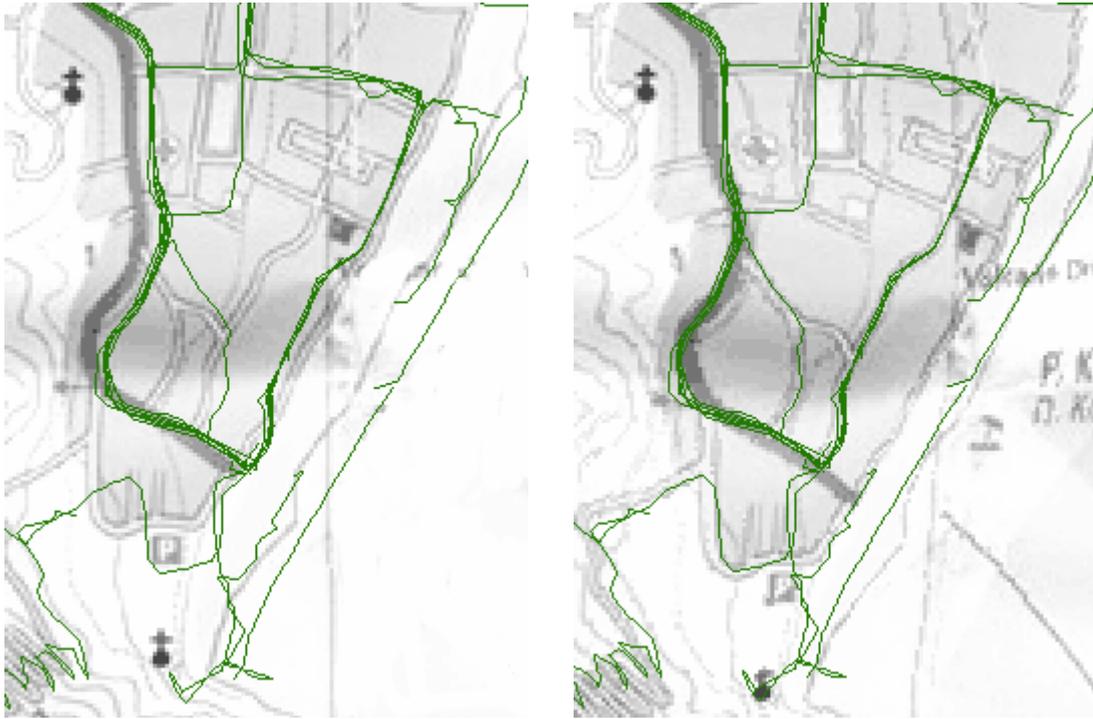


Fig. 1. Measured tracks do not match scanned paper map very well (left).
Image after non-linear calibration with three pairs of points (right).

Mapwel provides 'Image Morphing' tool for non-linear calibration of bitmap image to allow user to adjust image before actually drawing vector objects on top of it. Morphing function uses pairs of points defined by user. Image is calibrated so that area around the first point of each pair is transformed into area around the second point of each pair. Click on main menu / Image / Image Morphing to start image adjustment.

The first pair of calibration points will appear on the screen. They are one of top of the other. Click on the cross indicating position of the point and move it aside. Now you can see both points in the pair and an arrow between them, which indicates direction of image transformation in this place.

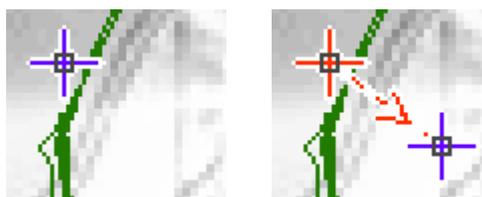


Fig. 2. Pair of calibration points.

If you click right mouse button on any of the calibration points, a pop-up menu appears, which contains following command: **Preview**, **Original**, **Add Pair**, **Delete Pair**, **Morph Image**, **Cancel**.

Place calibration pair on some corresponding places (fig. 3. left) and use the **Preview** command from pop-up menu to see effect of calibration (fig. 3. right). First point of the pair is placed on street on the raster image. Second point is placed on the corresponding place of the measured track. In **Preview**, area near first point is transformed into area near second point and raster image matches the measured tracks much better. We use **Preview** for now, because there will be more calibration pairs added. As adjustment is performed on a raster image, each change could add distortion to the image. Therefore, use **Preview** to see effect of calibration until all pairs are added. We will use **Morph Image** to perform all changes at once at the end of calibration.



Fig. 3. Image with single pair of calibration points before calibration (left) and after calibration (right).

Now we will add second pair of calibration points to calibrate upper part of the image. Use **Add Pair** command from the pop-up menu. Notice that image returns to original form to allow user to place all points under the same conditions. Use **Preview** command to see calibration with two pairs. You can switch between **Original** and **Preview** mode to examine points placement and calibration effect.

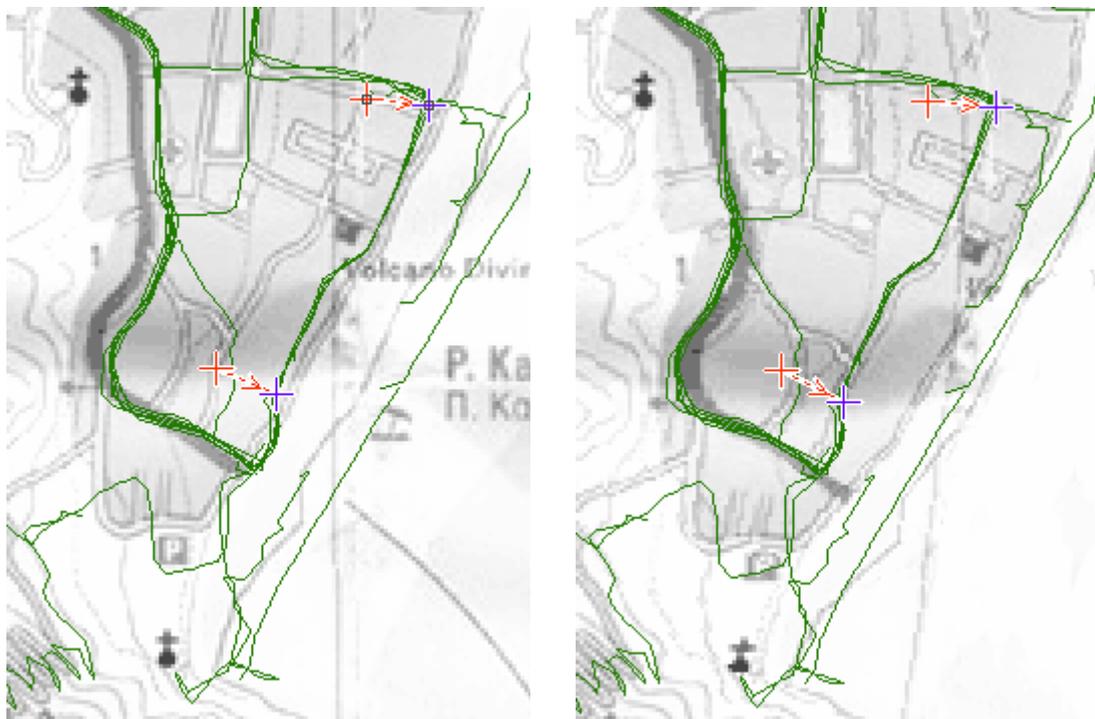


Fig. 4. Image with two pairs of calibration points before calibration (left) and after calibration (right).

Measured tracks fit adjusted image quite good now, except the bottom part of the image. There has to be one more calibration pair added.

Usually, there should be not many calibration pairs used, and they should be not placed one near to the other, because influence of each pair reaches only to the nearest pair. If pairs are too near one to the other, image gets distorted because of adjustments being too local.

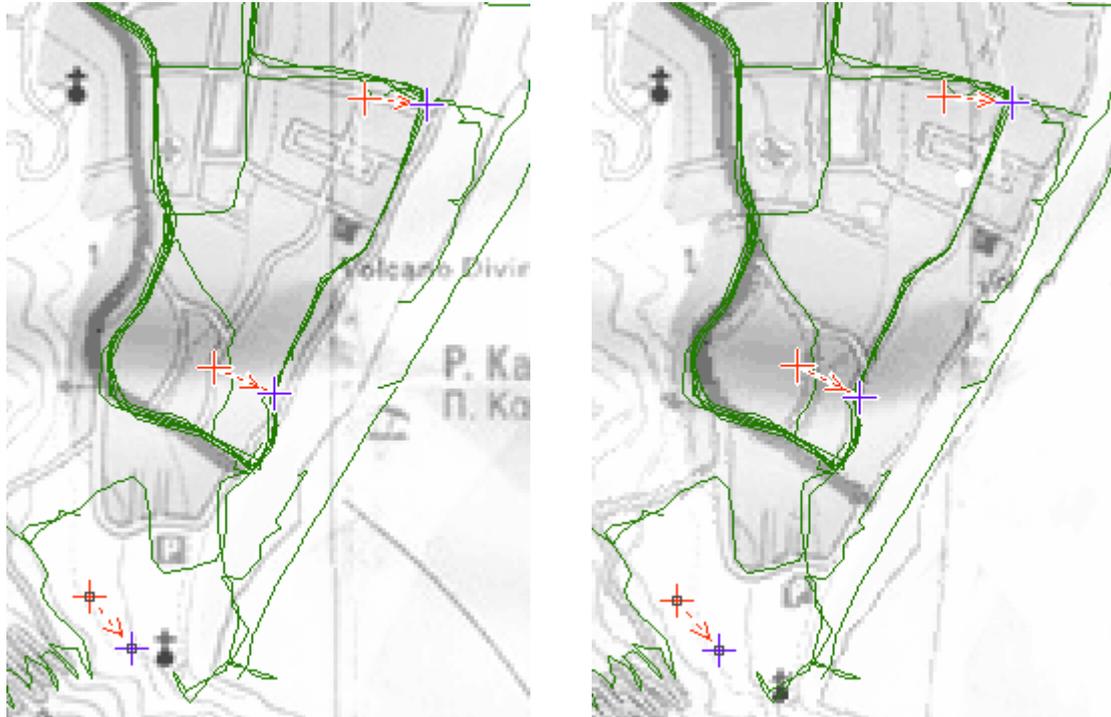


Fig. 5. Image with two pairs of calibration points before calibration (left) and after calibration (right).

Notice that roads near 3rd pair are calibrated even when the pair is not placed on any particular object on the image (left).

Use such approach to prevent pairs being too near one to the other.

The image seems to be calibrated quite well with three pairs of points. So far we were using the **Preview** mode. Now click on **Morph Image** function to perform all adjustments to raster image at once.

When doing a large map, calibrate it part-by-part, each part with use of several pairs (like shown in above example). Do not calibrate the whole map at once as each pair slows down the calibration process. As the influence of pairs is more or less local, there is no reason to calibrate large map at once.

Move Image

When drawing vector map with use of scanned paper map and tracks acquired with GPS, you can often encounter the problem of paper map not matching the tracks, even if it was declared as a 'GPS map'. If the whole image is just shifted, the main menu / Image/ Move function can be used to position the image under the vector tracks properly. In other cases, please [click here for more image editing and calibration tools](#)

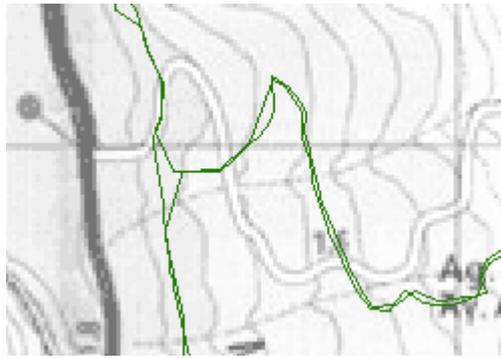


Fig. 1. Image under the vector objects needs to be shifted.

Let's suppose that deviation is constant in this case. Click on **main menu / Image/ Move** command to start image adjustment. Place pair of points to mark the current and desired position of any spot on the raster image.

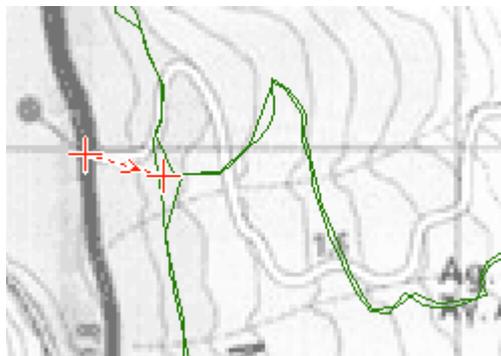


Fig. 2. Current and desired position of spot on raster image. The shift direction is marked by an arrow.

Click right mouse button to access a pop-up menu. Select **Move** to shift the raster image.

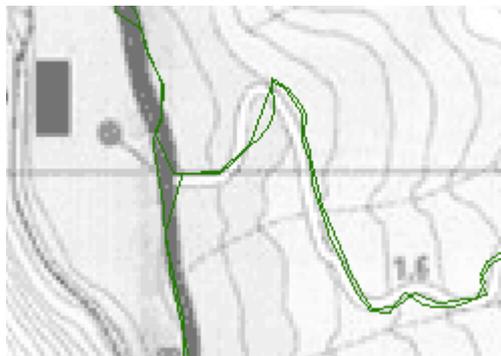


Fig. 3. Image shifted to fit under the vector objects.

Manual map preparation for iQue, Nüvi, Zumo, Oregon and Colorado

All above units store detail maps on a memory card or in the internal memory. All detail maps, normally stored as a separate img files, must be merged into a single file with GMAPSUPP.IMG name. Otherwise, GPS will not recognize and display the maps.

Mapwel Advanced allows to generate separate img files and then merge them into a single GMAPSUPP.IMG file for use with iQue, Nüvi, Zumo, Colorado, Oregon and Dakota.

Please follow these steps to create GMAPSUPP.IMG file:

Step 1. Generate separate img files with Mapwel Advanced. Use [main menu > File > Export Map](#) to save each map with img extension.

Step 2. Use Mapwel [main menu > Tools > Merge IMG Files](#) to merge your img files into a single file and store it with GMAPSUPP.IMG name. If you want to upload maps to iQue, proceed to step 3. If you want to upload maps to other GPS, proceed to step 4.

Step 3 (iQue only). Use synchronization software included with your iQue (ActiveSync®, HotSync® or other) to load finished GMAPSUPP.IMG file into GARMIN folder* of iQue memory card. Restart iQue to enable uploaded maps.

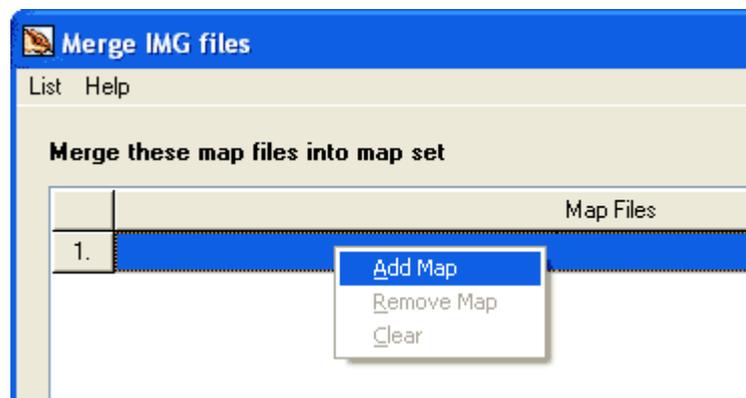
Step 4 (Nüvi, Zümo, Colorado, Oregon, Dakota). Connect GPS to your PC and switch it on. Use Windows Explorer or any file manager software to copy your GMAPSUPP.IMG file to GARMIN folder* in the GPS. Then disconnect the USB cable and wait until GPS reads the maps.

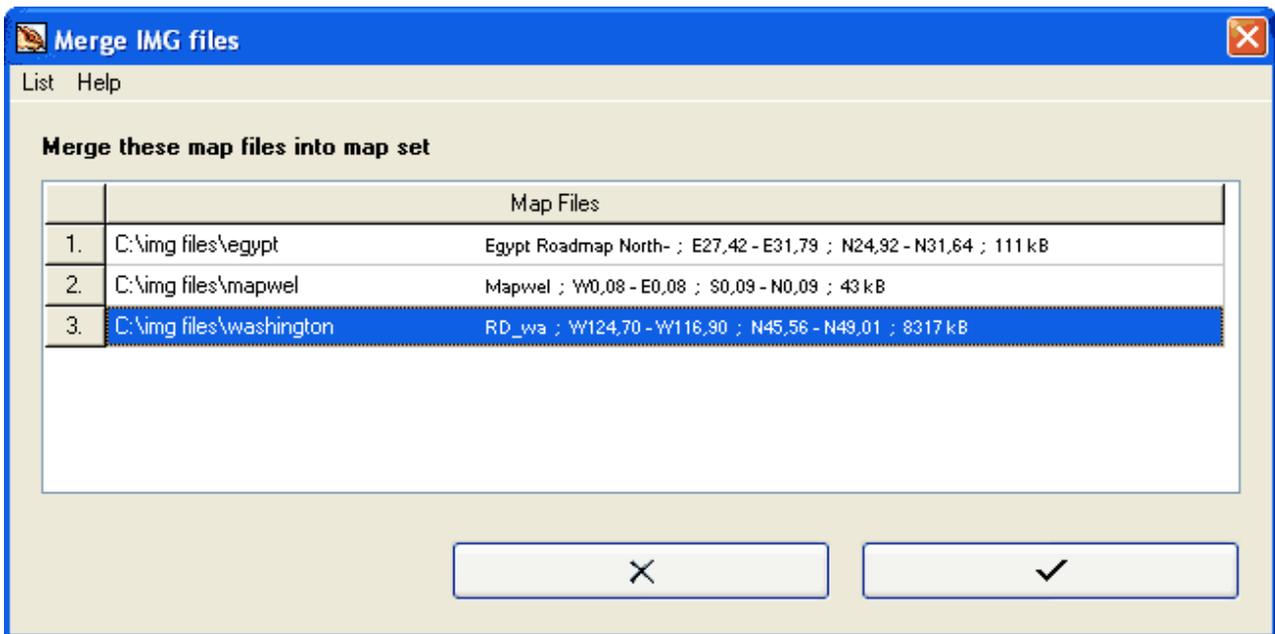
*Check where your GPS stores detail maps (GMAPSUPP.IMG file) and load your file into this directory. The previous GMAPSUPP.IMG file will be overwritten. If you want to preserve maps in this file, merge it to your maps like any other img file (see step 2), prior to loading your maps to the card.

Step 2 is discussed in more detail bellow:

Step 2 - Creation of GMAPSUPP.IMG File

Use Mapwel Advanced [main menu > Tools > Merge IMG Files](#) function to open window for merging separate img files into a single file. Click right mouse button on the tab and use Add Map command from the pop-up menu to add respective img files to the list.





You can save list of img files on disc, for a future use. Use List > Save List command to store list into Mapwel *.mml file.

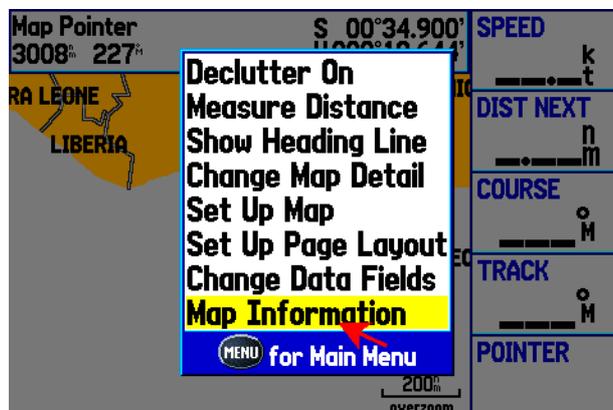
When finished, click ✓ button to generate single GMAPSUPP.IMG file from the list. Then upload this file to the GPS as described in steps 3 and 4 above.

Mapwel with GPSmap 276C

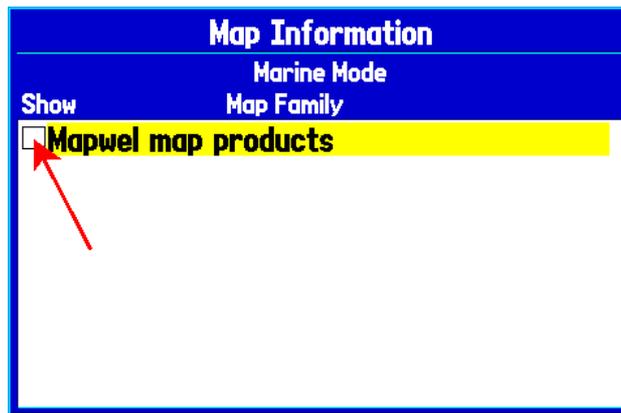
Default settings of this GPS units may cause that custom map uploaded from Mapwel is not visible. First of all, check the firmware version of your 276C. It should be 5.2 or higher. If you have older firmware, please upgrade it with use of upgrader on the official Garmin web site.

To make map visible, please follow these steps:

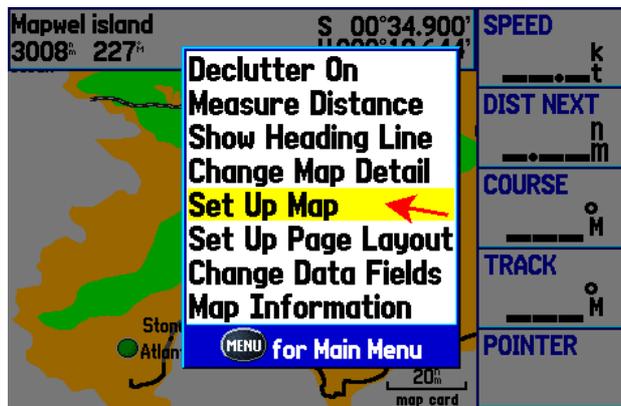
Make sure that the memory card is plugged into the GPS. Upload custom map from Mapwel to the GPS. Then use MENU button on the GPS to access this menu:



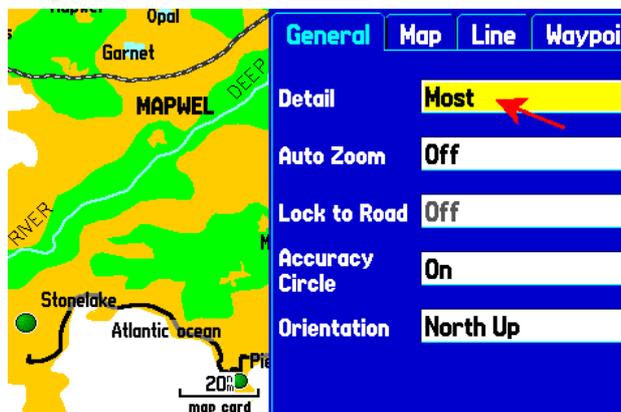
Select Map Information



If check box for Mapwel map is clear, check it. Quit the settings page (QUIT button). Now use MENU button again.



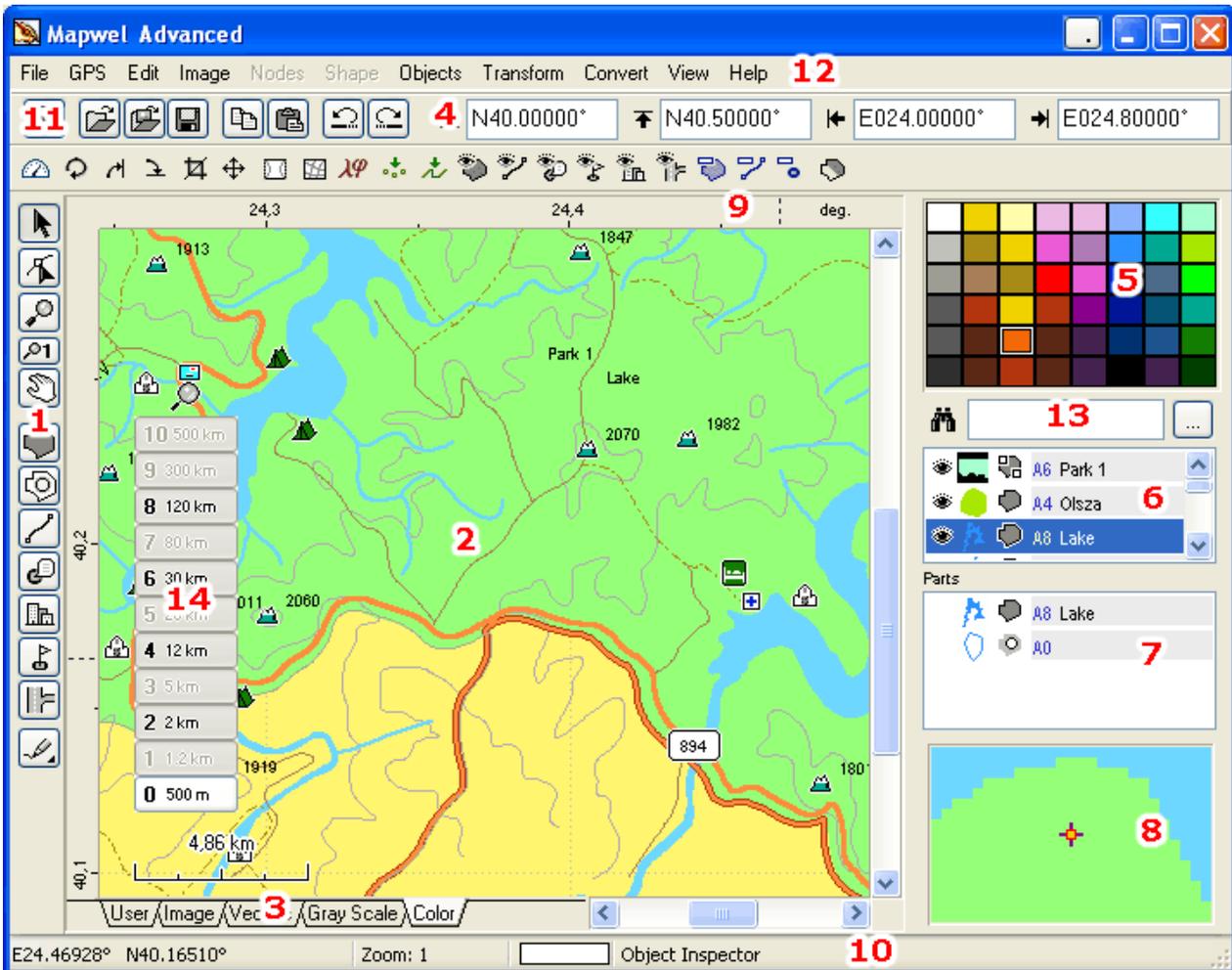
Select Set Up Map



Set Detail to Most. Also, make sure that Map Outlines option on the next tab (Map) is turned on. This procedure should make your custom map visible on the GPSmap 276C. If problem with visibility persists, please read further tips in the [Troubleshooting](#) chapter.

Controls

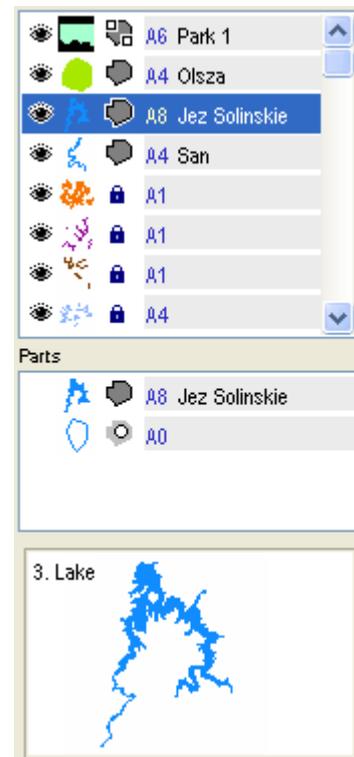
Main Window



- 1 The [Tool Bar](#) contains tools for creation, editing and transformation of objects.
- 2 **Work Area.** When starting a new map, the work area is blank. User can import scanned image or photo into the background of work area. Default colors of work area and grid lines are specified and can be changed in [Edit / Preferences](#).
- 3 **Display Mode Tabs.** In User mode, all objects (background image and map objects) are displayed in user colors. In Image mode only the background image is displayed. In Vector mode only the map objects are displayed (in user colors). Grey Scale mode simulates the monochrome display of GPS units and Color mode simulates the color display of GPS units. Use the last two modes to see how the map will look in GPS.
- 4 **Button bar.** The most used functions from main menu and pop-up menus are accessible through these buttons.
- 5 **Palette of Colors.** Click right mouse button on any color to adjust this color. To change color of an

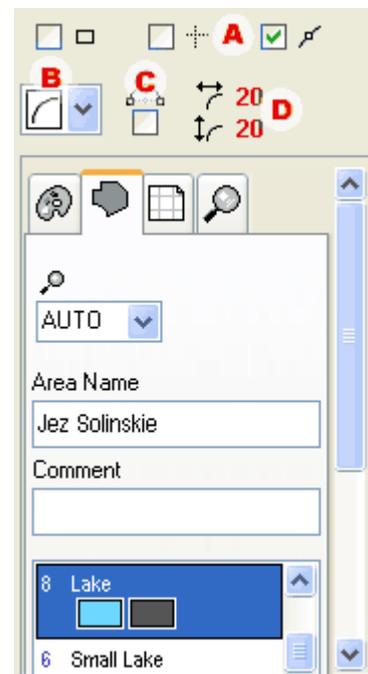
existing object, press left mouse button on color and drag and drop it on the object icon in [Objects Inspector window](#) or on the selected object in the work area. To set color that will be used for newly created objects click left mouse button on any color. Color that will be used for new objects is outlined in black and white.

- 6 Object Inspector window.** All objects created on working area are displayed here in order of creation. It shows order of objects, their type, visibility, name and comment. When composing complex map with many objects, it is sometimes difficult to isolate desired object in the work area. Use Object Inspector in this case. To change order of objects, select them with right mouse button, drag them to their new position, and release mouse button. To Hide/Show object click the eye icon to the left of each object. To access menu to duplicate, delete, or change properties, click right mouse button on selected objects in Object Inspector window. To change color of object in Object Inspector, press left mouse button on any color in Palette and drag it to this object. Then release the button. Another way is to double click the object icon to access the color dialog box, or use the Color command from the pop-up menu. Color can be also dragged and dropped from object in the list onto the palette. To select non-contiguous subset of objects, depress the Ctrl key and left click on each object.



In the editing mode the Object Inspector and Part Inspector windows are replaced with basic parameters of the object.

Read more about Object Inspector [here](#).



- 7 Part Inspector window.** Openings (holes) of area objects are displayed here as well as parts of grouped objects. This window serves to select holes and parts for further manipulation, because they cannot be selected in work area and in Objects Inspector.
- 8 Magnifying window.** This window displays enlarged area around mouse cursor. It aids precise placement of nodes, allowing user to maintain view of design in the Work Area. To hide this

window, use View/Zoom Window; this will enlarge the Parts Inspector window. When cursor moves over Object Inspector, this window displays enlarged object icon and description.

- 9 **Rulers.** Press left button on vertical or horizontal ruler and drag mouse to Work Area to create a Guide Line.
 - 10 **Status Bar.** The mouse cursor coordinates, zoom and tool hint or other information are displayed here.
 - 11 Button for sending the map into the GPS unit. Same command is available in [main menu / File](#).
 - 12 **Main Menu.**
 - 13 **Find Object control.** Type several characters of searched object name or comment into this box. If object with name or comment that begins with these characters exists, Object Inspector scrolls the list to make found object visible and selects it.
 - 14 **Zoom Levels Preview.** Use this control to preview how map layers will be displayed in GPS at various zoom levels.
- A **Snap Nodes options.** Use these check boxes to define snapping of nodes to work area edges, guide lines or other nodes. Snapping helps precise placement of nodes. Same options can be found in [main menu / Nodes](#).
- B  **Edge Mode** combo box - choose line or curve edge as default when creating new objects.
- C  **Middle Point First** check box - if checked, new curve element is created so that on first click, line is created. On a second click line turns to a curve using the previous point (end of line) as middle point of curve. If it is not checked, the curve is created on a first click, but the middle point must be dragged to proper position.
- D **Curvature of the rectangle with rounded corners.**
- E **Basic parameters of the newly created object.** More parameters can be accessed with use of Objects / Properties menu after finishing the object.

Object Inspector

The main features of Object Inspector are described in [Main Window chapter](#)

Right click on selected object or objects in Object Inspector to access a pop-up menu for operations with selected objects.

For meaning of **Group** and **Ungroup** commands please see [Main Menu / Objects chapter](#)

To select and manipulate openings or grouped objects, use the Part Inspector window beneath the Object Inspector window. It is not possible to select these parts directly on the Work Area.

To change order of objects in Object Inspector, select an object with a left click, depress the right mouse button and drag it to its new position in the list. Then release the right button and, from the menu that appears, choose whether the selection should be placed **Before** or **After** the item. You can choose also the **Set Identical Parameters** command to copy properties from one object to another of the same type. Double click on the object name to open the [Properties](#) window.



1 2 3 4 5 List item in the Inspector window



Zo
om
Lev
el
Name
&
Commen
t

1. Eye icon for showing/hiding object, 2. Small picture of object, 3. Type of object, 4. Name and comment of object.

Object is visible. Left click on the icon to hide the object.



Object is invisible. Left click on the icon to show the object.

Object Icon.

Object is Area.



Object is Area of type that is always displayed behind other objects.



Object is Line.



Object is land or depth contour (Line).



Object is railroad (Line).



Object is river (Line).



Object is trail (Line).

	Object is Line of road type.
	Object is Line of road type, with a road sign.
	Object is Point of Interest (POI) with empty address fields.
	Object is Point of Interest (POI) with address.
	Object is City.
	Object is Map Feature.
	Object is Exit.
	Object is Opening in the Area. Openings are displayed in the Parts window.
	Object is composed of several other objects that are grouped.

Name & Comment	
A2 0 km	Automatic zoom level of object.
20 km	Individually set zoom level of object.

Tools

	From top to bottom: - Select and Transform Tool - Edit Edges Tool - Zoom Tool - Zoom 1 Tool - Pan Tool	
		
		
		
		
	- Create Area Tool - Create Opening Tool - Create Line Tool - Create Point of Interest (POI) Tool - Create City Tool - Create Map Feature Tool - Create Exit Tool	
		
		
		
		
		
		
		- Create Routable Road



- Create Marine Area *



- Create Marine Line *



- Create Marine Point *



- Create object with [Freehand](#)



- [Trace tool](#) (tool for vectorization of raster images)

* Tools available only in the Mapwel versions that support marine charts.

Use **zoom tool** to zoom in (left mouse button click) or zoom out (right mouse button click). If you want to zoom in a specific area, depress the left mouse button and drag mouse to make selection. Then release the mouse button and selected area will be enlarged so that it fits on the screen.



Opening can be used only after Area or previous Opening object. It does not appear in Object Inspector window as a separate object and cannot be selected directly on the Work Area. To select the Opening object for transformation, use the Part Inspector window. To add Opening to Area, the Area must be either selected or it must be the last object in the Object Inspector list.

Main Menu

File

The first 6 commands are **New**, **Open**, **Open Recent**, **Save**, **Save As** and **Merge**

Open and **Merge** commands allow user to open map files in Mapwel MPW and other formats. Use **Merge** command to combine two or more maps. Note that background bitmap is discarded when merging maps. Only the vector map objects are preserved. Current version of Mapwel supports these formats:

File Format	Extension	Read	Write	Comment
Mapwel	.MPW			
ESRI Shape File	.SHP			
OpenStreetMap	.OSM			These maps are available for free from http://www.openstreetmap.org/index.html . Use Export tab to download osm file of browsed area.
Google Earth Keyhole Markup Language	.KML			Files exported in this format can be used with Google Earth.
Zipped Keyhole Markup Language	.KMZ			Both KML and KMZ files can contain calibrated raster image. To import such image into Mapwel, please use main menu > Image >
GPS eXchange	.GPX			
cGPSmapper GPSMapEdit	.MP			Current version of Mapwel does not support auto routing, streets numbering & marine charts
MapDekode	.DBX			
OziExplorer Waypoint File	.WPT			
OziExplorer Track File	.PLT			
Garmin GPS Database	.GDB			
Garmin	.IMG			Mapwel Advanced version can export maps into IMG format and/or upload IMG files into GPS. Advanced version also supports routable maps .

Click [here](#) to find out more about the ESRI shape files import.

Click [here](#) to find out more about the free OpenStreetMap *.OSM files support.

Mapwel allows to load osm file and upload it to Garmin GPS, or export into any of supported formats (see

above table).

Upload Map to GPS converts the map data into proper GPS format and allows user to [upload](#) one or several MPW and/or IMG map files into the GPS unit. This command is intended mainly for compilation and uploading of current map from the work area of Mapwel into the GPS. There is also another similar command [Upload IMG Files to GPS](#) available in the Tools menu. This command launches separate application MapUpload for loading one or multiple IMG files to the GPS. IMG files are maps already compiled into format compatible with Garmin GPS units.

Countries and Cities. This command is used to define [table of countries, states, cities, zip codes](#) and their mutual links. This table is necessary for creation of [Cities](#) and [POI](#) (points of interest) objects.

Export Map. Use this command to [export map](#) into Garmin IMG, Google Earth KML or cGPSmapper MP map file. This function works only in Advanced version of Mapwel. The GPS unit to which the registration is bound must be connected and switched on.

The last command is **Exit**, which follows the usual Windows convention prompting user to name the map and choose a location.

Tools

Commands in this menu allow access to separate tools for maps creation, processing and uploading. These commands do not affect current map in the work area of Mapwel. They work mostly with files stored on disc.

Upload IMG File to GPS launches the MapUpload.exe program, which allows user to upload one or several IMG map files into the GPS unit. MapUpload does not perform any checking if IMG file is correct. This function is intended to allow user to upload map files that he/she has created in other software. MapUpload also allows user to wrap multiple IMG files into self-extracting .exe file. It is also possible to embed author's logo and map set image, and optionally lock maps to a specific GPS ID number. However, protection method currently used in MapUpload is not secure. MapUpload can be used with command line to avoid manual insertion of img files into the list. Use command (in a .bat file, for example) in form MapUpload.exe file1.img file2.img file3.img to load multiple img files to MapUpload. Note: MapUpload.exe is a separate program that can be found in the Mapwel folder. Unlike Mapwel itself, MapUpload is FREEWARE and it can be distributed separately. It cannot be sold.

Download Free Maps. This command opens window with Downloader tool for [downloading of large map set from OpenStreetMap](#) servers and its automatic conversion into routable maps. This tool works only if your computer is connected to internet. It is supposed to be used with Advanced version of Mapwel. Maps downloaded with unregistered or Basic version of Mapwel are usable in GPS, but they are marked with 'Trial Map' labels and they are not routable.

Merge IMG files. Use this command to merge several IMG maps into a single file. This command is useful if you want to [prepare maps for iQue, Nüvi, Zumo, Colorado, Dakota, Oregon or Nüvifone manually](#). Otherwise, Mapwel makes all map operations (transfer, add map, erase, erase specific map) and user does not need to use this command.

Batch Conversion. Use this command to access window for batch conversion of multiple MPW, MP, GPX, KML, KMZ, [OSM](#) or DBX map files into the Garmin IMG format. First, select files to convert into the Map Files Table. Then choose the destination folder for the IMG files and hit Compile button. List of source files can be stored on disc with use of menu > List > Save command for later re-use. This function works only in Advanced version of Mapwel.

Google > Launch Google Maps. Use this command to compare your map created in Mapwel with satellite image or Google map. It is useful when it is not clear what kind of object the data you are working from represent. This command opens separate web browser window and launches Google Maps web site with map, satellite or hybrid image of the area of your map created in Mapwel.

GPS

Import Waypoints from GPS. Waypoints acquired by user can be used for map drawing. Import waypoints from GPS and they become part of the map automatically. Please note that map (the "work area" in Mapwel) is defined by North, West, South and East boundary (coordinate). User can either import only those waypoints, which coordinates fit into the map boundaries, or map boundaries can be adjusted automatically so that all waypoints fit on the map. Use the first option when you add waypoints to an existing map and you want to ignore the waypoints that are outside of map. Use the second option when you work on a blank background and you want to import all waypoints from the GPS.

Import Tracks from GPS. Tracks acquired by user can be used for map drawing as well as the waypoints.

Erase Maps in GPS. Use this function to delete all maps in the GPS. Base Map uploaded by manufacturer is not erased.

Erase Specific Maps. Use this function to delete specific maps in the GPS or in the IMG file that contains a map set (such file is usually named GMAPSUPP.IMG). Base Map uploaded by manufacturer to GPS is not erased with this operation. Learn more about this function [here](#).

Display GPS ID. Use this function to find out the unique identification number of the GPS unit defined by manufacturer.

Edit

Use the Preferences command to change the map and data transfer settings. The work area, nodes, edges, grid and guide lines colors can also be changed under Preferences. Click [here](#) for more information.

Snap to Guide Lines snaps selected objects to nearest guide line when user moves objects in the Transformation mode. Objects are snapped only if they are near to the guide line. This function allows user to align objects with use of the guide lines. It works with whole objects (not just edited nodes as snap options under then [main menu > Nodes](#)).

Lock Guide Lines disables editing of [guide lines](#) and adding of new guide lines. Locking of guide lines prevents unwanted seizure of guide lines when working with digitized objects in the work area.

Erase Guide Lines deletes all [guide lines](#) in the work area.

Copy and Paste are clipboard operations.

Image

Import command is used to bring an image into the background as a template for drawing; Mapwel can import an image in JPG, GIF, BMP, PNG and TIFF formats. Click [here](#) to learn about image size limit.

Import OziExplorer Calibrated Image command imports OziExplorer *.MAP with raster image and georeference information. [Click here to learn more](#)

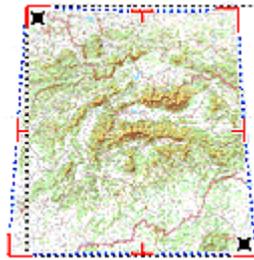
Import GeoTiff Calibrated Image command imports tiff raster images with embedded georeference information. [Click here to learn more](#)

[Background Filters](#) and [Edit Image Window](#) are described separately.

Rotate to Vertical and **Rotate to Horizontal** are tools for rotation of image. They are intended for precise rotation of images that contain either vertical or horizontal lines (grid). Place rotation marks on the object (line) in the image and then click right mouse button on the work area. Select 'Rotate Image' from the pop-up menu. Image will be rotated so that marked line is vertical or horizontal, respectively. Please note: use [Edit Image Window](#) for rotation of image with angle parameter.

Crop is tool for precise placement of crop marks and cropping of the image. Place crop marks on the image and then click right mouse button on the 'scissors' symbol near the crop mark. Please note: [Edit Image Window](#) can be used for cropping of image too.

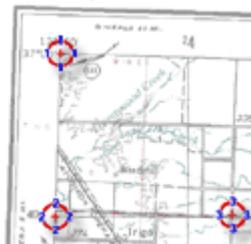
Straighten. Use this tool to compensate distortion of scanned images or photos. If deformed image has edges or grid that are supposed to be orthogonal, set the red marks on these deformed lines. Then click the right mouse button on the work area and select 'Straighten Image' command from the pop-up menu. Image will be transformed so that selected shape becomes a rectangle (see below image: blue shape transforms into a black rectangle)



[Image Morphing](#). Use this non-linear tool to stretch raster image to match measured tracks and waypoints.

[Move](#). Use this tool to move image under the vector map.

[Calibration](#). Use his tool to calibrate and georeference the image and the vector data drawn on top of the image.



Delete Image if you want to reduce the size of the MPW file (for publishing map on the Internet, for example) and you do no longer need the background image.

Export as BMP saves your cropped and adjusted image as a separate bitmap file. Use this function if you need to use the image in other application. Mapwel stores map, image and all other data in a single MPW file.

[Automatic Vectorization](#). Use this tool for quick creation of GPS map from raster image.

Acquire (Scan) ... command launches the image scanning software. This command work with scanners that support TWAIN. Scanned image is transferred into background of the work area as if it was loaded with **Import** command.

Nodes

The Nodes Menu is accessible only in creation/editing mode.

Align Beginning to Previous Object moves the beginning of an edited object to the end of previous object.

The next command, **Align End to Next Object**, causes the end of the object being edited to the beginning of the next object.

Align Line Beginning to beginning of Previous. When doing a complex line, some line parts start not on end of previous part, but on its beginning, instead. Use this function to place beginning of the new part exactly on beginning of previous part.

Reverse Nodes Order changes the order of nodes.

Use **Delete Whole Edge** command to erase whole edge and start its creation anew.

Snap nodes to Work Area Edges, Snap to Guide Lines, Snap to Nodes, Snap to Object Edges are options for alignment of nodes during editing or creation of object. Nodes are snapped only if they are moved near to the work area edges, [guide lines](#), other nodes or edges of other objects, respectively.

Please note: these options affect snapping of the edited nodes. Snap options under the [main menu > Edit](#) affect snapping of the whole objects.

Shape

The Shape Menu is accessible only in the creation/editing mode. To use any of the 10 commands, place at least one node in the work area, then select one of the shapes and draw it in the work area. Right mouse click and select **To Elements** from the small pop-up menu. Mapwel will move the last node to the nearest point on the shape just created and the shape will be started from that point. This means the shape can be started from any point.

Objects

Edit switches selected object to editing mode.

Group is function for combining several objects into one for easier manipulations. This lets you apply the same transformations, properties and other changes to all the objects within the group at the same time.

Use **Ungroup** function to divide grouped objects.

Sort Colors function changes order of selected objects so that objects of the same color are in the successive order.

Sort Types changes order of selected objects so that Areas are listed first, Lines are next and then Points of Interest, Exits, Cities and Map Features. This function helps you to organize objects in your map.

Sort Names function sorts selected objects alphabetically.

Sort Sizes function sorts selected objects according to their size.

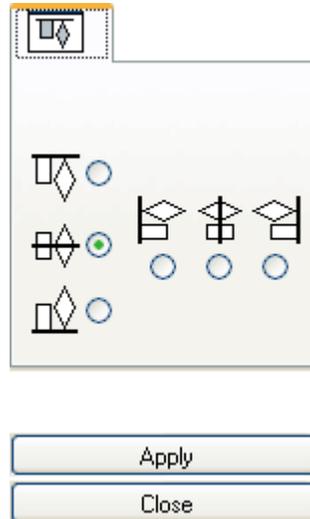
User Defined Styles command launches [editor of filled areas, lines and symbols](#)

Properties command opens the [window with properties](#) of selected objects and map parameters.

Calculate item contains submenu with commands for calculation of area and perimeter of selected polygon(s) and length of selected line(s).

Transform

Transformation Window command opens window for alignment of 2 or more selected objects. This command may be useful when drawing reference frames (circles) around some object



Please note: use [main menu > Convert > Create Circle around Point](#) command for easier and more precise drawing of reference circles.

Combine Outlines makes single line object from series of lines.

Expand Objects enlarges selected objects by offsetting the object contours. It is intended for creation of overlay of constant width between adjacent objects. Expand Objects command does not provide the same result as normal enlargement.



Shrink Objects reduces size of selected objects by offsetting the object contours. Shrink Objects command does not provide the same result as normal size reduction.

Shaping submenu contains commands for so called boolean operations on the filled areas. These operations include **union**, **intersection** and **difference**. Click [here](#) for more information.

Convert

The Convert commands work on objects selected with the Transform Tool (arrow) or in Objects Inspector.

Create Line from Area creates line object from selected area object. If area object has openings, program will create also lines from openings as a separate objects.

Create Area from Opening creates a new area object from selected opening in an existing area. Opening must be selected in the Parts Inspector window. This command is intended for situation when

user needs to create object of other color for a hole (opening) in the area. User should adjust the newly created area or the opening to make them overlay each other, to avoid gaps when displayed in the GPS.

Create Area from Line creates a new area object from selected line object. If area is not closed, program automatically closes it.

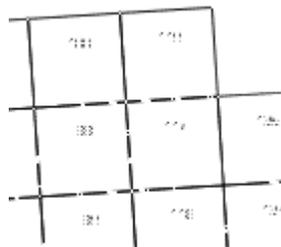
It is important to note that above commands will duplicate an object and then convert the new object as selected. Below commands just convert selected objects without duplication.

Area to Opening command can be used to convert areas like land or islands to openings in the underlying area like ocean, for example. Map may display faster in GPS if island is made as an opening in the ocean area, letting the background (yellow) area showing through, as opposite to island being a land area put on top of the solid ocean area. In the first case, GPS has lower number of layers to display. When converting selected areas to openings, some area object must precede selected objects in the list, as newly created openings cannot be a stand alone objects and they must follow after the area object.

Map Feature to POI and **POI to Map Feature** convert respective type of points into the other type.

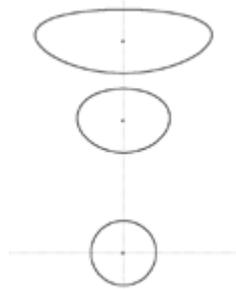
Area to POI can be used to convert small areas like buildings into the points of interest.

Area to Transparent Grid Cell serves to create transparent grid from the polygons. This command converts selected polygons to line objects with label in the centre of each cell. Label, in fact, is a point without icon. Text is taken from the polygon's "name".



Swap Object Name and Comment command helps to manipulate objects in the list when using the Sort objects on Name function.

Create Circle around Point creates "circles" of defined radius around all selected points. Near poles very large "circles" look deformed (see below image), because of coordinate system projection. However, real-world distance from center to any point on the "circle" is the same.



Select

Commands in this menu allow to select vector objects with use of various criteria, or modify existing selection.

The first command is **Zoom to Selected Objects**. This command scrolls selected object(s) to center of the

screen and zooms in or out to fit selection to the screen. It helps to localize object(s) selected in the [Inspector window](#) in the work area.

Next command **Zoom and Edit Selected Objects** works in the same way as above command, but it also starts nodes editing mode.

New Selection, Add to Selection and **Select Subset** options allow to define the way of how vector objects are selected.

Rest of the commands in this menu allows to select multiple objects of the same type (like Roads, POIs with address) at once. They work with either whole map or just selection, according to selection mode defined by above options.

View

Unlike the **Eye** icon in the Object Inspector window which hides/shows only particular objects, commands in the View Menu hide/show all objects that fit user-specified criteria.

Areas, Lines, Points of Interest, Map Features, Cities, Exits settings show or hide respective type of objects.

Area Captions, Line Captions, Symbol Captions show or hide names (captions) of respective type of objects in the work area. Symbols are all point objects (Points of Interest, Map Features, Cities, Exits).

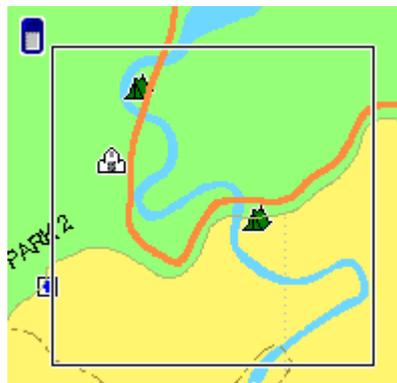
Fill of Areas. Uncheck this setting to turn into the "wire frame" display mode. This is useful for example when you need to make overlay of the Areas.

Show/Hide Objects. Use this sub-menu to show and hide set of selected or unselected objects.

Guide Lines, Button Bar, Grid, Rulers settings show or hide respective controls of the work area.

Zoom Window shows/hides zoom window in the bottom right corner of the screen. Hiding this window is useful in case of low screen resolution (800x600, for example) to enlarge Object Inspector window.

GPS Display Frame. Check this setting to show frame of the GPS unit display in the 'gray scale' and 'color' modes. This function allows you to see if map does not have too much detail and if it will be legible on the GPS display. To change size of the display frame, click on the GPS icon in the upper-left corner with right mouse button.



Nighttime, Marine Colors. Use these settings to change the map colors in 'gray scale' and 'color' display mode. Marine colors works in both 'gray scale' and 'color' display mode. Nighttime has effect only in the 'color' mode.

Routing

Show Intersections switches on/off displaying of small icons on intersections, i.e. nodes where routable roads intersect one another.

Split Self-Intersecting Roads function divides roads which form closed loop into several parts. Self-intersecting roads are not allowed in [routable maps](#). When Mapwel compiles routable map, it calls this function internally, so it is not necessary to use it unless you want to export routable map into file for processing in other software.

Detect Intersections is function for automatic marking of road intersections. Maps created from OSM and routable MP files should not need to mark intersections, because intersections are imported from these files. Use this function if you draw routable map manually or if you import data from vector files (like [ESRI shapefiles](#)) which do not contain node definition. Intersections can be marked also manually node-by-node in the creation/editing mode when user has access to individual nodes of object.

Locate Unused Intersections command identifies nodes that are declared as intersections, but they are used by only one road, i.e. they are not real intersections of two or more roads. Found nodes are highlighted in the work area. This command helps to discover errors in the routable map.

Clear Unused Intersections command deletes "intersection" flag from nodes that are used by only one road, i.e. they are not real intersections of two or more roads.

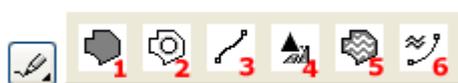
Merge Close Intersections. Data structure of routable maps uses approximately 0.00002 grid. Nodes that are closer than this grid spacing are regarded as identical. Adjustment of node coordinates to this grid is made automatically during map compilation. However, if you export map to *.MP or another file format for processing in other software, it may be necessary to use this command to avoid too close nodes.

Freehand Tool

Freehand tool works like a painting tool. Unlike the other Mapwel tools, which are based on the precise manual placement of the nodes, curves and lines, Freehand tool allows to draw many of the Mapwel objects with a free hand. Strokes are automatically converted to a chosen style. After conversion, strokes can be edited as other vector objects (node by node). The Freehand tool can be combined with any other tools in the Mapwel. Like other creation tools in Mapwel, Freehand tool can be used with various display modes (User, Grayscale, Color).

Freehand tool can work with any Microsoft Windows compatible mouse or digitizing tablet. Its use is not restricted to any specific brand of tablet.

Before you start actual drawing with the Freehand tool, you should choose the style you want to use. Click with right mouse button or corresponding tablet pen button depressed on the Freehand icon (in the [Tool Bar](#)). Panel with freehand styles will appear (picture below). This panel can be invoked also by holding the left mouse button or tablet pen tip depressed about 1 second on the Freehand icon. Each style is represented by its icon. Hover the cursor over the icon to display the style name. Select desired freehand style to activate the tool. Mapwel will switch to creation/editing mode.



Freehand Styles

1	Area
---	------

2	Opening of Area or Marine Area
3	Line/Road
4	Routable Road
5	Marine Area *
6	Marine Line *

* Styles available only in the Mapwel versions that support marine charts.

Click left mouse button or tablet pen on the Freehand tool to start drawing. When the Freehand tool is active, parameters of respective style are displayed on panel at the right side of the Mapwel window. **After Stroke** options allow to configure the Freehand tool. For example, it is possible to define whether to finish freehand mode after a single stroke or reactivate the tool.

Freehand Options

Meaning of the **After Stroke** options is as follows:



- **Finish Object** - converts stroke into nodes and finishes creation/editing immediately
- **Edit** - converts stroke into nodes and switches to normal nodes editing mode
- **Another stroke** - converts stroke into nodes and allows to add another strokes. When finished, single vector object contains several strokes.

Only one of above options can be active at once. If Reactivate tool is checked, Mapwel automatically reactivates Freehand tool after each stroke. This feature works only with Finish object option. To end strokes creation, hit ESC or ENTER (RETURN) key on the keyboard, or click the STOP button above the freehand options.

User Defined Styles

Some Garmin GPS units support user defined styles* for filled areas, lines and points. Mapwel software includes editor of these styles and library of predefined styles. Editor allows user to create her/his own fill patterns, colors, line styles and point icons (cities, map features, points of interest and exits). New styles are saved with map in Mapwel *.MPW format.

* Support of user defined styles may require upgrade of the GPS firmware. User defined styles were successfully tested on GPSmap 60C, 60CSx, Nuvi and Vista C. If map with user defined styles is loaded to Garmin GPS that does not support them, objects are displayed with use of the GPS built-in styles, i.e. user defined styles are not used.

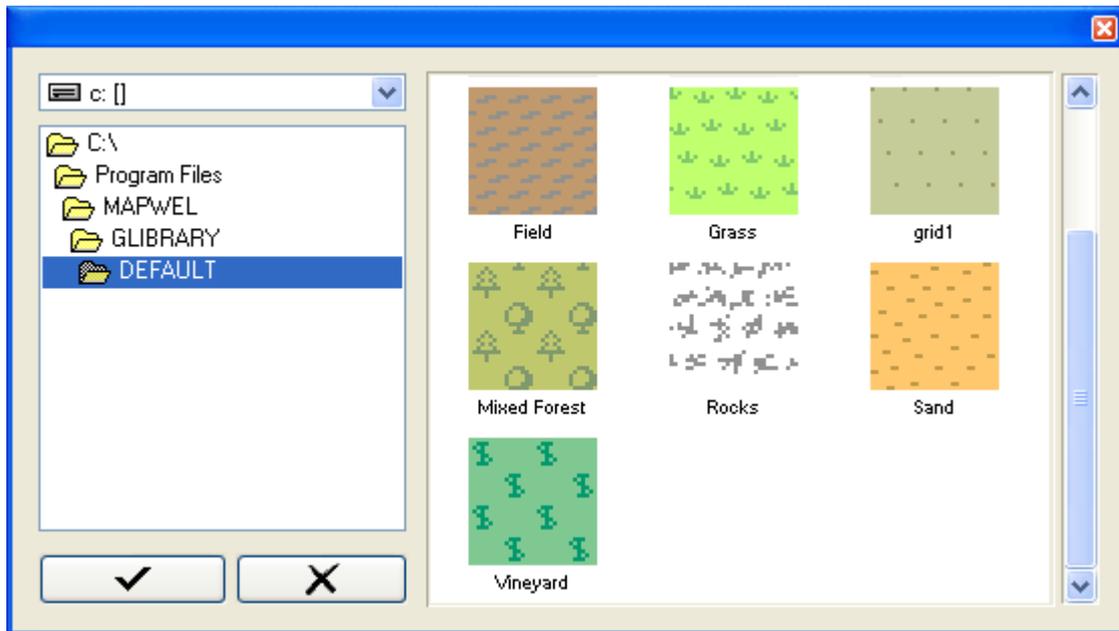
Warning: if you create map for loading into several types of GPS units, make sure that all of them support user defined styles, before actual creation of the map!

Assign different **Map Set Data** ([main menu > File > Properties > ID tab](#)) to all your maps if they contain user defined styles. This ensures displaying of map with correct colors in the GPS. GPS uses the same color palette for all maps in a map set. Therefore, maps with different palettes are not displayed correctly if they have the same **Map Set Data**



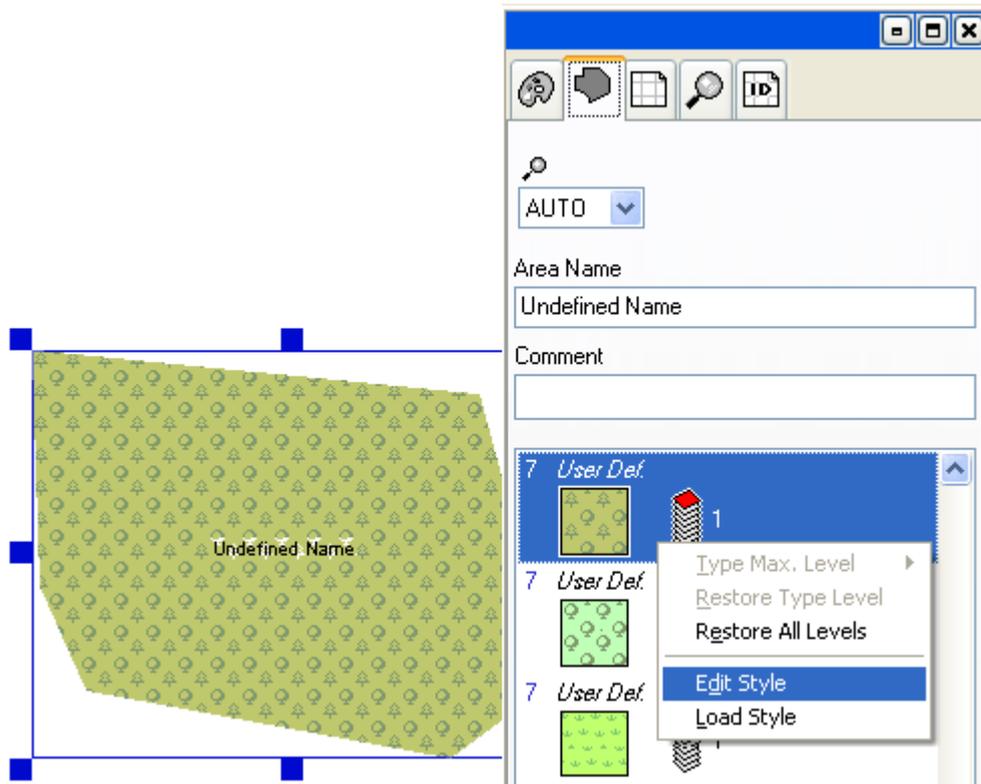
User defined styles for filled area, line and point of interest.

It is also possible to save respective new styles as a separate files to disk, for future use in other maps, or to export styles in *.txt format to use with other mapping software.



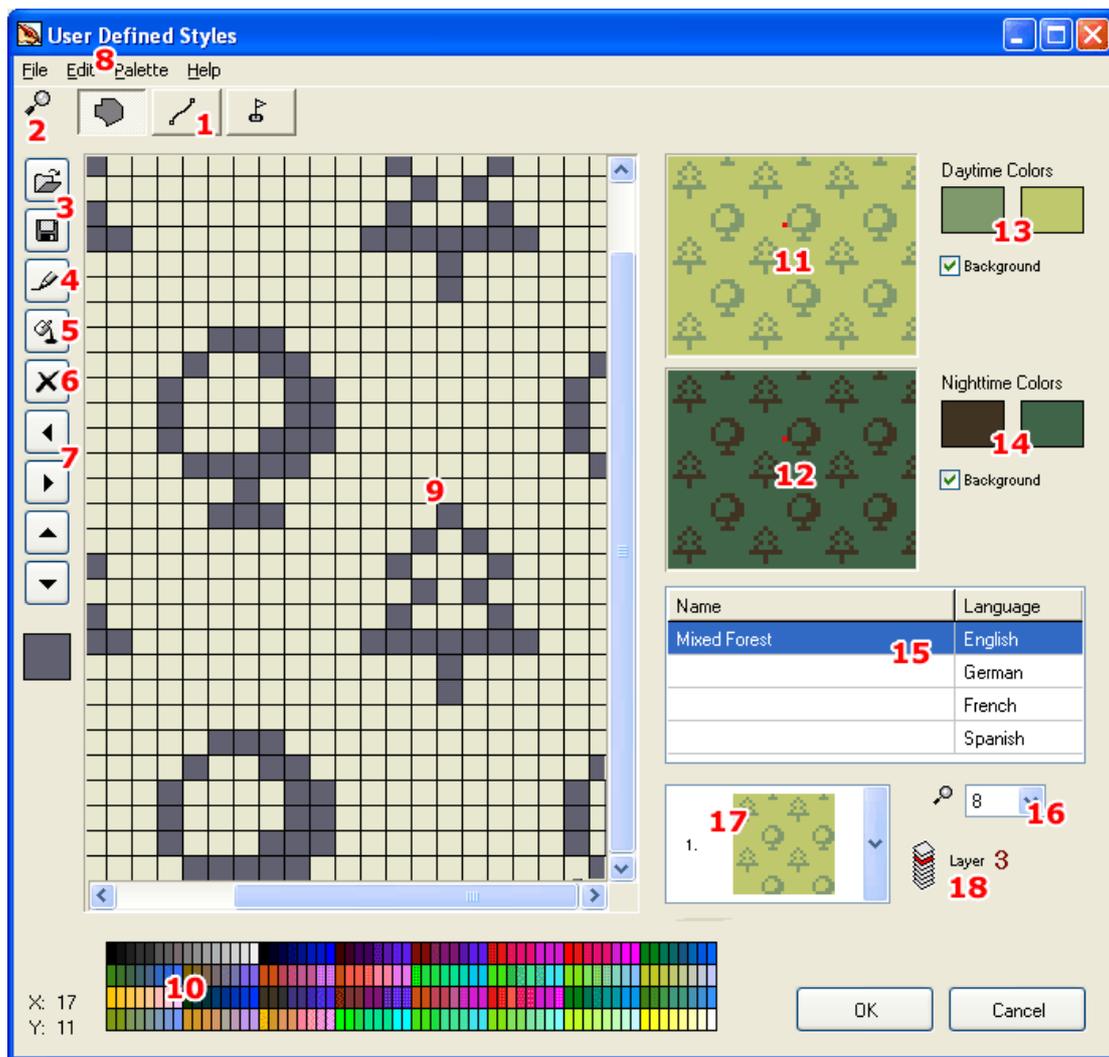
Library of predefined styles.

Editor of user styles can be accessed with Mapwel main menu > Objects > User Defined Styles, or with pop-up menu in the [Properties window](#)



Filled Areas

Editor of user styles contains separate tabs (1) for editing of areas, lines and points. User defined areas are bitmaps of 32x32 pixels size. Only 2 colors (foreground and background) per pixel are allowed. User can define one pair of colors for GPS daytime mode (13) and another pair for the nighttime mode (14). Use of the background colors is optional. If they are not used, the area will be transparent. It is possible to define name of the style (displayed by some GPS units) in up to 4 languages. Use table (15) to type-in the name of the style. use right mouse button click on the Language column to choose from available languages.



Zoom level (16) control allows to define maximum zoom level at which the object using this style will be visible in the GPS.

Layer specifies order in which object will drawn by the GPS. By assignment of proper layers user can define which object will be drawn on top of the other objects.

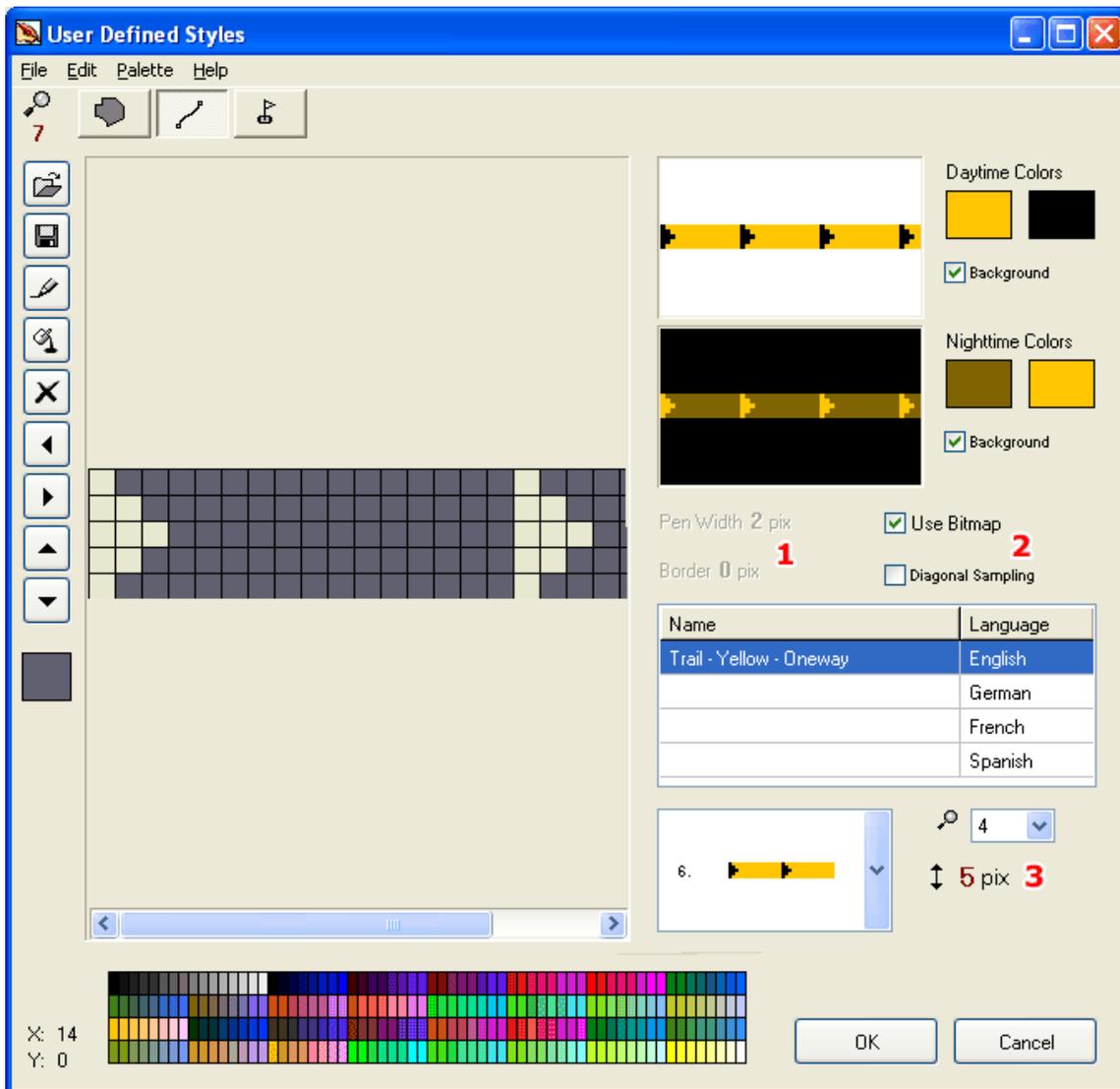
Please see below table for description of the rest of the controls.

- 1 Tabs with editors for areas, lines and points.
- 2 Editor zoom control. It is also possible to use mouse wheel to zoom the work area in and out.
- 3 Open and Save buttons. Use these buttons (or menu>File) to open or save styles from/to library.
- 4 Pencil tool.
- 5 Paint Bucket tool.
- 6 Clear style button.
- 7 Scroll buttons.
- 8 Menu.
- 9 Work area.

- 10 Color palette. Some GPS units (GPSmap 60CSx, for example) use fixed 256-colors palette. Use default colors from this palette to ensure that your styles will look the same on the PC and GPS. Use left and right mouse button click to copy color from palette to Day colors controls. Use SHIFT, CTRL or ALT + left and right mouse button click to copy color from palette to Night colors controls.
- 11 Style preview in daytime colors.
- 12 Style preview in nighttime colors.
- 13 Daytime foreground and background colors. If Background check box is unchecked, the area will be transparent.
- 14 Nighttime foreground and background colors. If Background check box is unchecked, the area will be transparent.
- 15 Table with optional style names in various languages.
- 16 Maximum zoom level for the style.
- 17 Combo box with available user defined styles.
- 18 Layer (see above). Use left and right mouse button click on the number to increase/decrease the value. Click on the caption to use other ways of inserting the value.

Lines

Lines editor is available on the second tab. Line styles are defined as either the bitmap of 32 pixels width and variable height, or line with set pen and border width. In both cases, line uses only two colors, which can be defined separately for the daytime and nighttime modes.



Please see below table for description of the rest of the controls.

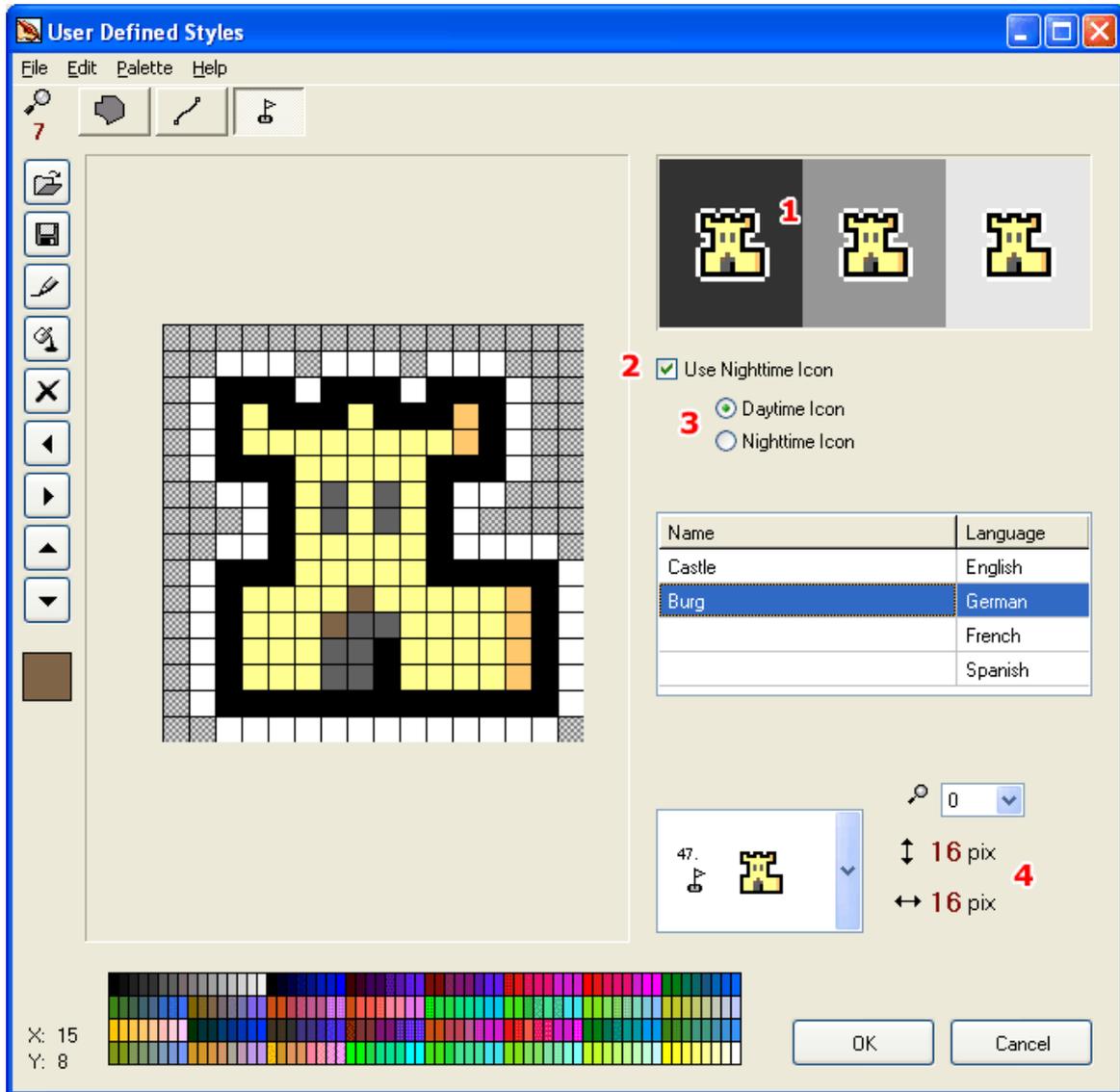
- 1 Pen and Border width for lines that are not defined by bitmap.
Use Bitmap control for switching on/off the bitmap mode. When displayed on the GPS, bitmap is rendered with either horizontal or vertical sampling (according to angle of the line), unless the Diagonal Sampling is enabled. In such case, rendering uses also the diagonal sampling, but it does not look good for all bitmaps.
- 2
- 3 Height of the bitmap. Use left and right mouse button click on the number to increase/decrease the value. Click on the icon to use other ways of inserting the value.

Points

Unlike areas and lines that use only 2 color bitmaps, point styles use multicolored icons with optional transparent background. Point icons are of variable size (up to 24x24 pixels), with up to 255 colors. Use left mouse button when drawing the icon to fill pixels with color chosen from the palette. Use right mouse button to erase pixels (transparent background). See next chapter (Menu) for useful command that help with drawing of the icons.

Please note: Left mouse click on the palette selects the drawing color. Right click opens the color mixer that

allows to define a new color. However, some GPS units (GPSmap 60CSx, for example) use fixed 256-colors palette and they are not capable of displaying more colors. In such case, all colors are mapped to the default palette.



Please see below table for description of the rest of the controls.

- 1 Preview of icon on various backgrounds.
- 2 Control to enable/disable nighttime icon.
- 3 Controls to switch between editing of daytime and nighttime icon.
- 4 Width and Height of the bitmap. Use left and right mouse button click on the number to increase/decrease the value. Click on the icon to use other ways of inserting the value.

Menu

Menu > Edit contains some useful commands that make creation of the styles easier:

Derive Night Colors from the Day Colors command generates automatic night colors for edited area or line style.

Replace Colors with Closest Matching Colors in the Palette command replaces all colors in edited style with the most similar colors from the palette.

Add Border command creates thin border of selected color around the point icon (see above castle icon example).

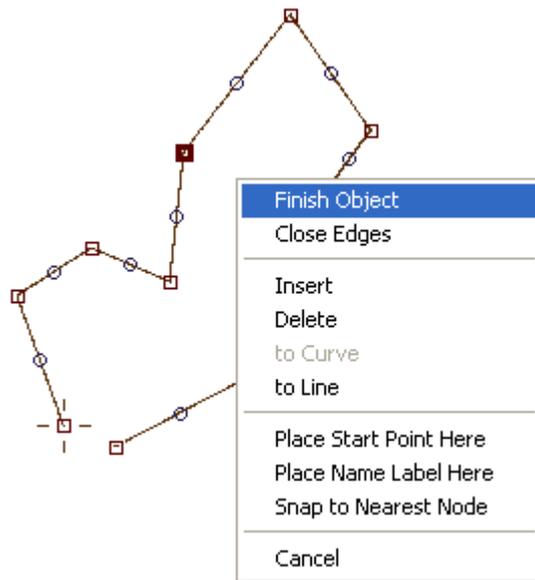
Copy Daytime Icon to Nighttime Icon and Copy Nighttime Icon to Daytime Icon commands create copy of the respective icon.

Create Nighttime Icon from Daytime Icon command generates the nighttime icon, which is a darker copy of the daytime icon.

Use menu>File>Save Whole Set and menu>File>Open Whole Set commands to copy all styles from one map to another if you want them to use the same set of styles.

Edit Mode Pop-Up Menu

Click right mouse button in creation/edit mode on the work area to access this pop-up menu.



Finish Object ends the creation/edit mode. If object is Area, program automatically closes the object.

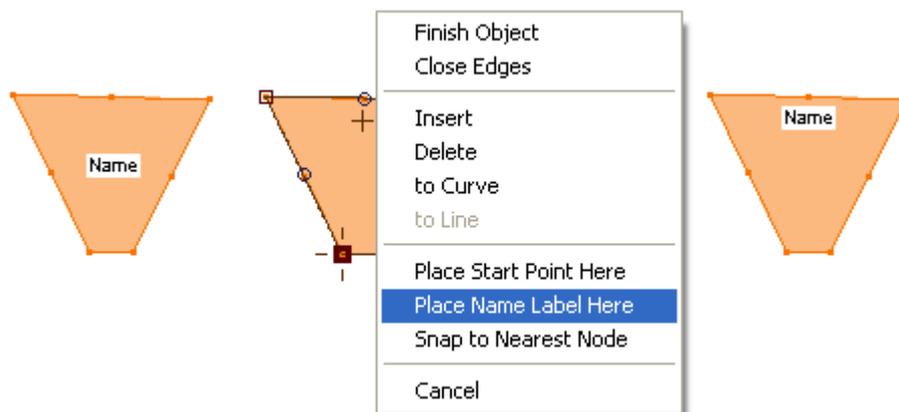
Close Edges closes the object. Use it for land and depth contour lines to ensure that line is closed.

Split Object. This command is available only for Line objects. Select square node (end of curve or straight line element) and use this command to split the object.

Insert, **Delete**, **to Curve** and **to Line** commands are available only if rectangular node is selected (end of curve or straight line element). **Insert** creates a new element before the selected element. **Delete** erases selected element. **To Curve** converts selected straight line element into curve. **To Line** converts selected curve element to straight line.

Use **Place Start Point Here** command to change beginning of the object. This command is available only if rectangular node is selected (end of curve or straight line element).

Mapwel automatically places the name label of Area object. If you want to assign position of label manually, use the **Place Name Label Here** command. The label center is positioned on a place where the mouse cursor was before you invoke this pop-up menu (small cross on the below picture). Note: Label position is valid only in the Mapwel. It is not transferred into the GPS. GPS decides where to display name labels by itself.



Snap to Nearest Node moves selected node to nearest node which belongs to other object (not to currently edited object).

Preferences

The Preferences window is accessible through main menu under **Edit / Preferences**. The map and data transfer settings as well as the work area and grid settings can be changed in this window. Choosing **Save and Apply** means these parameters will be loaded automatically for each new map.

Edit Mode Colors allow user to define colors of edges and nodes used in edit mode.

If **Max. Contrast** is checked, edge and node colors are darkened or brightened according to the edited object background. **Max. Contrast** can make edited objects more visible.

Note: the **Grid Color** can be set also in **Image/Adjust** individually for current design. It is saved with file and it overrides the default grid color from Preferences.

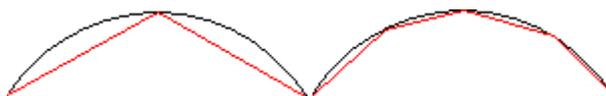
Map Export parameters:

If map is **Transparent**, it is uploaded into the GPS without the background area and it overlays the GPS base map or other maps located on the same position, letting the underneath maps show through. Use this setting if you want to add details to an existing map in the GPS.

Please note: many line objects are displayed in a different way if the map is transparent. Use the **display mode Tabs**

to check the look of your map after setting it to transparent mode. Mapwel does not show underneath maps, because they are in GPS, not in Mapwel.

Precision / Data Size. If map is drawn with use of curves, this control allows user to set to how many lines the curves are converted when map is uploaded into GPS (as the GPS accepts only the lines). Mapwel provides curves for easier drawing of map and for precision control. Once the map is drawn in curves, user can adjust the size of data according to available memory in GPS.



Characters Encoding. This option allows to display special characters (like chinese, slavic ...) on the GPS by setting an appropriate characters codepage to the map. Technical note: only ANSI characters which codes fit into single byte are supported. Unicode is not supported.

Transfer Speed. Use this control to set speed of the map upload. If you encounter problems with loading maps into GPS, decrease the transfer speed. This parameter affects only the serial data transfer. Speed of USB data transfer is set automatically.

Trace Tool

Trace Tool lets you create vector objects from raster images. This process is almost (though not entirely) automatic. Trace tool allows to vectorize one object (or set of similar objects) at once, but it cannot vectorize whole map with different types of objects at once. Tracing should be repeated for respective types of objects (filled areas, roads, rivers, etc.). Trace tools works on images with any common color depth (including True Color and bi-tone) that are sufficiently clean.

Raster image should be imported into work area with use of [main menu>Image>Import](#) command.

Vectorization involves several steps (please see animated Fig.1):

1. Activation of the trace tool, choosing of the proper trace style (see Fig.2).
2. Setting of magic wand tolerance, selection options and vector object properties.
3. Selection of respective object or multiple objects on raster image with magic wand.
4. Setting of vector objects parameters (type of line, zoom level, etc.)
5. Conversion of selected raster objects into vector objects.



Fig. 1. Animation - Use of the Trace Tool

Before you start using the Trace tool, you should choose the style you want to use. Click with right mouse button on the Trace tool icon (in the [Tool Bar](#)). Panel with trace styles will appear (picture below). This panel can be invoked also by holding the left mouse button depressed about 1 second on the Trace tool icon.

Each style is represented by its icon. Hover the cursor over the icon to display the style name. Select desired style to activate the tool. Mapwel will switch to creation/editing mode.



Fig. 2. Trace Tool styles (styles 4-6 are not available in the current version of Mapwel).

Trace Styles

1	Area
2	Line/Road
3	Routable Road
4	Marine Area *
5	Marine Line *

* Styles available only in the Mapwel versions that support marine charts.

Trace Controls

Use these controls to adjust:

- Parameters of vector objects
- Magic wand sensitivity (tolerance)

- Selection operations for selecting multiple objects



Color box - define color of vector objects. "Auto Color" must be unchecked.

Tolerance **25**

Auto Color - color of vector objects will be taken from raster image.

Simplicity **7**

Simplicity - varies in range 0..10. 0 means precise vector objects with high number of elements. 10 means low precision and low number of elements.



Edge Type combo box - select curve (polycurve) or straight lines (polyline) type of vector objects

Ignore Openings

Ignore Openings - valid only for filled areas. Holes in vectorized areas are ignored, only the outer shape is vectorized.

Selection

- New
- Add
- Add Similar
- Subtract
- Intersect

Selection - various operations for selection of multiple or complex objects. Use "Add Similar" if you want to select non-contiguous objects of similar color at once.

Background Image Filters

Background filters affect the way the background (imported image) is displayed behind the drawn vector objects. Characteristics such as **Brightness**, **Contrast**, **Gamma** and colors **Saturation** can be adjusted, as well as the grid color.

In contrast to graphics programs where the main meaning of filters is to enhance the look of an image, filters in Mapwel are intended for dimming, darkening, brightening or other adjustment of image so that its colors do not interfere with objects drawn on top of the background image. All these parameters are saved with map into a single MPW file.

The **grid color** in this window does not affect the default grid color in [Preferences](#) that is used when starting a new map.

Gamma

parameter changes brightness mostly of dark colors and it does not affect absolute black and white. All above settings do not affect the map appearance in the GPS. They serve to make map drawing more comfortable.

Shortcut Keys

3	Place beginning of object to end of previous object
e	Add new line part to edge
d	Add new curve part to edge
space	Finish object creation/editing, if possible
esc	Cancel object creation/editing
arrow keys	Scrolls Work Area

arrow keys +ALT	Moves selected objects in transform mode and selected node in edit/create mode.
-	Zoom out
+	Zoom in
Page Up	Zoom out
Page Down	Zoom in
SHIFT+ Page Up	To Front (order of objects)
SHIFT+ Page Down	To Back (order of objects)
CTRL	When depressed, forces new lines and curves to precise horizontal, vertical or diagonal direction in edit/create mode. If used with Shapes, creates precise circle instead of ellipse and square instead of rectangle.
CTRL+1	Zoom to selected object(s)
CTRL+2	Zoom to selected object(s) and start nodes editing mode.
CTRL+A	Select all objects (in transformations mode)
Shift+CTRL+A	Deselect (in transformations mode)
CTRL+C	Copy selected objects into clipboard
CTRL+D	Duplicates selected objects
CTRL+E	Edit selected object. If more objects are selected, the first of them is edited.
CTRL+I	Import image
CTRL+N	New document (map)
CTRL+S	Save file
CTRL+V	Paste objects from clipboard
CTRL+Y	Redo
CTRL+Z	Undo
Delete	Deletes selected objects (in transformations mode). Deletes an element that ends with selected square (in edit/create mode).
INSERT	Inserts a new element before selected square node in edit/create mode.
CTRL+ALT+B	Background Filters (Image brightness and colors)
CTRL+ALT+I	Display Edit Image window
ALT + mouse cursor move	Pan work area without having to switch tools. Cursor must move near edges of the work area.
ALT+A	Hide / Show Map Features objects
ALT+D	Hide / Show grid

ALT+E	Hide / Show Exit objects
ALT+F	Hide / Show Area objects
ALT+G	Hide / Show guide lines
ALT+I	Hide / Show City objects
ALT+O	Hide / Show Line objects
ALT+P	Hide / Show Points of Interest
ALT+R	Hide / Show rulers
ALT+T	Hide / Show button bar
ALT+Z	Hide / Show zoom window

Double click on Work Area The new object is started immediately without need to select any tool. The new object is of the same type as the last object.

CTRL+F1	Align beginning of object to end of previous object (in editing mode)
CTRL+F2	Align end of object to beginning of next object (in editing mode)
CTRL+F3	Align beginning of Line object to beginning of previous Line object (in editing mode)

CTRL+F5	* Set/Clear selected node(s) attribute "Intersection"
CTRL+F6	* Set/Clear selected node(s) attribute "Border node"
CTRL+F7	* Set/Clear selected node(s) attribute "No left turn"
CTRL+F8	* Set/Clear selected node(s) attribute "No right turn"
CTRL+F9	* Set/Clear selected node(s) attribute "No U turn"
CTRL+SHIFT+F7	* Set/Clear selected node(s) attribute "No left turn (opposite direction)"
CTRL+SHIFT+F8	* Set/Clear selected node(s) attribute "No right turn (opposite direction)"
CTRL+SHIFT+F8	* Set/Clear selected node(s) attribute "No U turn (opposite direction)"
CTRL+SHIFT+F10	* Clear all restrictions of selected node(s)

CTRL+ALT+O Create Line from Area

TAB When creating new object, TAB key can be used to quick adjustment of the curve elements. Create new curve element with TAB key instead of left mouse button. Then move the mouse with TAB key depressed to adjust the curve. Then release the TAB key.
Please note: to use the TAB key for curves adjustment, the edge mode must be

set to 'curve'. 

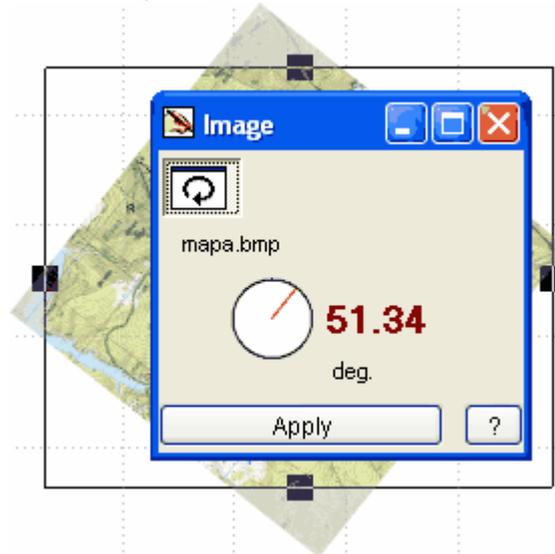
x Works like right mouse button. It is intended for use with tablet.

* applies to routable roads only.

Edit Image Window

[Click here for more image editing and calibration tools.](#)

The **Edit Image Window** is accessible through main menu under Image / Edit Image Window. While Edit Image window is visible, four small rectangles appear in the work area to allow user to crop the image.



Rotate image first. Usually, the scanned image is not perfectly horizontal or vertical. Press left or right mouse button on the red angle parameter or click the rotate icon to adjust the angle. Second step is setting of crop lines. Press left mouse button on any of four small rectangles and drag them to a new position. Area outside of selection will be cropped.

Please note: to rotate or crop image precisely, use main menu / Image / [Rotate to Vertical](#), [Rotate to Horizontal](#) and [Crop](#) tools. After above steps, click **Apply** to perform changes.

Guide Lines

Guide Lines are horizontal, vertical, or slanted lines that can be placed anywhere in the work area window to aid in object placement and nodes alignment.

To create a new guide line, position cursor on either vertical or horizontal ruler, depress the left mouse button and drag cursor to the work area.

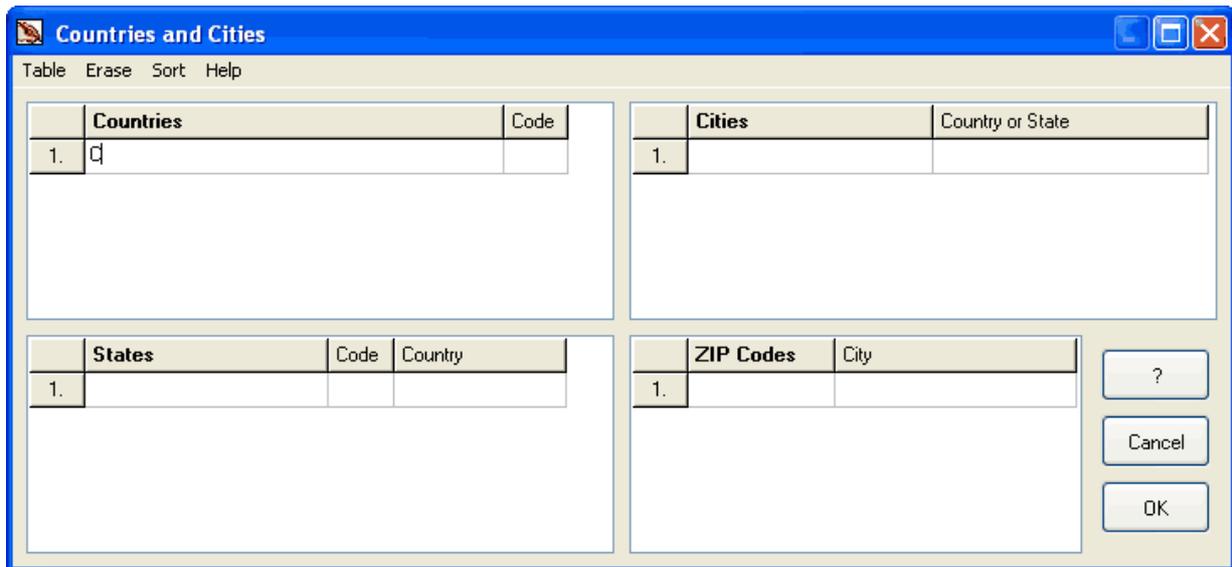
Animated image

Guide lines can be used for areas and lines splitting. Place the guide line on the object. Select object and then select the guide line. Click right mouse button on the guide line to access pop-up menu. Choose **Slice Selected Objects** command.

Use [main menu > Edit](#) to lock or erase guide lines or to switch on/off snapping of objects to the guide lines. Use [main menu > Nodes](#) to switch on/off snapping of nodes to the guide lines.

Countries and Cities Table

Access this table either via [main menu > File](#) or click Countries and Cities button in the [Properties window](#).



Countries and Cities Table is used for City and POI (point of interest) objects. If you want to use [City objects](#) in your map, you should fill this table first. City objects with undefined name are not transferred into the GPS.

If you use [POI objects](#) in your map, you need to fill this table only if you want to use country, state, city or zip code fields in the POI address. Any field in the POI address can be left empty.

To fill Countries and Cities Table follow these steps:

1. Enter countries and their codes (codes are optional) into the first table. To add new a line, press the F2 key on your keyboard. To delete last line in the table, hit F3 key on your keyboard.
2. If Country has states, enter states and their codes (codes are optional).
3. Assign respective country to each state. Click right mouse button on the 3rd column in the States table to access pop-up menu with countries list.
4. Enter cities.
5. Assign respective country or state to cities. Click right mouse button on the 2nd column in the Cities table to access pop-up menu with countries and states list. Countries are marked with a blue square and States are marked with a red square.
6. Enter ZIP codes
7. Assign respective city to ZIP codes. Click right mouse button on the 2nd column in the ZIP Codes table to access pop-up menu with cities list.

Main menu in this window contains following commands:

Table. Use it to save and open Countries and Cities Table. If several maps use the same table, you can save the table and open it in another map.

Import command allows to load countries, states, cities or zip codes from separate text (*.TXT) files. TXT file must have following format:

```
Item1/Code1
Item2/Code2
Item3/Code3
...
```

"/Code" section optional and it is valid only for countries and states (for example: Great Britain/GB). TXT files with cities and zip codes should not have "/Code" section.

Edit. Use it to add or delete last line in the table.

Erase. Use it to erase tables in this window.

Sort. Use it to sort tables in this window alphabetically. If there are objects in the map which are already using Countries and Cities table, they are automatically adjusted.

Valid characters

Country, State, City - letters and - & ' /

Country and State Code - letters

Zip Code - letters and digits

Objects

Object Types

Area Object

Use Area Tool  to create an area object. The edge of the area object is composed of straight lines and curves. Small rectangles are end points of lines and curves. Small circles are middle points of curves. The cross at the left side is beginning of the edge.

Area object can contain openings. Opening objects must be created with Opening Tool  and they must follow after the main Area object.



User can adjust properties of area object, like name, comment, zoom level and type.

Click with right mouse button on the object type to set individual zoom level for object and/or [edit user defined object style](#)

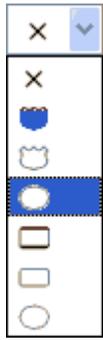
Areas are drawn in order determined by 'layer'. For example, 'Park' type objects are drawn in layer 6, which means that they are drawn behind areas in layers 1..5 and on top of areas in layers 7 and 8. Therefore, some area types are displayed in the background, even if they were created on top of other areas. To make such areas visible, you have to create openings in objects that are displayed in front of them. 'Layer' is adjustable for [user defined styles](#).



The green object is the area that is displayed behind others (park, in this example). We need to make an opening in the surrounding land to make park visible (it shows through the opening). Notice that the two areas overlap. This is very important, because GPS could display tiny gap between the two areas, otherwise.

Line Object

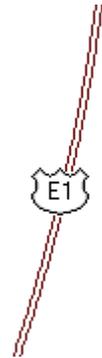
Use Line Tool  to create a line object. The edge of the line object is composed of straight lines and curves. Small rectangles are end points of straight lines and curves. Small circles are middle points of curves. The cross at the left side is beginning of the edge.



Depending on the type, Line object can have:

- Normal name label with optional comment.
- Altitude or depth label.
- Road label and any of the 6 road signs. Select the proper road sign in the **Sign** combo box in [Properties](#) window.

Use the [Line Tab](#) in Properties window to measure length of line objects.



Symbols

These objects display on the map mostly as an icon with name. If cursor is placed on top of the icon (in GPS or in 'Grey scale' and 'Color' tabs in Mapwel), the optional comment is displayed as a hint.



Point of Interest. This object can be assigned with address (house number, street, phone number, city, zip code, state and country). If city, zip code, state and country are used, they must be chosen from the already filled-in [Countries and Cities](#) table. Address is displayed in the GPS when you click on the POI icon.



City. The city name must be chosen from the already filled-in **Countries and Cities** table. City cannot have comment.



Map Feature.

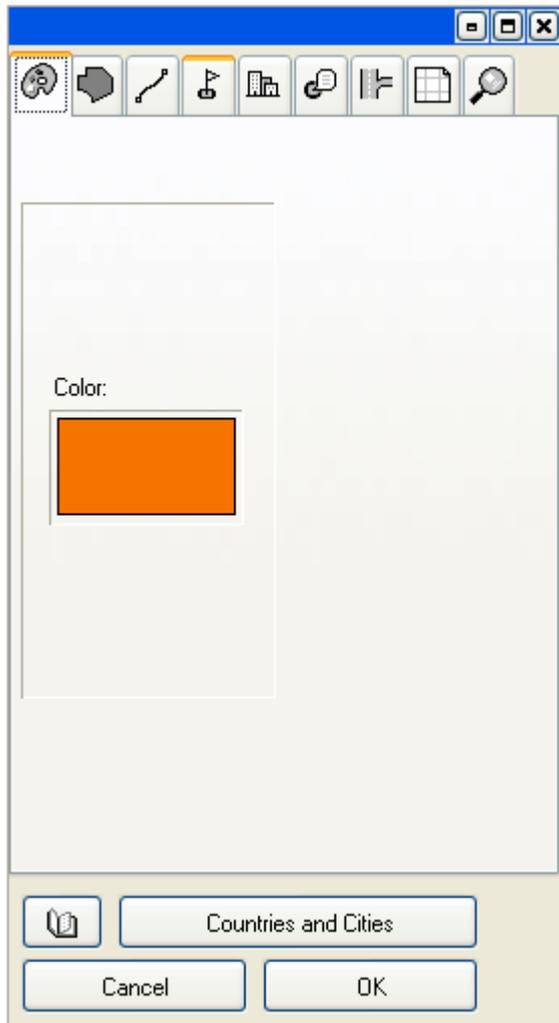


Exit.

Properties of Objects

To change parameters of several objects at once, select objects, click right mouse button and select 'Properties' command from the pop-up menu. Properties are organized in several tabs, according to type of objects.

-  [Color Tab](#)
-  [Area Tab](#)
-  [Line Tab](#)
-  [Routable Road Tab](#)
-  [Map Feature Tab](#)
-  [City Tab](#)
-  [Point of Interest \(POI\) Tab](#)
-  [Exit Tab](#)
-  [Map Tab](#)
-  [Map Zoom Levels Tab](#)
-  [Map ID Tab](#)

 [General Routing Parameters](#)

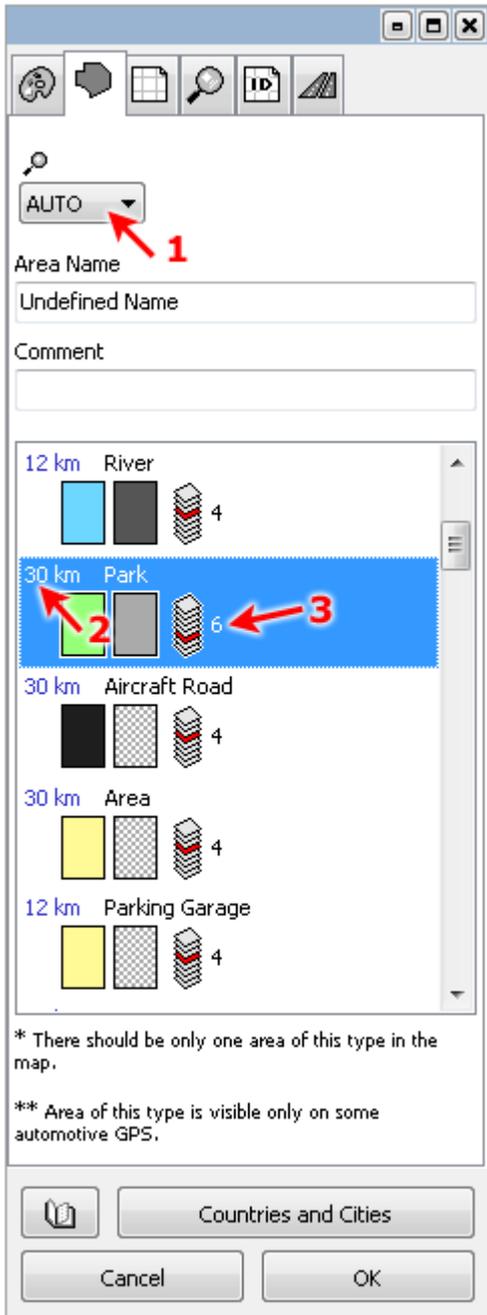
Color Tab

This tab is common for Areas and Lines. Symbols (Map Features, Cities, POIs and Exits) do not have color property.

Use the color control to assign work color to the object. Work colors are used only in the Normal and Vector display mode. When transferred to the GPS, the work color information is discarded. GPS uses its own colors according to type of object (see Area and Line tabs).

Work color can help you when you draw large and complicated map. For example, you can assign different colors to land contours according to their altitude.

If you want to define custom colors and patterns that are transferred to GPS with map, please use editor of user-defined styles ([main menu > Objects > User Defined Styles](#)).



Area Tab

These parameters are applicable only to Area objects. All these settings are uploaded with map into the GPS. Control marked with arrow 1 is Individual Zoom Level of selected object(s). If set to AUTO, the global zoom level of respective area type is used (in this case, zoom level of 'Park' type). Zoom Level defines maximum zoom in which the object is displayed in GPS.

Name is the text that is displayed on the area in the GPS.

Comment is text that is displayed when you place cursor on top of the area.

The list at the bottom contains available area types. Always assign the proper type to the area object, because the area type defines how the object is displayed in the GPS. Each row in the list contains type name, color sample and gray scale sample of the area.

Color sample shows the area color and pattern if loaded into GPS with color display. Grey scale sample shows the area color and pattern if loaded into GPS with monochrome display.

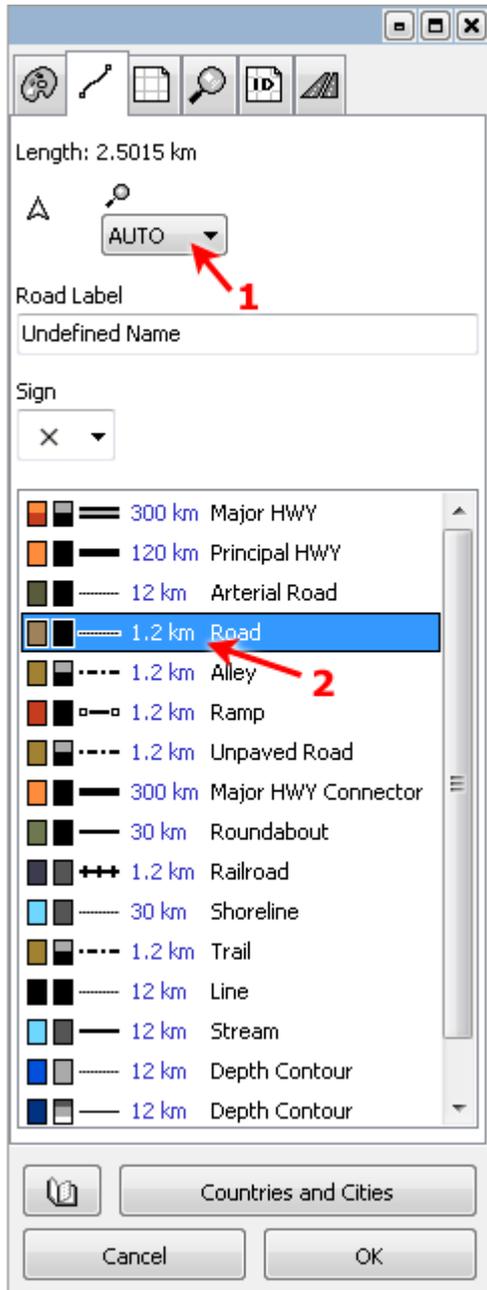
Arrow 2 marks Global Zoom Level of areas of 'Park' type. The global zoom level is used for each object of the same type, unless the object has set an individual zoom level. To set global zoom level for any area type, click right mouse button on the area type and use the pop-up menu that appears.

The icon marked with arrow 3 indicates layer in which the object of respective type is displayed. By proper assignment of layers to the types you can achieve one type of area objects to be displayed on top of (or under) the other types.

Objects in layers with higher index are displayed behind areas with lower layer index, regardless of their creation order (the 'Park', for example). To make such area visible, you have to make openings to all areas that cover this area.



In this example, an opening was made to the yellow area to allow the green area show through.



Line Tab with road Line object

Line Tab

These parameters are applicable only to Line objects. All these settings are uploaded with map into the GPS. Please note: objects of this type are not routable, even if they are roads. You have to use Routable Roads objects if you want to use routing in GPS.

When accessed through pop-up menu / Properties (i.e. not through editing mode), the total length of all selected line objects is displayed in this tab. You can use it to measure imported tracks, for example. To change distance units use the [Edit > Preferences](#) window.

Control marked with arrow 1 is Individual Zoom Level of selected object(s). If set to AUTO, the global zoom level of respective line type is used (in this case, zoom level of 'Road' type). Zoom Level defines maximum zoom in which the object is displayed in GPS.



Setting of this check box defines whether to display the direction indicator after the line name or not.

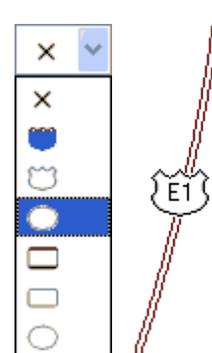
Depending on the type, Line object can have:

- Road label and any of the available 6 road signs (roads).
- Normal name label with optional comment.
- Altitude or depth label (land and depth contours).

Name is the text that is displayed next to the line or over the line in the GPS. Comment is text that is displayed when you place cursor on top of the line.

Altitude or Depth label can contain only digits. You can choose the elevation and depth units in the [Edit > Preferences](#) window.

Road label can contain both letters and digits.

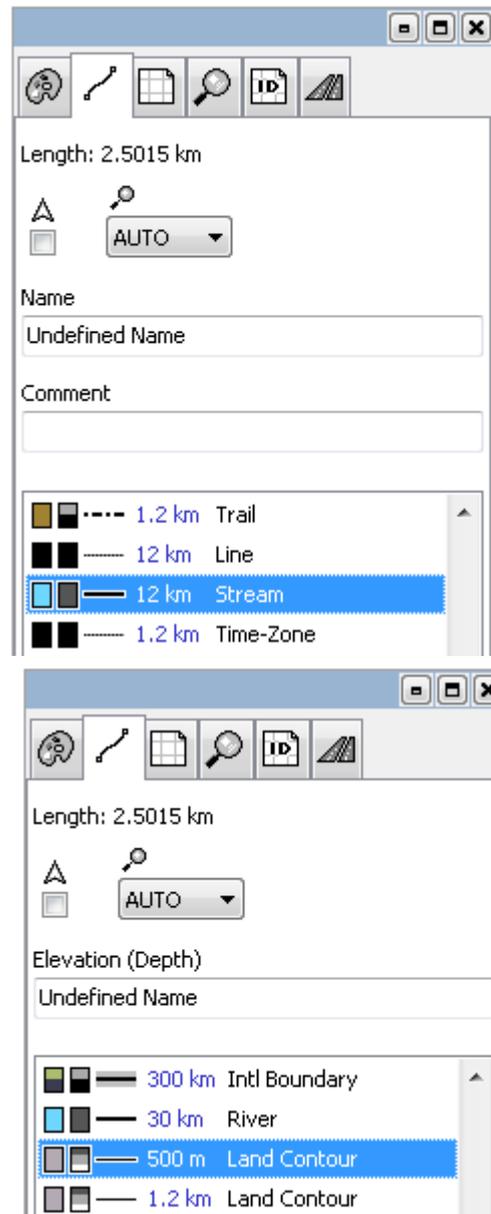


The list at the bottom contains available line types. Always assign the proper type to the line object, because the line type defines how the object is displayed in the GPS. Each row in the list contains color icon and gray scale icon, line style and the type name. Icons show the color (or several

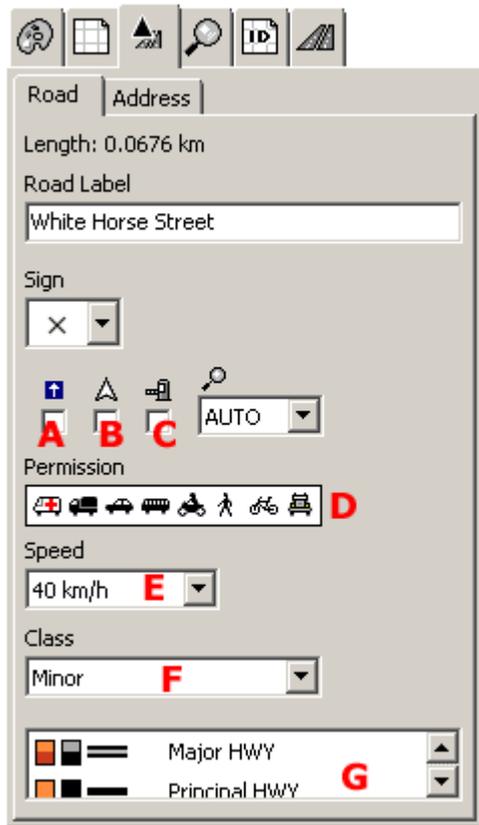
colors) used for displaying of this line type in the color and monochrome GPS.

Arrow 2 marks Global Zoom Level of lines of 'Road' type. The global zoom level is used for each object of the same type. unless the object has set an individual zoom level.

To set global zoom level for any line type, click right mouse button on the line type and use the pop-up menu that appears.



Left: line tab with normal Line object. Right: line tab with elevation (depth) Line object



Routable Road Tab

Polylines of this type allow to create routable map with voice turn-by-turn navigation. Besides below mentioned parameters it is possible to define house numbers along the road. [Click here to find out more>>](#)

A - "oneway" road attribute

B - "show direction" attribute - direction is added to the text label of road when displayed on the GPS

C - "toll road" attribute - toll or fee must be paid to access the road

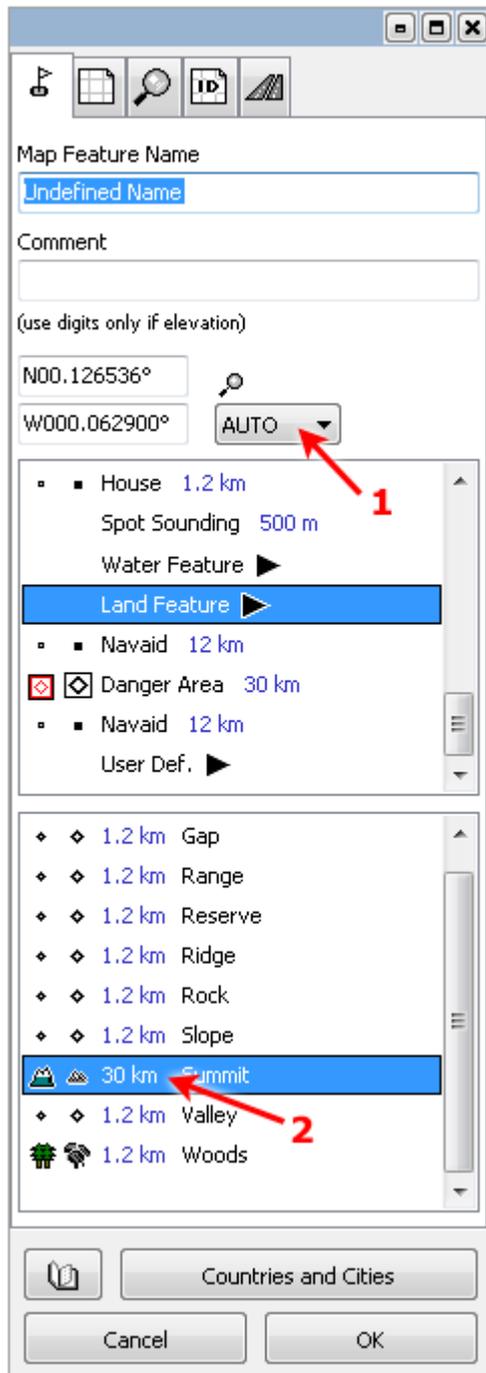
D - access permission - from left to right: 1. emergency vehicles, 2. delivery vehicles (up to 3.5 tonnes), 3. cars, 4. public service vehicles (bus, taxi), 5. motorcycles, 6. pedestrians, 7. bicycles, 8. trucks, lorries (over 3.5 tonnes)

E - max. speed

F - road class. Max. speed and road class define the road hierarchy important for the optimum navigation.

G - type of polyline - defines how the road is rendered on the GPS screen.

There are two special road types: Roundabout and Ramp for which GPS generates a special navigation instructions. Mapwel identifies these road types automatically when importing map from [OSM file](#). It is also possible to convert road to any of these types manually with use of the Properties window.



Map Feature Tab

These parameters are applicable only to Map Feature objects. All these settings are uploaded with map into the GPS.

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

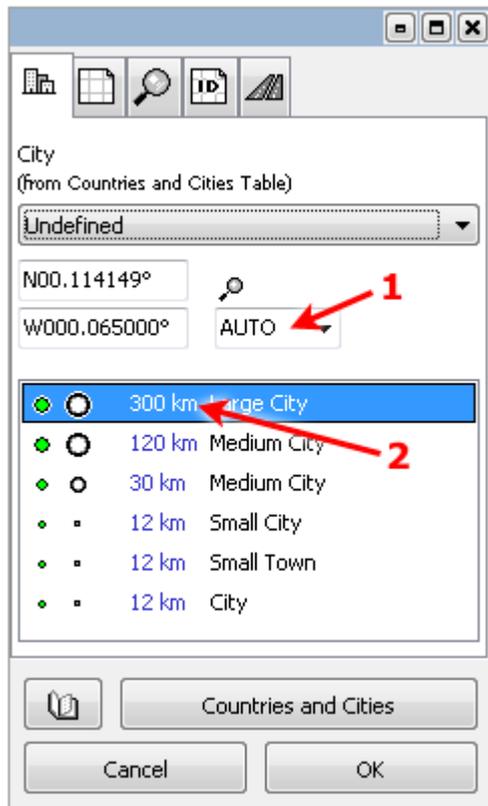
Map Feature Name is the text that is displayed next to the object icon in the GPS.

Comment is text that is displayed when you place cursor on top of the icon.

Coordinate controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

The list in the middle is the Map Feature Class. Some classes have several subclasses that are displayed in the bottom list. Choose the proper Map Feature type using the class and subclass lists.

Icons in the class and subclass lists show how the Map Feature will look like in the color GPS (left icon) and monochrome GPS (right icon).



City Tab

These parameters are applicable only to City objects. All these settings are uploaded with map into the GPS.

City is the text that is displayed next to the object icon in the GPS. User is not allowed to type the city name directly into this box. It is necessary to fill the [Countries and Cities](#) table first (click on the button at the bottom). Then it is possible to choose city from drop-down list in this combo box.

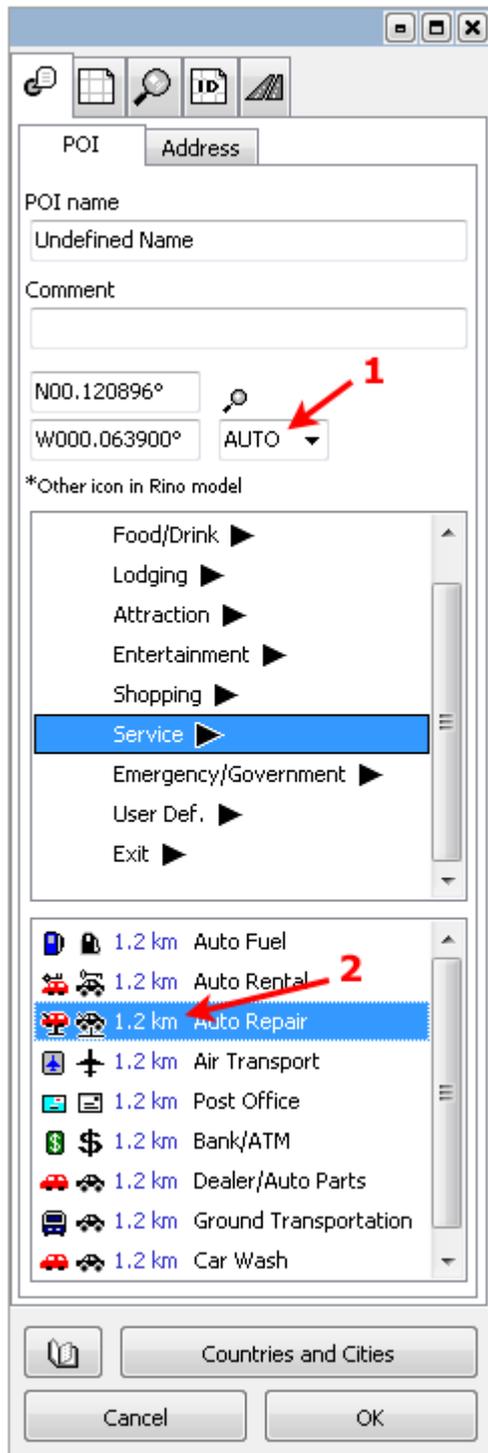
Please note: City objects with undefined name are not uploaded into the GPS.

Coordinate controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

The list in the middle is the City Type.

Icons in the type list show how the City will look like in the color GPS (left icon) and monochrome GPS (right icon).



Point of Interest (POI) Tab

These parameters are applicable only to POI objects. All these settings are uploaded with map into the GPS.

POI Name is the text that is displayed next to the object icon in the GPS.

Comment is text that is displayed when you place cursor on top of the icon.

Coordinate controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#)

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

The list in the middle is the POI Class. Some classes have several subclasses that are displayed in the bottom list. Choose the proper POI type using the class and subclass lists.

Icons in the class and subclass lists show how the POI will look like in the color GPS (left icon) and monochrome GPS (right icon). A few monochrome icons looks different in the Garmin® Rino™ GPS. These icons are marked with *.

The screenshot shows a dialog box with a title bar containing standard window controls. Below the title bar is a toolbar with icons for a speech bubble, a grid, a magnifying glass, a document with 'ID', and a map. The dialog has two tabs: 'POI' and 'Address'. The 'Address' tab is selected. The main area contains the following fields:

- House: A text input field.
- Street: A text input field.
- Phone: A text input field.
- Country: A dropdown menu showing 'Undefined'.
- State: A dropdown menu showing 'Undefined'.
- City: A dropdown menu showing 'Undefined'.
- ZIP Code: A dropdown menu showing 'Undefined'.

At the bottom of the dialog, there is a button with a book icon labeled 'Countries and Cities', and two buttons labeled 'Cancel' and 'OK'.

POI can have addresses assigned. User can fill any of the address boxes or left them empty.

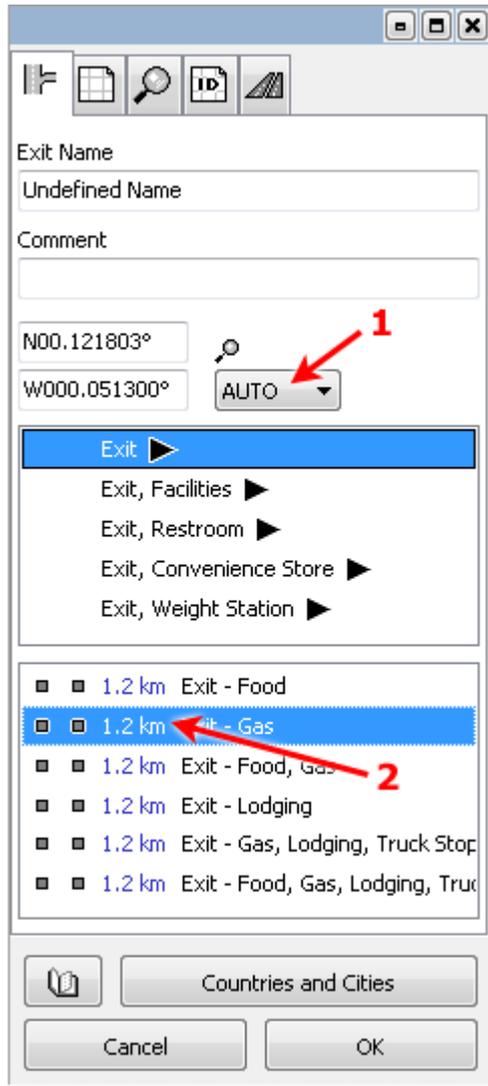
House, Street and Phone data can be typed directly.

Country, State, City and ZIP Code are available from the [Countries and Cities Table](#), which must be filled first (click on the button at the bottom).

Address is displayed in the GPS when you click on the POI icon. The address format can be defined in the Map Tab (see below).

Valid characters:

- House - letters and digits.
- Street - only letters.
- Phone - digits and - sign.



Exit Tab

These parameters are applicable only to Exit objects. All these settings are uploaded with map into the GPS.

Exit Name is the text that is displayed next to the object icon in the GPS.

Comment is text that is displayed when you place cursor on top of the icon.

Coordinate controls allow you to change the object position. To change position format, use the main menu [Edit > Preferences](#).

Meaning of controls marked by arrow 1 and 2 is the same as on the area or line tab.

The list in the middle is the Exit Class. Some classes have several subclasses that are displayed in the bottom list. Choose the proper Exit type using the class and subclass lists.

Icons in the class and subclass lists show how the Exit will look like in the color GPS (left icon) and monochrome GPS (right icon).

Map Name (as shown in GPS)

My Map

Map Coordinates

↓ S36.00001°

↑ S33.99994°

← W060.00011°

→ W056.99999°

Address Format

Map Draw Priority (in GPS)

25

User Defined Styles

Countries and Cities

Cancel OK

Map Tab

These parameters apply for the whole map.

Map Name is the text displayed in GPS as a name of the map

Map Coordinates define the coordinates of bottom (south), top (north), left (west) and right (east) edge of the map. To change coordinates format, use the main menu [Edit > Preferences](#).

Address Format defines mutual position of house, street, city and zip code data fields in the Points of Interest address (see the POI Tab above) as it is displayed in the GPS.

Map Draw Priority affects order in which overlapping maps are displayed on the GPS. Map with higher Draw Priority is drawn on top of the overlapping map with lower Draw Priority, unless the second map is [transparent](#). Transparent maps are always drawn on top of the non-transparent maps, even if they have lower Draw Priority.

User Defined Styles check box allows to switch on/off saving of the user defined styles into the map file when exporting map into IMG file or uploading map to GPS. It does not affect the storage of user styles in source *.MPW file.



Map Zoom Levels Tab

These settings apply for the whole map.

Map uploaded into GPS has several layers (zoom levels). Each zoom level contains different amount of data to speed-up map displaying and to prevent too many objects being displayed in higher zoom. Default settings are intended for detailed custom map of relatively small scale. You do not need to change them (very much) unless you create map of large scale, for example map of the whole continent or world map.

Controls on this tab allow user to define number of zoom levels and approximate zoom by which map layers appear on the GPS display.

The number of objects visible in respective zoom level is displayed at the right side of the check box.

In zoom level 0 all objects are visible. The higher is the zoom level, the lower is the number of visible objects. Use controls in above parameter tabs if you want to make some individual object or all objects of the same type more visible or less visible. When you define zoom level of individual object (POI, for example) zoom level 6 means that object will be coded into all available layers from layer 0 up to layer 6, which is visible at zoom 30km or closer.

Upper layers contain less objects coded with lower accuracy for fast and legible rendering of maps in GPS. GPS does not render all layers at the same time - it chooses the one closest to the current zoom. Each layer is coded with 2 times lower accuracy than below layer.

For detailed maps the most important layer is layer 0, with best possible accuracy 2.54 m. This layer, however, requires lot of memory space because it contains all objects and coordinates are coded with best accuracy.

Most of custom maps can use default zoom levels. In some cases it may be useful to redefine one or two levels to optimize appearing layers as you zoom in because GPS uses slightly more complicate logic to choose which layer is displayed at which zoom. For example, layer 6 does not necessarily appear at zoom 30 km. On some maps it can appear one step above or below 30 km zoom.

Best Possible Accuracy informs you about accuracy available for the current map scope (map coordinates range) when uploaded map to the GPS. Internal data structures of GPS use coordinates grid that limits coordinate accuracy to this value.



Map ID Tab

These settings apply for the whole map.

Each map contains ID number, which should be unique among maps that are present in the single GPS unit at the same time.

Mapwel generates internal map ID automatically from map coordinates and creation time.

This tab allows to define map ID manually and/or set the map ID as a filename for export of map into the IMG and MP format, which can be useful if you want to use map in other software programs.

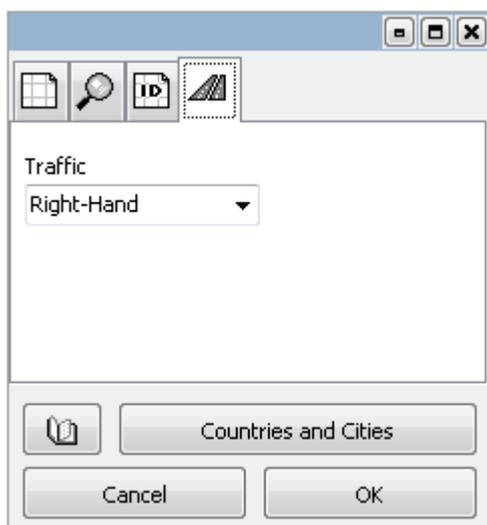
Copyright text is coded in the map file and it is usually displayed during the GPS start-up or in Map Information menu. Each GPS type may display the copyright text in other way.

Map Set Data

allow user to define set to which the map belongs. If two maps belong to different map sets, they are listed as a separate items in the Map Information menu in GPS. This allows user to switch on/off individual map sets in GPS. Sub-region ID does not affect the map set definition. It is reserved for future use.

Map Set Data also affect the way of how [user-defined colors and styles](#) are used by GPS. Maps within the map set share the same user defined styles, i.e. all maps with same Map Set Data are displayed with same colors and patterns. Assign different Map Set Data to all your maps if they contain user defined styles. This ensures displaying of map with correct colors in the GPS.

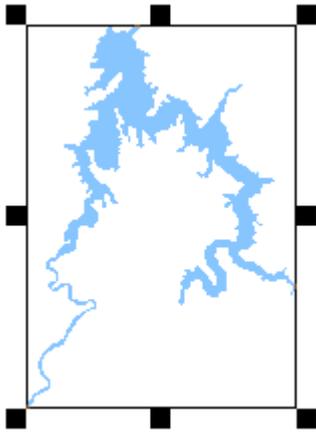
These settings are supposed to be used only by an expert user. If you upload your maps directly into GPS with Mapwel or MapUpload, you do not need to change default values.



General Routing Parameters

Traffic defines the driving side. Setting of this parameter affects coding of U-turn restrictions.

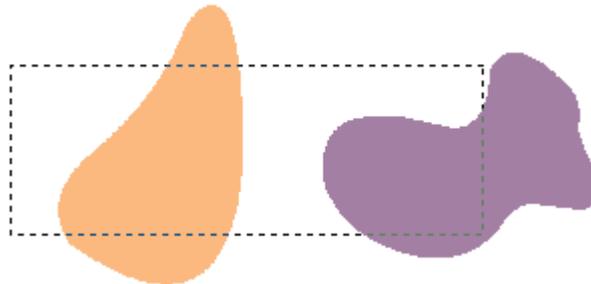
Transformation of Objects



Select object with use of [Transform Tool](#)  and:
To change size proportionally, left click any corner square and drag to desired size.
To change size non-proportionally, left click a middle square and drag to desired size.

There are 2 ways of how to make selection of objects with marquee box:

1. Drag marquee box from left to right to select objects without completely enclosing them with a marquee box



2. Draw marquee box from right to left to select only those objects that lie completely within the marquee box.



Shaping

These commands work on objects selected with the Transform Tool (arrow) or in [Objects Inspector](#).

The [main menu > Transform > Shaping commands](#) allow to modify and combine selected objects with use of the boolean operations.



Two selected objects. Green object has an opening.

Union - this command creates an object or objects that contain all selected objects merged together. Vertices inside of the filled areas are erased. If selected objects do not overlap one another, result of the union are copies of the original objects.



Union of two objects.

Intersection - this command creates an object or several objects that are intersections of the selected objects. If selected objects do not overlap one another, this function does not produce any new object (as intersection does not exist).



Intersection of two objects.

Difference - this command subtracts selected objects from the object that is first in order of creation among the selected objects. It is necessary to arrange order of respective objects in the [object inspector list](#) before use of this function, to assure proper order of objects. Newly created object or objects contain only those areas of the first object that are not covered by the next objects.



Difference of two objects.