

**APPROVED**  
**PARB.00165-04 34 01-AS**

**SOFTWARE PRODUCT**

**GIS WEBSERVER**  
**(GIS WebServer SE)**

**User guide**

**PARB.00165-04 34 01**

65 pages

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**ANNOTATION**

This document contains the operator's manual for using the software GIS WebServer (GIS WebServer SE) PARB.00165-04.

The document is intended for maintenance and operation of the software GIS WebServer (GIS WebServer SE) PARB.00165-04.

<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

## CONTENT

<b>1</b>	<b>Assignment of the program .....</b>	<b>4</b>
<b>2</b>	<b>Conditions of the program execution .....</b>	<b>6</b>
<b>3</b>	<b>Executing the program .....</b>	<b>7</b>
3.1	General information .....	7
3.2	Authorization .....	7
3.3	Management of the map projects .....	8
3.4	Management of the map .....	9
3.4.1	Moving the map image .....	9
3.4.2	Scaling the map .....	9
3.4.3	Composition of the map .....	10
3.4.4	Obtaining information about the map object .....	11
3.4.5	Search by area .....	14
3.4.6	Objects highlighting .....	17
3.4.7	Search by semantics .....	18
3.4.8	Search .....	19
3.4.9	Search by address .....	20
3.4.10	Search by cadastral number .....	20
3.4.11	Address search by coordinates .....	20
3.4.12	Printing the map .....	21
3.4.13	Measuring the distance .....	21
3.4.14	Measuring the area .....	21
3.4.15	Measuring the angles .....	22
3.4.16	Creating the buffer zone .....	22
3.4.17	Shutter of the map .....	23
3.4.18	Parameters .....	24
3.4.19	Moving to the specified point .....	25
3.4.20	Share the link .....	26
3.4.21	Creating the thermal map .....	26
3.4.22	Lists of objects .....	28
3.4.23	Objects of the layer .....	31
3.4.24	Map editor .....	31
3.4.25	Routing and analysis of data from a drone .....	44
3.4.26	Information from the State Real Estate Cadastre .....	45
3.4.27	Thematic mapping .....	45
3.4.28	Clustered data .....	48
3.4.29	Local layers .....	49
3.4.30	3D map .....	52
3.4.31	Aerial view .....	55
3.4.32	Creating the route on the map .....	56
3.4.33	The value of matrices at the point .....	57
3.4.34	Navigating the map .....	57
3.4.35	Calculating on the map .....	58
<b>4</b>	<b>Input and output data .....</b>	<b>62</b>
<b>5</b>	<b>Messages to operator .....</b>	<b>64</b>

Изм.	Лист	№ докум.	Подп.	Дата

## 1 ASSIGNMENT OF THE PROGRAM

GIS WebServer (GIS WebServer SE) PARB.00165-04 is a geoinformation system for building the geoportals for various purposes, implemented on cloud technologies. It automates the publication of changing the spatial data based on web services. It creates new data layers and allows them to be edited. It combines layers from various services and geoportals with the recalculation of the coordinate systems, the choice of the sequence for display and the transparency of the layers. It provides access to user data from any computer. It creates the thematic maps and cartograms. It performs the geodetic calculations on the terrain. It displays 3D model on the open vector maps, height matrices and terrain images without model preparation. It performs searching for the shortest routes along the road graph.

As a source of spatial data, it is used the cartographic service GIS WebService (GIS WebService SE) PARB.00160-02. Data exchange with the GIS WebService SE service is performed according to the specification OGC WMTS, OGC WMS and the extended interface REST API via protocol HTTP.

Access to spatial data is carried out through Web-browser.

GIS WebServer (GIS WebServer SE) PARB.00165-04 provides the following operations:

- the automatic authentication of users application authorized by operating system of security tools or performing digest authorization using Web-server;
- viewing in the Web-browser of digital vector maps, remote sensing data and height matrices displayed via the protocol OGC WMTS by means of cartographic services based on pyramid tiles of different standards and the coordinate systems;
- viewing in the Web-browser of digital topographic and special maps, digital city plans, digital nautical charts, digital aeronautical charts in specified symbols displayed via the protocol OGC WMS through the means of cartographic services;
- viewing in the Web-browser of digital vector maps based on spatial data in the formats GML, GeoJSON and vector graphics of the format SVG, issued by the protocol OGC WFS by means of services, or located (stored) on the client computer;
- viewing in the Web-browser of height matrices, issued using the protocol OGC WSS, using map services;
- management of the multilayered image of spatial data displayed together on different protocols: selection of displayed layers, changing the display sequence, changing the transparency of layers;
- display of the legend for the displayed data in the form of a layer tree with the name of the layers and the objects included in the layer of conditional signs, and their names;
- moving a multi-layer map image in the Web-browser window;
- changing the scale of the map display in the Web-browser window;
- displaying the current scale in the form of a scale ruler and the current coordinates of the cursor when you move the cursor over the image of spatial data;
- selecting objects at an arbitrary point in the image and displaying their attributes requested by the protocol OGC WFS in formats GML or GeoJSON from the map service from which the image of the corresponding layer was obtained;
- geodetic calculations on the map: determination of distances, lengths, areas;
- search and selection of objects among the displayed layers by separate attributes, including the name, or combinations of attribute values, positioning the map image on the found objects or selecting the found objects in the specified color;
- search and selection of objects taking into account their relative position relative to previously selected objects or the specified area: entry, intersection, location at the specified distance, and so on;
- display of the statistical data for selected objects in tabular form, including, area, length, perimeter;

Изм.	Лист	№ докум.	Подп.	Дата

- editing the objects of the displayed layers that are available for edition: creating, deleting, moving, stretching, editing points and sections of the contours for individual objects or groups of objects that have common points or areas;
- editing the attributes of objects with taking into account the type of value: string, number, date, reference to the document, value from the directory and so on;
- cancellation and restoration of previously performed editing operations based on the transaction log managed by requests to the service;
- creating the buffer zones around the selected objects of the specified radius and shape;
- execution of requests for solving problems on the road graph (search for the shortest distance, building the accessibility area at the specified distance from the starting point, solving the traveling salesman problem);
- creating the cartograms (surfaces that represent the distribution of a certain property on the ground by specified colors);
- creating 3D model of the terrain and objects on the basis of a description for 3D models of objects, textures, tiles of the vector description of terrain sites, tiles for elevations of terrain areas issued by the service;
- printing a map on printers connected to the client's computer;
- providing remote administration of the application through the Web-browser or in the console mode using the text editor of the file xml;
- compatibility with data protection tools included in the system-wide software of supported operating systems;
- logging the user actions, the result of the procedure, error messages when processing requests.

<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

## 2 CONDITIONS OF THE PROGRAM EXECUTION

The program can run in the operating environment «Astra Linux Special Edition», MCBC 5.0, «Zarya-Center of Data Processing» on computers with the Intel Process Architecture.

Recommended requirements for the composition of hardware and software:

- Processor: Intel Core i3 3.33 GHz or higher;
- RAM from 16 GB or higher;
- Operating system: «Astra Linux Special Edition», MCBC 5.0, «Zarya-Center of Data Processing»;
- Hard disk capacity of 500 GB or higher;
- HTTP-server Apache 2.2.14 and higher for OS «Astra Linux Special Edition»;
- HTTP-server Server Geodata Processing for OS MCBC 5.0;
- HTTP-server Apache 2.2.15 and higher for OS «Zarya-Center of Data Processing»;
- Environment of the interpreter PHP version 5 and higher;
- Cartographic service GIS WebService SE 11.6.1 and higher.

<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

### 3 EXECUTING THE PROGRAM

#### 3.1 General information

To run GIS WebServer SE PARB.00165-04, it is necessary to enter its URL in the browser's address bar: «<http://Web-node/directory/index.php>»

To start the remote administration module, enter the URL of the form:

«<http://<Web-node/directory>/admin/admin.php>»

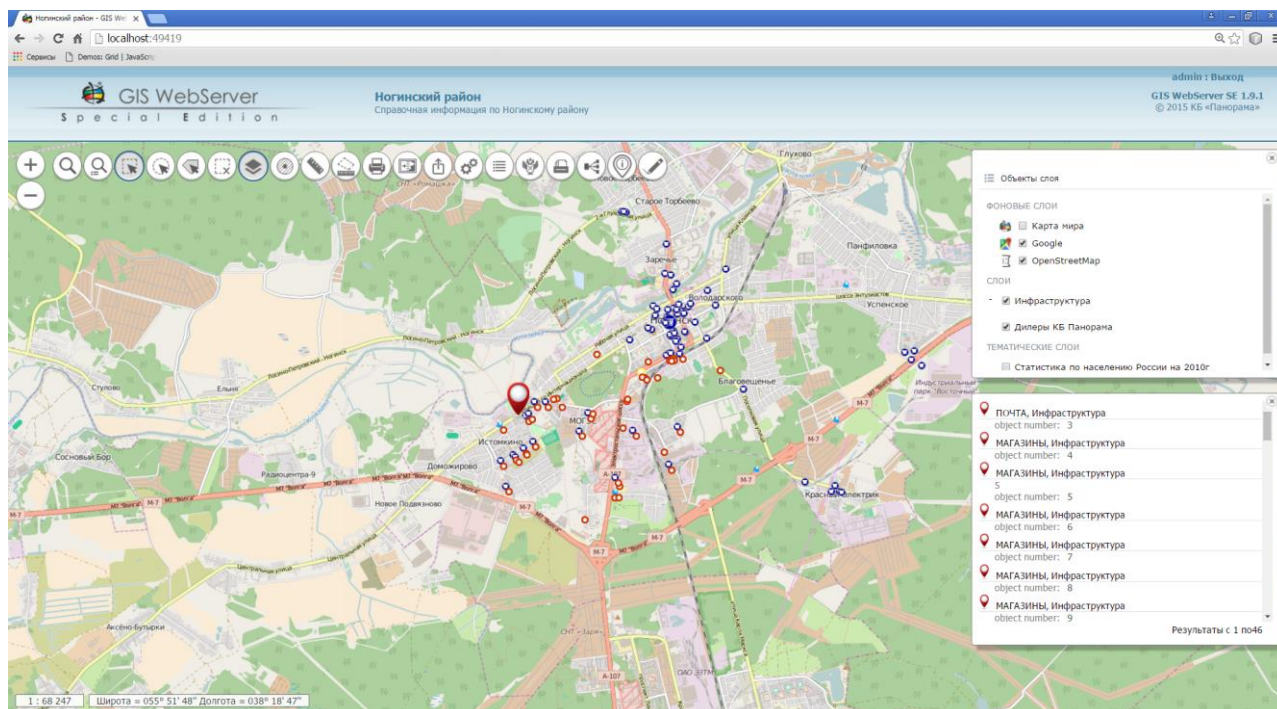



Figure 1 - View the attributes of objects

#### 3.2 Authorization

In order to limit access to the application, the user authorization mechanism is implemented, which allows to restrict access to certain layers and/or modules of the application. Description of user rights settings and application settings is given in the document «Guide for programmer» PARB.00165-04 32 01.

For unauthorized users, there is usually a minimum level of access that is configured by the administrator of application.

To authorize in the application, click on the button «Enter»  in the upper right corner and to enter login and password.

Изм.	Лист	№ докум.	Подп.	Дата

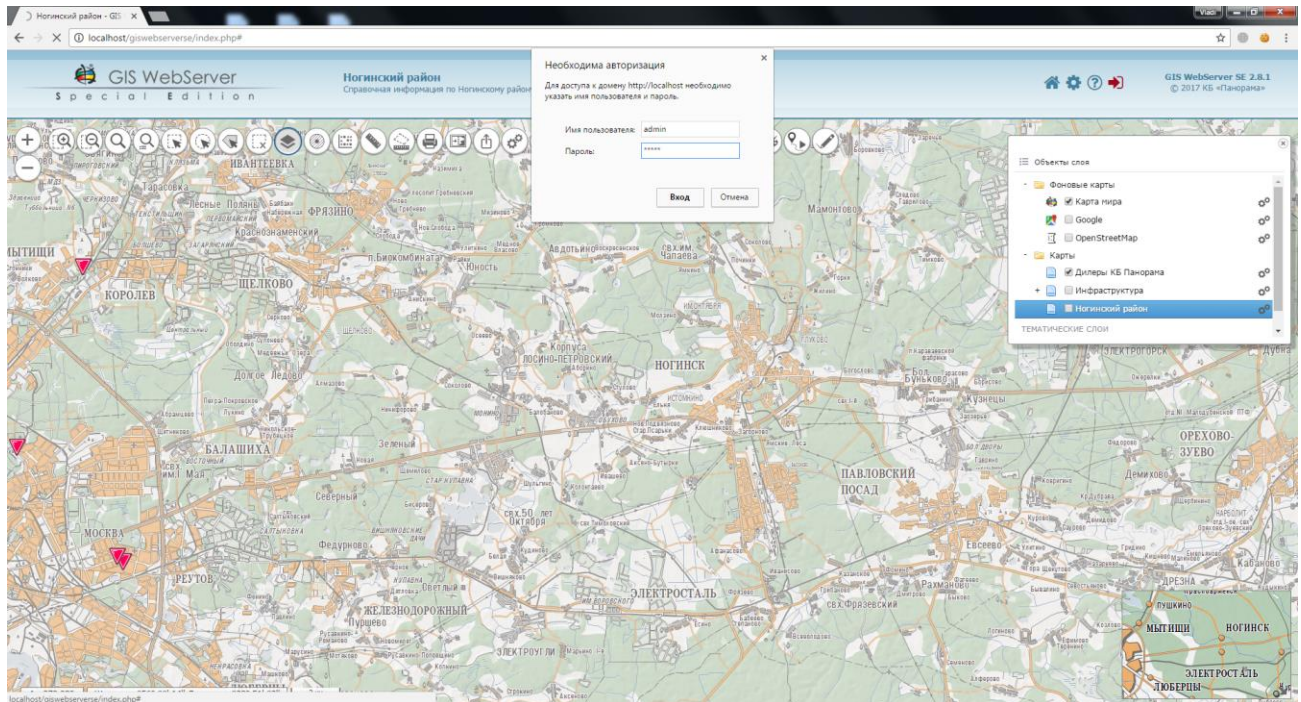


Figure 2 - Authorization in the application

After successful authorization, the user will have access to the application resources in accordance with the rights.

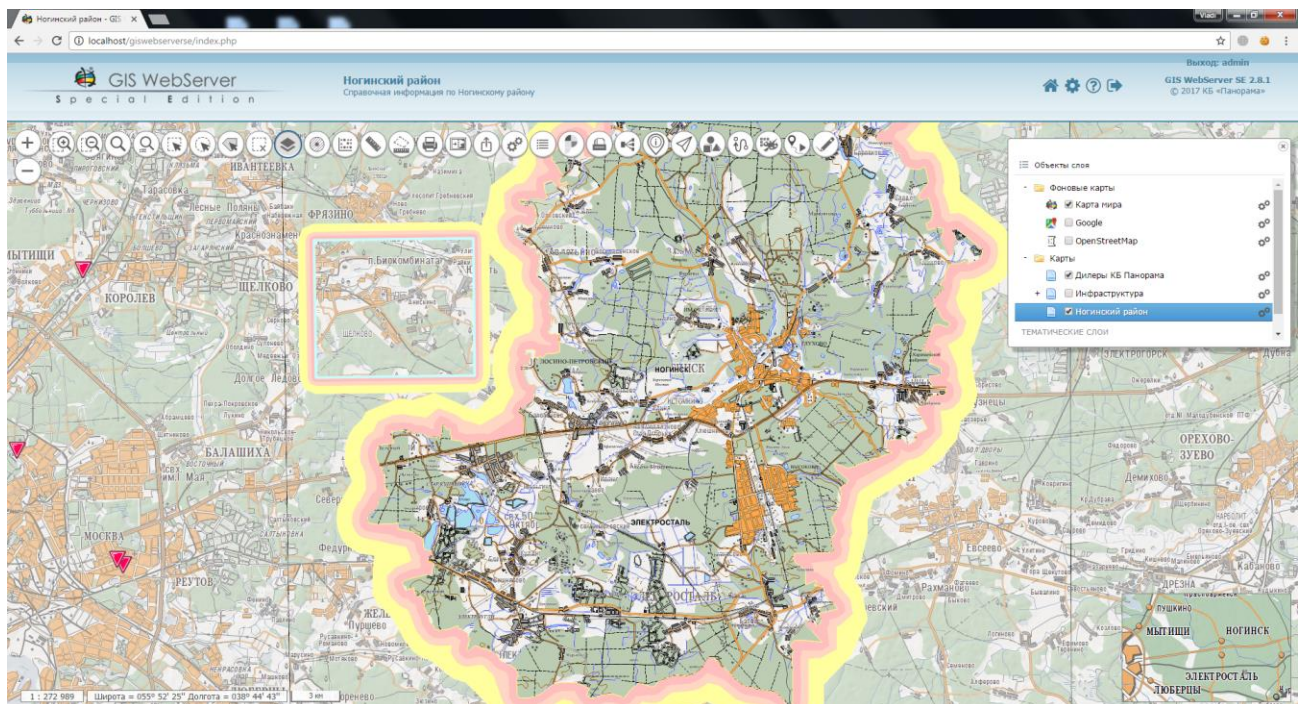


Figure 3 - Application window after successful authorization

### 3.3 Management of the map projects

Manager of projects is used to manage the map projects. The project of map contains the settings for layers of map data and components. Manager of projects for the map is displayed in the window GIS WebServer SE.

Изм.	Лист	№ докум.	Подп.	Дата
------	------	----------	-------	------

Manager contains a list of map projects available to the user. After selection of the project from the list, the map is initialized, the composition of the data layers and elements of control, installed in the project, is displayed in GIS WebServer SE.

Configuration of the map projects and the access rights to them is performed by the administrator.

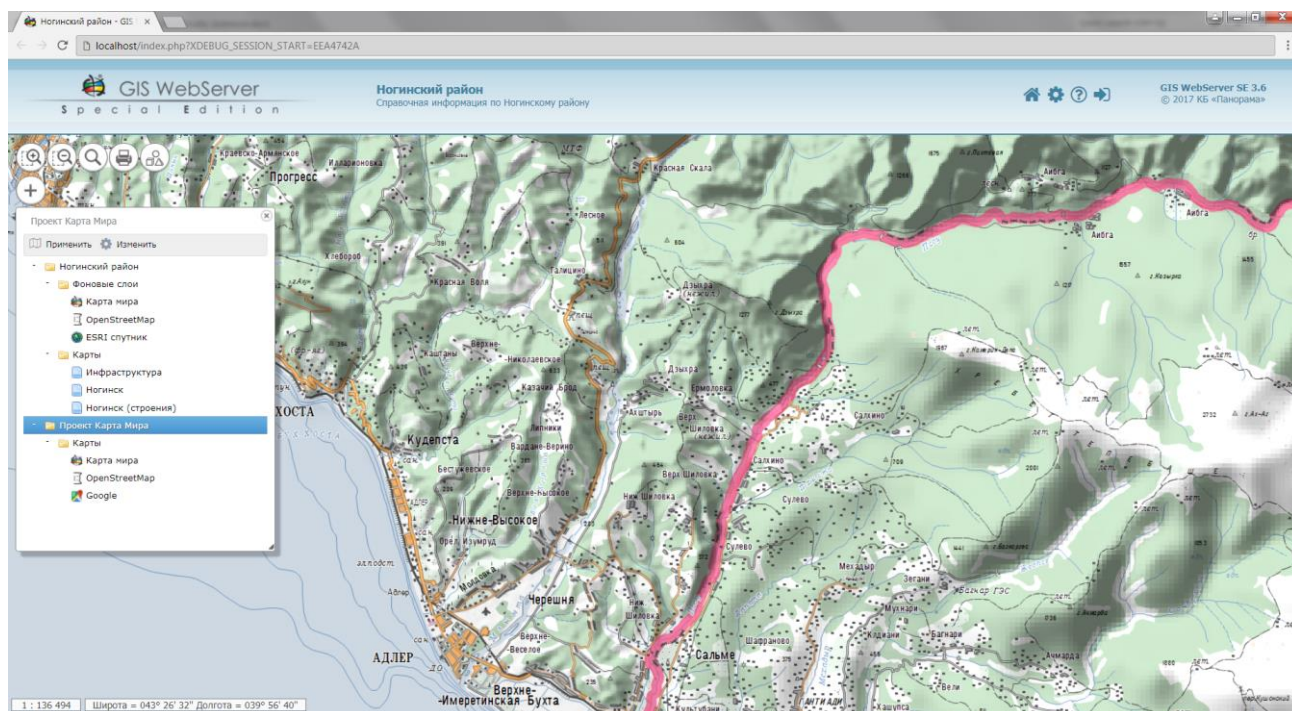


Figure 4 - Application window with the manager of projects

To select a project, select its node in the project tree by clicking the mouse. The selected project is installed in the map. The data layers, have selected in the project of manager window, are opened in the map.

To change the composition of layers for the map project, select the required layers in the tree for manager of projects, and to click on the project node. The map image is updated in accordance the selection of layers in the project.

### 3.4 Management of the map

#### 3.4.1 Moving the map image

To move the map image, it is necessary to move the mouse over the map drawing with the left button pressed.

#### 3.4.2 Scaling the map



Clicking the button increases the current map scale by 2 times.



Clicking the button decreases the current map scale by 2 times.

When the cursor is in the map area, moving the mouse wheel also scales the map.

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.3 Composition of the map



The composition of the map layers is displayed in the panel «Composition of the map» as a tree. To manage the composition of the layers, it is necessary to turn on the button «Composition of the map».

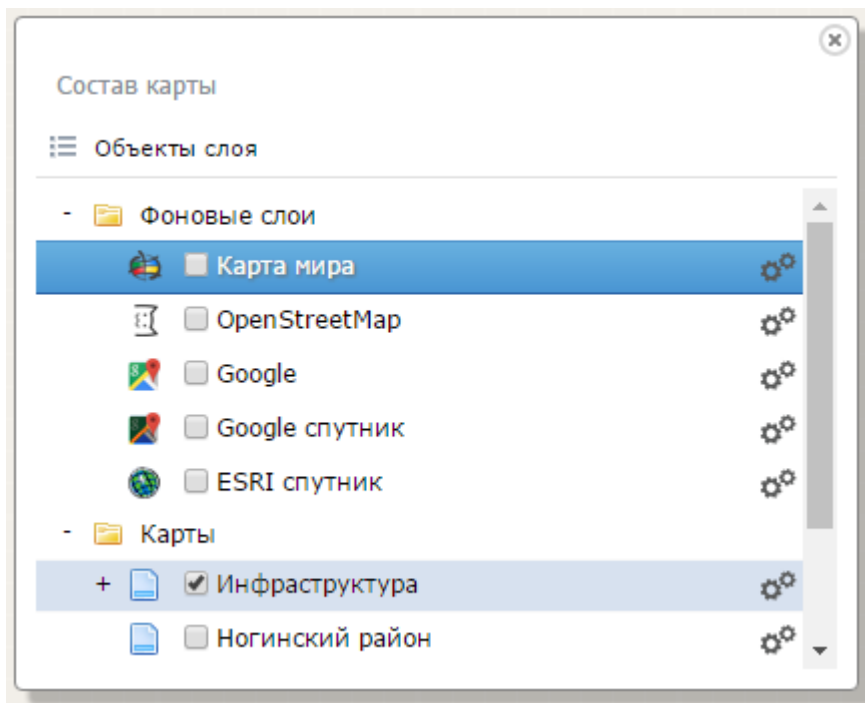


Figure 5 - Change the composition of the displayed map layers

To change the composition of the displayed map layers, it is necessary to enable/disable the button of the corresponding tree element. It is performed the map window updating.

Layers that are virtual folders or folders from GIS server are displayed as a separate tree node. The list of layers in such node is updated automatically when clicking the button «Update». ↻

Изм.	Лист	№ докум.	Подп.	Дата

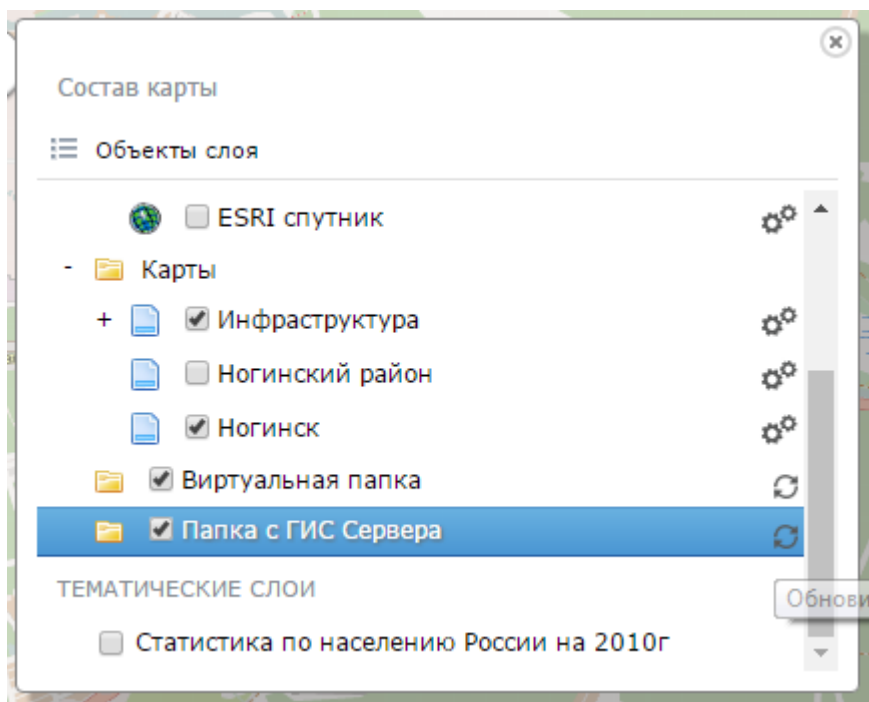


Figure 6 - Updating the composition for layers of type Virtual folder and folder from GIS Server

### 3.4.4 Obtaining information about the map object

For information about the map object, click on the object image in the map.

Information about the selected object is displayed in the panel «Map objects».

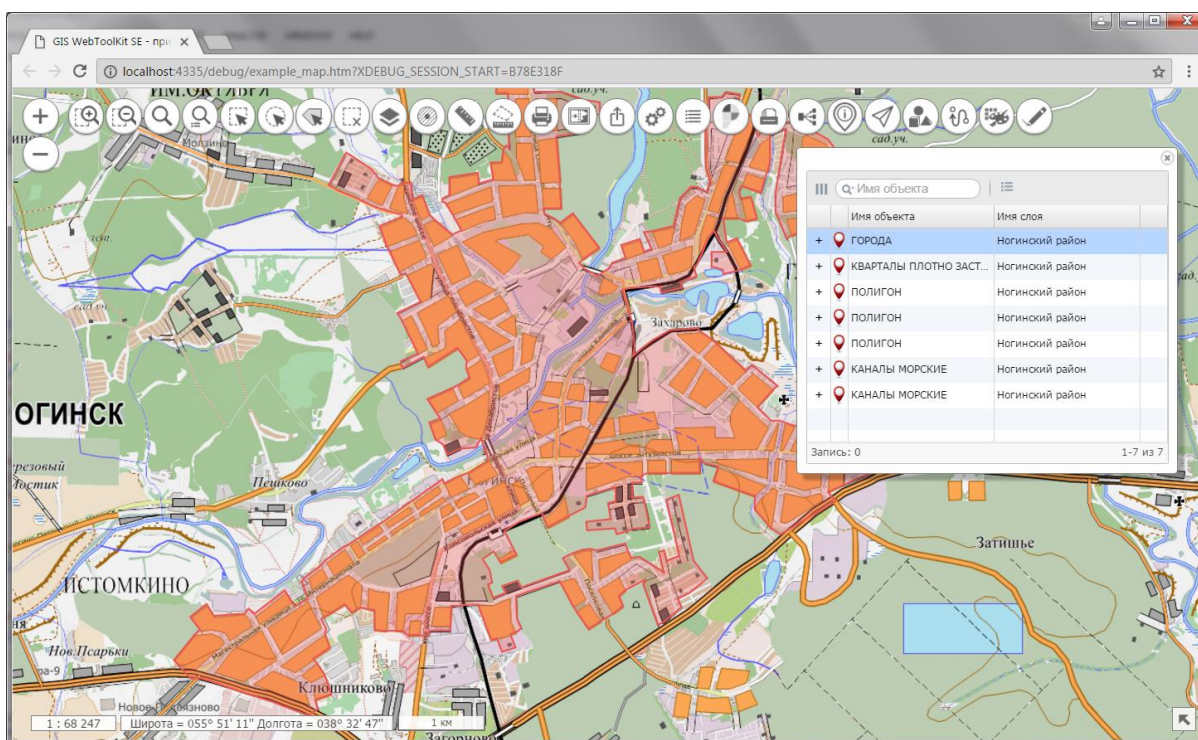


Figure 7 - Information about the map object

Due to the fact that the digital map has a multi-layer structure, in a point, several objects can be simultaneously located there. Therefore, after clicking in the dialog window, information about all objects will be displayed in the specified point.

Изм.	Лист	№ докум.	Подп.	Дата

#### 3.4.4.1 Documents of the map object

The characteristic of the map object can contain the name of the document (file) that is stored on GIS Server and it is attached to the object.

When selecting an object in the map, the document name is displayed in the properties of the object in the panel «Map objects» as a reference.

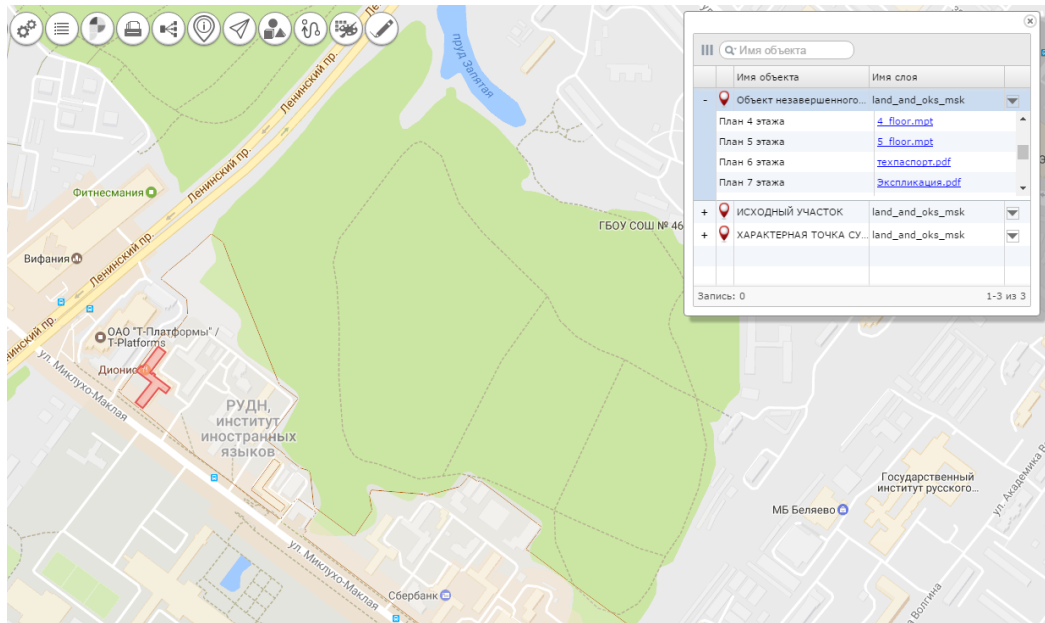


Figure 8 - Displaying the document name in the characteristic of map object

To download a document file, click on the file name. The file is retrieved by means of the Web-browser. It is necessary that the settings of pop-up windows are allowed in the browser.

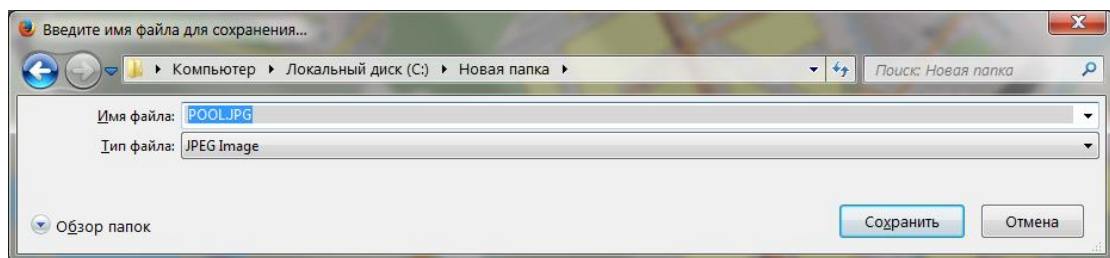


Figure 9 - Saving a document on the user's computer

Using a standard browser window, it is possible to save or to view the document file received from the server.

#### 3.4.4.2 Additional information about the map object

In the panel «Map objects», the additional information about the object can be displayed. Additional information can be viewed in a record about the object by clicking on the button ▼ in the last column of the table.

Изм.	Лист	№ докум.	Подп.	Дата

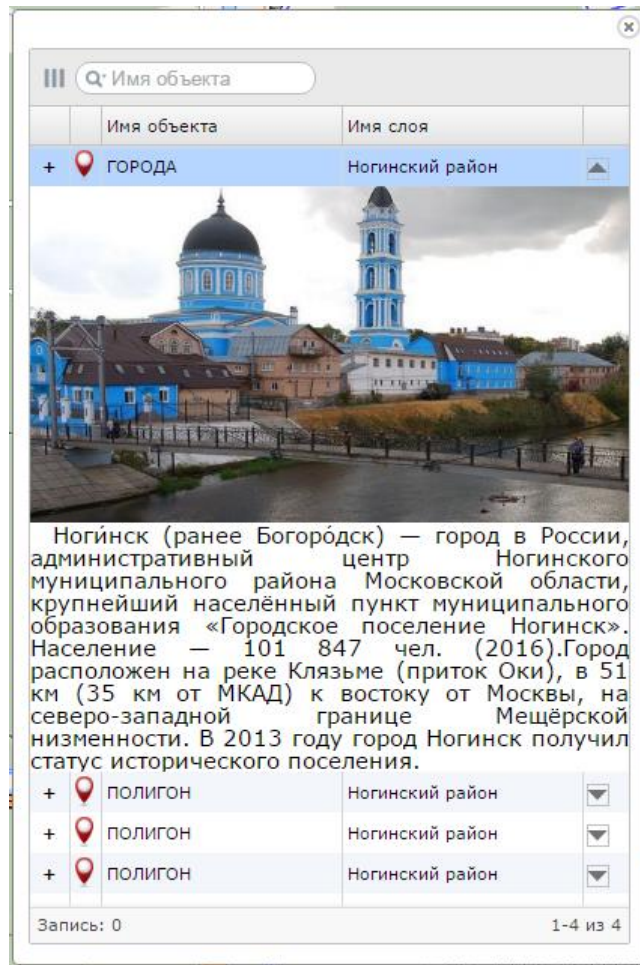


Figure 10 - Additional information about the object

#### 3.4.4.3 Editing information about the map object

In the panel «Map objects», there is a possibility to edit the semantic characteristics of the current object. This is done if the object is available for editing. The parameters for editing objects are specified in the settings of Map Editor.

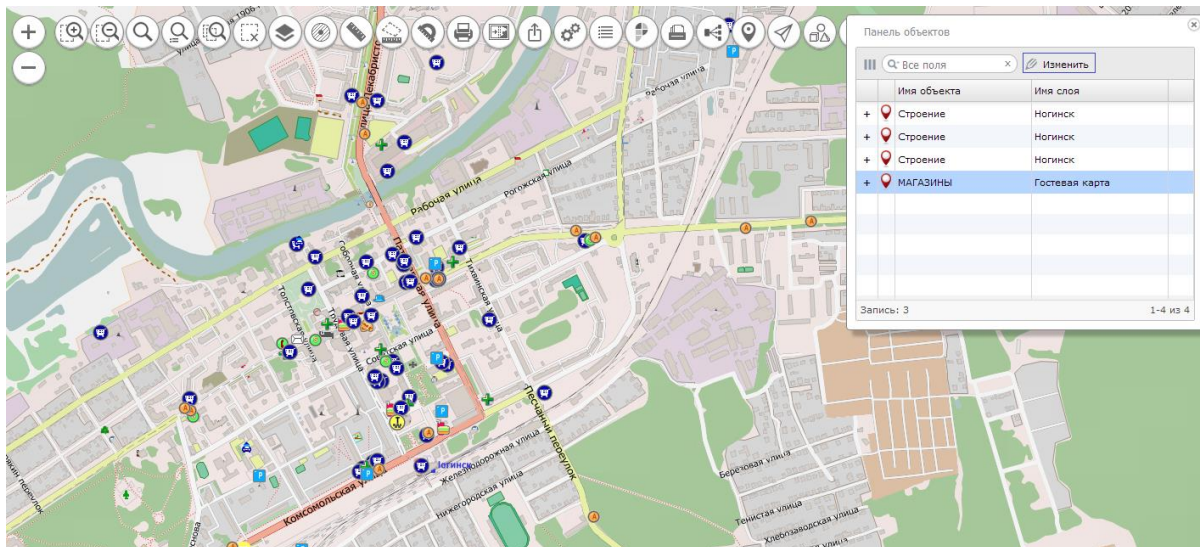


Figure 11 - The panel of objects with the ability to edit information

Изм.	Лист	№ докум.	Подп.	Дата

To edit an object, it is necessary to click the button «Edit» in the panel «Map objects».

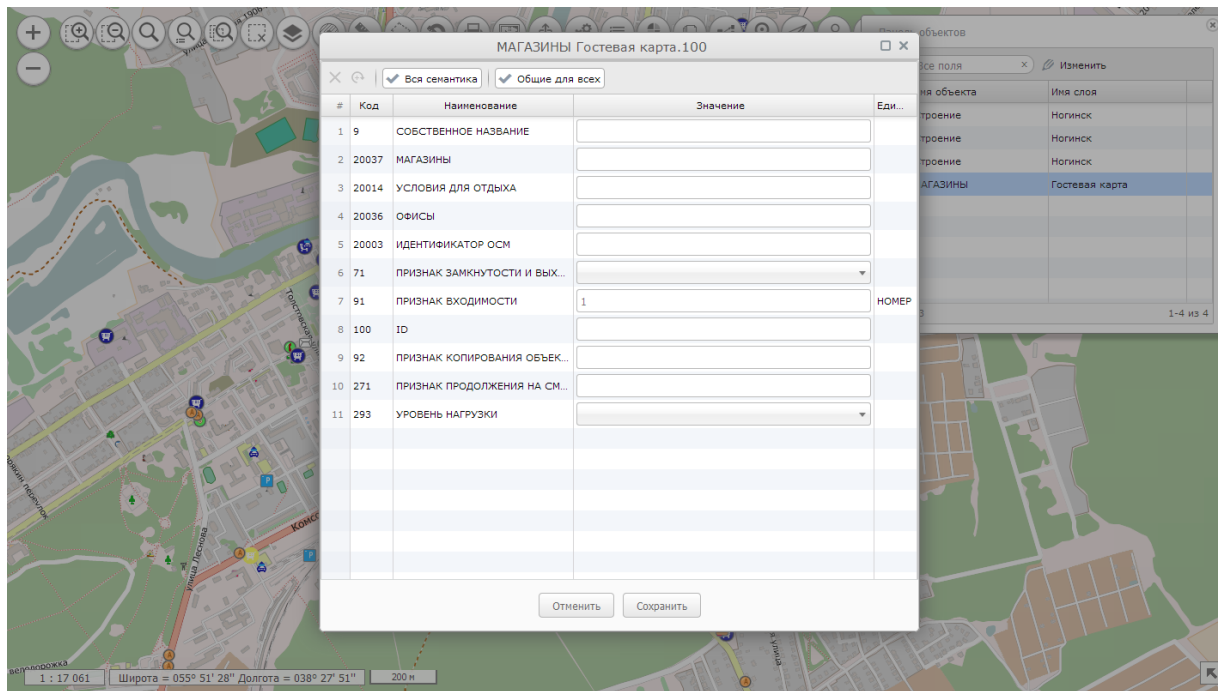



Figure 12 - The window for editing the semantic characteristics of the object

### 3.4.5 Search by area

The operations of searching objects by area allow to select the map objects taking into account their location on the terrain in relation to the specified area. The search area is described by a set of coordinates. Map objects, whose coordinates are inside or intersect with the coordinates of the search, are selected.

To activate the search by area, it is necessary to enable the button  in the command bar of the map and to select the search mode in the toolbar.

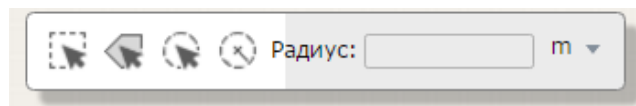



Figure 13 - Toolbar Search by area

The following selection modes for the search area are available to the user.

#### 3.4.5.1 Search by rectangular area

 When the button is turned on, the rectangular area search mode is activated. It is necessary to click the left button and to move the mouse on the map image to select a rectangular area. When the left mouse button is released, objects are searched. The search result is displayed in the panel «Map objects».

Изм.	Лист	№ докум.	Подп.	Дата

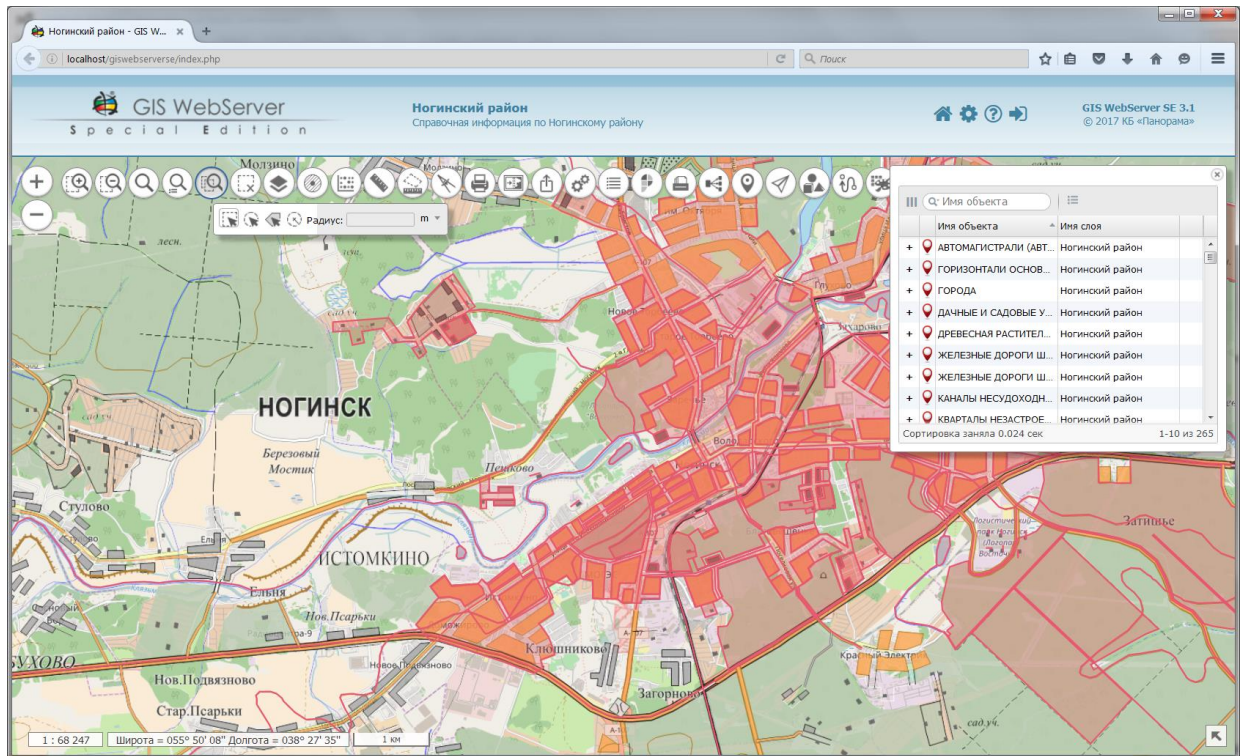


Figure 14 - Search by rectangular area

#### 3.4.5.2 Search by area specified by the map object



To search by the area specified by the map object, it is necessary to click the button «Search for map object» in the toolbar, select the map object by clicking the mouse in the map and click the pop-up button «Search by object».

The search result is displayed in the panel «Map objects».

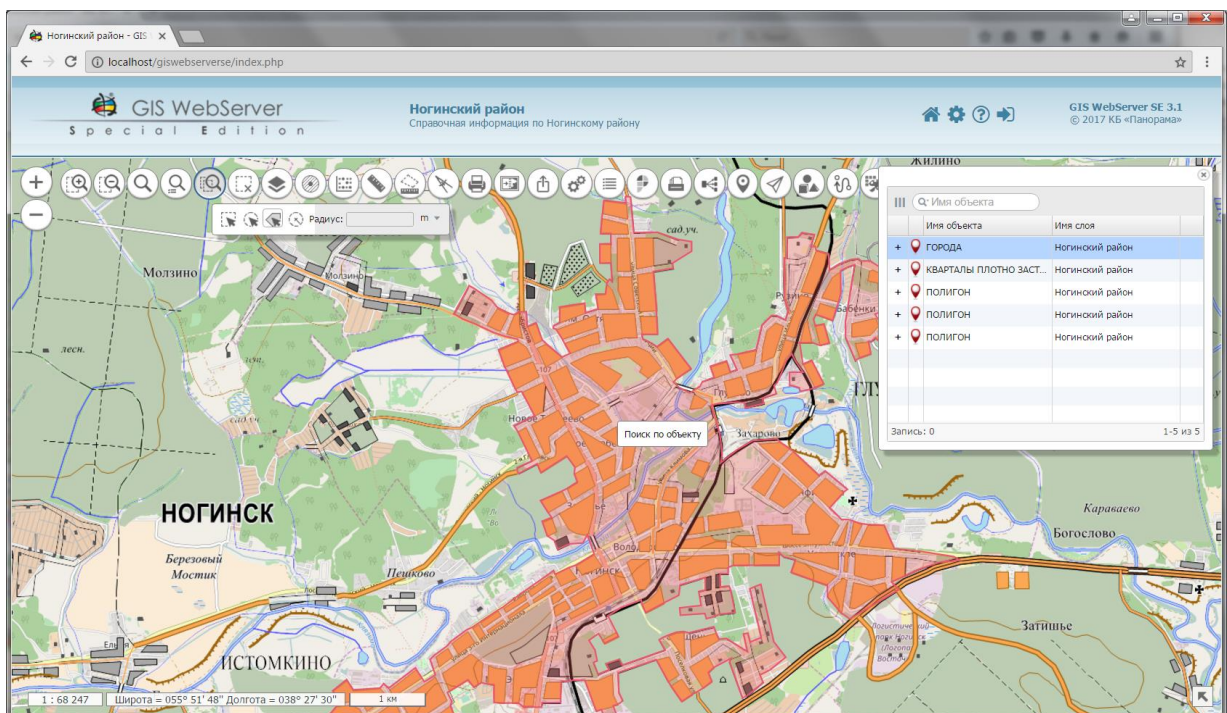


Figure 15 - Searching by map object

Изм.	Лист	№ докум.	Подп.	Дата
------	------	----------	-------	------

### 3.4.5.3 Search in the radius from a point with the radius selection



To search for map objects within a radius from a specified point of the terrain with a radius selection, you must click the button «Search in the radius from a point». Then click the left mouse button in the map image to select the point and, without releasing the buttons, move the mouse pointer to specify the search radius. When the left mouse button is released, the objects are searched. The search result is displayed in the panel «Map objects».

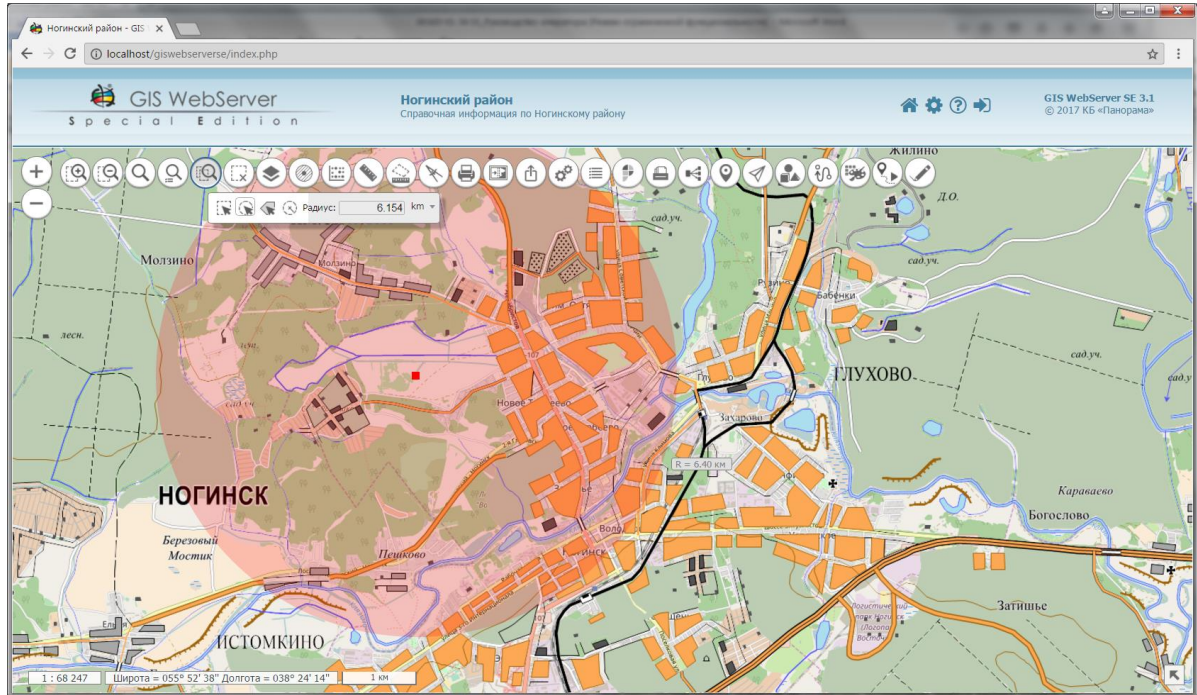


Figure 16 - Search in the radius from a point with the radius selection

### 3.4.5.4 Search within the specified radius from a point



To perform a search, it is necessary to enable the button «Search within the specified radius from a point» in the toolbar. In the field «Radius», enter the radius value in the keyboard, press the key «Enter» on the keyboard, and specify the point by clicking the mouse button on the map.

When the mouse button is released, objects are searched. The search result is displayed in the panel «Map objects».

Изм.	Лист	№ докум.	Подп.	Дата

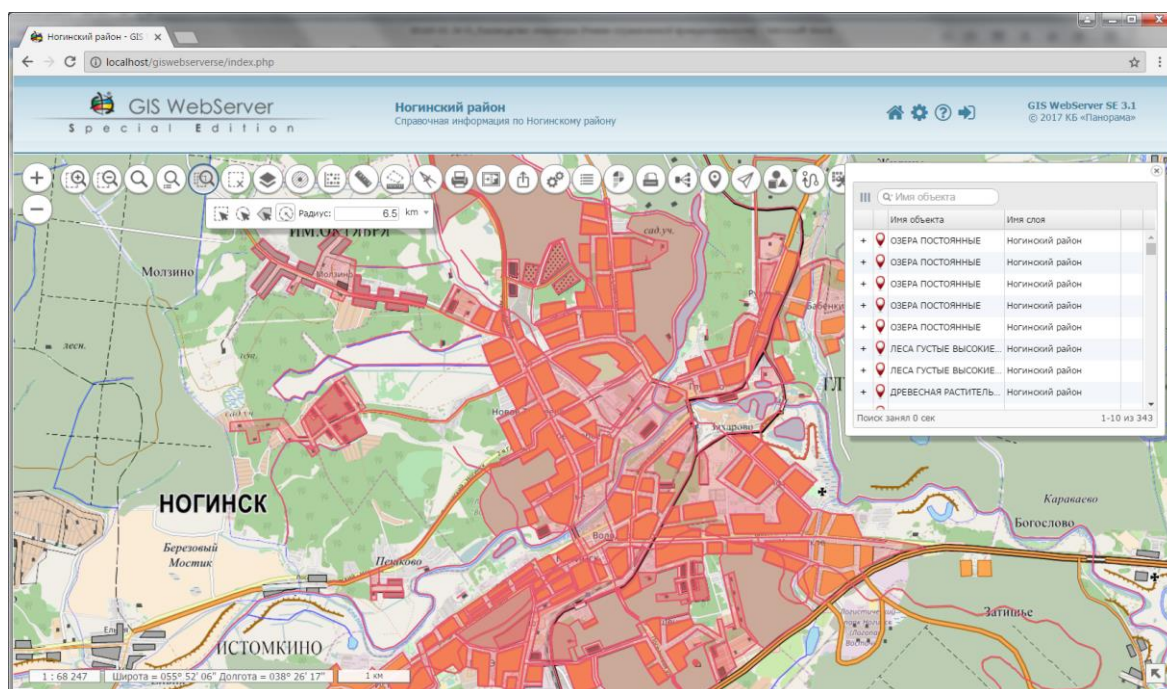


Figure 17 - Search the objects in the specified radius from a point

### 3.4.6 Objects highlighting



There are two modes for highlighting objects: «Highlighting of arbitrary objects» and «Highlighting of objects by symbol». To activate the mode, press the corresponding button. When turning on the mode at hover over the map object with the mouse, it is highlighted.

The mode «Highlighting of arbitrary objects» allows to select an arbitrary number of objects, the mode «Highlighting of objects by symbol» allows to select all objects whose parameters (type, code and localization) coincide with the parameters of the selected object. The number of highlighted objects is displayed in the status bar.

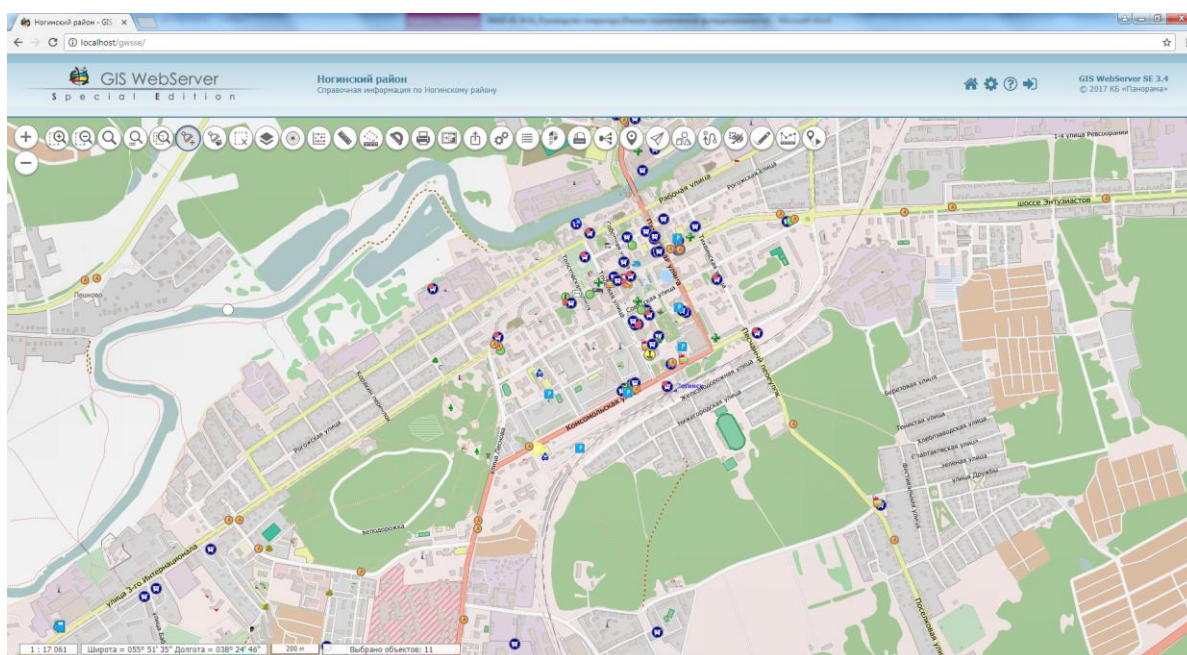


Figure 18 - Highlighting of arbitrary objects

Изм.	Лист	№ докум.	Подп.	Дата

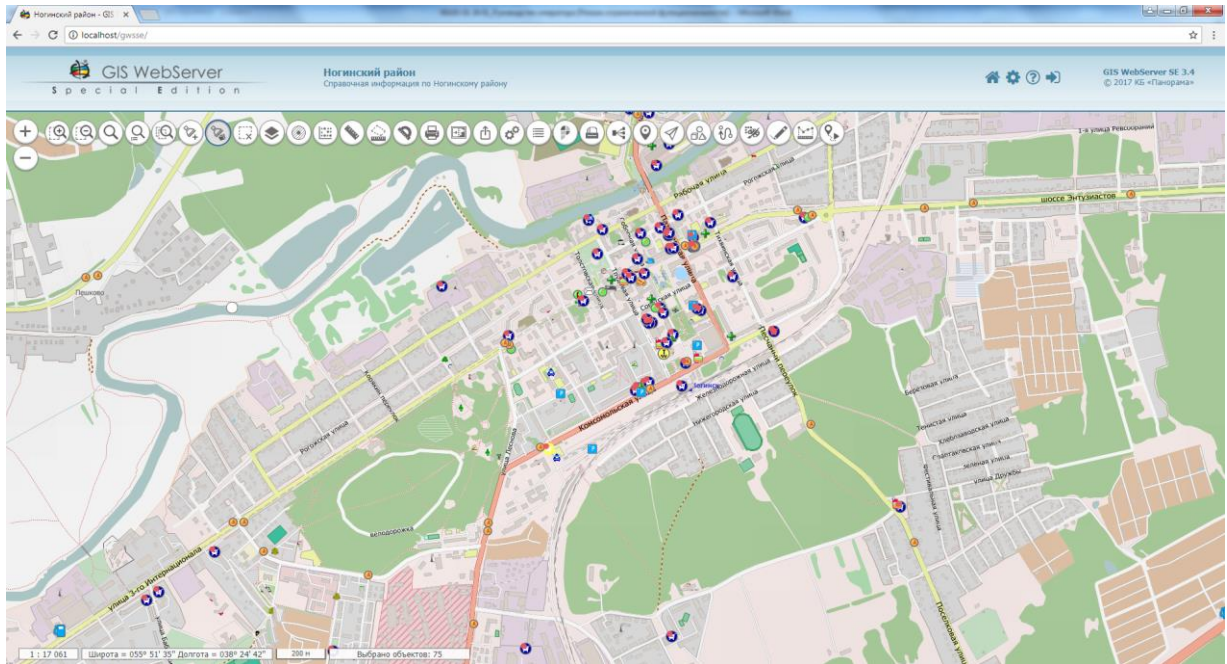



Figure 19 - Highlighting of objects by symbol

### 3.4.7 Search by semantics

 To perform a search for objects by semantics, it is necessary to click the button «Search by semantics». This will display the panel «Search the objects by semantics».

In the list Layer, only layers with the ability to select objects are displayed.

In the list «Types of objects» the types of objects for xsd scheme (layers of the map classifier) are displayed, having semantics. Creation xsd-scheme of the layer is performed by the map classifier when the layer is published on the service GIS WebService SE PARB.00160-01.

To perform a search by semantics, it is necessary to select the desired layer, the type of objects, and in the table Semantics, specify the condition that is superimposed on the semantics value. The condition can have the following values:

=, >, >=, <, <=, \*

\* – It means any value.

Multiple search conditions are combined by the group condition «OR» (show all objects that satisfy at least one condition).

To perform a search by object number, it is necessary to specify the object number in the field «Object number». If the object number is specified in the field «Object number», the search will be performed by the object number, otherwise the semantics will be searched.

To delete the saved search conditions, click the button «Clear».

Изм.	Лист	№ докум.	Подп.	Дата

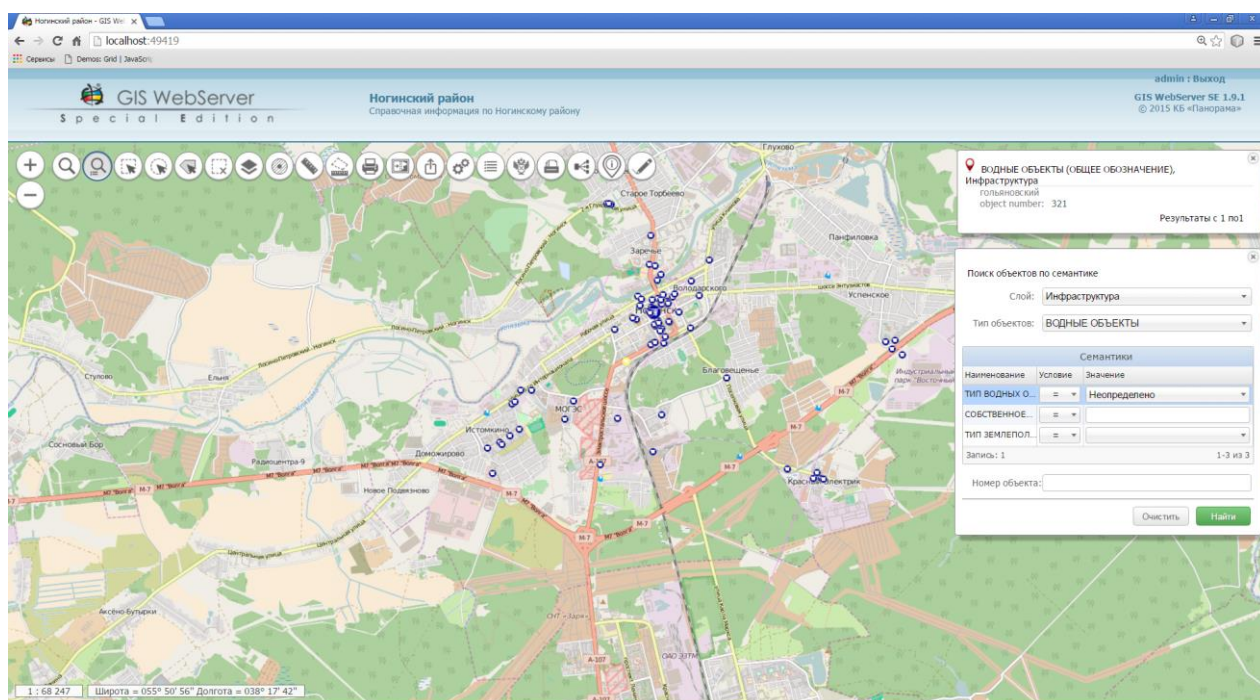


Figure 20 - Search the objects by semantics

### 3.4.8 Search

In the panel «Search», it is possible to search for objects in the map, address search by various sources or search by cadastre number on the portal of Rosreestr. The search is carried out according to the type Search installed in the open toolbar.

To perform a search in the map, it is necessary to click the button «Search», in the opened panel, to turn on the button «Search on the map», to enter text and click the button «Find».

The search is performed in the layers where the search parameters by name are set.

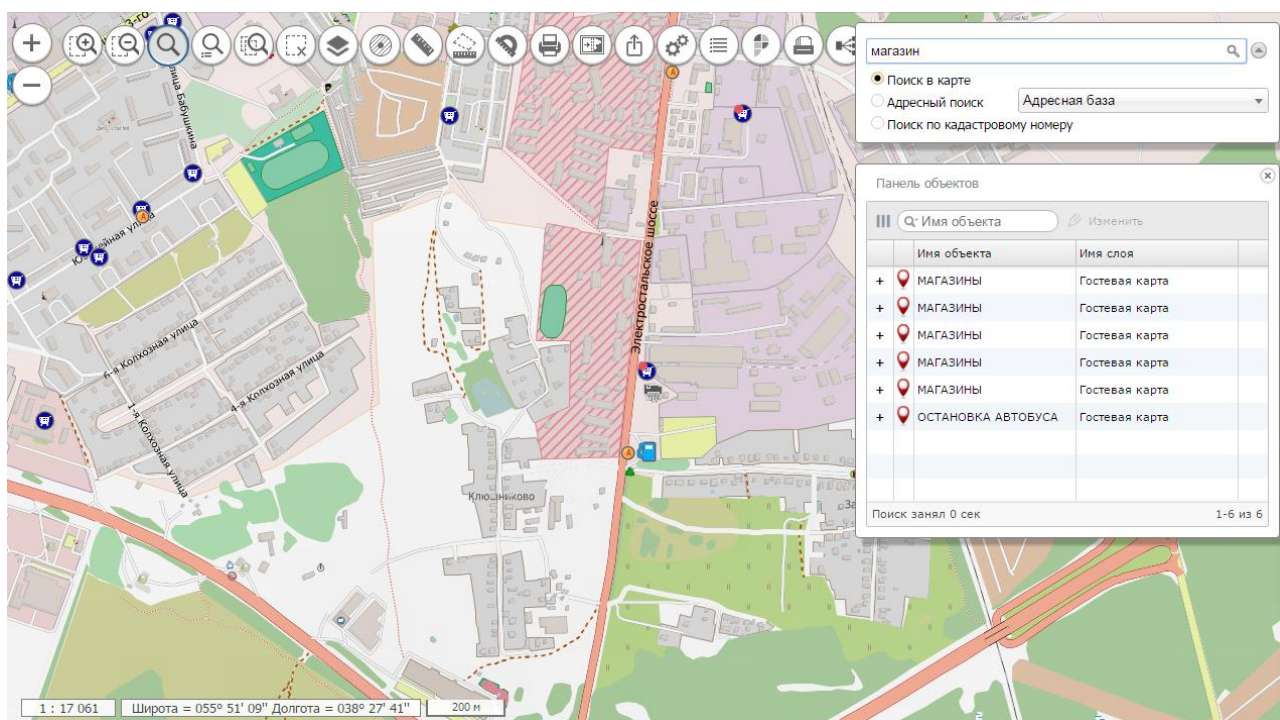



Figure 21 - Search on the map

Изм.	Лист	№ докум.	Подп.	Дата

As a result of the operation on the map, all objects with semantics containing the entered value will be marked. The list of found objects will be displayed in the panel «Map objects».

### 3.4.9 Search by address

 To perform a search at the address, click the button «Search». In the opened panel, set the type of «Address search», select the desired address service (Yandex maps, OpenStreetMap (OSM), own address base or any other source of geodata from the list), enter a text, click the button «Find». The result of the query will be displayed in the form of markers on the map and the address list in the panel «Map objects».

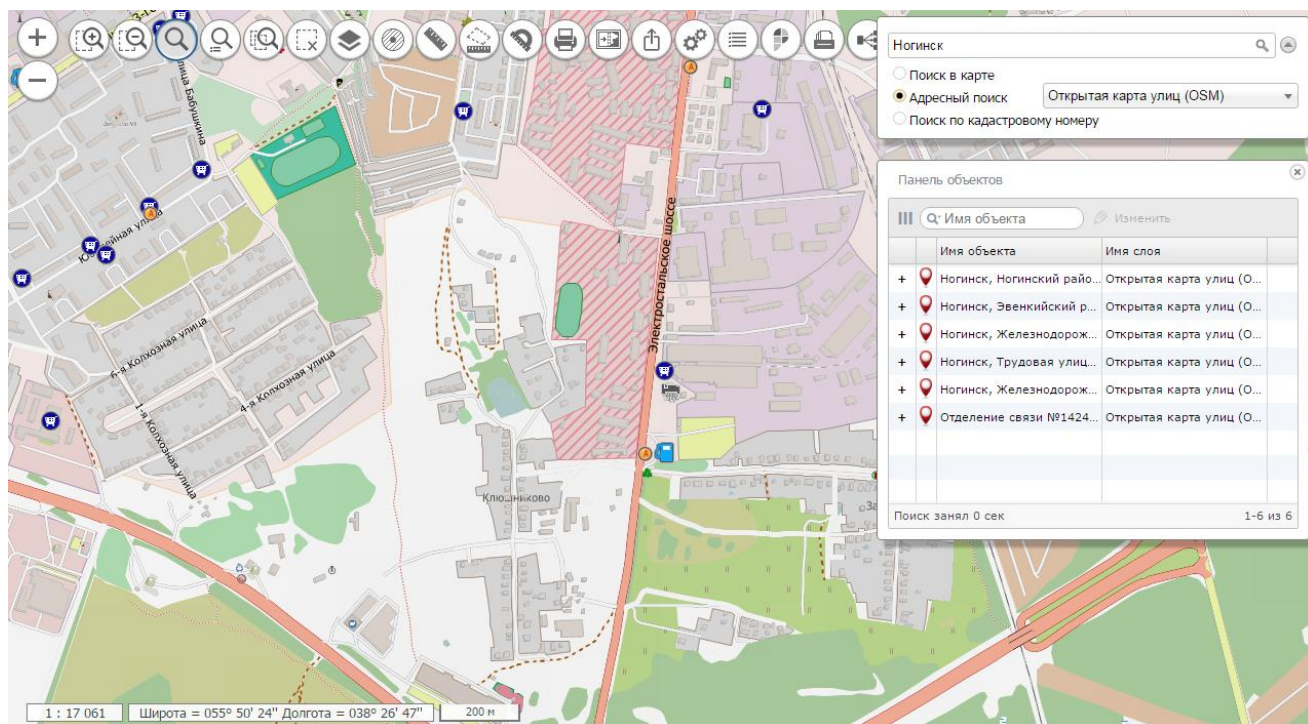




Figure 22 - Search by address in Yandex maps

### 3.4.10 Search by cadastral number

 To perform a search for the cadastral number, it is necessary to click the button «Search». In the panel that opens, set the type of «Search by cadastral number», enter the cadastral number and click the button «Find».

The result of the operation will be displayed in the panel «Information of the State Real Estate Cadastre».

### 3.4.11 Address search by coordinates

 To activate the address search mode by coordinates, it is necessary to click the button «Address in the point». Next, mouse click on the point on the map. Search is carried out by the source of «Address search», installed in the search panel. The list of found objects will be displayed in the panel «Map objects».

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.12 Printing the map



To print the map, press the button «Print». It will display the panel with the map image on the current territory. At output for printing, it is possible to add own comment.

To save the map image to disk, it is necessary to right-click on the picture and select - «Save As ... ».

To print the map, it is necessary to press the button «Print».

### 3.4.13 Measuring the distance



To measure the distance, click the button «Distance» and click the mouse to specify the points of the measured path. In this case, the road mark and the distance from the first to the last points will be displayed in the map window. It is possible to change the position of points, add new points or delete superfluous. In this case, the distance will be recalculated.

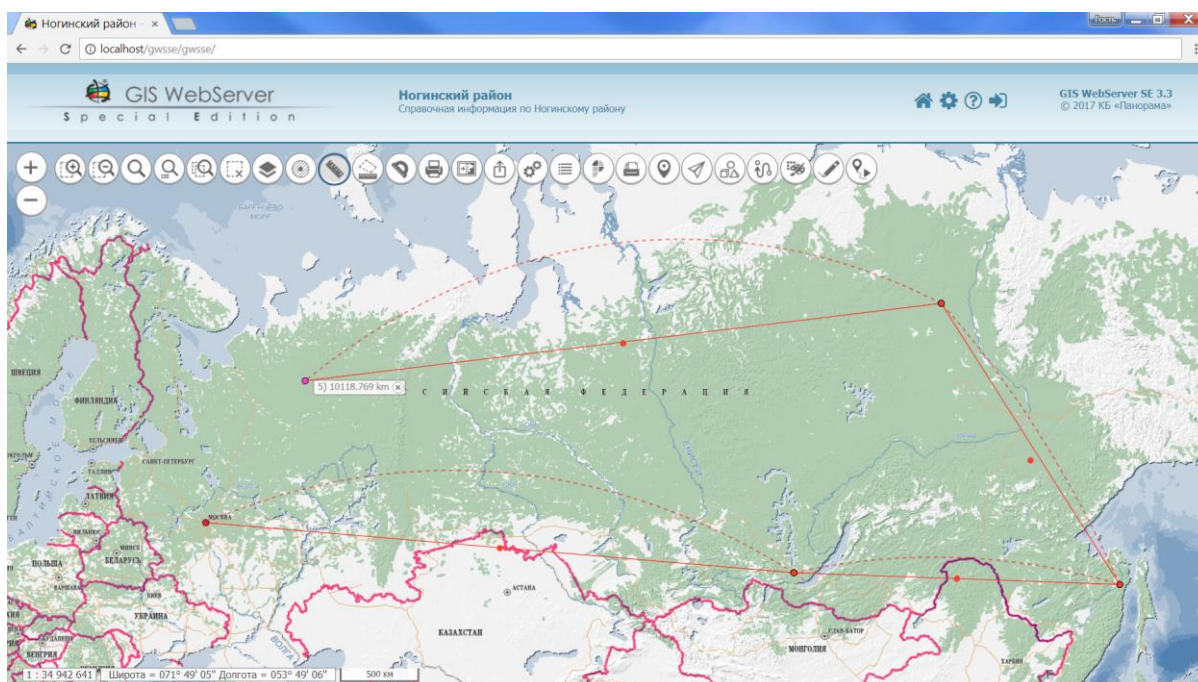


Figure 23 - Measuring distances on the map

### 3.4.14 Measuring the area



To measure the area, it is necessary to click the button «Area» and click the mouse to specify the points of the measured area. In this case, the polygon and the selected area value will be displayed in the map window. It is possible to change the position of points, add new points or delete superfluous. In this case, the area will be recalculated.

Изм.	Лист	№ докум.	Подп.	Дата

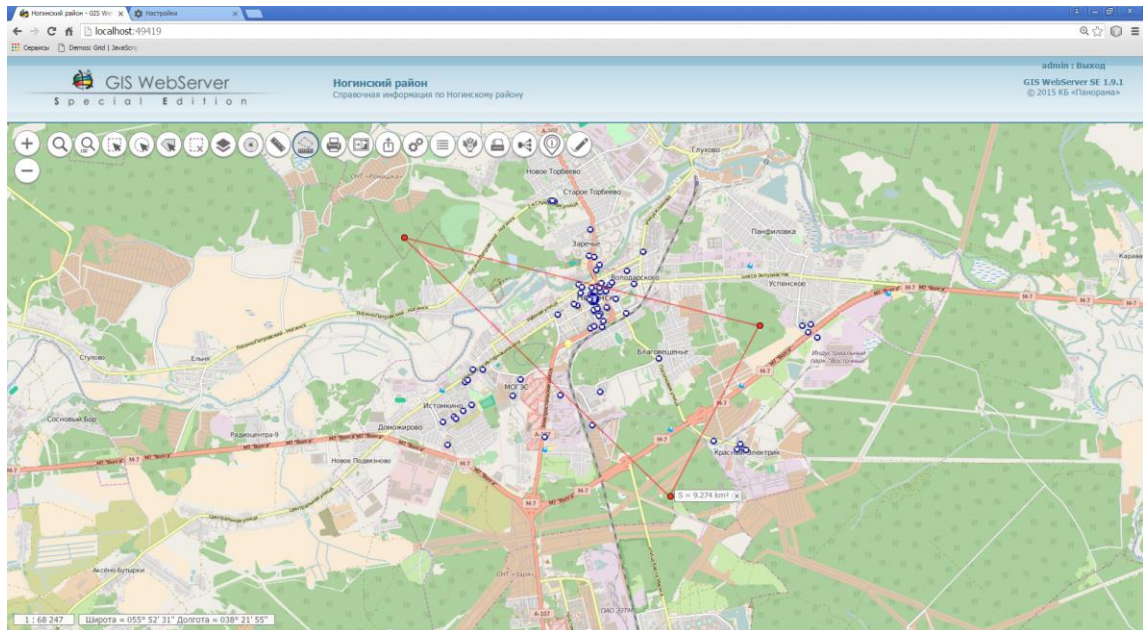


Figure 24 - Measuring the area on the map

#### 3.4.15 Measuring the angles

To measure the angles, click the button «Angle measurement» and click three points to click the mouse. The map window displays the angle value. The number of measurements in this mode is unlimited.

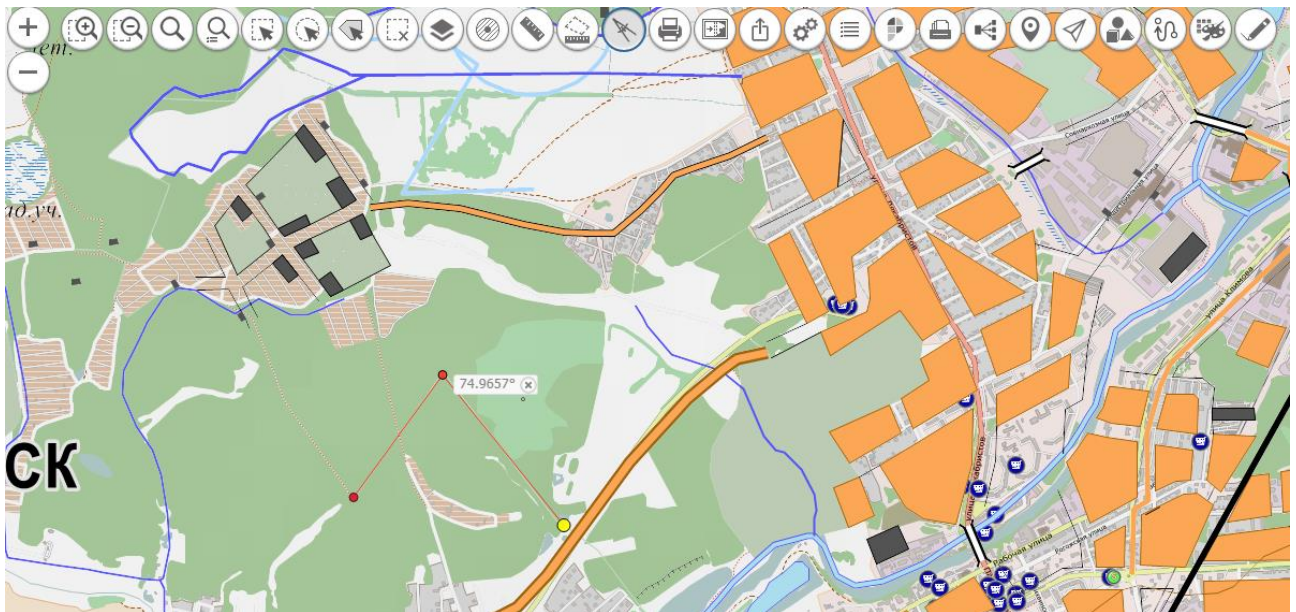


Figure 25 - Measuring the angles

#### 3.4.16 Creating the buffer zone



To build a buffer zone around objects, it is necessary to enable the button «Create the buffer zone». The panel «Creating the buffer zone» is displayed on the right side of the map window.

Изм.	Лист	№ докум.	Подп.	Дата
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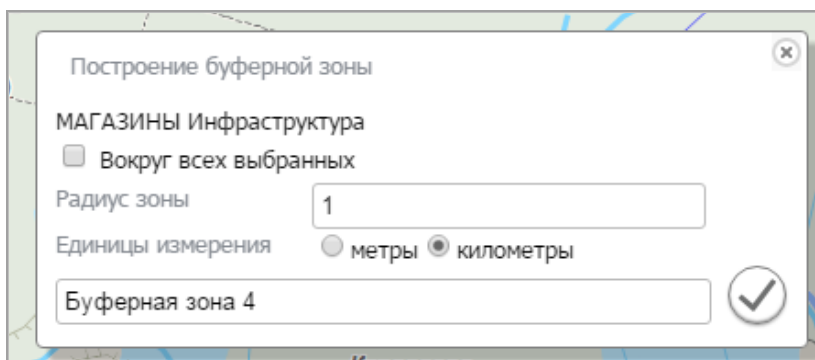


Figure 26 - Creating the buffer zone

It is necessary to select one or several map objects around which you want to build a buffer zone, specify the size of the zone (radius) and click the button «Create». The buffer zone is automatically assigned a name before creating, which can be changed.

The zone image is displayed in the map window. The node with the zone name is automatically added to the tree «Composition of the map» in the list «Buffer zones».

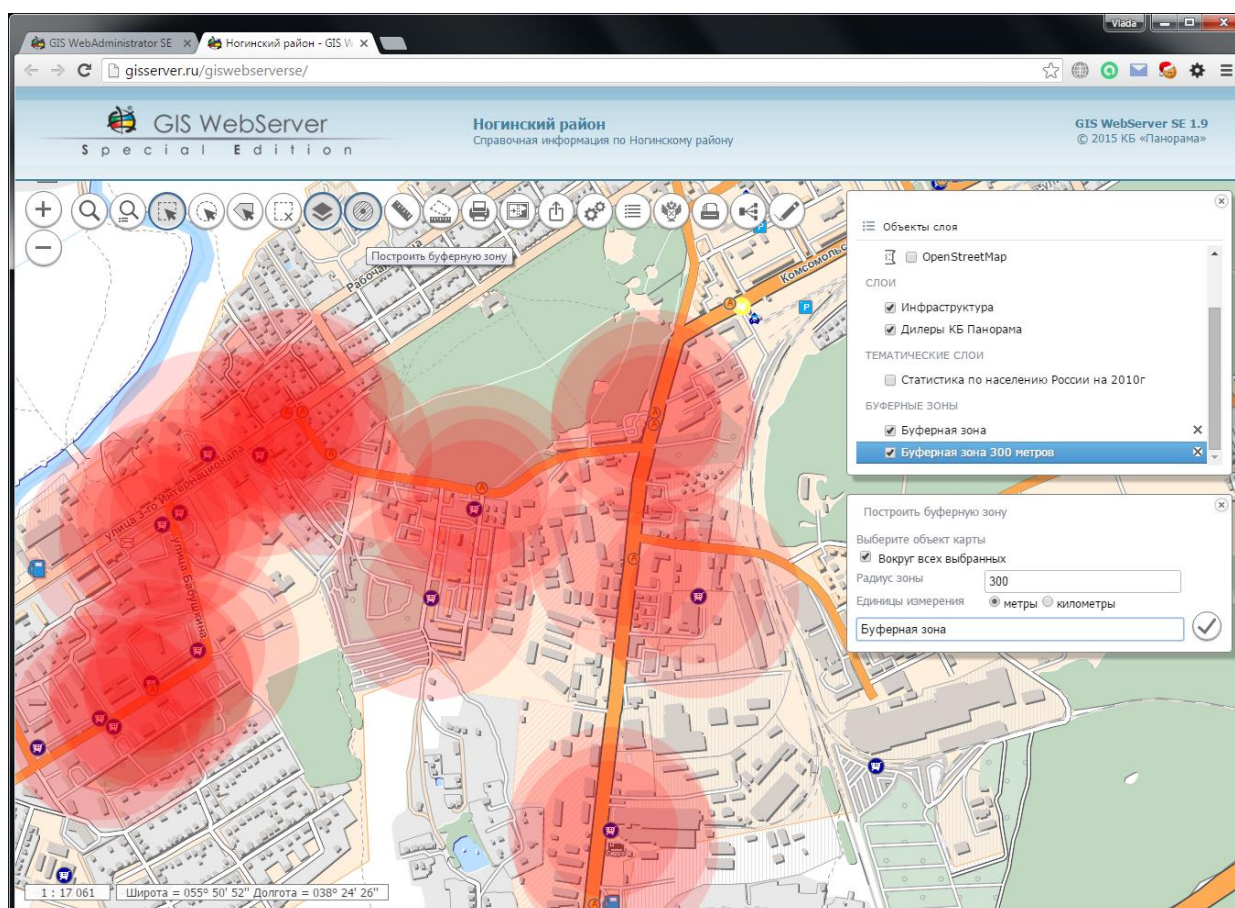


Figure 27 - Displaying the buffer zones

### 3.4.17 Shutter of the map



To activate the mode it is necessary to press the button «Shutter». It will display the panel on the right side of the screen with a list of available layers for the shutter, after selecting the layer, the image will be cropped.

Изм.	Лист	№ докум.	Подп.	Дата

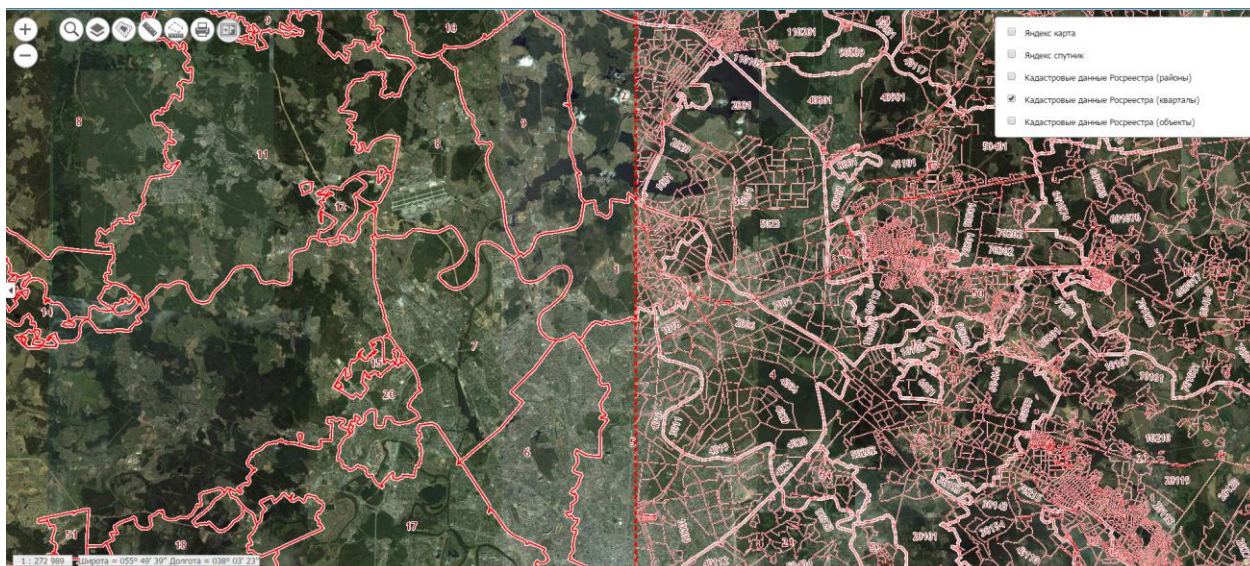


Figure 28 - Shutter mode

### 3.4.18 Parameters



To enable the mode, click the button «Parameters» in the toolbar.

The component «Parameters» is used to configure the user interface.

The mode allows to control the sequence of display and transparency for map layers, select map layers to search for objects by area, set units of spatial characteristics of map objects.

The component «Options control» contains the tabs: «View order», «Search by area», and «Advanced».

To control the sequence for display and transparency of map layers, it is necessary to turn on the tab «View order». The tab contains a list of map layers in the sequence that they are displayed in the map. To change the sequence of the layer display, left-click on the list item and drag it to the list. When the mouse button is released, the map image changes. To change the transparency of the layer drawing, you need to expand the corresponding list item and set the required transparency value.

To change the search parameters for the area, it is necessary to enable the tab. «Search by area». The tab contains a list of map layers, on which objects are selected when searching by area. To enable or deselect objects in the map layer, it is necessary to enable or to disable the corresponding list item.

Изм.	Лист	№ докум.	Подп.	Дата

Figure 29 - The panel «Options control», the tab «Advanced»

The tab «Additionally» is used to select units for measuring the spatial characteristics of objects in the user interface and for setting the type for selection of objects.

Units of measure affect the display of area, perimeter and length of map objects when displaying information about objects.

When the button «Counting the total area and length» is turned on, information is displayed on the total area and length of all objects selected on the map. The information is displayed in the panel «Map objects».

The appearance of objects affects the way that selected and found objects are displayed. A selection is available as a marker or drawing around the contour object with or without fill. The color of the outline and fill, the line thickness and transparency are adjusted.

#### 3.4.19 Moving to the specified point

To move the center of a map to the specified coordinate point, click the left mouse button on the coordinate panel. In the panel that appears, enter the latitude and longitude of the point in the format: degrees, minutes, seconds in the coordinate system WGS 84. To move to the specified point, click the button «Go to».

Изм.	Лист	№ докум.	Подп.	Дата

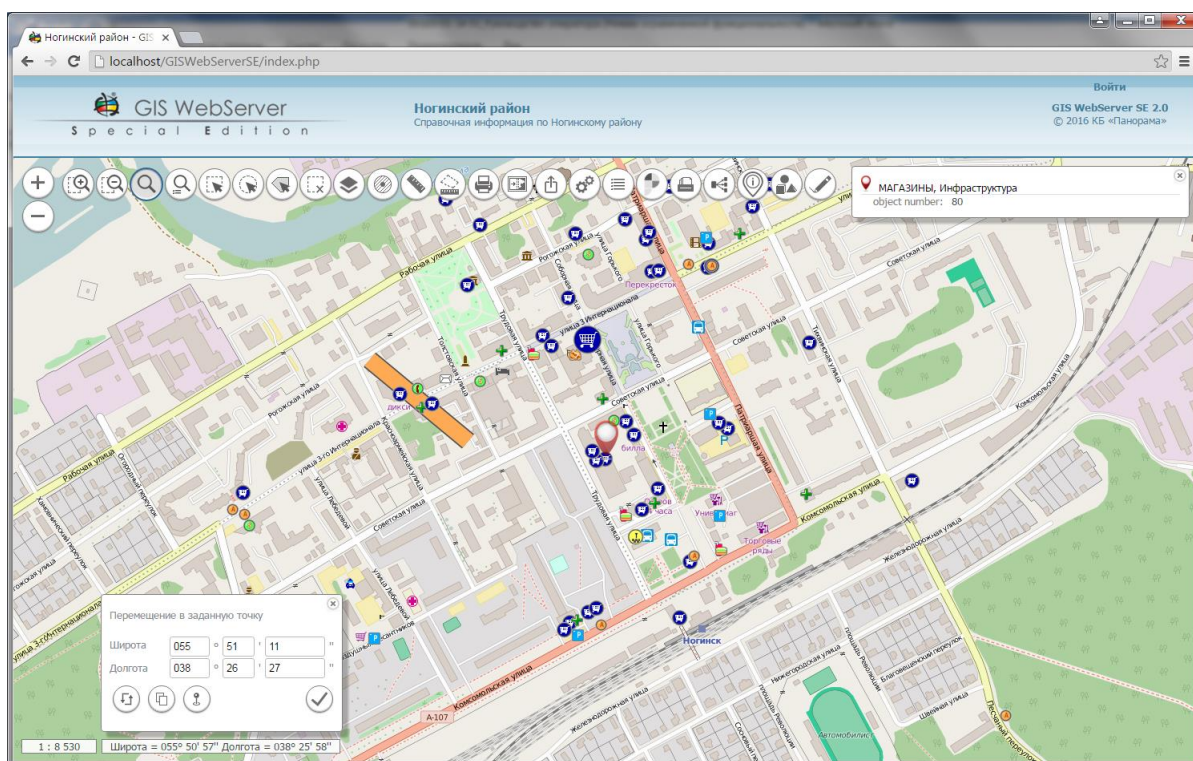


Figure 30 - Moving to the specified point



To obtain the coordinates of the point, it is necessary to turn on the button «Get coordinates at the point» and click in the map image. The coordinates of the point on the terrain will be displayed in the panel.



The button «Copy to clipboard» is used to copy the values of coordinates to the clipboard.



The button «Format of the coordinates display» is used to change the display format of the coordinates - Degree Minutes Seconds to decimal Degrees and back.

#### 3.4.20 Share the link



The component «Share» allows to get a link (URL) to the current map image. By entering this link in the browser, it is possible to go to the application with the desired list of included maps, at a specified point and on a specified scale.

To receive the link, it is necessary to enable the button «Share». The link will be displayed in the opened panel. The button «Copy» allows to copy the link to the clipboard.

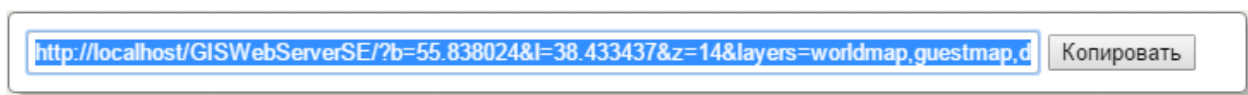


Figure 31 - Share the link

#### 3.4.21 Creating the thermal map



To create a thermal map, it is necessary to turn on the button «Create the thermal map». The panel «Creating the thermal map» is displayed on the right side of the map window.

Изм.	Лист	№ докум.	Подп.	Дата

Построение тепловой карты

Имя тепловой карты

Слой

☒ Инфраструктура (Растительность)

☒

Figure 32 - Creating the thermal map

In the field «Name» of thermal map, it is possible to specify a suitable name or accept the default value and select a layer in the layer list and to click the button «Create».

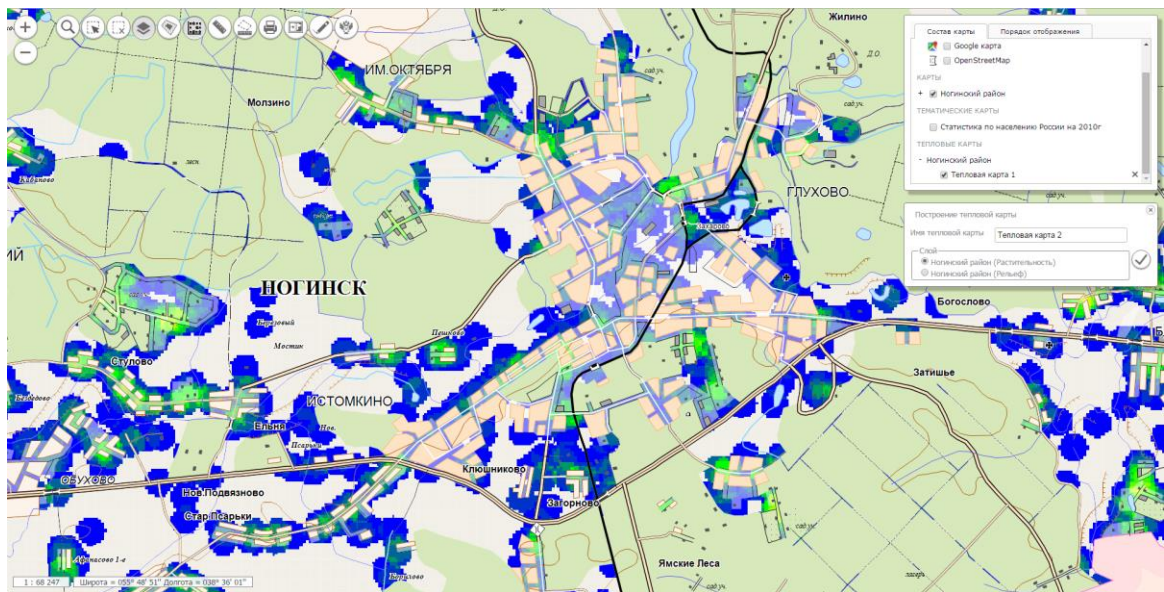


Figure 33 - The example of the thermal map displaying

Состав карты

Порядок отображения

☒ Google карта

☒ OpenStreetMap

КАРТЫ

+ ☒ Ногинский район

ТЕМАТИЧЕСКИЕ КАРТЫ

☐ Статистика по населению России на 2010г

ТЕПЛОВЫЕ КАРТЫ

- Ногинский район

☒ Тепловая карта 1

Figure 34 - Control of the thermal map

To control the thermal map there are the controls (checkbox - to display/hide the thermal map, a cross - to remove the thermal map).

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.22 Lists of objects

☰ To activate the mode, it is necessary to click the button «Lists of objects». It will bring up the mode control panel on the right side of the screen.

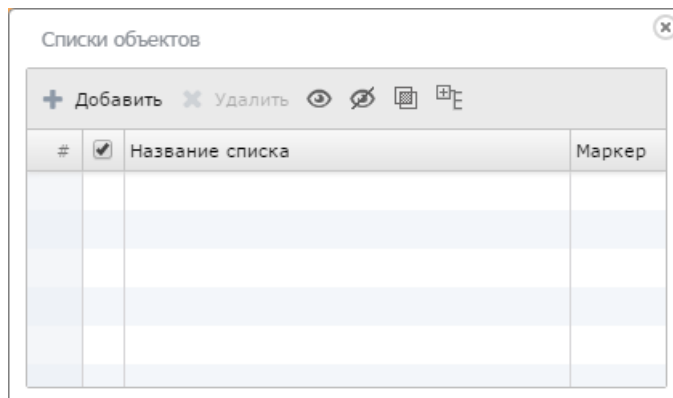


Figure 35 - The panel «Lists of objects»

At selection the objects on the map and clicking on the button «Add» in the panel «Lists of objects», the entry with the edited name and the individual marker will be added to the table.

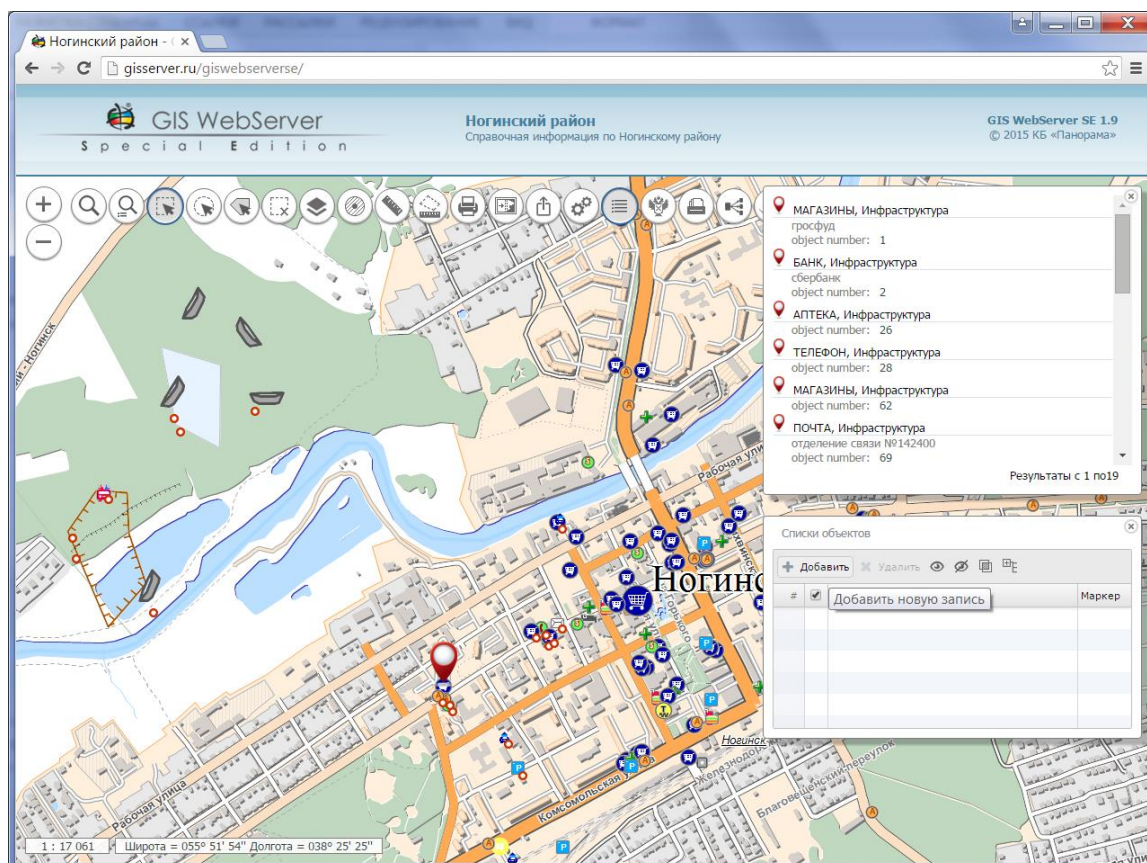


Figure 36 - The result of execution

To display on the map, it is necessary to select an item and click the button «Show» in the panel «Lists of objects».

Изм.	Лист	№ докум.	Подп.	Дата

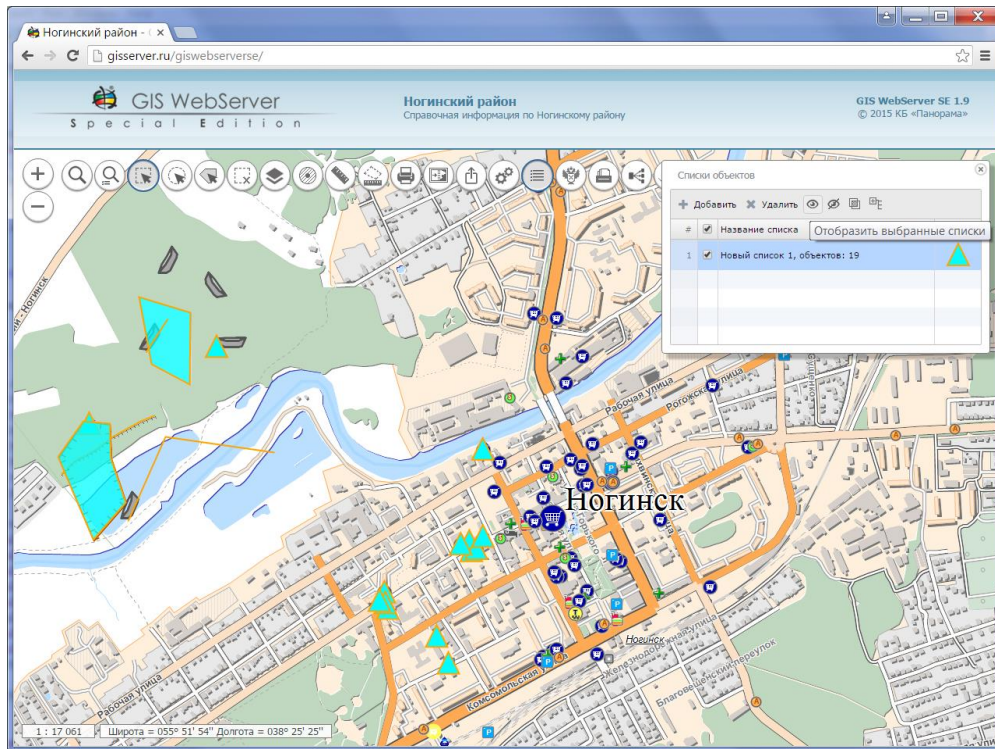


Figure 37 - The result of execution

In order to hide the list of objects, it is necessary to select an item and click the button «Hide» in the panel «Lists of objects».

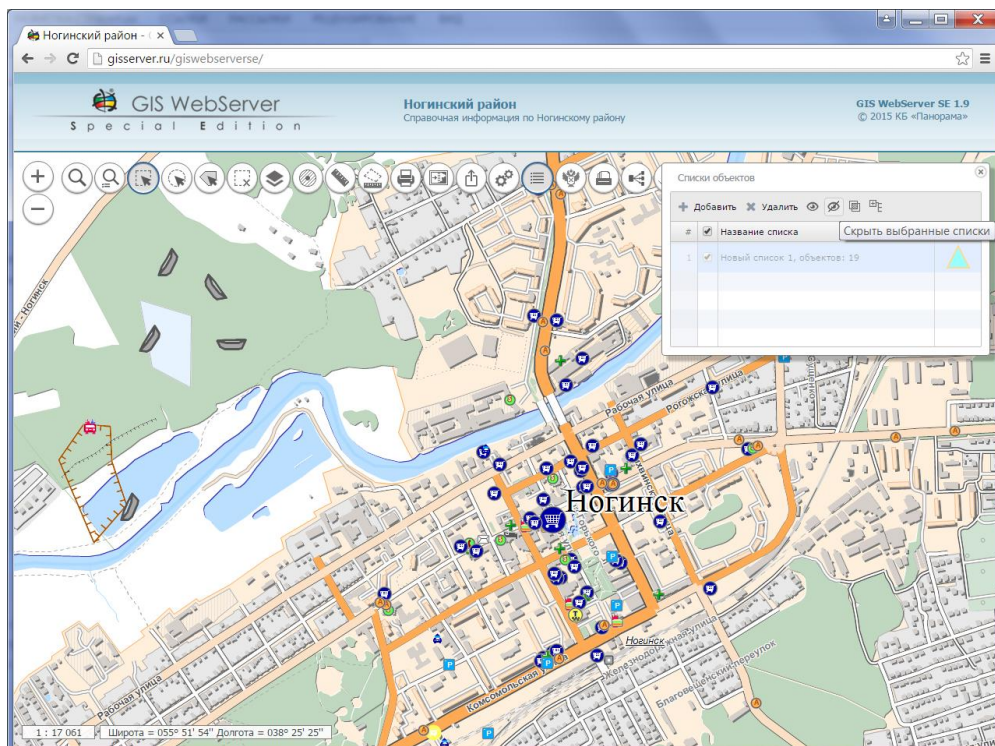


Figure 38 - The result of execution

In order to delete the list of objects, it is necessary to select an item and click the button «Delete» in the panel «Lists of objects».

Изм.	Лист	№ докум.	Подп.	Дата

To add two maps to the intersection list, click the button «Intersection», then select 2 maps from the drop-down list, and click the button «Add».

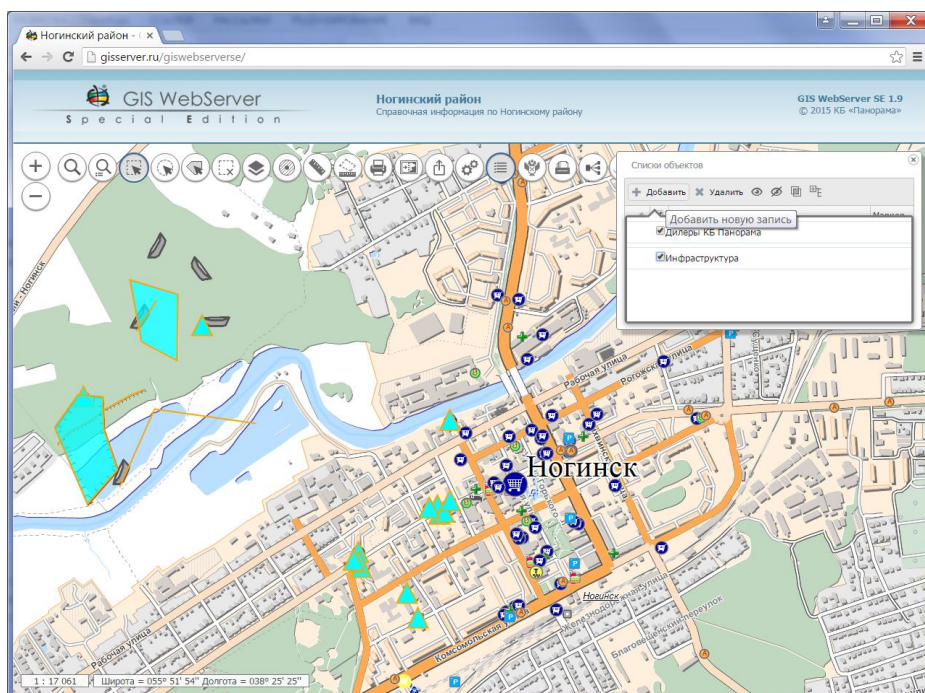


Figure 39 - Selecting the maps

To display the list of objects, select the list and click the button «View list».

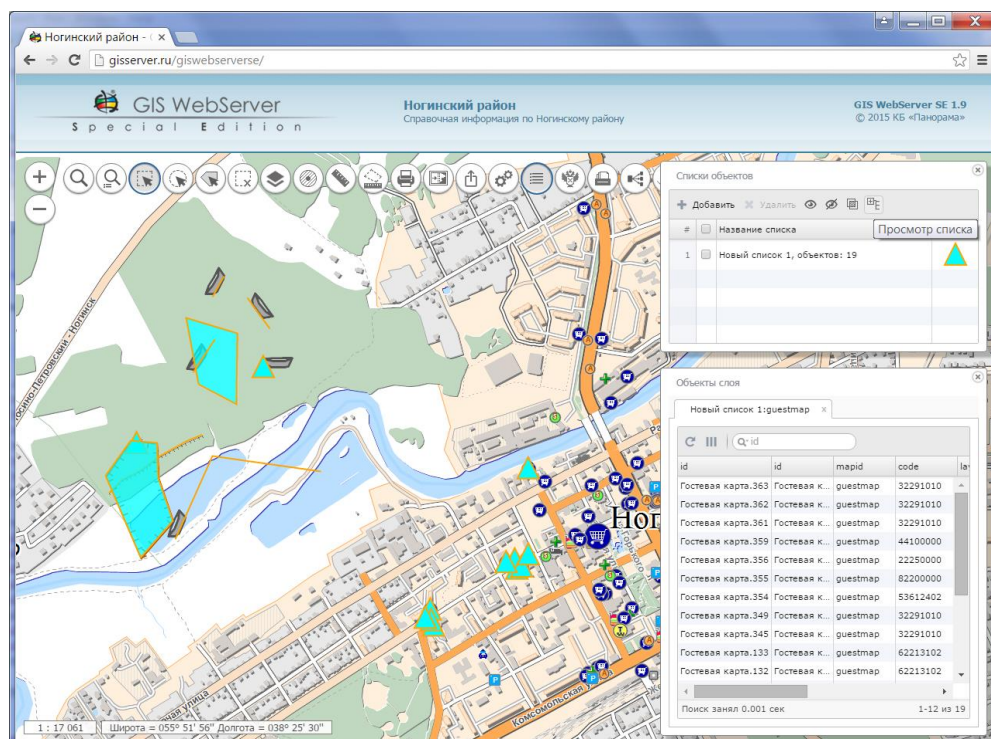


Figure 40 - Viewing the content for list of objects

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.23 Objects of the layer

The component is designed to display a list of objects for the selected layer. To activate the mode, select a layer in the panel «Composition of the map» and click the button «Objects of the Layer».

For each layer, a separate tab is created, containing a list of its objects. The list of objects is formed in the form of a table that contains the name of the object and all available semantics. In the table are available tools for sorting and filtering data, it is possible to customize the list of displayed fields. At selection an object in the list, it is searched on the map. If in the settings there is an object selection type – marker, then in addition to the search, the object is positioned on the center of the screen.

The button «Export to Excel» allows to save a list of layer objects as the file XLS on the client computer via the Web-browser.

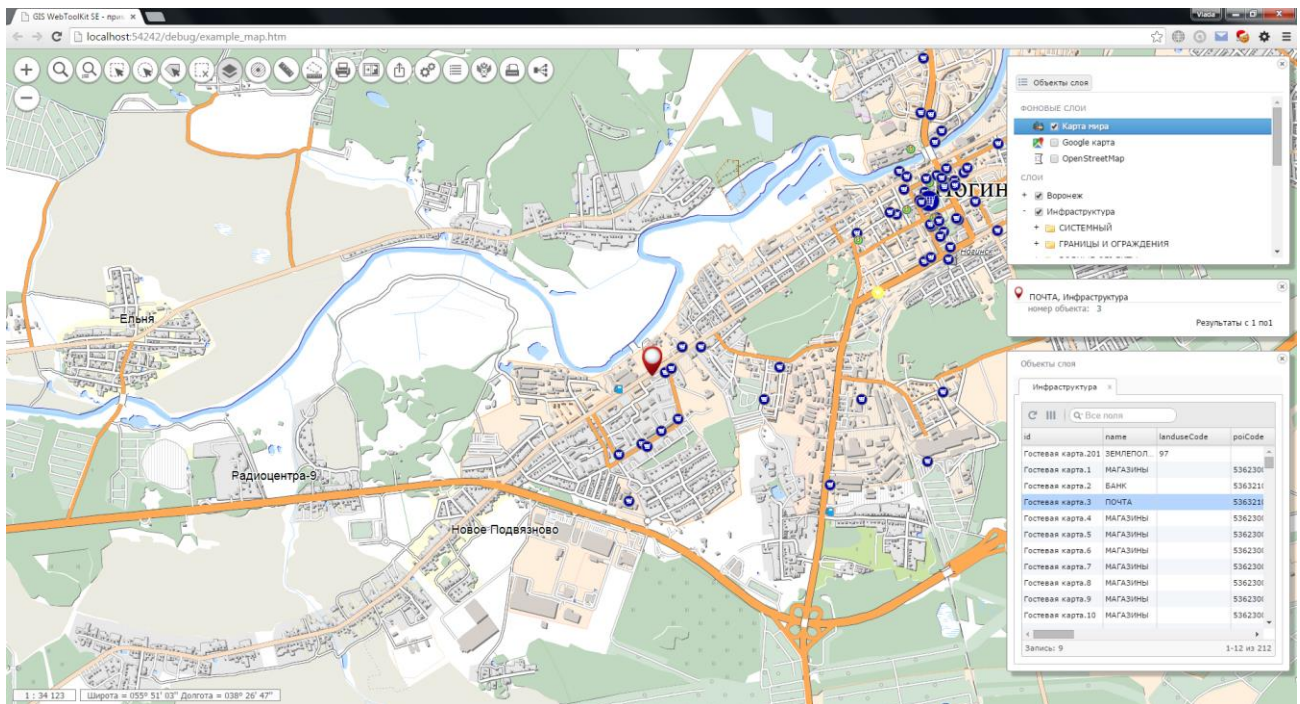


Figure 41 - List of objects in the selected layer

### 3.4.24 Map editor

To enable the tool, click the button «Map Editor». The panel of the map editor appears on the left side of the screen under the toolbar.

The component has the following modes:

- creating the object;
- editing of the object;
- moving, zooming, rotating;
- stitching of the similar map objects;
- object deleting;
- parameters;
- canceling and restoring operations.

When the modes are activated, it can appear panels with additional information. The entire sequence of actions is accompanied by prompts in the status bar at the bottom of the map window.

Изм.	Лист	№ докум.	Подп.	Дата

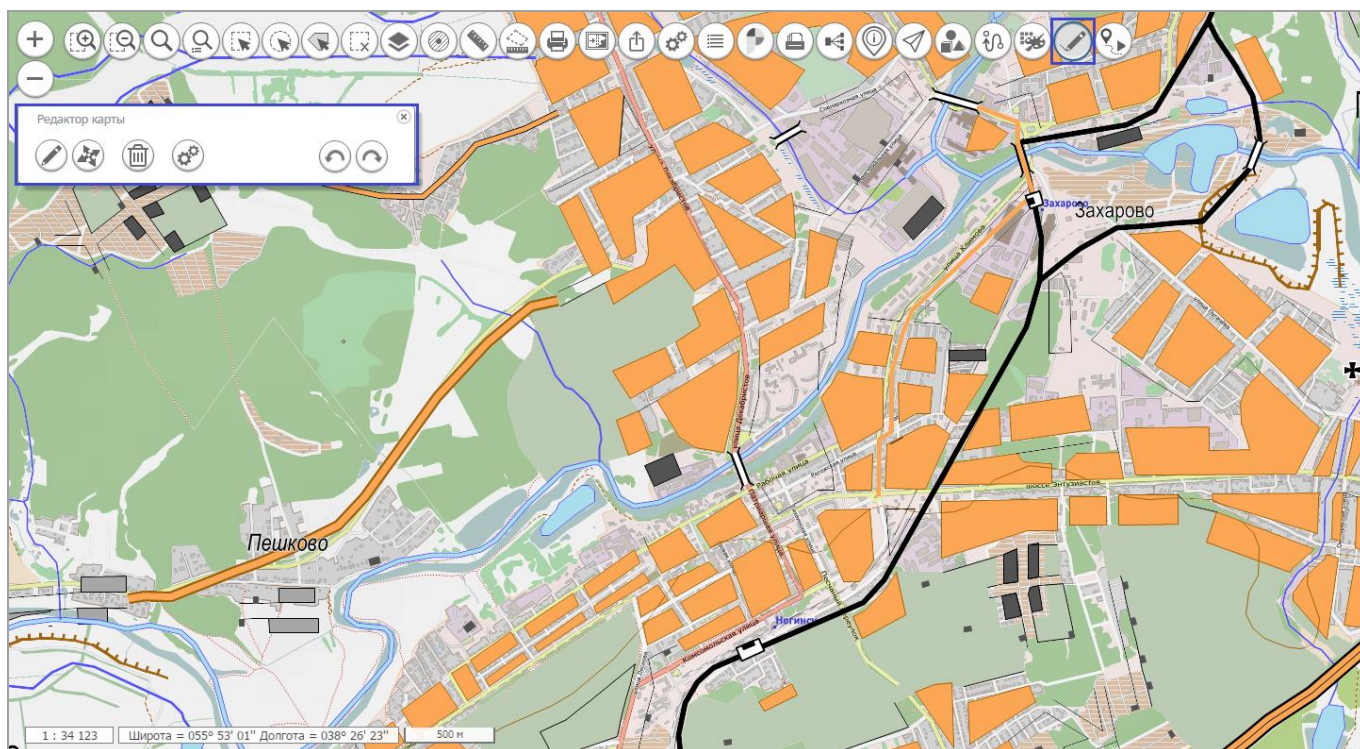


Figure 42 - The result of starting the map editor

#### 3.4.24.1 Creating the object

After activating the mode, a panel appears, including the list of editable layers and the type of the object to be created. Depending on the selected layer (the layer created by the classifier or the local/user layer), a tree of object code description appears or a panel showing the types of objects. Next, it is necessary to select the type of created object. At creation the objects according to the classifier, the last view of the created object is saved in the layout bar located at the bottom of the map window, which will further accelerate the process of selecting the object type to be applied to the map (at clicking the layout button, the map editor automatically switches to the object creation mode). The number of saved species is 10. Later, selecting a new view from the classifier and a completely filled line of layouts, the most rarely used view of the object is replaced by the newly selected one.

After selecting a view, the toolbar for applying objects (the contour, the horizontal rectangle, the inclined polygon, the circle, the button «My movements» for drawing routes of movement in real time) is activated. To start drawing an object on the map, you need to activate a specific creation method.

To change the appearance of the created object, just activate the desired layer in the layer list.

Изм.	Лист	№ докум.	Подп.	Дата

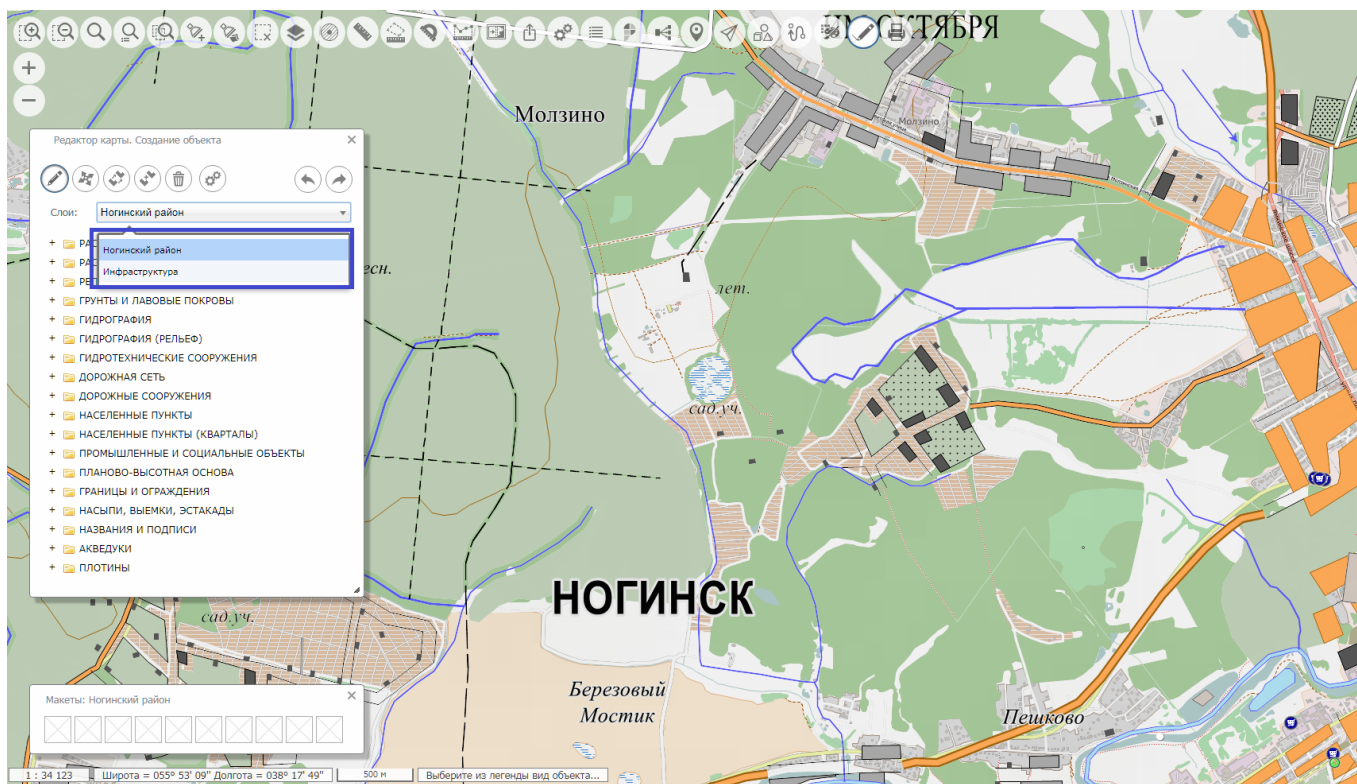


Figure 43 - Mode of object creation, selecting a layer from the list of layers

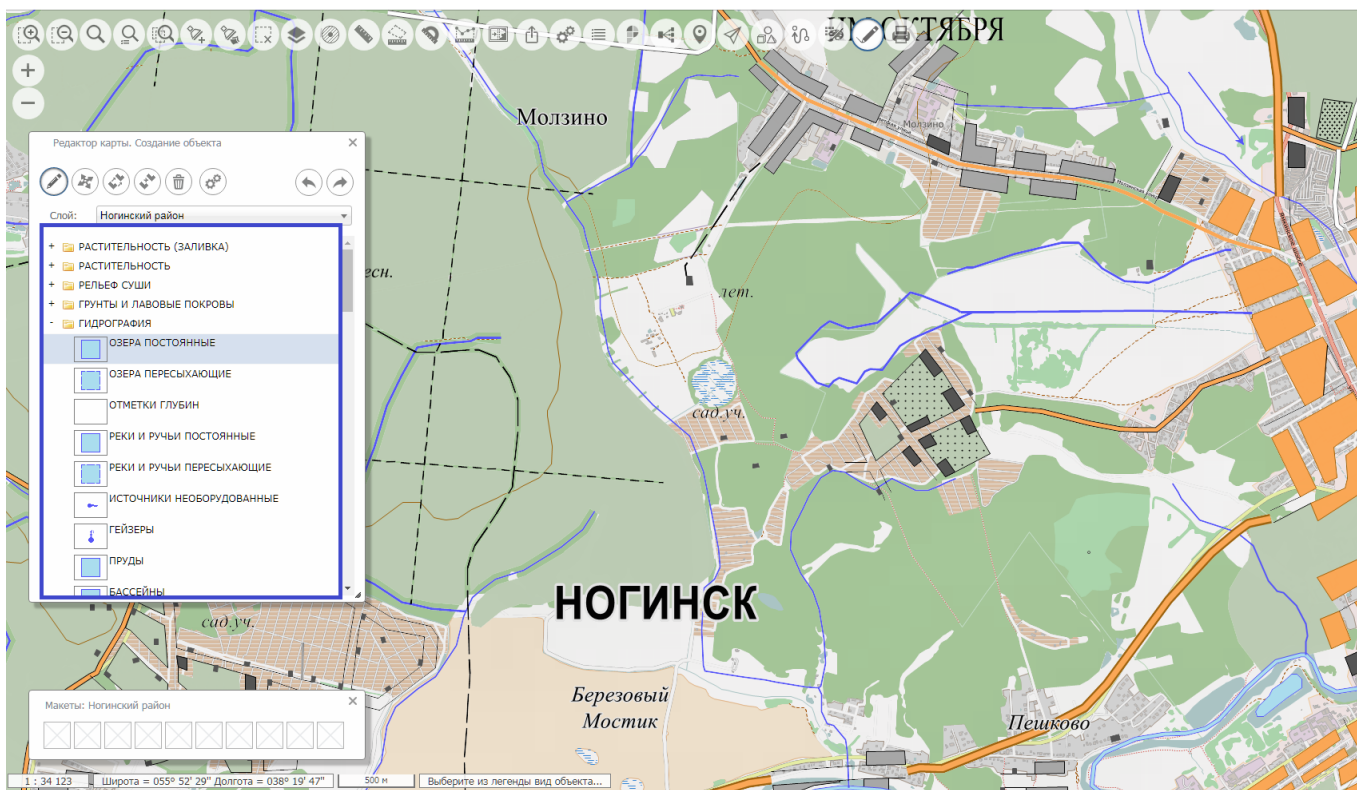


Figure 44 - Mode of object creation, selecting an object type for the layer created by the classifier

Изм.	Лист	№ докум.	Подп.	Дата

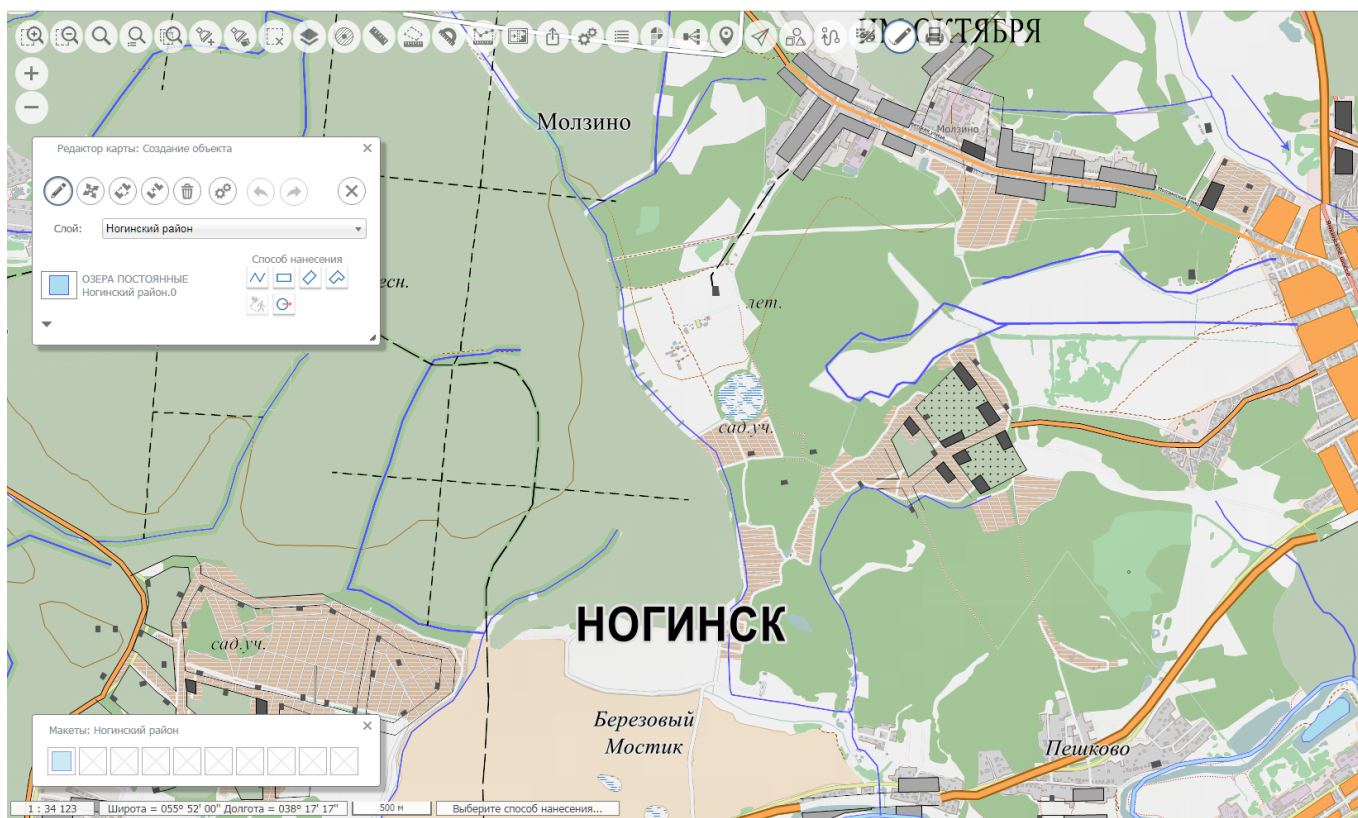


Figure 45 - Mode of object creation by the type selected from the classifier

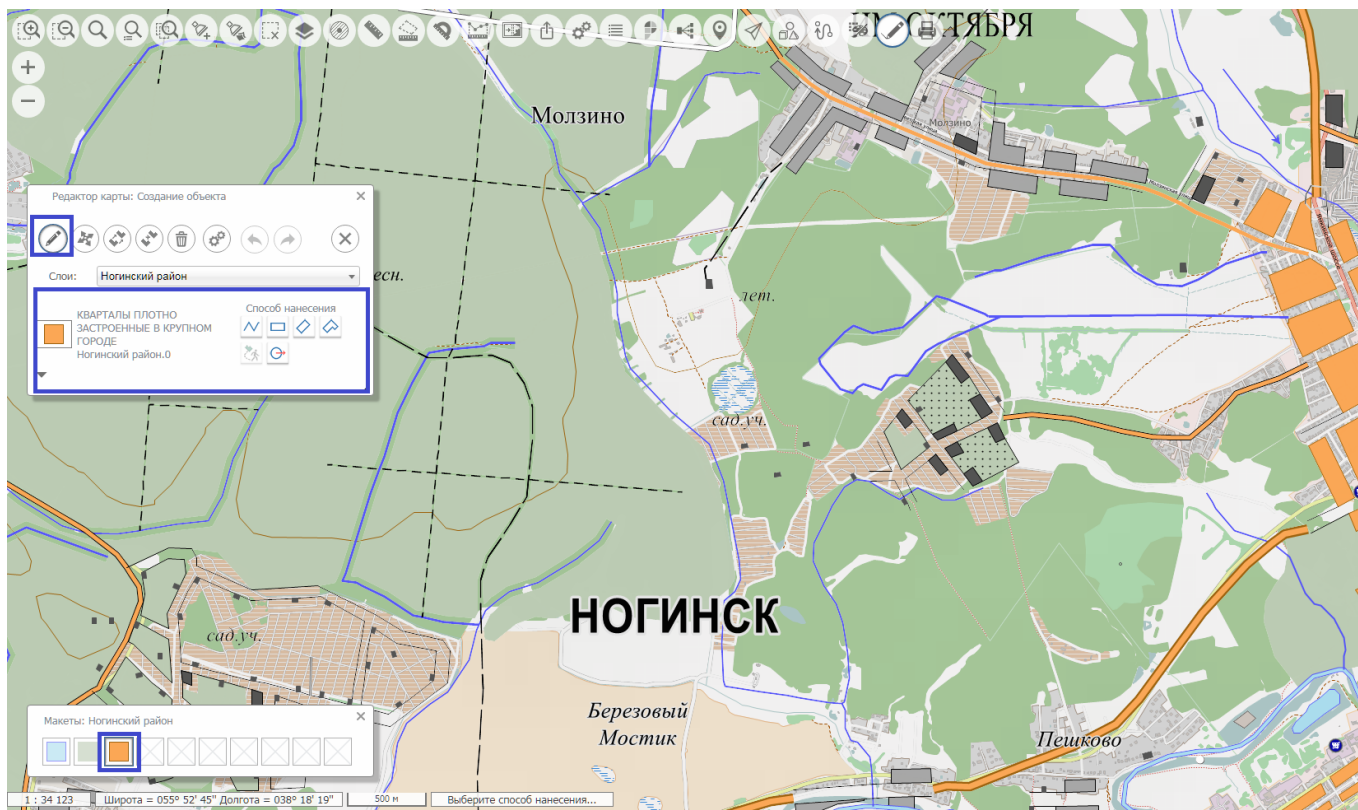


Figure 46 - Mode of object creation by the type selected from the layout

Изм.	Лист	№ докум.	Подп.	Дата

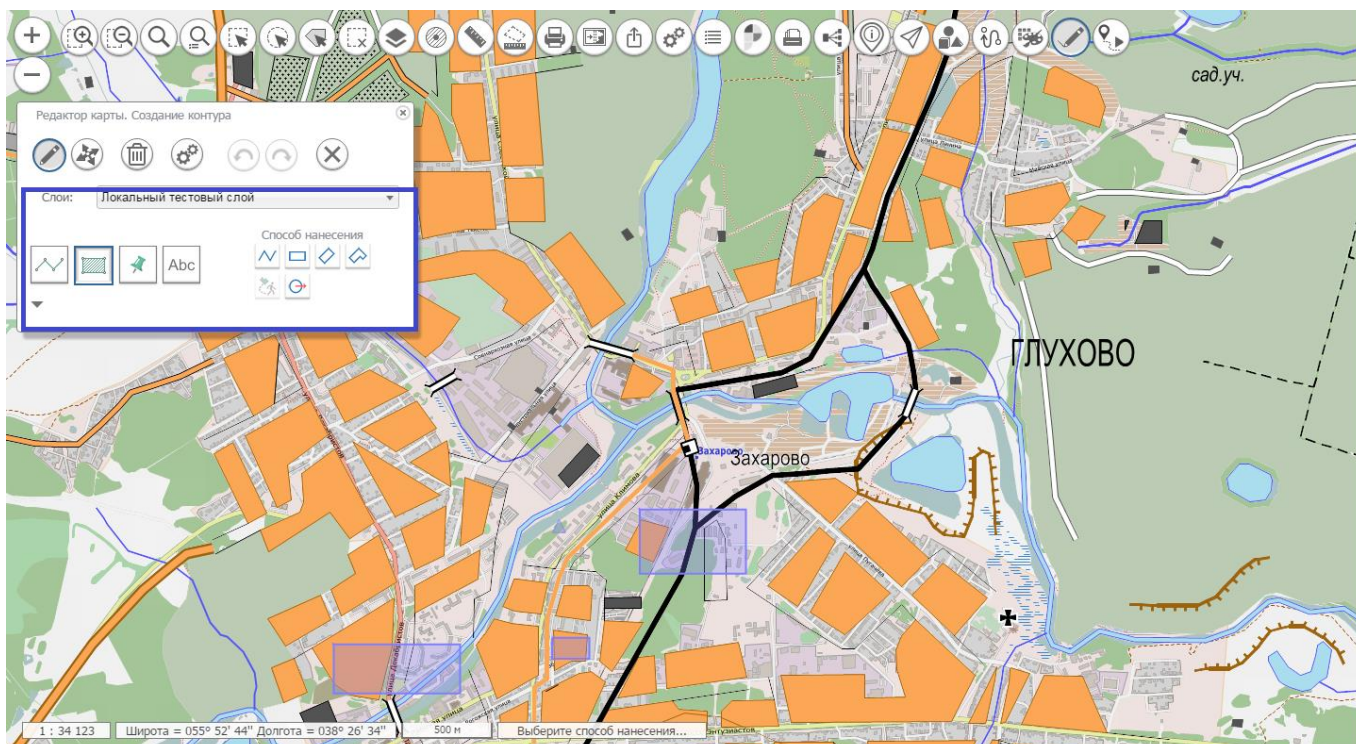


Figure 47 - Mode of creating the map object, object type selection for the local layer

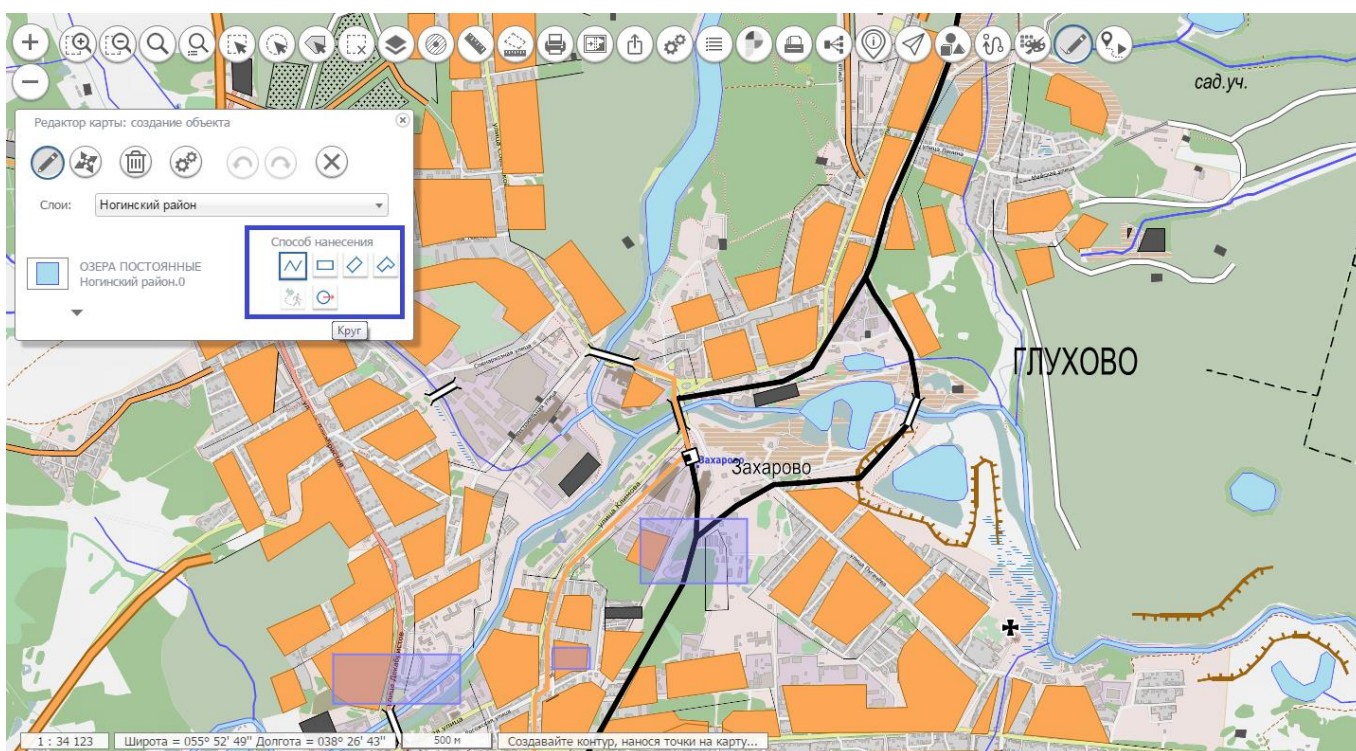


Figure 48 - Mode of creating the object, drawing a polygon with an arbitrary contour

When the contour is applied, it is possible to delete a point, change the direction of a bypass, capture the point of a nearby object. An object whose points can be captured is highlighted with a dark, bright green color with real points along the contour. The capture radius is adjusted in the parameters of the map editor.

To delete a point or to change direction, select the menu item that appears when the mouse clicks on the plotted point.

Изм.	Лист	№ докум.	Подп.	Дата

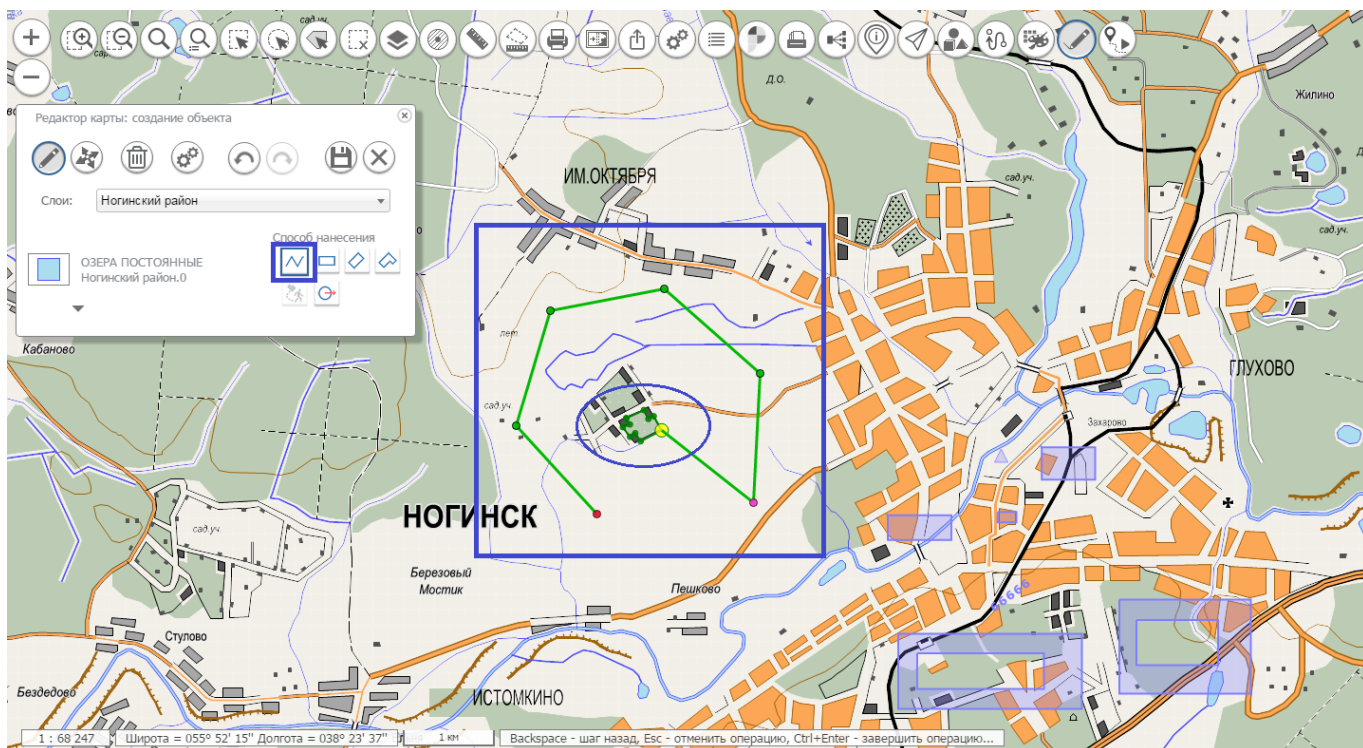


Figure 49 - Mode of creating the object, plotting a polygon, capturing the point of a nearby object

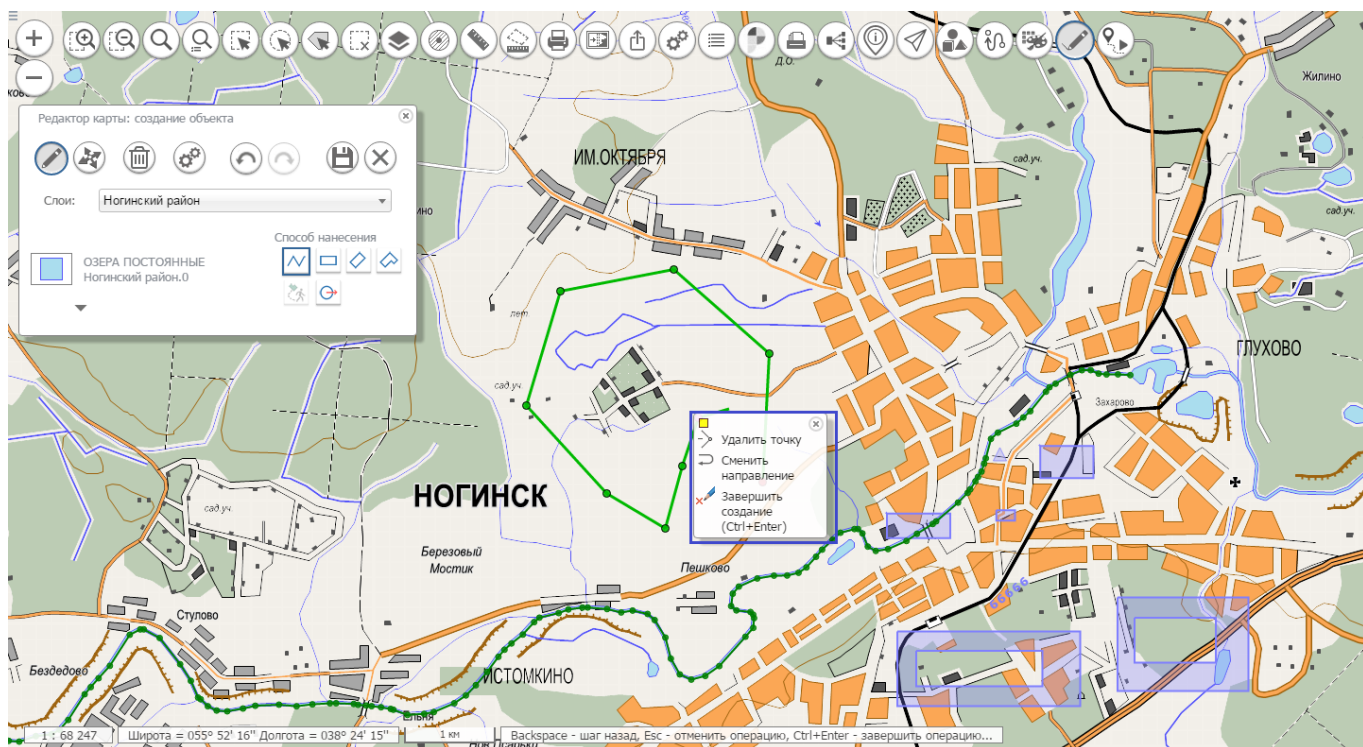


Figure 50 - Mode of creating the object, plotting a polygon, pop-up menu for a point

In parallel with the application of points on the map, it is possible to edit the semantic characteristics of the object and directly the coordinates of the plotted points. To do this, just open the editor window by clicking on the arrow at the bottom of the editor panel. For a better visual perception of a large set for semantic characteristics of the object, the window size can be changed by clicking the extension button on the left side of the editor panel. The panel location and its size are saved and when

Изм.	Лист	№ докум.	Подп.	Дата
------	------	----------	-------	------

the map is restarted, the Map Editor is restored. To cancel the current operation (point editing, editing semantics, moving, etc.), the corresponding buttons are used on the panel.

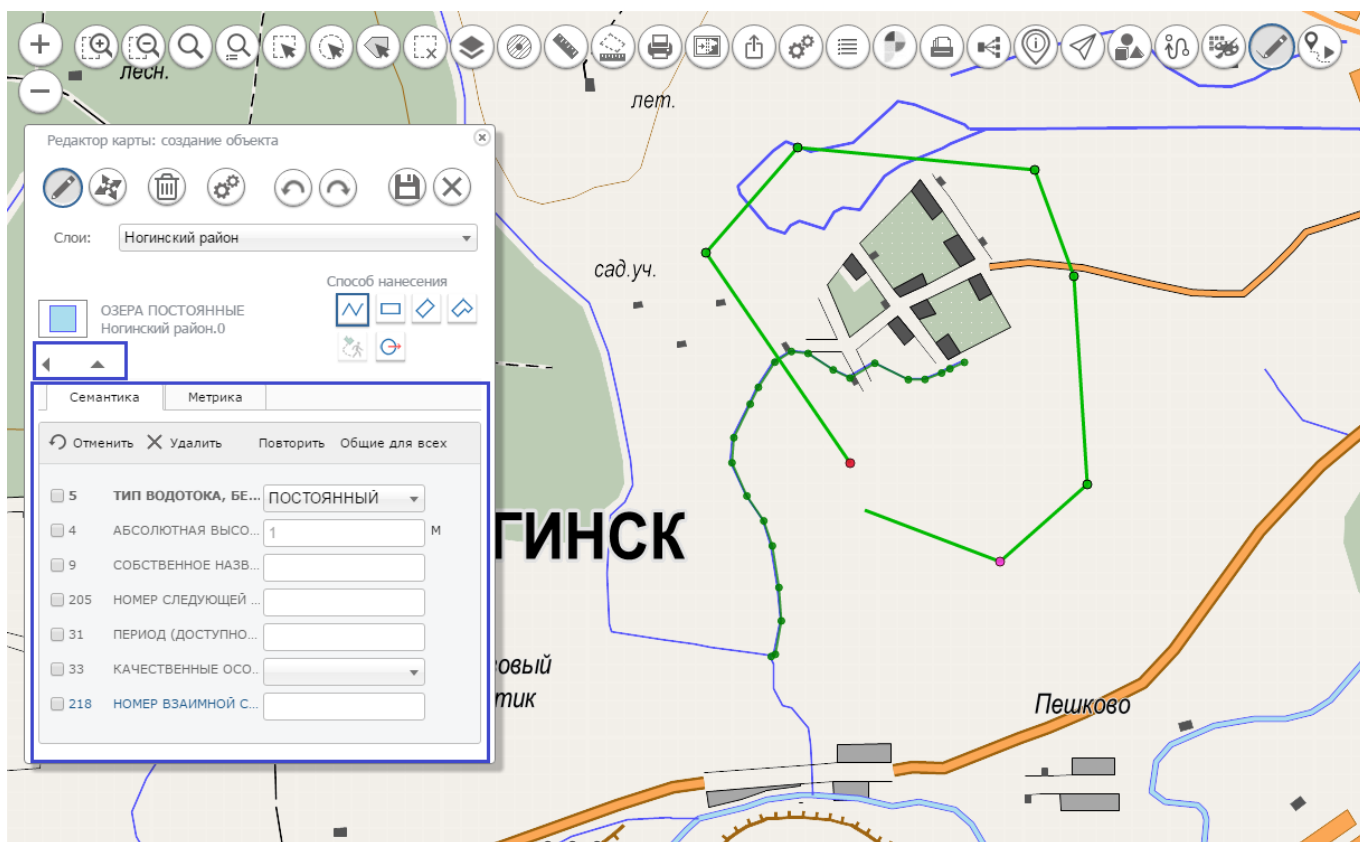


Figure 51 - Mode of creating the object, polygon drawing, a window of editing for semantic characteristics

At the end of the operation for drawing the contour of the object, the creation process passes to the editing stage of the created contour.

At this stage, the toolbar is replaced. It is possible to edit individual points, to move, to rotate, to scale an object, to create new paths, to delete unnecessary contours, working in topology mode (edit common points of adjacent objects). When the mode of adding a new contour is activated, the editing modes panel changes to the creation methods panel.

After entering all necessary information, the object can be saved by pressing the save button or the key combination (Ctrl + S). When objects with multiple contours are saved, the internal and external contour intersection is checked. In the presence of intersections, a message and a request for further preservation are issued.

While in the creation mode, it is possible to continue to create objects of the previously selected type, or by clicking a layer change in the layer list, select a new kind of object from the legend.

Изм.	Лист	№ докум.	Подп.	Дата

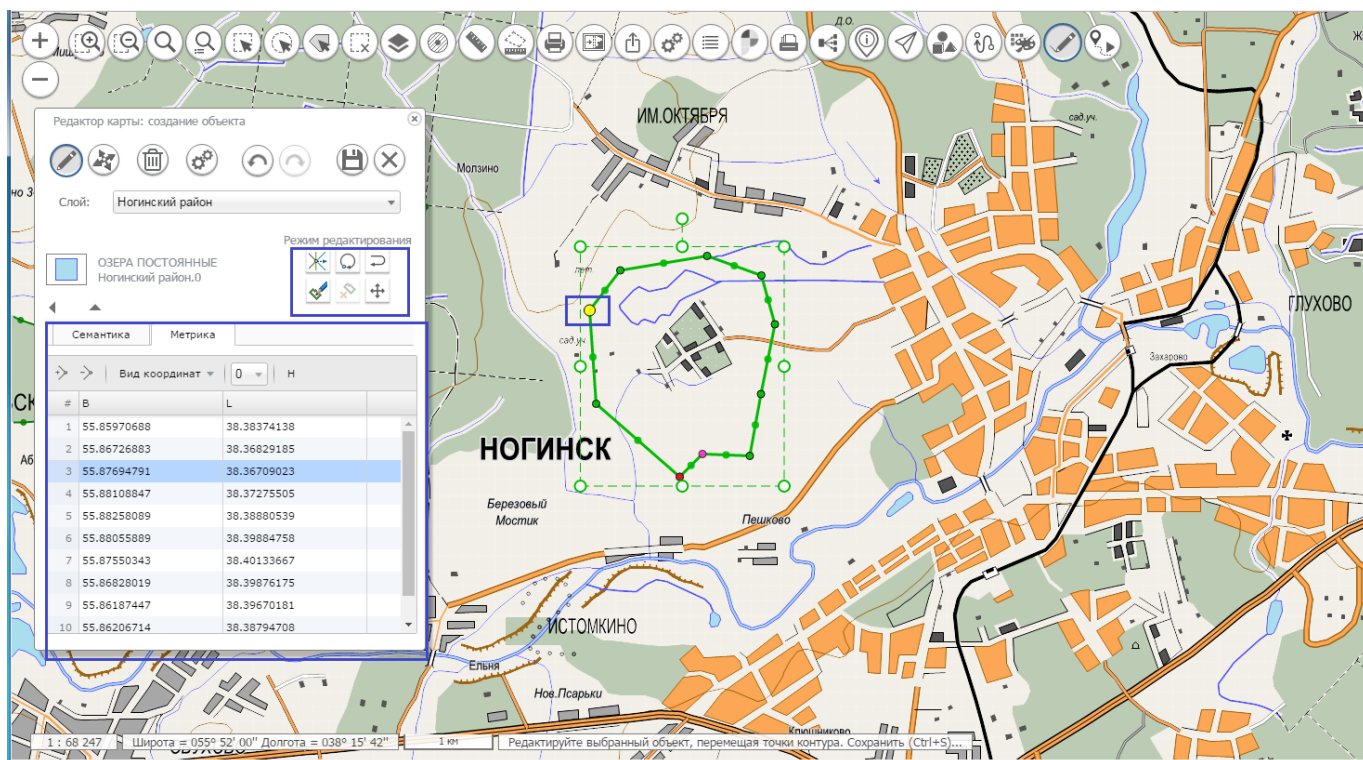


Figure 52 - Mode of object creation, polygon drawing, editing stage of the applied contour

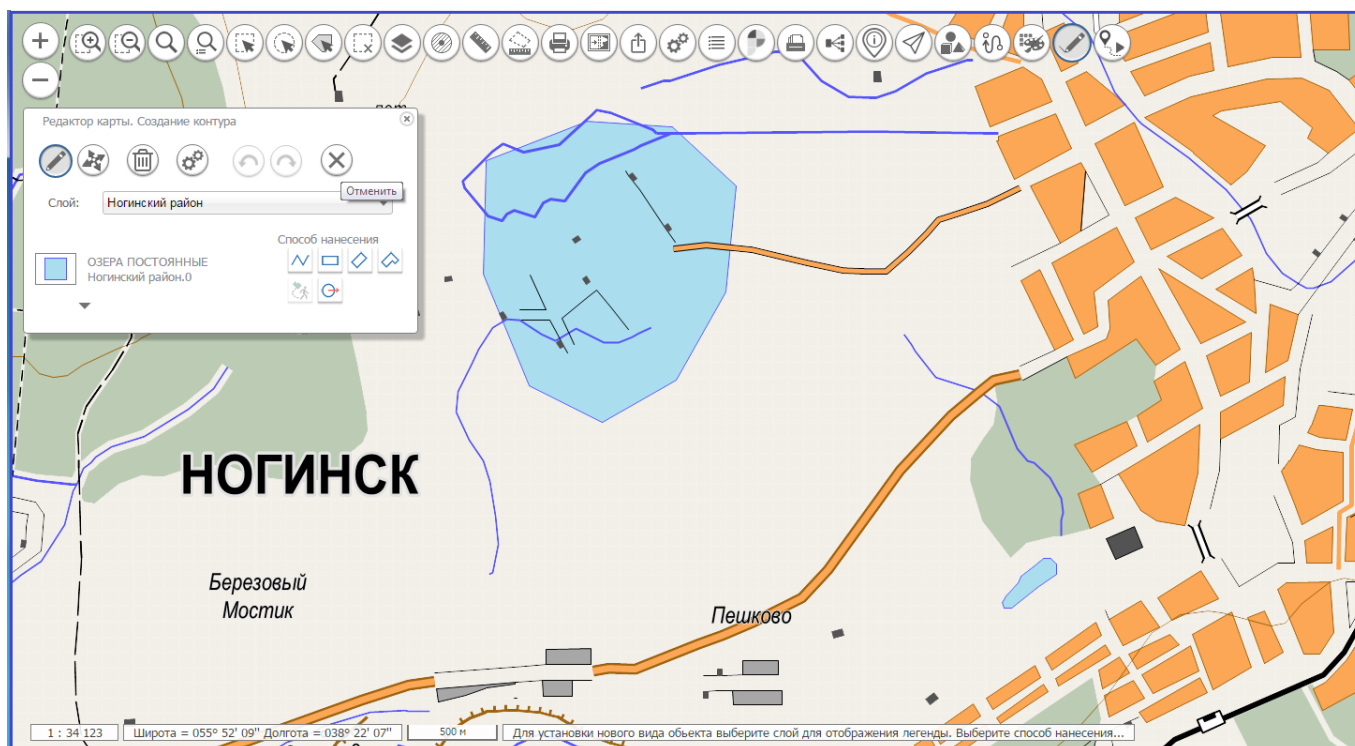


Figure 53 - Mode of object creation, creating a new object after saving the previous one

#### 3.4.24.2 Editing the object

After clicking the button «Object editing» on the map, red objects will highlight objects that can be taken for editing. Select the object by clicking on the highlighted path or point (if the object is a point object).

Изм.	Лист	№ докум.	Подп.	Дата

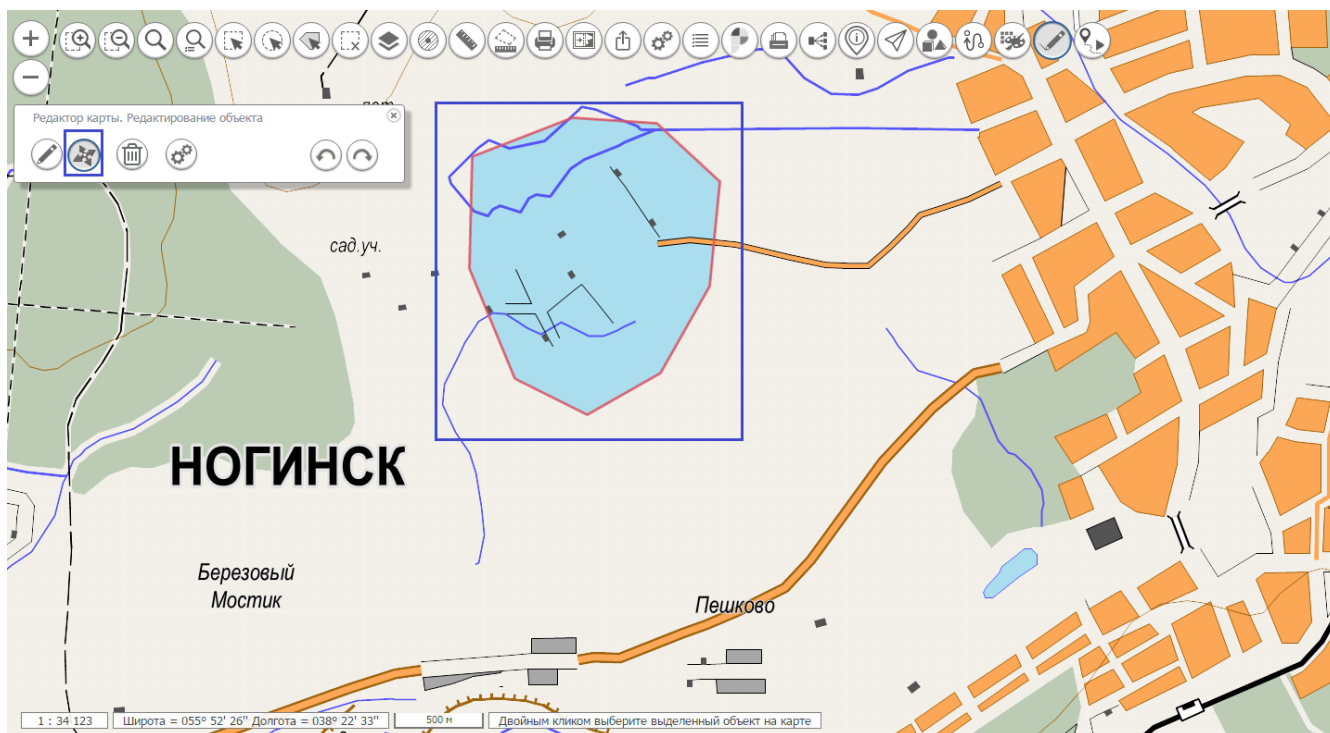


Figure 54 - Mode of object editing, selection the object for editing

After selecting the object, the panel Map Editor will look similar to the contour of editing window in the create mode, except that the list of map layers will be absent.

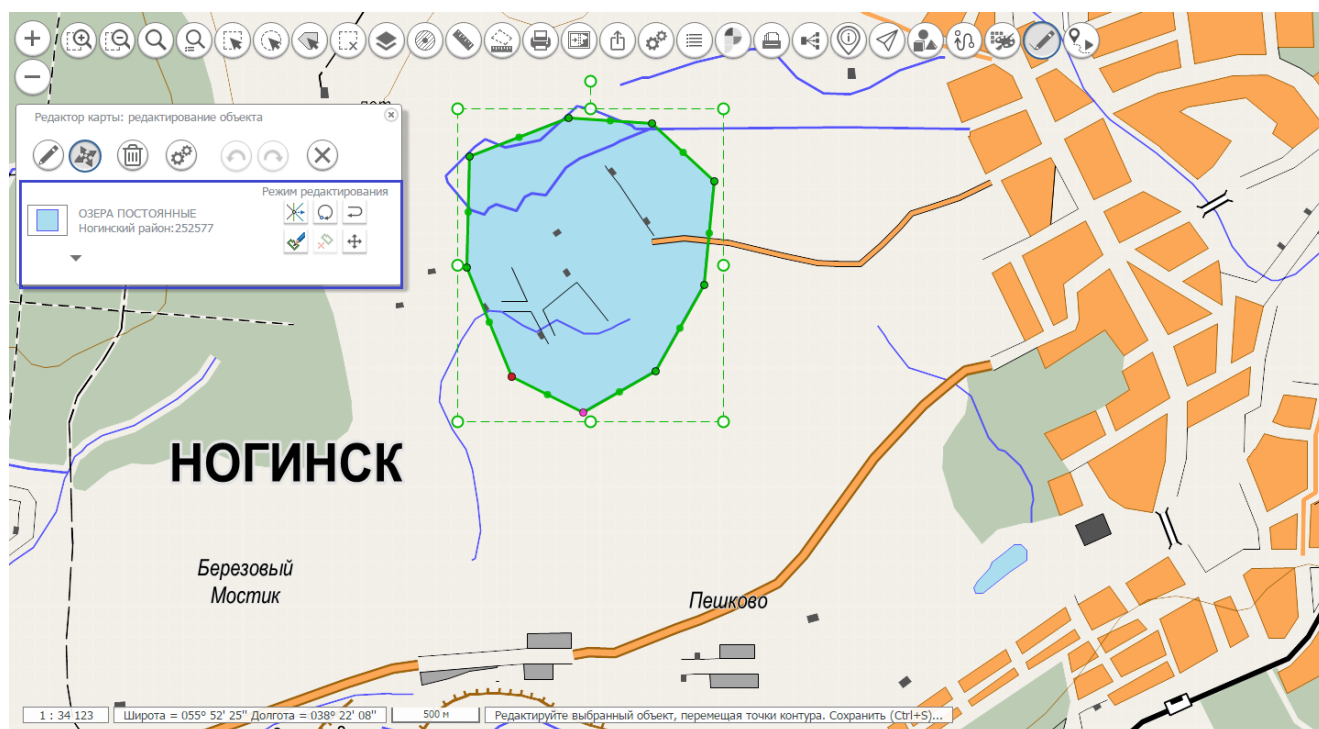


Figure 55 - Mode of object editing, the selected object

#### 3.4.24.3 Moving, scaling, rotating

If there are previously highlighted objects on the map, a message is displayed about the number of highlighted objects that meet the editing conditions with a proposal to move them.

Изм.	Лист	№ докум.	Подп.	Дата
------	------	----------	-------	------

If the answer is positive, the group of highlighted objects is placed in the overall frame. Then it is possible to perform operations of moving, rotating, and scaling on a group of objects.

If there are no highlighted objects, the map highlights the selected objects in red outline. The object is selected by clicking on the highlighted contour or point (if the object is point). Next, the operations of moving, rotating, scaling for a single object are performed.

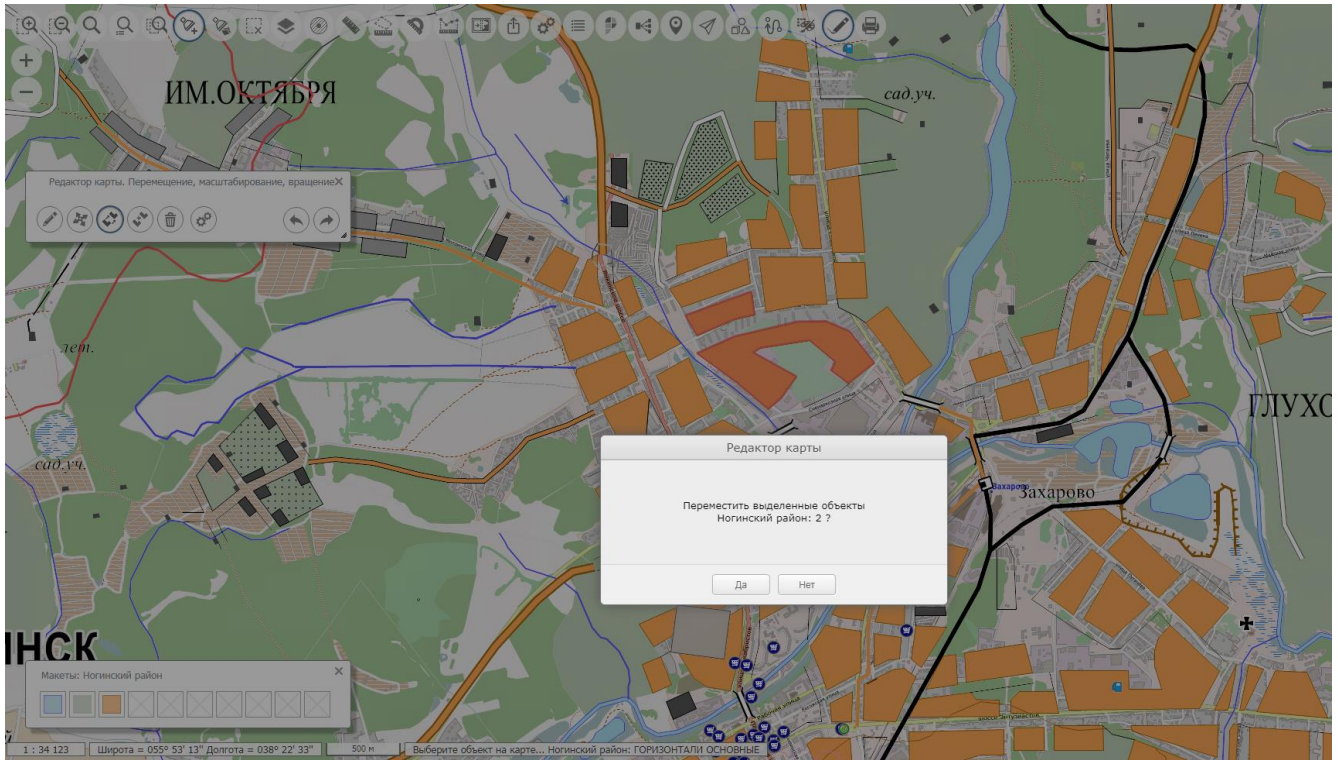


Figure 56 - Mode of moving objects, the request to move the selected objects

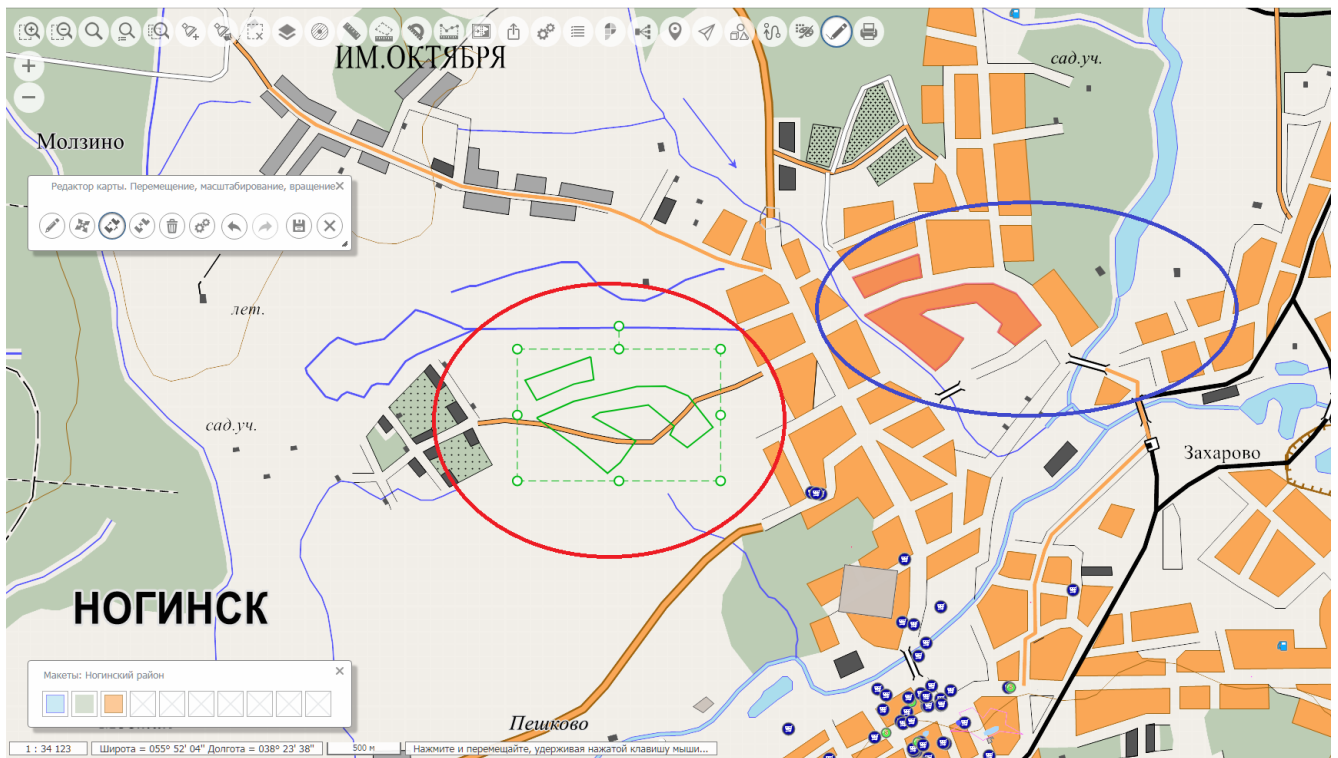


Figure 57 - Mode of moving objects, moving a group of highlighted objects

Изм.	Лист	№ докум.	Подп.	Дата
------	------	----------	-------	------

#### 3.4.24.4 *Stitching of the same type map objects*

In this mode, cross-linking (stitching) of the same type of map objects is performed. Alternately, it is prompted to select objects on the map. Then, the metric and semantic characteristics of the objects are combined.

#### 3.4.24.5 *Deleting the object*

Enabling the delete mode is performed after pressing the button «Delete object». If there are previously highlighted objects on the map, a message is displayed about the number of highlighted objects that meet the editing conditions with a proposal to delete them.

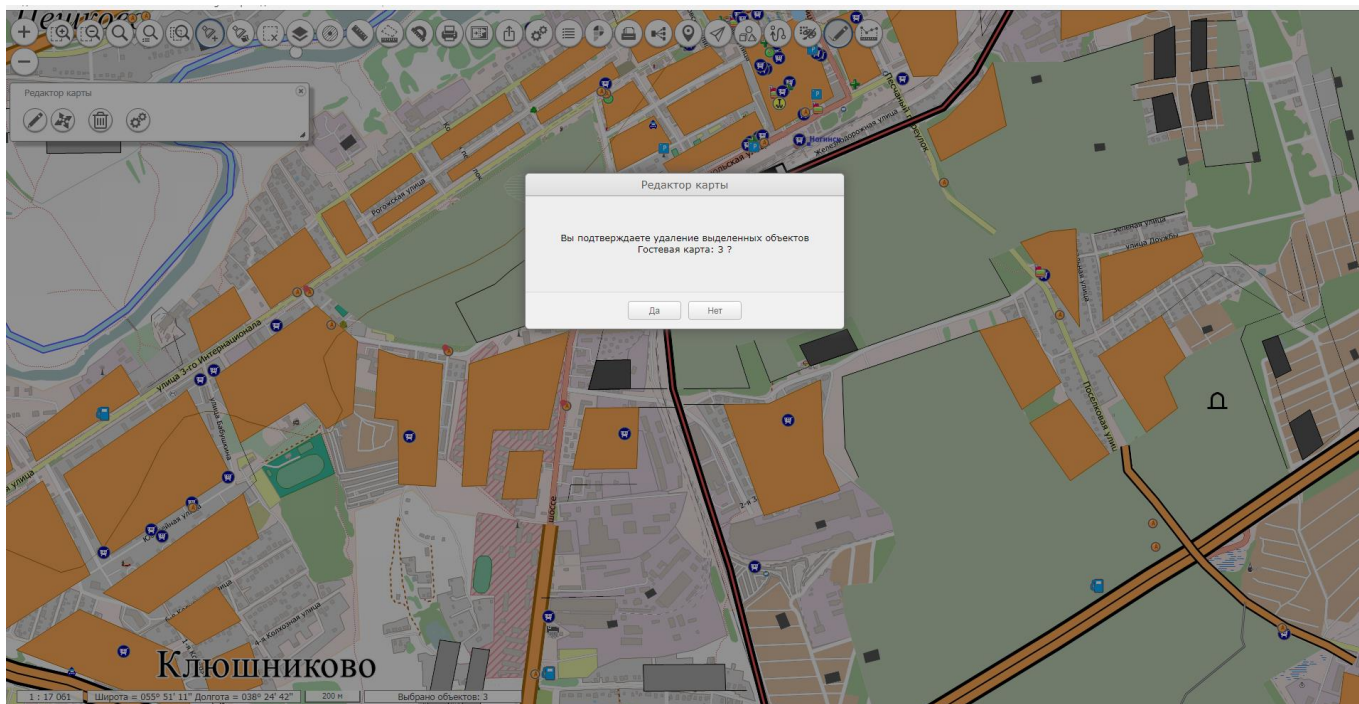


Figure 58 - Delete object mode, delete request

If the answer is positive, it appears the additional dialog for processing the highlighted objects. Upon completion of objects sorting out (button «Yes» or «Skip») or closing the dialog (button «All» or «Complete»), the delete operation is performed.

Изм.	Лист	№ докум.	Подп.	Дата



Figure 59 - Mode of deleting objects, dialog for sorting out of highlighted objects

If you refuse to delete, the mode of selecting one object is started. Objects that can be deleted are highlighted in red outline on the map. Select an object by clicking on the highlighted contour or point (if the object is point). Then it will be prompted to delete the selected object. If the answer is positive, the object will be deleted.

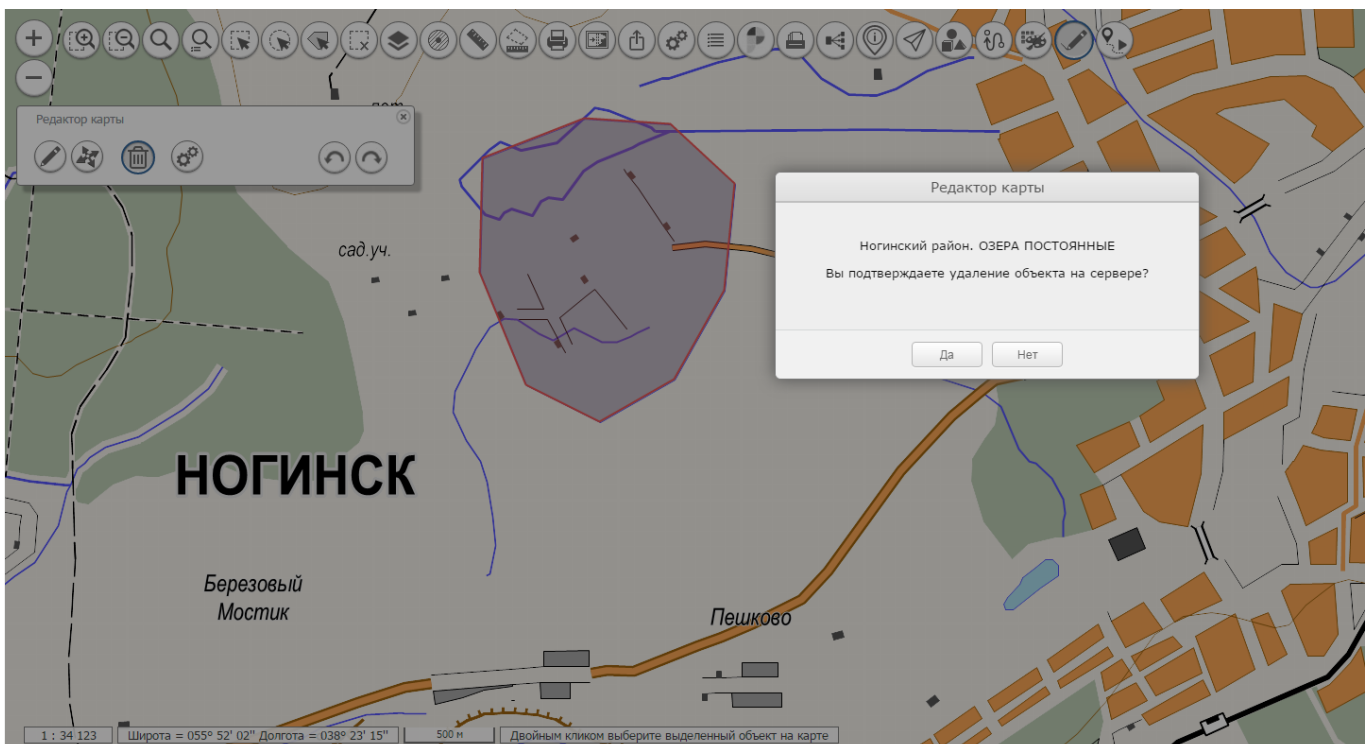


Figure 60 - Mode of object deletion, the delete request

It is possible to cancel server operations for creating, updating, deleting objects using the buttons

«Cancel» and «Restore».

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.24.6 Parameters

Clicking the button «Parameters» (Settings), a window will appear with the parameters of the editing session.

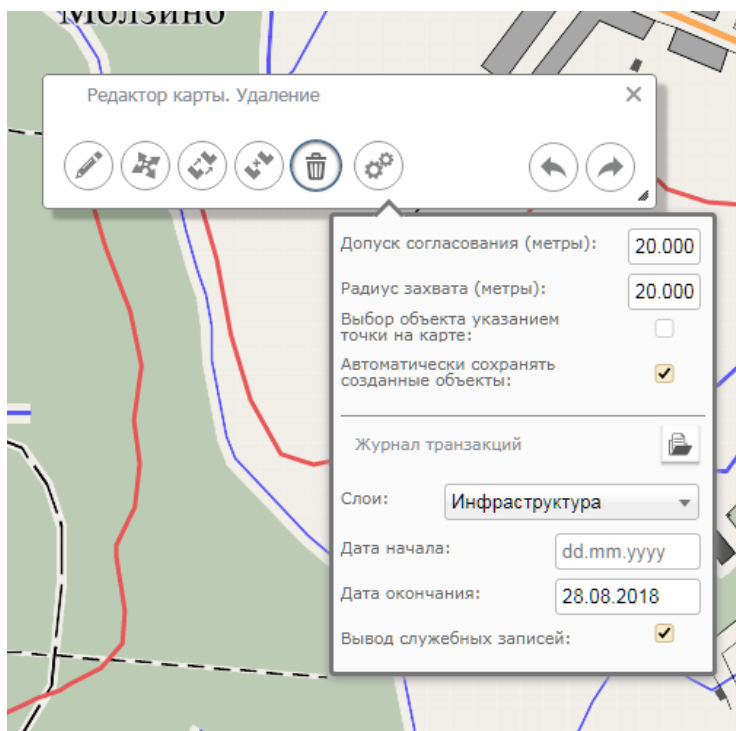


Figure 61 - Parameters of editing session

- the matching tolerance is used when editing the object with «Topology» mode enabled (nearby objects whose points are included in the tolerance, they will be automatically edited and they will be highlighted with a light green outline during editing);
- the capture radius is taken into account when editing or creating objects while moving the mouse on the screen (points within the specified radius are captured automatically);
- selecting the object by specifying a point on the map (if the parameter is enabled, instead of the standard object selection mode (highlighting contours and points on mouse hover), the map object is selected by clicking the mouse in the desired location on the map, and then sorting out for the object in the dialog that appears);

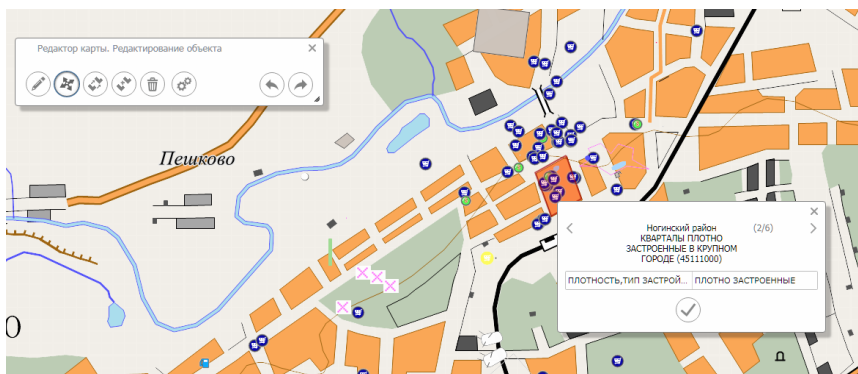


Figure 62 - Parameters of editing session, selection the object by specifying point on the map

Изм.	Лист	№ докум.	Подп.	Дата

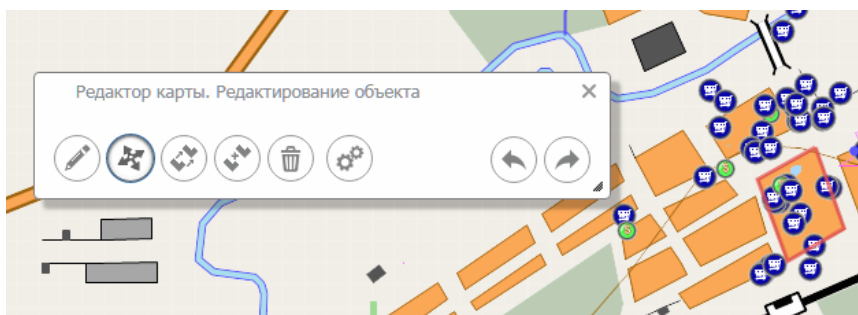


Figure 63 - Parameters of editing session, standard selection of the object on the map

- the transaction log allows to view information about the operations performed by the server.

The parameters of the editing session are saved when Map Editor finishes to work, and they are restored during its restart.

### 3.4.25 Routing and analysis of data from a drone

To enable the mode, it is necessary to click the button «Retrospective analysis of data from a drone». In this case, a panel with a list of analyzed data appears in the right part of the map window.

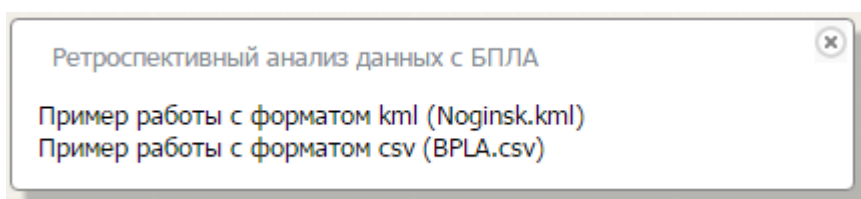


Figure 64 - Routing and analysis of data from a drone

After selecting the desired line, a panel with control buttons and a video file browser window will appear on the right side of the map panel.

The map displays the flight route. When navigating through the control panel, the marker moves along the route points synchronously. And, on the contrary, at selection of any point for the route, it moves to the desired fragment of the video file.

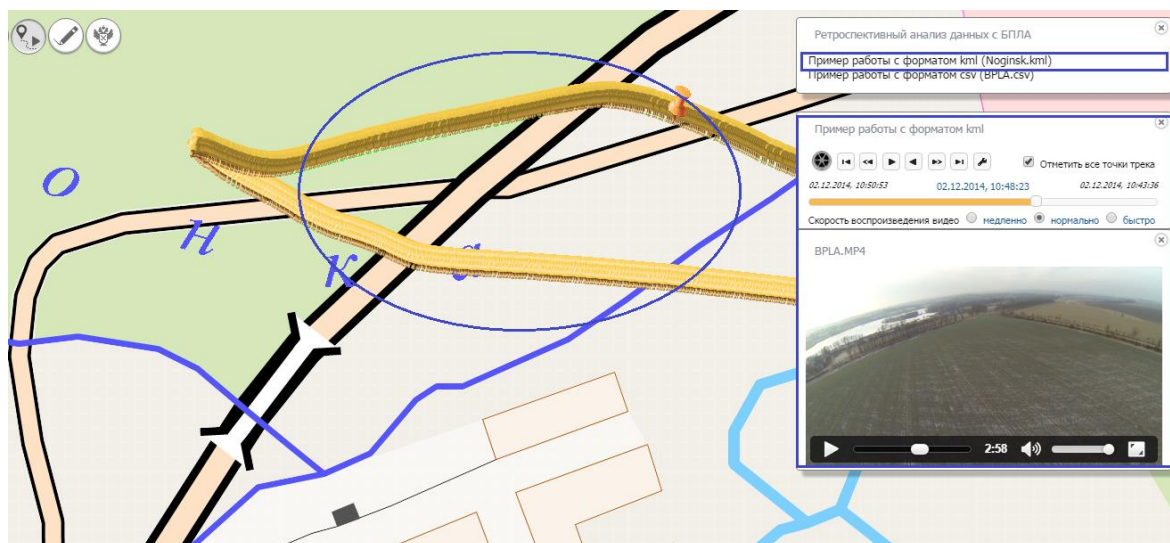


Figure 65 - Component operation Routing and data analysis from a drone

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.26 Information from the State Real Estate Cadastre



To activate the mode, it is necessary to click the button «Information of the State Real Estate Cadastre». It will display the panel on the right side of the screen. To fill the panel with data, click in the map window.

Figure 66 - Displaying information

### 3.4.27 Thematic mapping

Thematic mapping includes two components, «Creating a thematic layer» and «Displaying thematic layers».

#### 3.4.27.1 Creating a thematic layer



The component «Creating a thematic layer» is designed to construct a thematic map on the characteristics (semantics) of the selected objects.

To create a thematic layer, it is necessary to select objects on the map, turn on the mode «Creating a thematic layer», select the characteristic for which the building will be performed, and go to the tab «View» to configure the parameters.

Изм.	Лист	№ докум.	Подп.	Дата

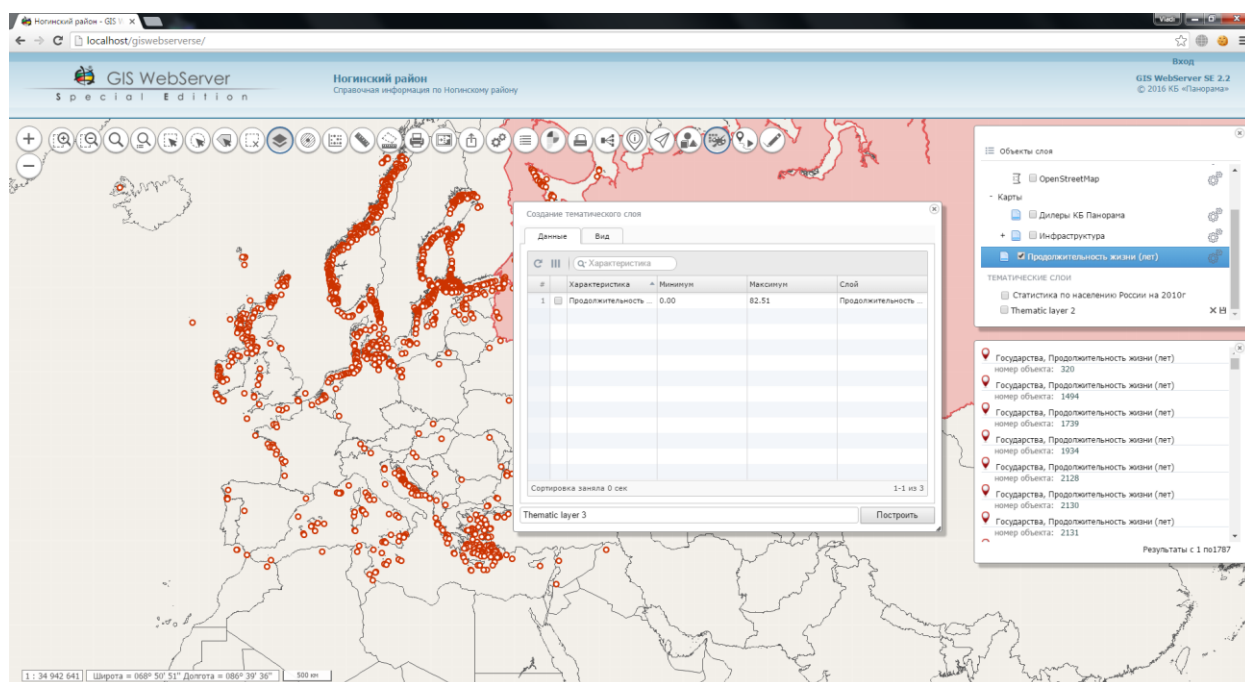


Figure 67 - Choosing the characteristic for constructing the thematic layer

The list of available characteristics for the selected objects is displayed on the tab «Data». Only numeric characteristics and directory-type characteristics are available.

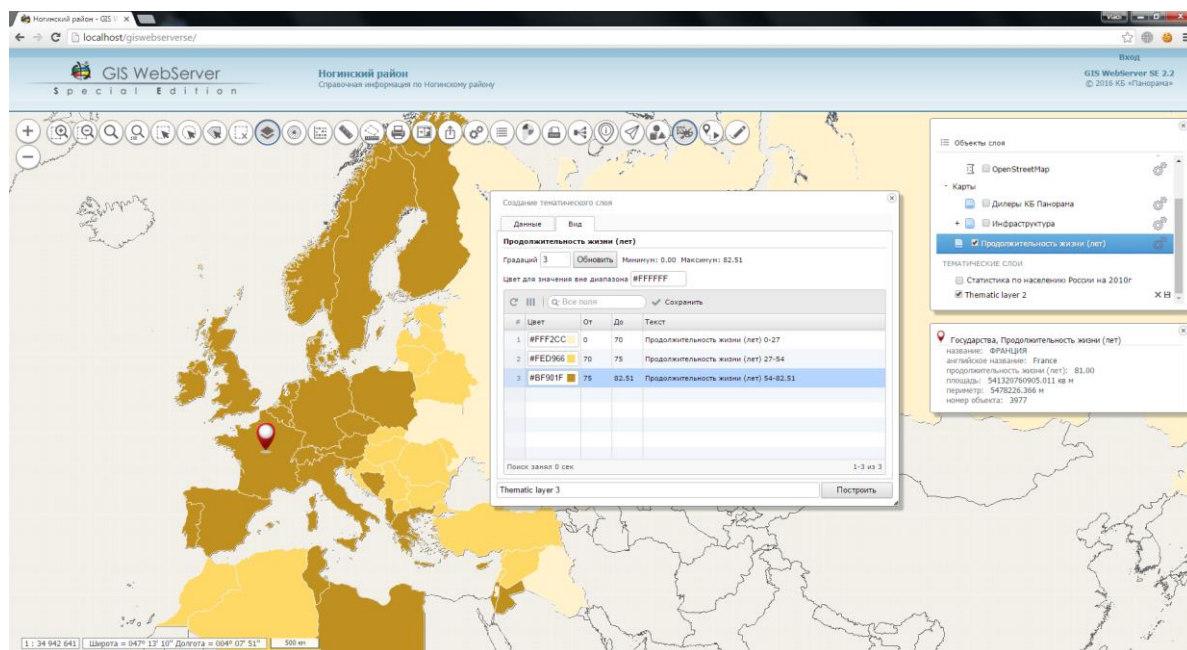


Figure 68 - Customizing the View

On the tab «View», it is adjusted the number of gradations and color fills for the interval values of the selected characteristic. Interval values are calculated automatically when the number of gradations changes. The values of the interval values can be adjusted manually. After adjusting the values, it is necessary to save the changes by clicking the button «Save» in the gradation table.

The constructed thematic layer is added to the map. The element of the thematic layer is added to the map composition tree in the node «Thematic layers». It contains the name of the layer and the buttons for saving the layer to a file or removing it from the map.

Изм.	Лист	№ докум.	Подп.	Дата

The thematic layer can be saved to a file on the user's local computer in GeoJSON format. The thematic layer file can be opened and displayed in the map through the Local Layers component.

The Layers tab is used to select the objects of the specified map layers to create a cartogram.

The Projects tab is used to work with the project of thematic maps. Project – a file of thematic map parameters. The project consists of one or more topics. Theme – a set of parameters for creating a thematic map for interval values of the specified characteristics of objects.

To add a theme to the project, you need to configure the thematic map in the tab «Data» and «View» and click the button «Add a theme to the project» on the tab «View».

To save the project to a file on the user's computer, it is necessary to click the button «Save Project» on the tab «Projects»

To open the project, you must click the button «Open Project», select the file and click the button «Open». The content of the project is displayed in the table «Projects».

To create the thematic map by topic, it is necessary to select the required topic (entry) in the table «Projects» and click the button «Apply».

#### 3.4.27.2 Displaying the thematic layers

With customized parameters for displaying thematic layers, «Thematic layers» section with a list of available sections is added to the map composition panel.

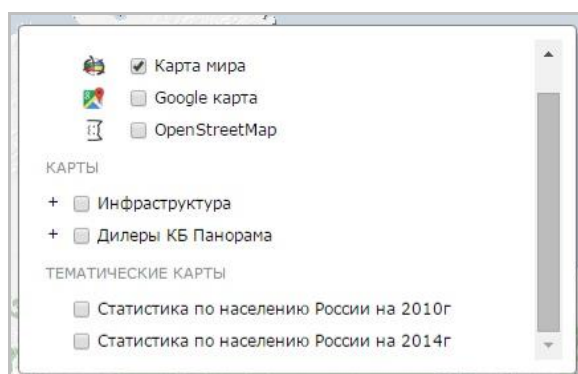


Figure 69 - Available sections

At selection of mapping section, it is downloaded available themes and adding them as a list to the panel «Composition of the map».

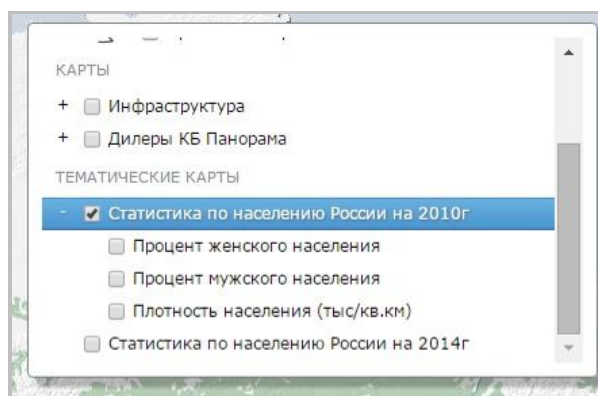


Figure 70 - Available themes

At selection the theme of mapping, objects with the specified fill colors are applied to the map, the information panel about the object is added, the legend for the current topic is loaded into the panel

Изм.	Лист	№ докум.	Подп.	Дата

«Composition of the map». Hovering the cursor on the map object, the object's parameters are displayed on the information panel.

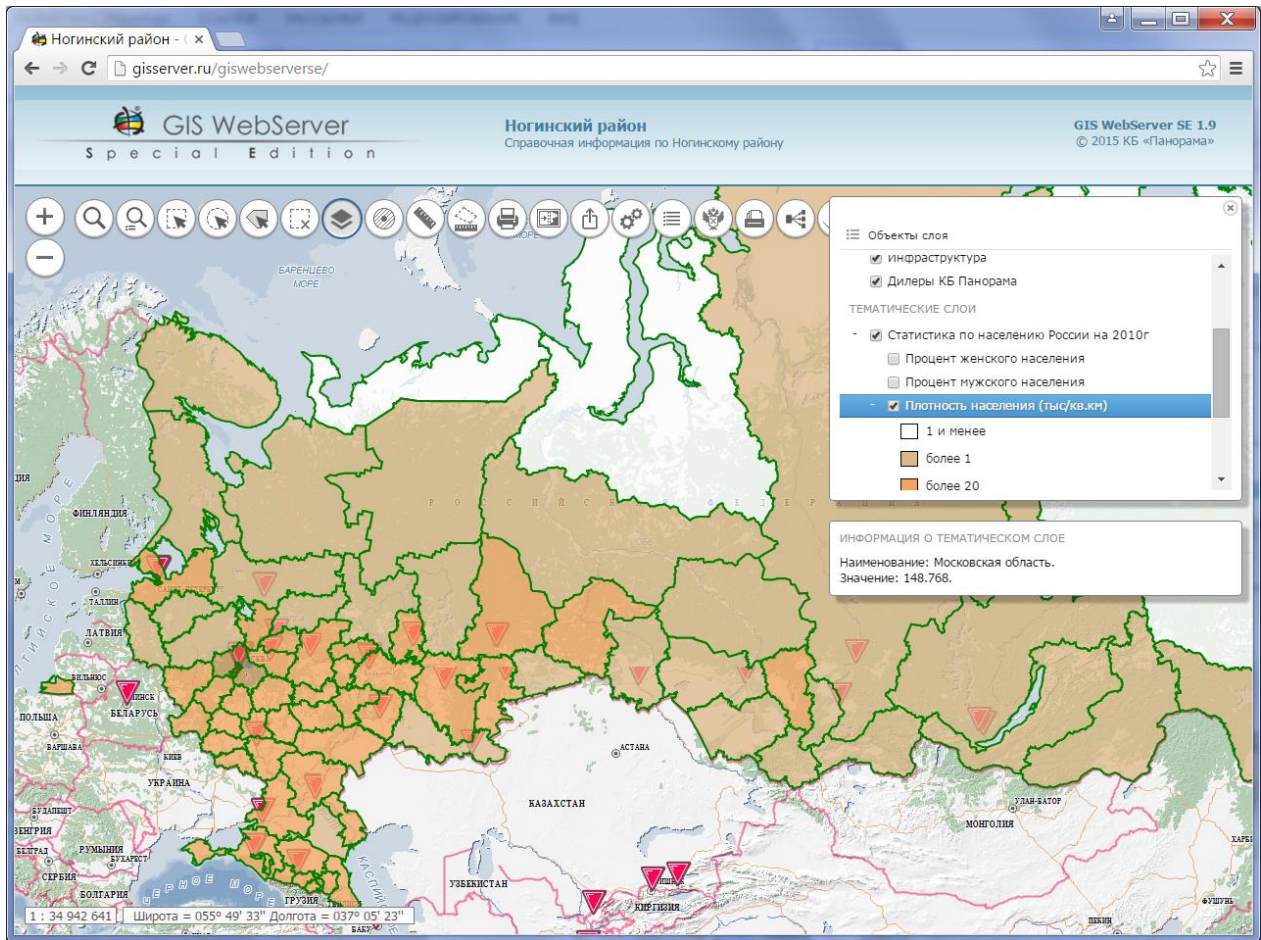


Figure 71 - The result of execution

### 3.4.28 Clustered data

The component «Clustered data» allows you to split objects into groups (clusters) and visually display them, querying the metric of objects from the server in GeoJSON format.

To enable the mode, it is necessary to click the button «Show the clustered data».

Изм.	Лист	№ докум.	Подп.	Дата

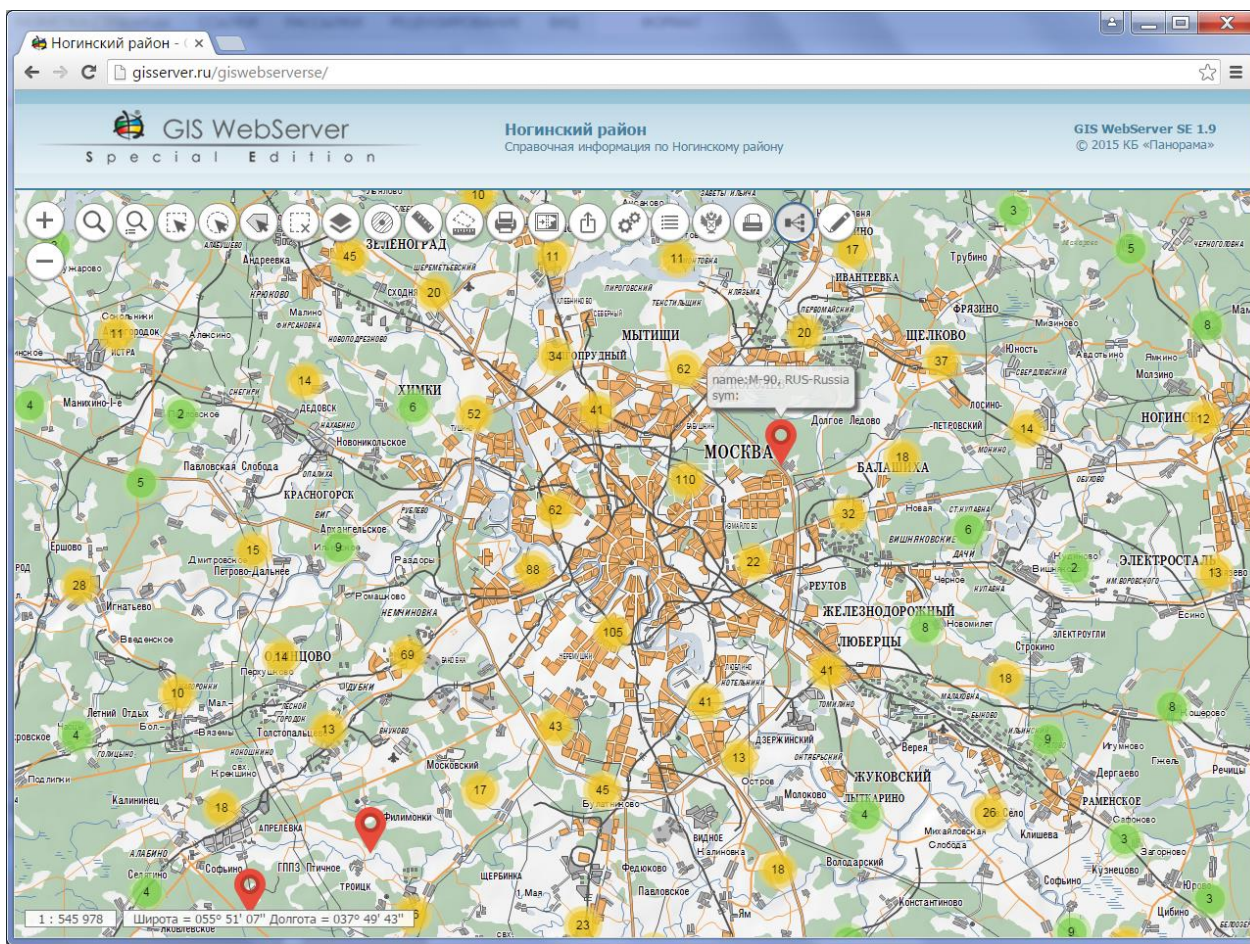


Figure 72 - Display the clustered data

### 3.4.29 Local layers



To enable the mode, it is necessary to click the button «Local layers». The mode control panel will appear below the button.

Opened or created local layers are added to the map data tree, «Composition of the map / Local layers»

Изм.	Лист	№ докум.	Подп.	Дата

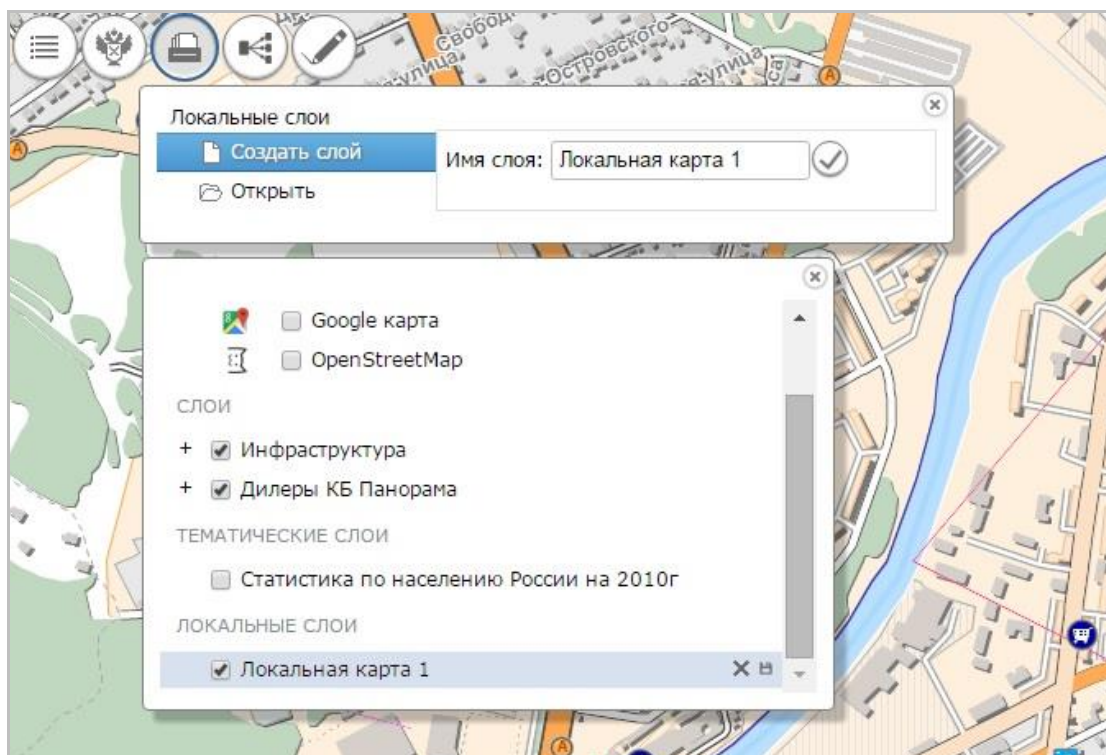


Figure 73 - The panel «Lists of objects», the added layer in the panel «Composition of the map»

When the map is opened from the user's computer, the objects will be converted according to their styles, or presented in the standard form, depending on the availability of parameters in the file GeoJSON.

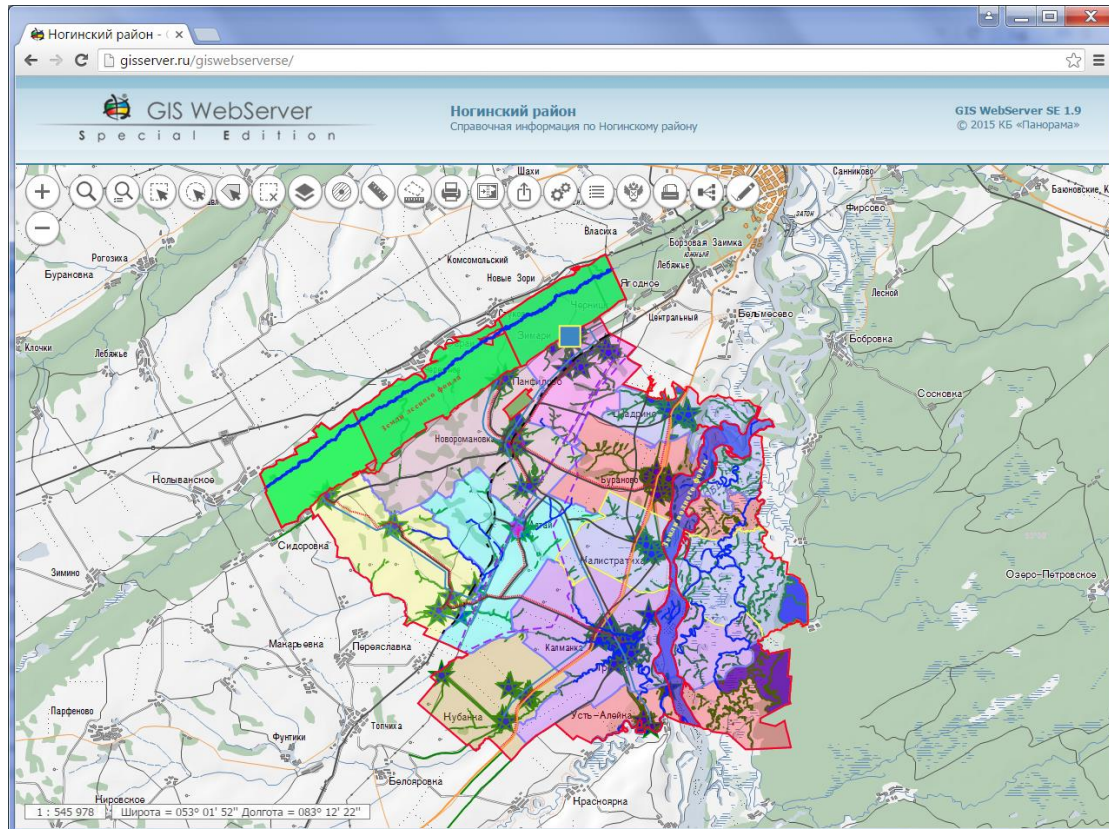


Figure 74 - Displaying the local layers in the presence of object styles

Изм.	Лист	№ докум.	Подп.	Дата

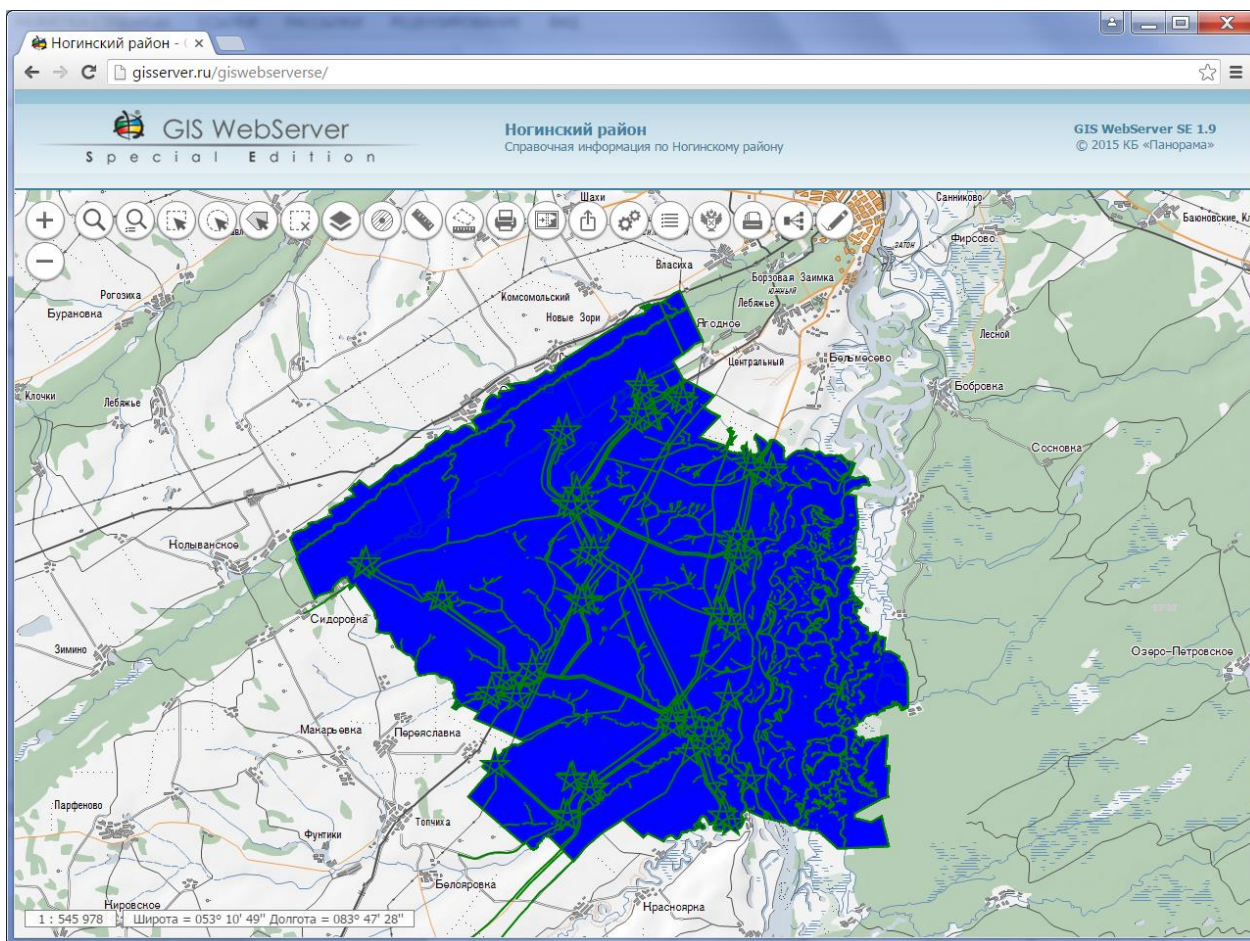


Figure 75 - Displaying the local layer when there are no object styles

To control the visibility of the map layer, it is necessary to turn on / off the button of the corresponding tree element.

To save / delete a local layer, use the buttons in the corresponding tree element.

The mode «Map Editor» is used to create /edit the objects of the local layer.

When editing a local layer, the set of possible types for created objects changes: Line, Polygon, Point object and Inscription.

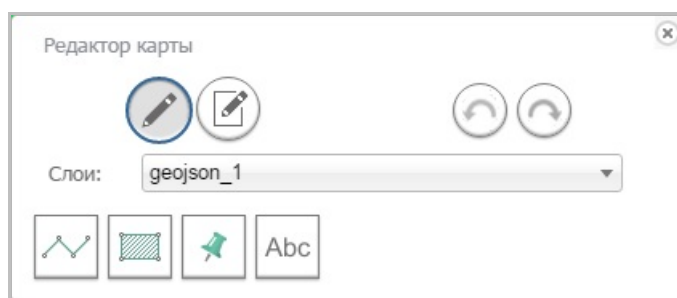


Figure 76 - The panel «Map Editor» is in the mode for creating the objects of the local layer

In the edit mode, it is available a predefined set of characteristics for each type of object.

Изм.	Лист	№ докум.	Подп.	Дата

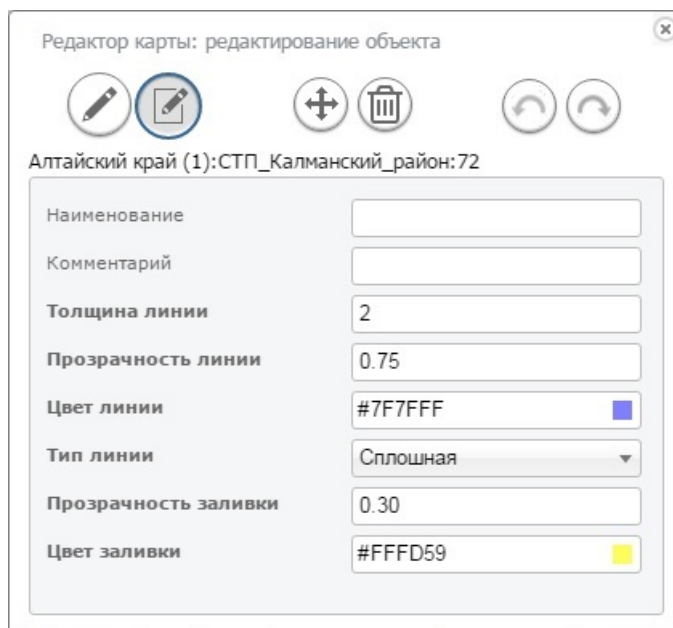


Figure 77 - The panel «Map Editor» in the mode for editing the objects of the local layer

### 3.4.30 3D map

To activate the mode, it is necessary to click the button «3D type». At the same time, on a certain scale (starting from 1:17 471 320 and larger), the map display will go over into a three-dimensional view on the plane, which is a three-dimensional model of the terrain.

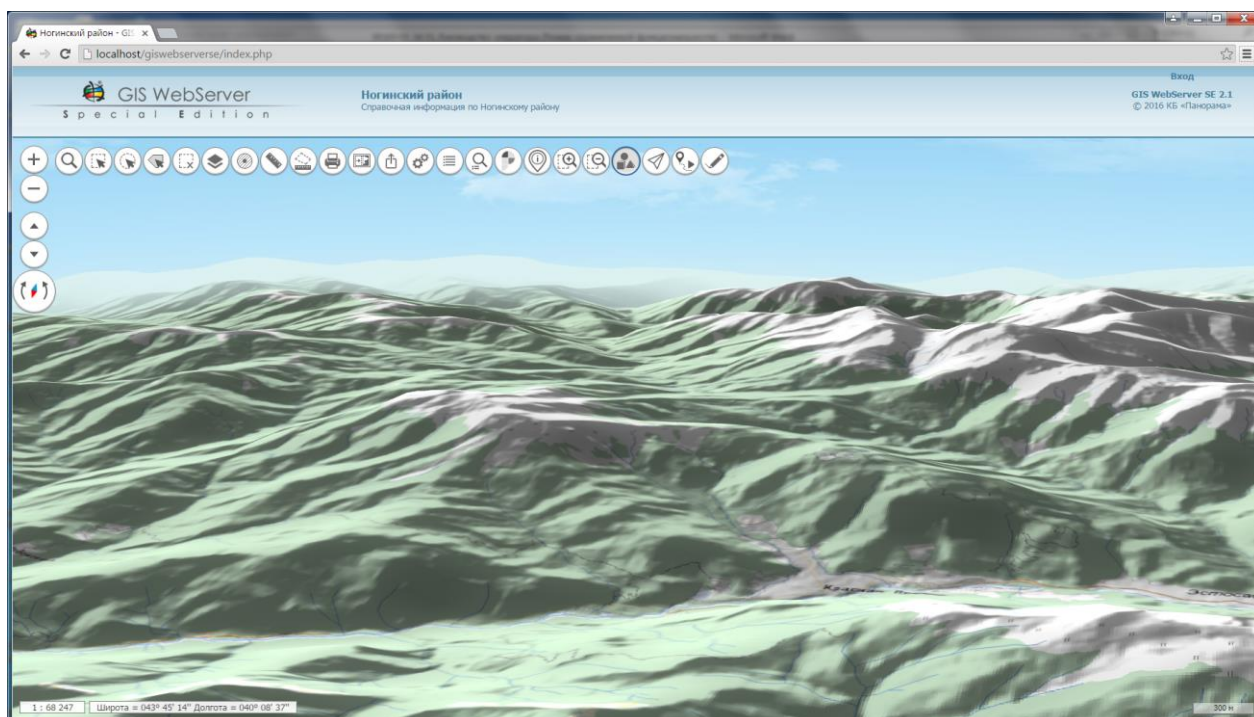


Figure 78 - Displaying 3D view of the map

For scales up to 1:17 471 320, a sphere is used as the basis for the three-dimensional surface. As a background, it is used the map of stars with the marked lines of constellations.

Изм.	Лист	№ докум.	Подп.	Дата

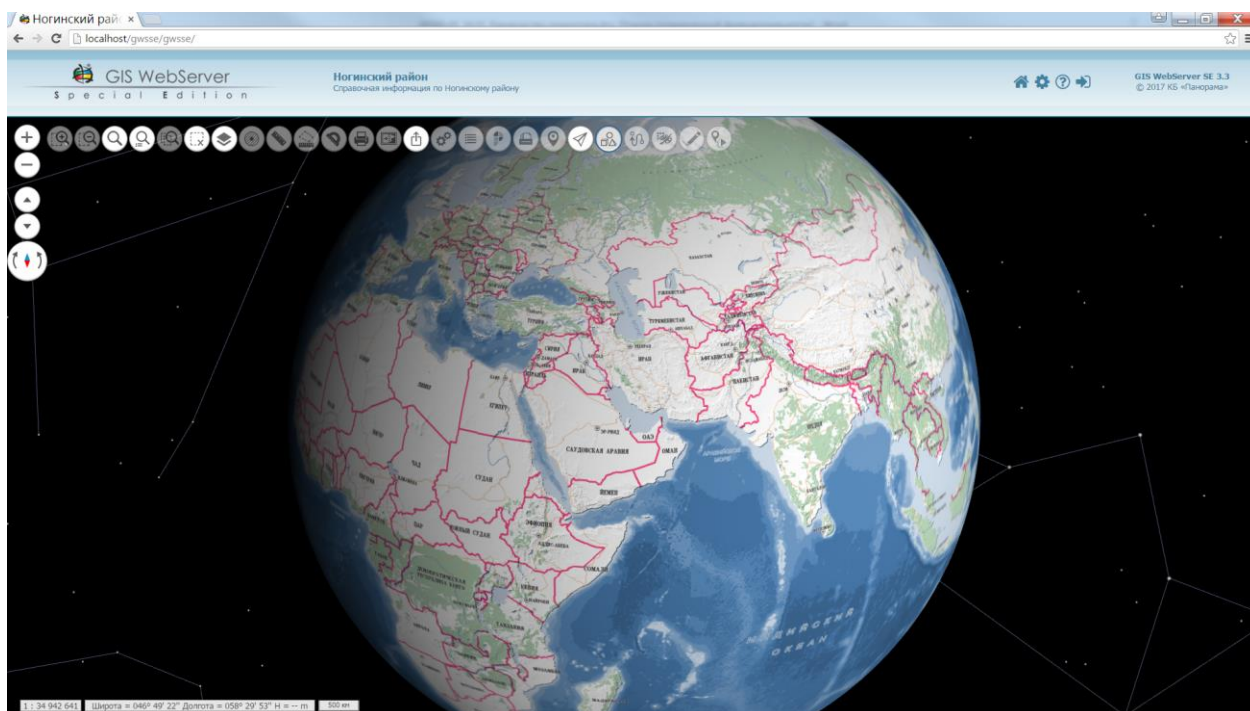







Figure 79 - Displaying 3D map type based on the sphere

In the left part of the screen, it will appear additional buttons for controlling the tilt   and the turn   of the 3D map. The button  moves (orients) the map north up south down. Moving a three-dimensional map is similar to moving a two-dimensional map by moving the mouse in the window of GIS WebServer with the left key pressed, or using the arrows on the keyboard. To tilt and rotate the 3D map, use the vertical and horizontal mouse movement, respectively, while the right key is pressed, and it can also be used arrows on the keyboard with the key «Shift» pressed.

In the case of configuration in the administration module, the terrain objects are placed on the map in bulk. A three-dimensional view of objects can be configured as a view from the classifier, in the presence of the 3D-view library (p3d-library) attached to this classifier. The library of three-dimensional types of objects is developed in the local application GIS «Panorama». The current version of GIS WebServer supports the following 3D display templates: vertical bar, horizontal bar, horizontal plane, inscription, sign, point mark.

If the specified map layer does not have a connected 3D view library, then the objects are displayed as the default graphical view. The default views are divided by object localization: area, linear, point and inscription.

Изм.	Лист	№ докум.	Подп.	Дата

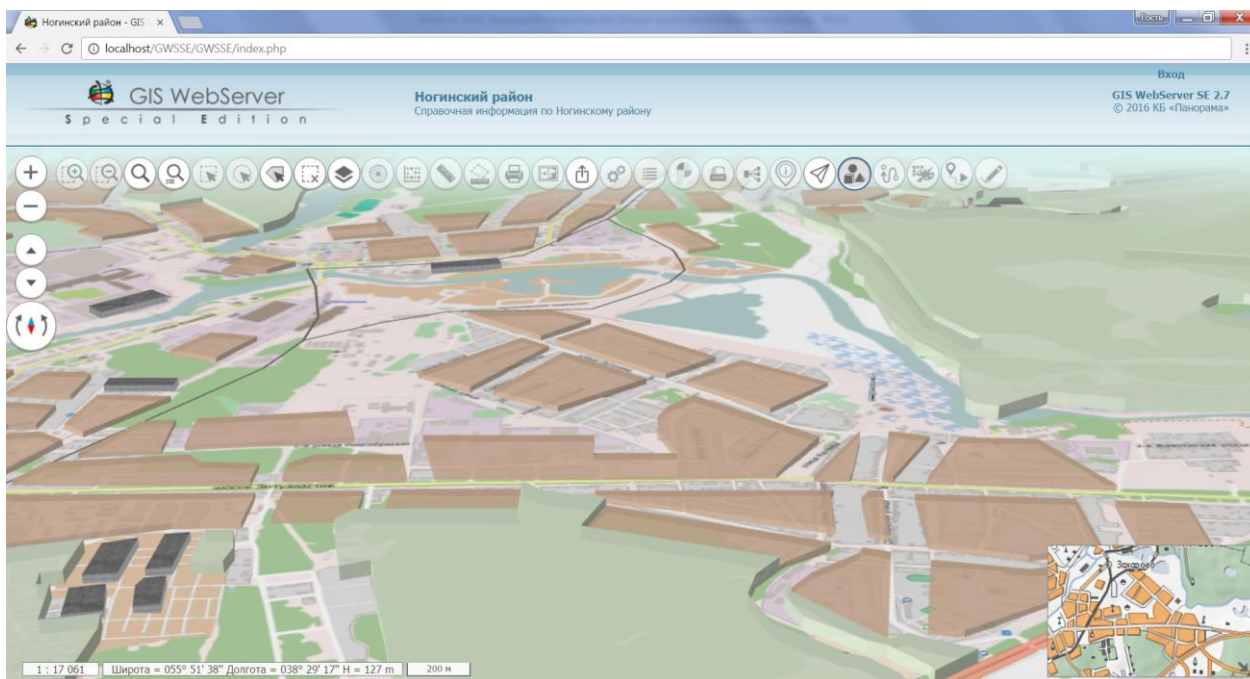


Figure 80 - Displaying 3D map objects on a small scale

For each object type, the color and height are adjusted. The height can be specified by the absolute value, or calculated with the specified object semantics and the height multiplier.

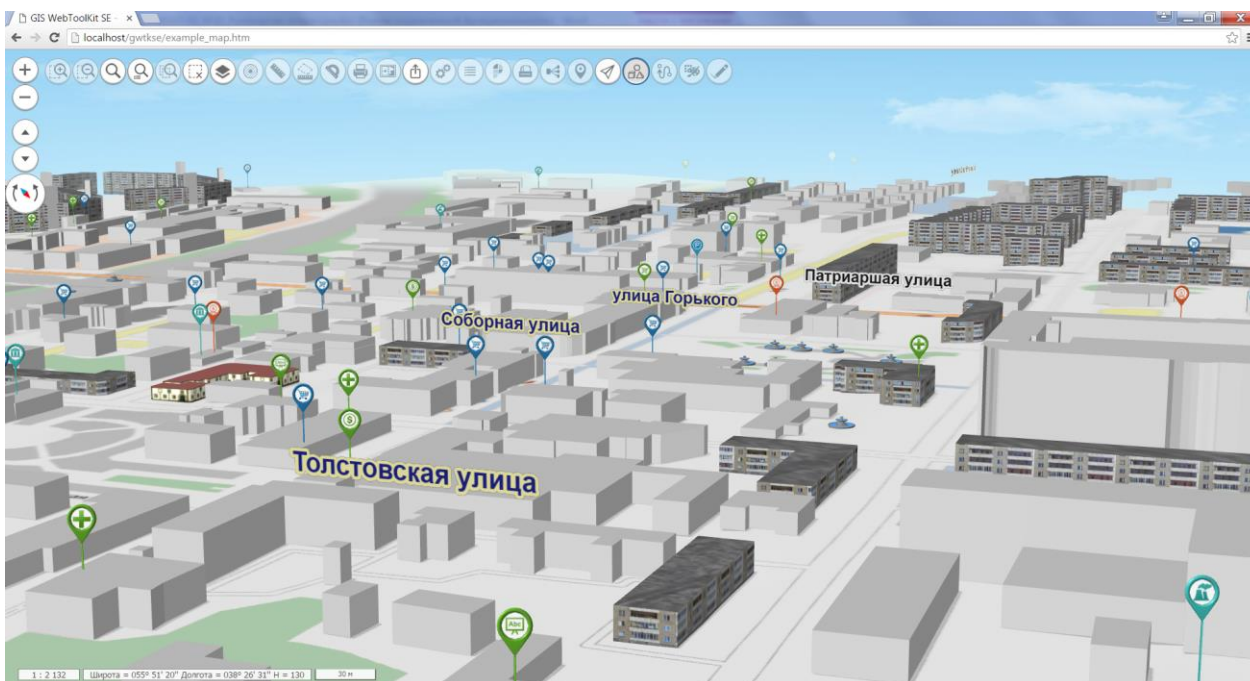


Figure 81 - Displaying 3D map objects on a large scale

The selected objects are displayed as a translucent three-dimensional contour.

Изм.	Лист	№ докум.	Подп.	Дата

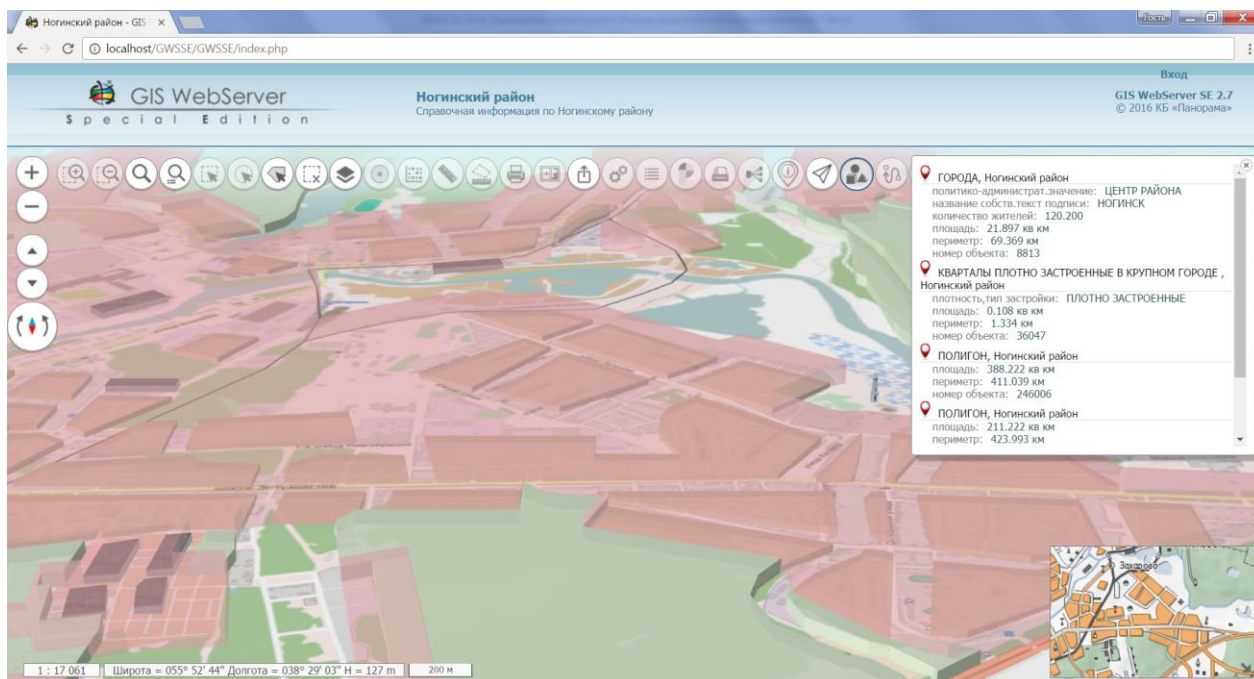


Figure 82 - Displaying the selection of the object on the map

### 3.4.31 Aerial view


To activate the mode, press the button «Free flight»  in 3D map mode. This mode starts a continuous movement on the map. At the same time, at a certain scale (starting from 1:17 471 320 and larger), the flight trajectory is set in the component parameters file.



Figure 83 - Flight along a trajectory

For scales up to 1:17 471 320 the flight trajectory coincides with the parallel at the current point of the map.

Изм.	Лист	№ докум.	Подп.	Дата



Figure 84 - Flight along a parallel

After activating the mode, it is possible to change the flight speed using the control buttons to the right of the activation button. It also displays the current value for the multiplicity of the flight speed (range from 0.25 x to 4.0 x).

#### 3.4.32 Creating the route on the map



To activate the mode, it is necessary to click the button «Route creating». This mode is intended for constructing an optimal route of travel between two points. Then click the mouse in the map to specify the start and end points of the route. The result of the construction will be displayed in the map as a line. The route description is displayed in the panel «Route creating». The path length and the route time are displayed. The route path is displayed on the map and it is accompanied by a route sheet. Route list is a list for sections of the route (segments). Each section of the route is separated from neighboring maneuvers; each length is indicated by its length, the name of the street along which the segment passes, and the direction of the maneuver (right, right, left, right, left). It is possible to change the direction of the constructed route to the opposite.

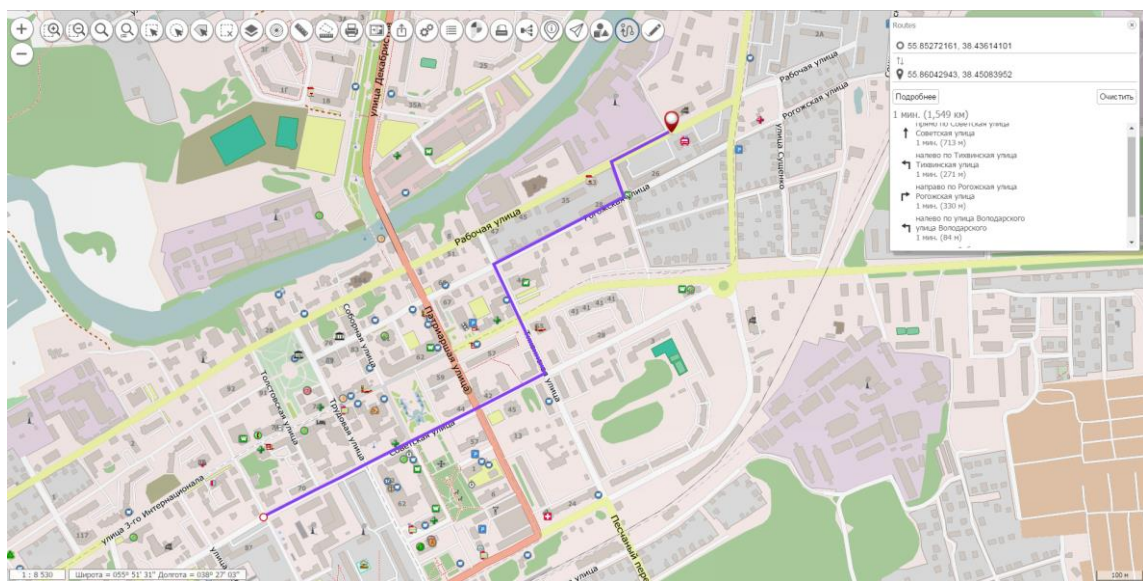


Figure 85 - Creating the route

Изм.	Лист	№ докум.	Подп.	Дата

### 3.4.33 The value of matrices at the point



To activate the mode, it is necessary to click the button «Matrix value at the point». The mode allows you to display the heights and quality characteristics at the matrix point when the mouse cursor moves over the map image. The component panel displays the characteristics of the visible map layers represented by the matrix spatial data. The table displays the matrix value at the point, the name of the characteristic, the units of measure, and the name of the layer.

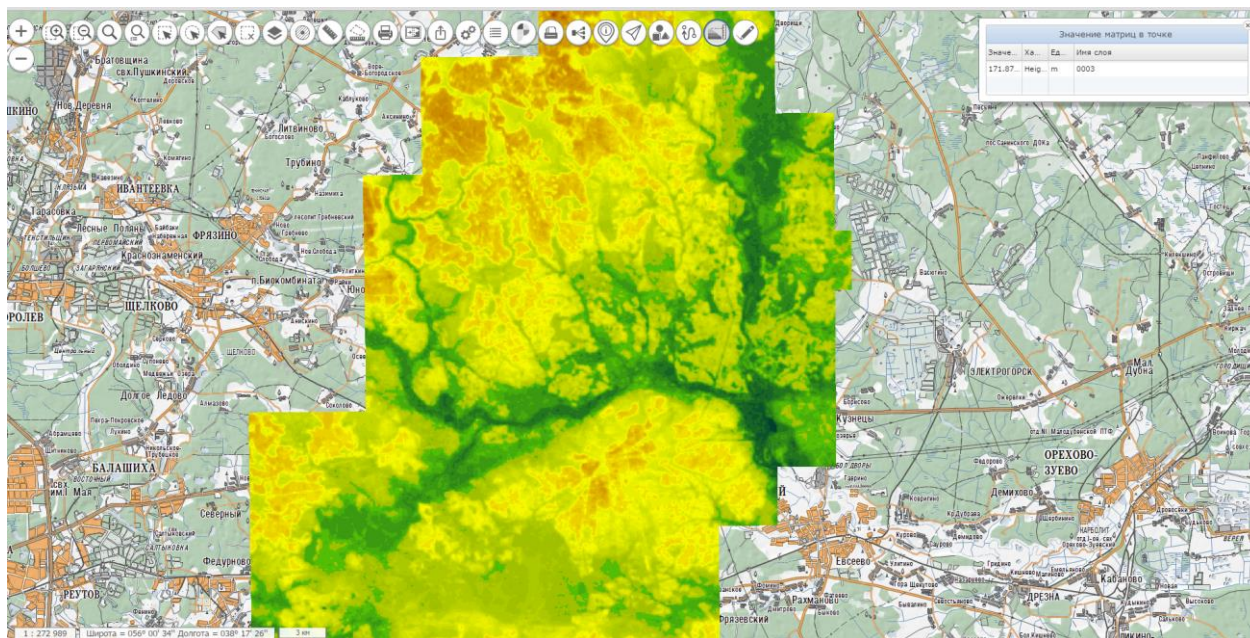


Figure 86 - The value of the matrices at the point

### 3.4.34 Navigating the map

The navigation component provides the ability to quickly and visually navigate the map. Moving the reduced map in the browser window, the user can move the map in the main window.

The navigation component is displayed in the lower right corner of the map and represents a review map in a reduced size.

Изм.	Лист	№ докум.	Подп.	Дата

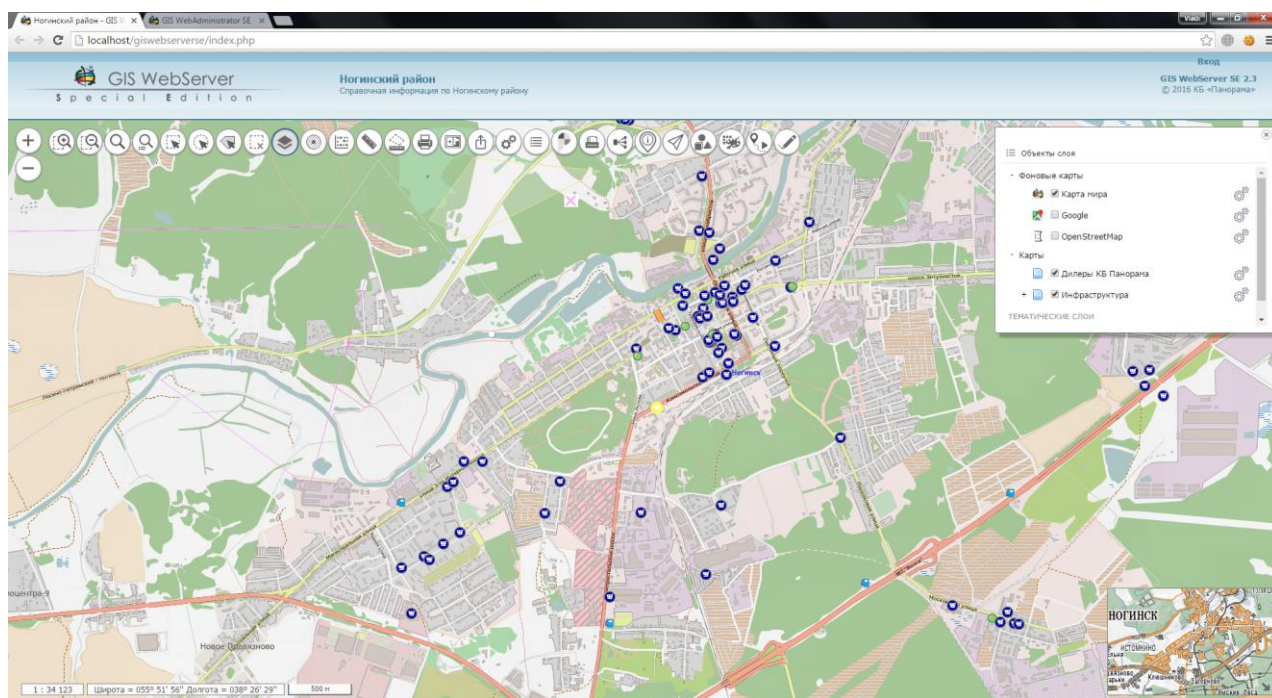



Figure 87 - Navigating the map

### 3.4.35 Calculating on the map



The component of calculating on the map provides a means of performing calculations based on the use various metric information about vector map objects.

To perform calculations it is necessary to enable the button  in the command bar of the map.

#### 3.4.35.1 Length and distance

This item provides the ability to use the following modes: «Search of a point by point, azimuth, distance» and «Search of azimuth by two points».

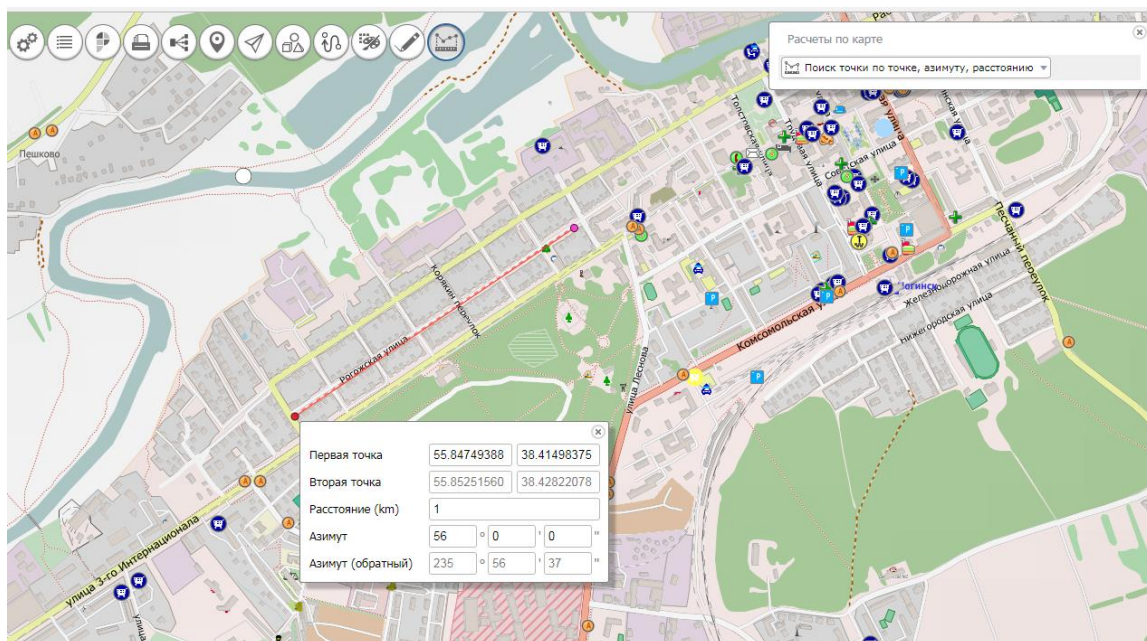



Figure 88 - Search of a point by point, azimuth, distance

Изм.	Лист	№ докум.	Подп.	Дата
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To use the search of a point by point, azimuth, distance, it is necessary to enable the button  in the command bar of the map, in the menu item «Length and distance» and the menu item «Search of a point by point, azimuth, distance». Click the left mouse button to select the point on the map, in the window that appears in the field «Distance» and «Azimuth», enter the required values. As a result of the actions, the coordinate of the second point is calculated and displayed on the map and in the component window.

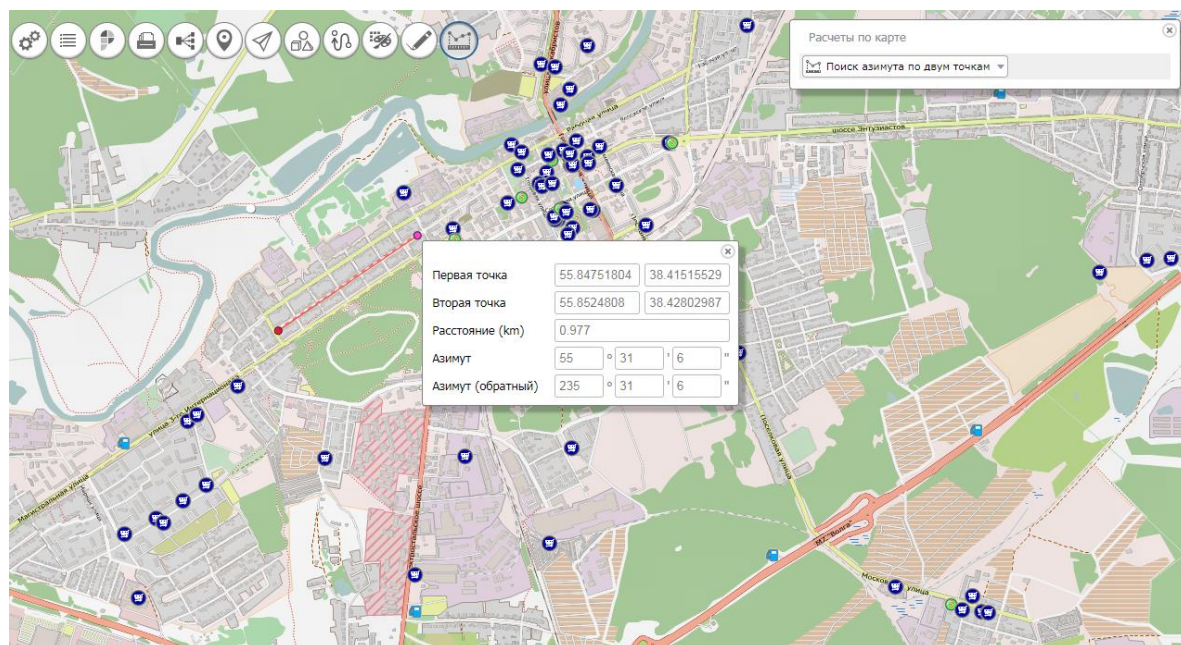





Figure 89 - Search of azimuth by two points

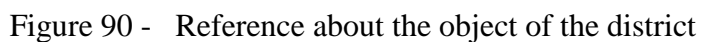
To use the search of azimuth by two points, it is necessary to enable the button  in the command bar of the map, in task pane, select the mode «Length and Distance» the menu item «Search of azimuth by two points». Click the left mouse button to select two points on the map, in the appeared window, the field «Azimuth», it will appear the calculated value.

#### 3.4.35.2 Reference about the object of the district

The mode displays statistics of characteristics for the object of the district. The object of the district is a group of map objects that have the same value characteristic (semantics).

To activate the mode, it is necessary to enable the button «Reference about the object of the district»  in the panel Calculating on the map . Then it is necessary to select the map object, in the form to specify the required characteristics, and to search for objects. If the search is successful, the found objects are highlighted in color in the map, information about the objects is displayed in the panel Map objects.

Изм.	Лист	№ докум.	Подп.	Дата



This mode is used to check for intersections of the geometry (metrics) of map objects.

The menu item «Intersection of two objects» is used to check the intersection of the geometry of two selected map objects. Click the mouse on the map to select the objects, the report on the result of the operation is displayed in a pop-up window.



<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

The pop-up window «Intersection of objects» contains information about the selected objects and the result of the intersection check.

Information about the object includes the object number and name, the name of the map layer where the object is located, and the object type.

<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

#### 4 INPUT AND OUTPUT DATA

Input data of GIS WebServer (GIS WebServer SE) PARB.00165-04 are located on a remote resource on the network. Access to the data is done through the execution of requests HTTP in Webbrowser.

Various types of maps can be used: remote sensing data, vector, matrix, thematic maps.

The map image consists of one or more layers superimposed on each other. When the map is displayed, the layers are combined and superimposed on each other, thus forming a single image.

The spatial data source is the cartographic Web service GIS WebService SE (GIS WebService SE) PARB.00160-02. Obtainment the raster images of the map is performed using the protocol OGC WMTS, WMS or another, which provides the output of images in the formats png and jpeg. Obtaining information about map objects, it is performed in format XML by executing extended requests GetFeatureInfo REST API.

Supported types for matrices of input tile data:

- GoogleMapsCompatible;
- Miller;
- matrix Yandex.maps in the projection EPSG:3395.

Supported types of tile projections for the map:

- EPSG:3395;
- EPSG:3857;
- EPSG:4326;
- SK 54003.

The parameters of operation GIS WebServer (GIS WebServer SE) PARB.00165-04 and addresses of the spatial data servers are described in the configuration file config.xml.

Input data of the program are:

- configuration files for the parameters of the work (config.xml);
- graphic files of tile data (\*.png, \*.jpeg);
- graphic files of WMS-data (\*.png, \*.jpeg);
- attributive data of map objects (\*.xml);
- metadata (\*.xml).

Output data of the program are:

- Web page of application index.php;
- HTML controls containing a map image (map tiles);
- HTML controls containing text information about the characteristics of map objects;
- HTML controls to control the display of the map and perform operations on the map.

Using matrix data gives a possibility to display the relief on a two-dimensional map. To do this, the map must be specially prepared. The map and the height matrix must be merged into one mpt-project, and to publish as a layer on the map service GIS WebService SE.

<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

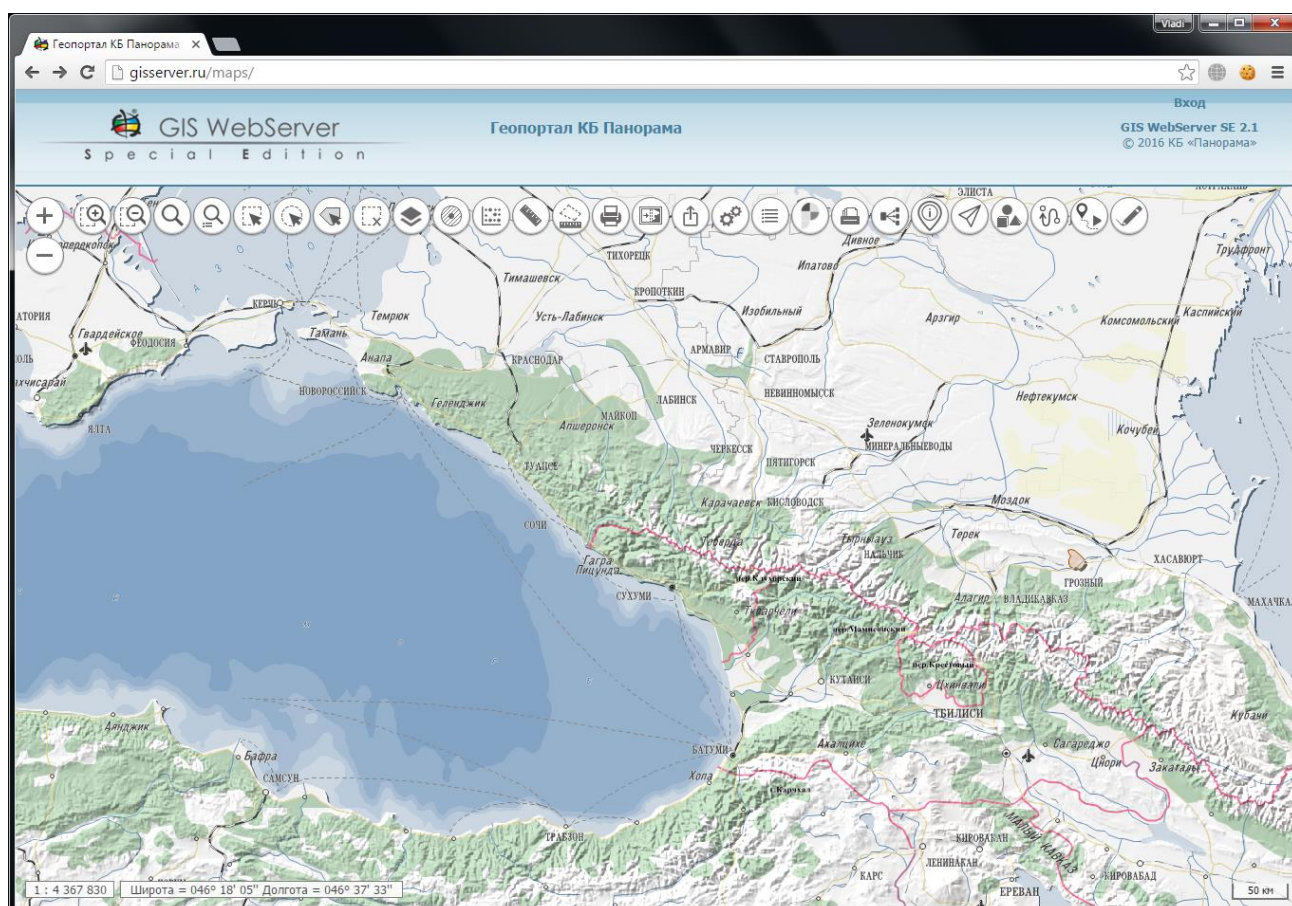


Figure 92 - Relief display on a two-dimensional map

Изм.	Лист	№ докум.	Подп.	Дата

## 5 MESSAGES TO OPERATOR

During the execution of the program, messages can be issued to the operator about execution errors.

The text of the message contains a description of the error. The error description can contain the following text:

Types of errors.

«The parameters could not be saved. It is possible no rights to record. - »

Actions: check the rights to record in the file admin\config.xml.

«It could not add the layer. It is possible no rights to record. - »

Actions: check the rights to record in the file admin\config.xml.

«It could not delete the layer. It is possible no rights to record. - »

Actions: check the rights to record in the file admin\config.xml.

The operator must eliminate the cause of the error (allocate space on the disk, check the permissions for recording, check the health of the data storage device) and repeat the task execution.

<i>Изм.</i>	<i>Лист</i>	<i>№ докум.</i>	<i>Подп.</i>	<i>Дата</i>

[illegible]