

## Promilleafgiftsfonden for landbrug

### INVESTMENT: CONSTRUCTED WETLAND WITH SEDIMENTATION POND AND BIOFILTER FOR WATER QUALITY MANAGEMENT IN GURIEVSK, KALININGRAD OBLAST, RUSSIA (OUTPUT 5.4)

In accordance with the plan, the scope of the Waterdrive project is defined:

In the Waterdrive project, the Guryevka River catchment area was selected as the observation zone. The catchment basin of the Upper Pond / Lake Dambas is part of the main catchment area of the Guryevka River. The selected area includes 3 drainage channels. The total drainage canal drainage area is 1030 ha, of which 490 ha are agricultural land.

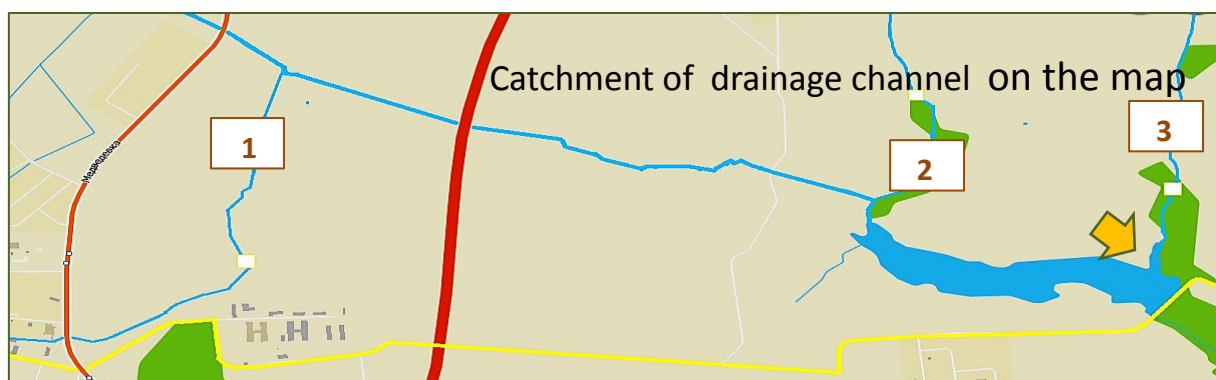
- Upper Pond Area / Lake Dambas: approximately 11.5 ha.
- The floodplain zone of the lake is about 6 hectares.
- The water level in the lake is regulated by a dam.

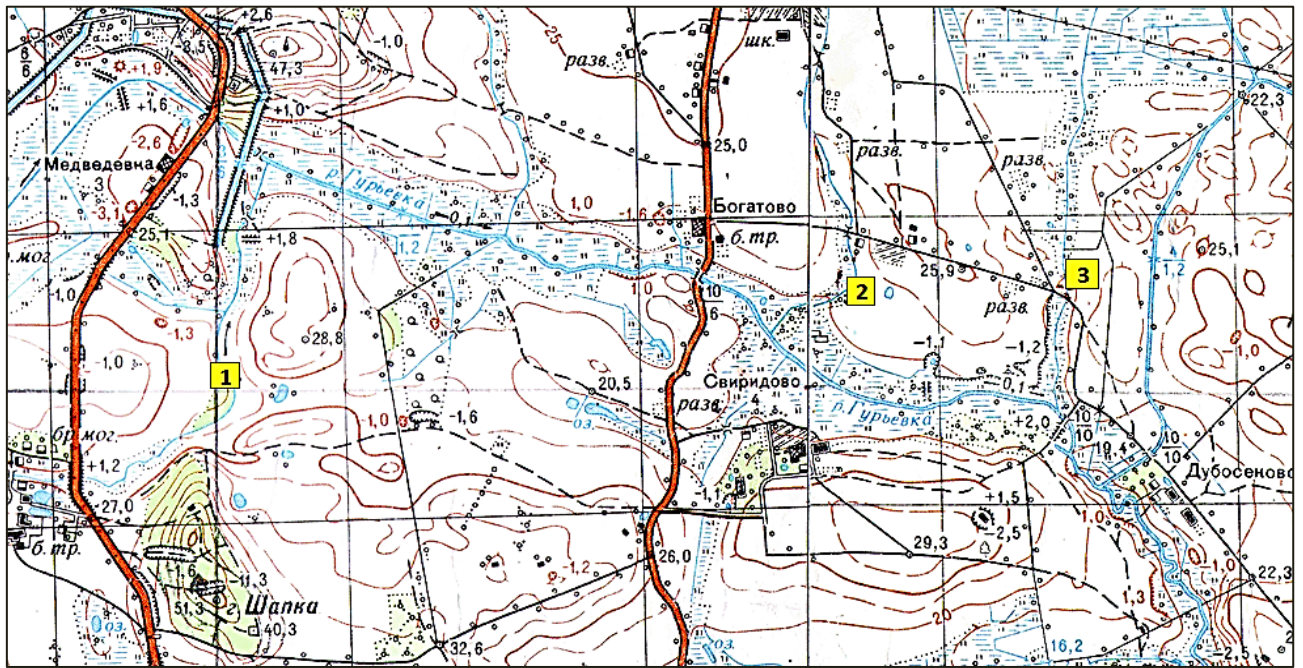


Investments in construction wetland will reduce the nitrogen and phosphorus content in the water, which will lead to improved water quality in the lake and the Guryevka river downstream.

The investment will be used as a demonstration and reference site both locally and presented internationally in different networks, events and databases exemplifying multifunctional nature-based solutions/natural water retention measures in the context of river basin management or diffuse source pollution mitigation.

### Location of case area





#### Drainage channel 1

Channel catchment area: 147 ha  
 Flow rate: 1,27 m<sup>3</sup> / s  
 Length: 2,2 km  
 Territorial zone: Settlement land  
 and agricultural land  
 Point info:  
 Lon, Lat: 20.5437, 54.8013

#### Drainage channel 2

Channel catchment area: 393 ha  
 Flow rate: 1,23 m<sup>3</sup> / s  
 Length: 3,2 km  
 Territorial zone: agricultural land  
 Point Info:  
 Lon, Lat: 20.5704, 54.7996

#### Drainage channel 3

Channel catchment area: 431 ha  
 Flow rate: 1,07 m<sup>3</sup> / s  
 Length: 3,5 km  
 Territorial zone: agricultural land  
 Point Info:  
 Lon, Lat: 20.5854, 54.7962





## OBJECTIVES OF THE PILOT CASE

- Reducing nutrient load from agriculture landscape in the river Guryevka.
- Field research and analysis of the drainage system of the upper catchment area of the river Guryevka, to assess the state of pollution and determine the level of the terrain relief.
- The study of practical examples of the use of wetlands.
- Promote collaboration between agricultural producers, private landowners and the municipality using of the Water User Partnership Model (WUP).
- Review the outcome of the results of the field research and to make the decision on the exact location and specifications of the wetland and its properties and functionalities.
- Initiate issues associated with land relations and the procedure for obtaining building permits.
- 6. To develop a technical project and estimate documentation for construction of the wetland, followed by implementation of the project.

## DEFINED TARGET GROUPS AND HOW THEY WILL USE THE INVESTMENT

The immediate target group of the investment in the municipality of Gurievsk (PP22) and the local rural community and the 'pilot-WUP'.

The secondary target groups are local and regional authorities in Kaliningrad and the downstream communities as well as rural communities and authorities across the BSR.

## STAKEHOLDERS TO BE INVOLVED AND THEIR ROLES

- Local and regional authorities - (support activities aimed at the implementation of the project);
- Department of Agriculture (Interaction with farmers);
- Farmers and local private landowners in the selected area (main stakeholders);
- Institutions/universities and schools (an active role in the case study);
- Contractors (implementation of plans and activities)
- Ministries (coordination of environmental measures);
- WUP - ensuring close cooperation with entire groups in the preparation and implementation of the project.

## ACTIVITIES, WE IMPLEMENTED IN 2020

### ➤ THERE WAS CONSULTED WITH THE FOLLOWING INSTITUTIONS:

the Ministry of Natural Resources and Environment, the "Kaliningrad melivodhoz» (AO 39), Kaliningrad Technical University (KSTU, AO38), Baltic Institute of Ecology and the hydrosphere (BIEG), Department of Agriculture (Gurevsk), Municipal budget enterprise "Vodokanal", Gurevsk (water supply - sewerage). "ECAT Kaliningrad" (AO 36).

**Output:** Information about the borders of water-security zone Guryevka River: According to Article 65 of the Water Code of the Russian Federation, the water-protection zone r.Gurevka is 100 m. According to item 16 in the zone permitted the design, construction, reconstruction, commissioning, exploitation of economic and other objects, providing water protection from pollution, contamination and exhaustion of water in accordance with the water legislation and that in environmental protection.



➤ **THERE WAS CARRIED OUT AERIAL PHOTOGRAPHY**

FGBU "Kaliningradmeliovodhoz", (AO39) made a survey CASE AREA, using quadrocopter.



➤ **THERE WAS COMPLETED ENGINEERING AND GEODETIC SURVEYS:**

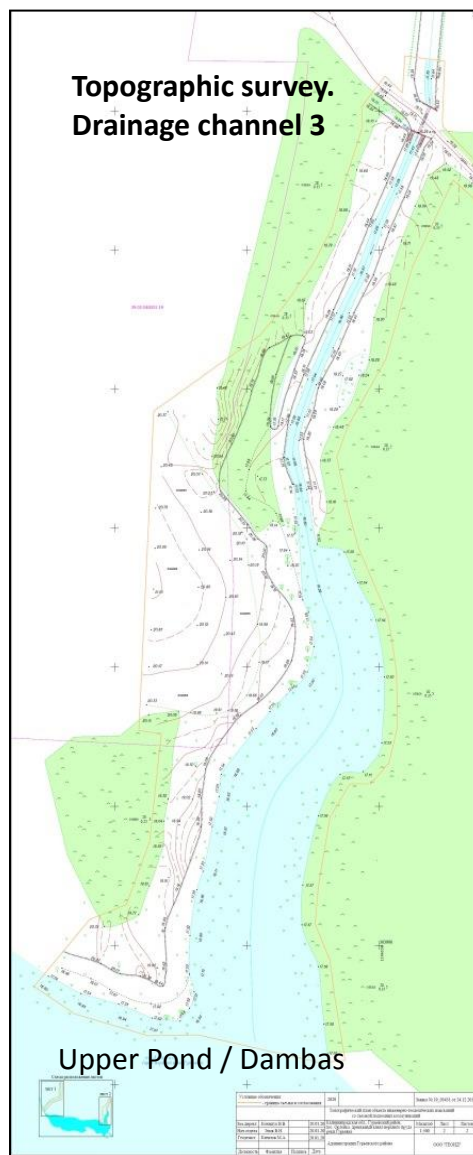
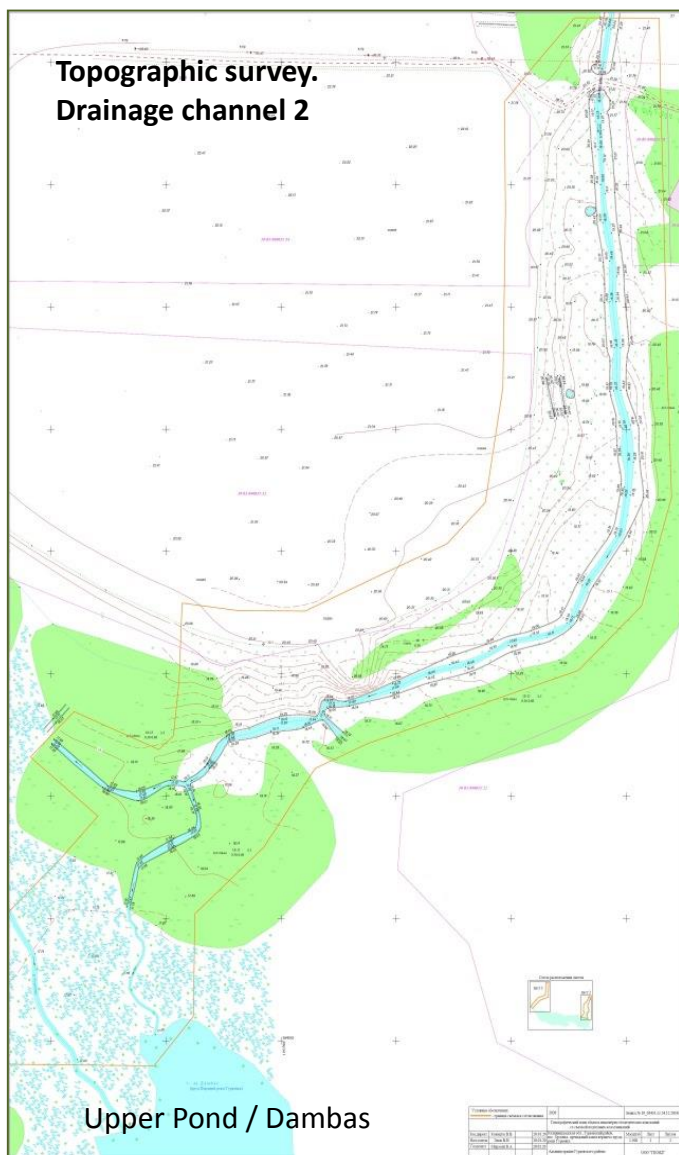
To completed engineering and geodetic surveys

Area survey -1.7 hectares

Topographic plan 1: 500 with height-sectional elevation of 0.5 m;

Territory: within the borders of water-security zone Guryevka River.

The territory does not include the land of private landowners and farms



➤ **SCHEDULE OF FIELD WORKS ESTABLISHED AND COORDINATED WITH THE PROCUREMENT PROCESS**

Drafted plan for monitoring the state of the nutrient load in catchment drainage channels (Upper pond of Guryevka river) for 2020.

Implementer: Baltic Institute of Ecology and the hydrosphere, AO13

Schedule:

In the period of January - March 2020 (once a month- 6 points).

In the period April - December 2020 (once a month - 4 points).

Indicators: ammonia nitrogen (N-NH<sub>4</sub>), nitrate-nitrogen (N-NO<sub>3</sub>), nitrite nitrogen (N-NO<sub>2</sub>), total nitrogen (N Society.), Phosphorus phosphate (P-PO<sub>4</sub>), total phosphorous (P Society.).

The catchment of the UpperPond (44 km<sup>2</sup> in area) is allocated within the catchment of the Guryevka River (amounting to 114 km<sup>2</sup>). The drainage system of the catchment is represented by the main channel of the Guryevka river, streams, drainage channels and ditches, and their total length within the catchment is 112 km. Currently, the drainage system is designed in such a way that its watercourses collect water mainly from forest areas and agricultural lands (Fig.1).

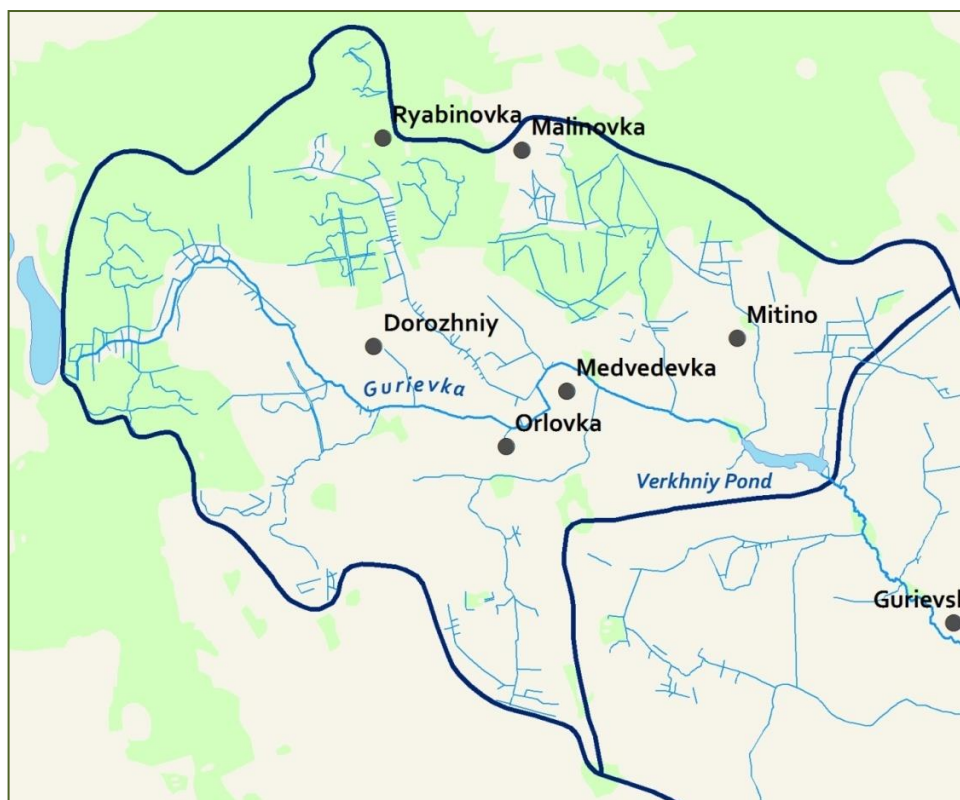


Figure 1 – The drainage system of the drainage basin of the Upper Pond

The network density of the Guryevka River is 0.95 km per km<sup>2</sup>. The average annual runoff in the river basin ranges from 8 liters per sec. from km<sup>2</sup> (in the upper reaches) to 6 liters per sec. from km<sup>2</sup> (in the estuary). According to the simulation results, the water discharge in the closing section is 0.7 m<sup>3</sup> per sec. (0.8 m<sup>3</sup> per sec. according to publications). The river's food is mixed, groundwater is located at a depth of 0.4-1.8 meters. The aquifer connected to the river system of Pregolya is at a depth of 8-15 meters. The Guryevka River has many small tributaries. The largest tributary is the Bolshaya Moryanka River.



The river system of the Gurievka river includes ponds (downstream): Upperpond, Guryevskiy pond, Chistiy pond. Water is purified when it passes through the ponds (Fig. 2).

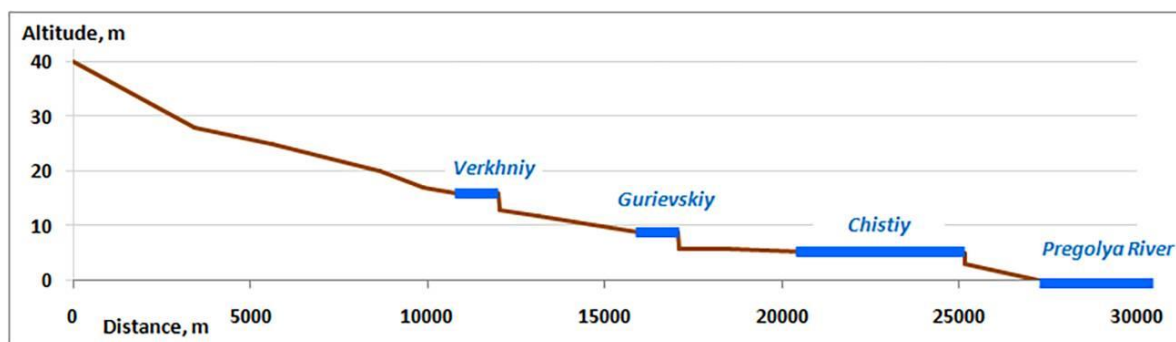


Figure 2 – Location of ponds on the Gurievka riverbed profile

The land use structure of the UpperPond catchment has the following form (Fig. 3): about 50% of the land within the catchment area is meadows and pastures, 10% of the catchment area is occupied by arable land.

Grassland, pastures and arable land are unevenly distributed. Forests located in the north and east of the catchment occupy 26% (Fig. 4).

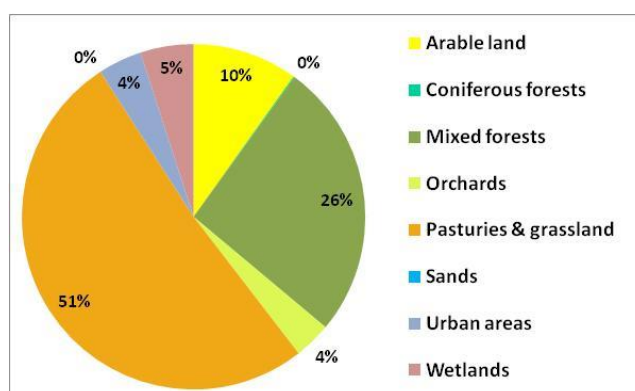


Figure 3 – The land use structure of the UpperPond catchment

All the main tributaries of the Gurievka River originate from this territory. Built-up land makes up 4% of the territory. Gardens and marshes together comprise about 5% of the catchment area. A drainage network exists to combat waterlogging.

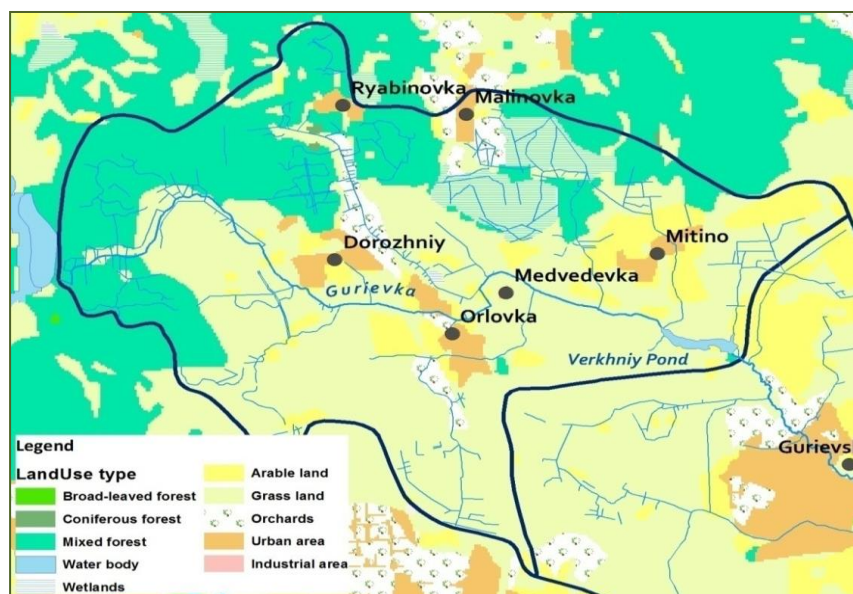


Figure 4 – Scheme of the land use structure of the UpperPond catchment





The main sources of water pollution in the catchment area of the Upper Pond are agriculture (arable land and pastures) and settlements.

To analyze the nutrient load coming from different pollution sources, a monitoring network consisting of six points was proposed (Fig. 5). Three points are located on tributaries (drainage channels), two on the main watercourse (Gurievska River) and one is a trailing one (below the dam of the UpperPond). Points on the channels control the removal of them; the highest point on the riverbed controls the background content of nutrients in the water; a point above the UpperPond controls the entry of nutrients into the UpperPond; a trailing point controls the removal of nutrients from the Upper Pond.

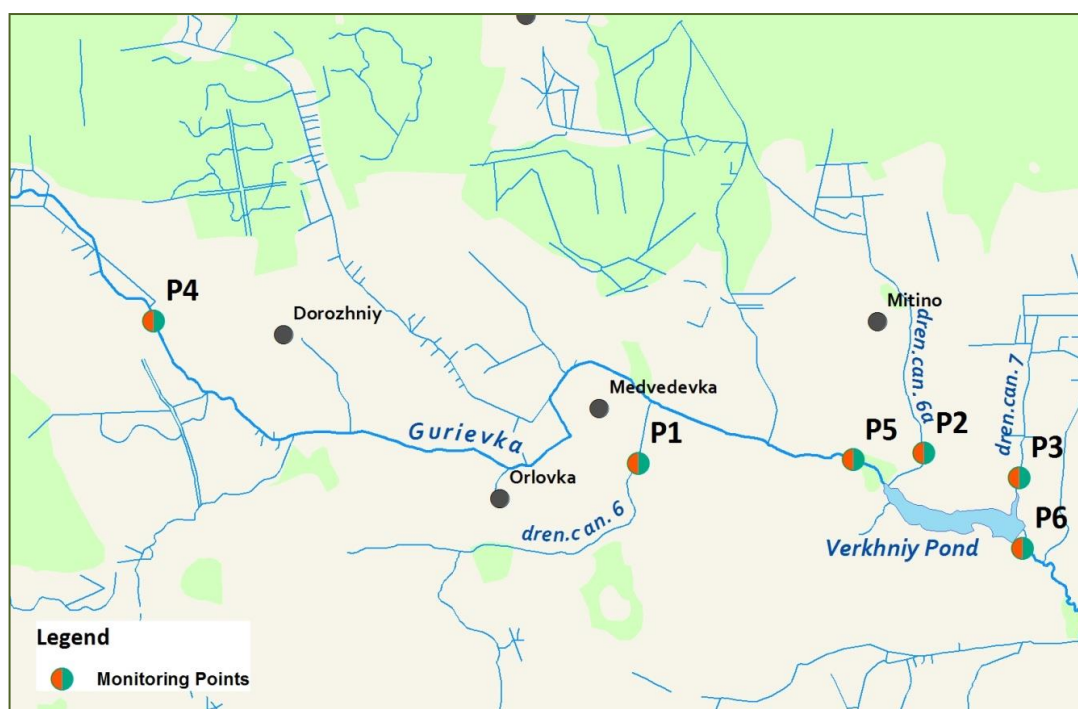
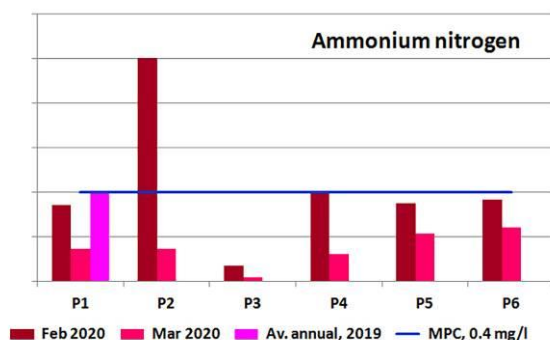


Figure 5 – Monitoring points for the catchment of the Upper Pond

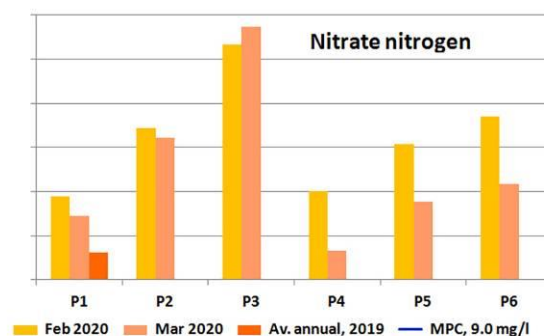
The analysis of water samples was carried out on the content of elements in it: total nitrogen ( $N_{tot}$ ), nitrates ( $NO_3$ ), nitrites ( $NO_2$ ), total phosphorus ( $P_{tot}$ ), phosphorus phosphate ( $PO_4$ ).

Concentrations of nitrogen and phosphorus compounds naturally increase from source to mouth. The values of the concentration of nitrogen compounds in the points of the main channel of the Gurievka river are lower compared with the values recorded in the channels (Fig. 6). It was noted that the value of the concentration of nitrates at points P2 and P3 is high in comparison with other observation points. This indicates the impact of agriculture.

a)



b)



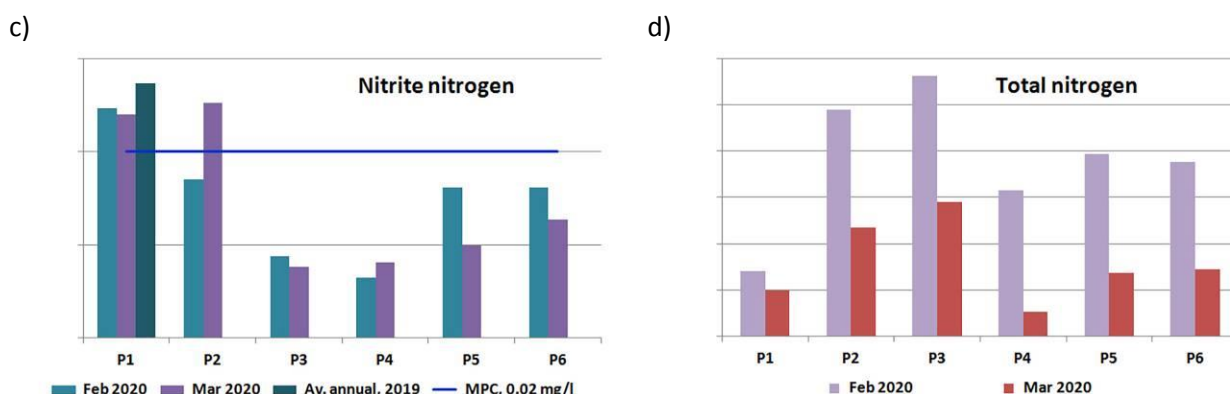


Figure 6 – Concentrations of ammonia nitrogen (a), nitrate nitrogen (b), nitrite nitrogen (c) and total nitrogen (d) in water at control points of the drainage system of the Upper Pond in February and March 2020

The change in the concentration of phosphorus phosphates in water is such that it is higher at the control points in the main channel of the Gurievka river compared with the control points in the drainage channels. However, the highest total phosphorus was recorded in the drainage channel at point P1 (Fig. 7).

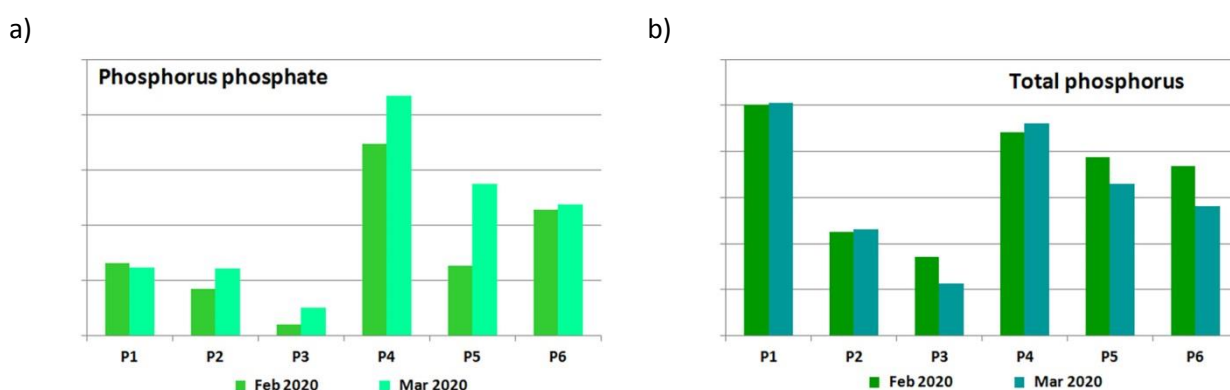


Figure 7 – Concentrations of phosphorus phosphates (a) and total phosphorus (b) in water at control points of the drainage system of the Upper Pond in February and March 2020

In accordance with the main objective of the WaterDrive project – determining the location of the treatment facilities for wetland type with surface runoff / wetland / – it is recommended to continue monitoring water quality at control points. However, to optimize the study, it is possible to reduce the number of monitoring points from 6 to 4. And in the summer, repeat the analysis for all 6 points.

The research is only the beginning of the study of the nutrient load changes in the catchment of the Upper Pond. Laboratory analysis of water samples, which has been carried out since the beginning of 2020, shows the situational state. Accordingly, further research is required for one to two annual cycles. After that, it can be concluded about the geo-environmental state in the drainage system. It is possible to expand information on the quality of water in the Gurievka River using the data obtained earlier in the WaterNet project for 2017-2018.





## FOCUS GROUPS MEETINGS

3 meetings with focus groups were conducted and 2 individual meetings with landowners on the construction of wetlands and new measures to protect the environment

Dates: 01/15/2020; 30/01/2020; 03/03/2020.



The attendance of the meeting was lower than expected.

Most of the farmers haven't a strong motivation to renovate their fields or local waterbodies.

One of the major bottlenecks is that farmers do not know about the benefits of wetlands and also they need financial support.







### VISIBILITY

Partner's contribution of Guryevsk (22) to project communication:

Project page on Facebook

<https://www.facebook.com/WaterDrive-105505640984583/>

Project page on the site Guryevsky District Administration

<http://guryevsk.gov39.ru/index.php/culture/international-cooperation>

A Roll-Up mobile stand was made and project posters were printed.

### SITE SELECTION AND DESIGN OF THE WETLAND COMPLETED

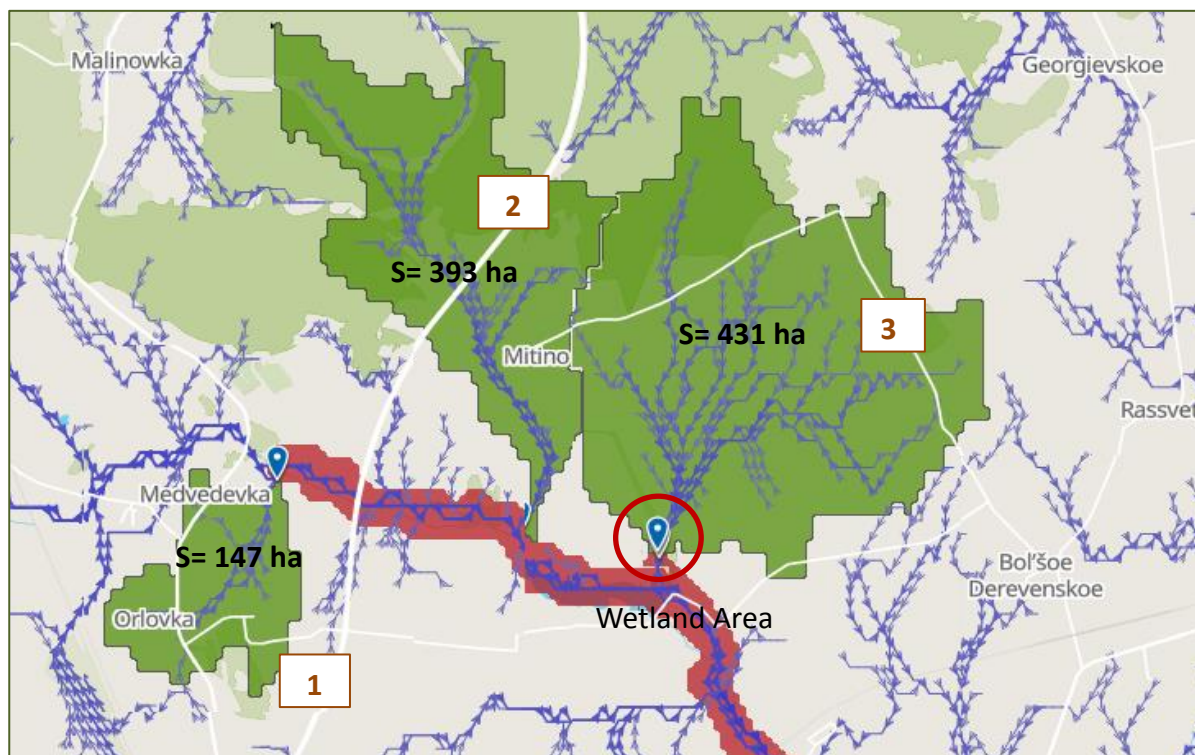
In the Waterdrive project, the Guryevka River catchment area was selected as the observation zone. The catchment basin of the Upper Pond / Lake Dambas is part of the main catchment area of the Guryevka River. The selected area includes 3 drainage channels. The total drainage canal drainage area is 971 ha, of which 490 ha are agricultural land.

Catchment drain channel 1 only includes wastewater from settlements.

Catchment drain channel 2 includes agricultural land. But the territory does not have the road infrastructure.

Catchment drain channel 3 includes agricultural land. The territory has a road infrastructure.

### The water catchment of drainage channels in CA



On the map, the theoretically optimal place of wetland is shown.

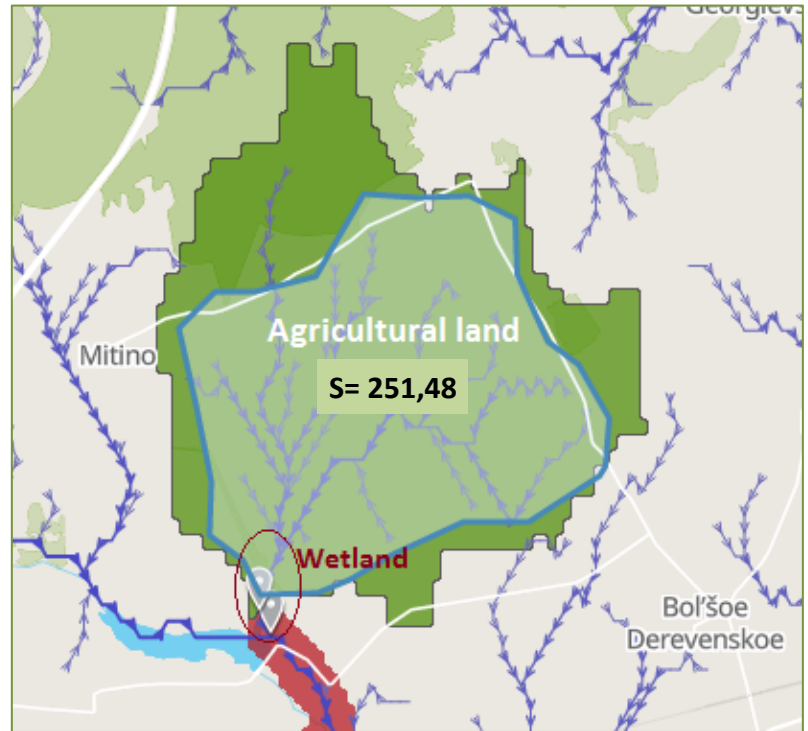




## PLACE OF DRAINAGE CHANNEL

(point 3 on the map)

- Channel catchment area: 431 ha
- Flow rate: 1,07m<sup>3</sup> / s
- The Length to the pond: 3,5 km
- Agricultural land about 251,48 ra



PS

- The size of the catchment area in SCALCO (SRTM) - 580 ha
- The size of the catchment, according to "Kaliningradmeliovodkhoz" is 431 ha

## CHARACTERISTICS OF WETLAND AREAS

We analyzed the use and construction of wetlands in Denmark. (example: Minivådområde-ordningen 2019 Etablering af åbne minivådområder og minivådområder med filtermatrice). Based on the results of the land survey, we came to the following decision: it is advisable to place an open-type wetland with an open drain in the selected area.

It was selected territory, a total area of - 1.87 hectares.

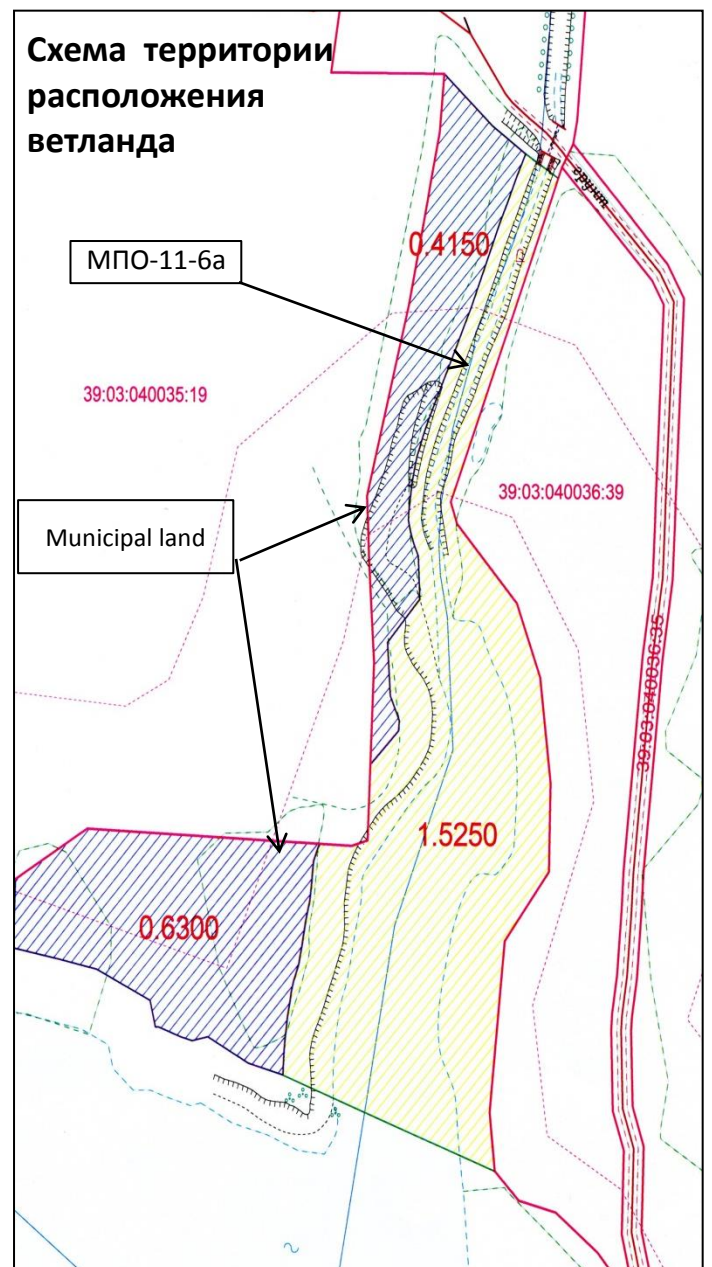
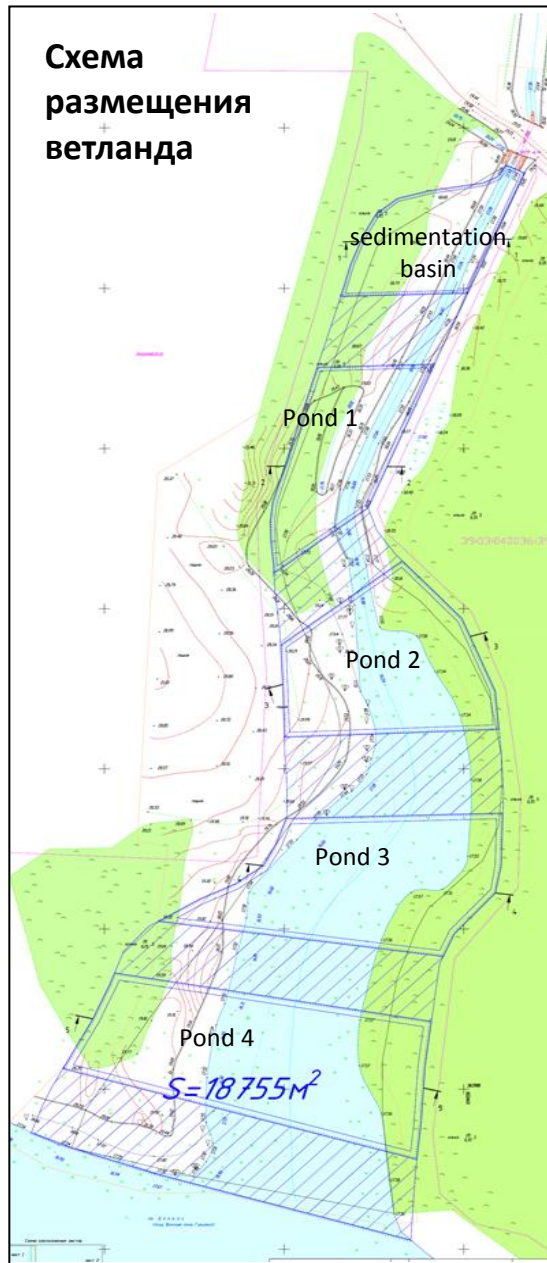
This area includes:

- The municipality's plots of land are the area of 0,416 hectares and 0.63 hectares (These plots of land bordering the river's and drainage canal's water protection of territories );
- Zone of drainage channel MPO-11-6a (including water protection zone of a width of 5 m on both sides of the flood);
- Zone of Guryevka River (including water protection zone width of 20 m on both sides of the watercourse).

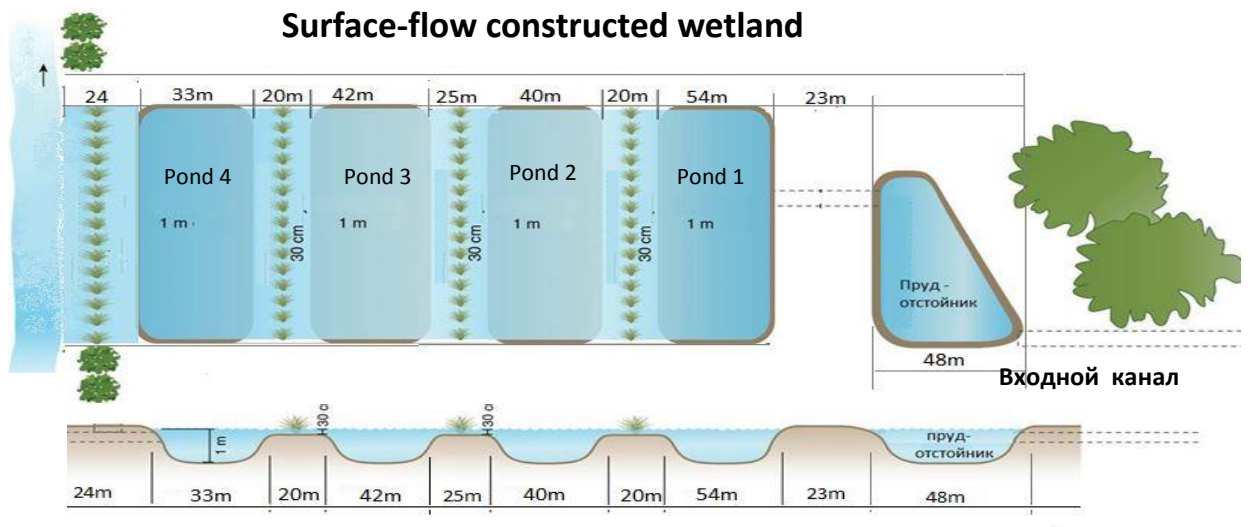
*The total area of aqueous land (part of Guryevka river and part of the drain channel) is 1.52 ha.*



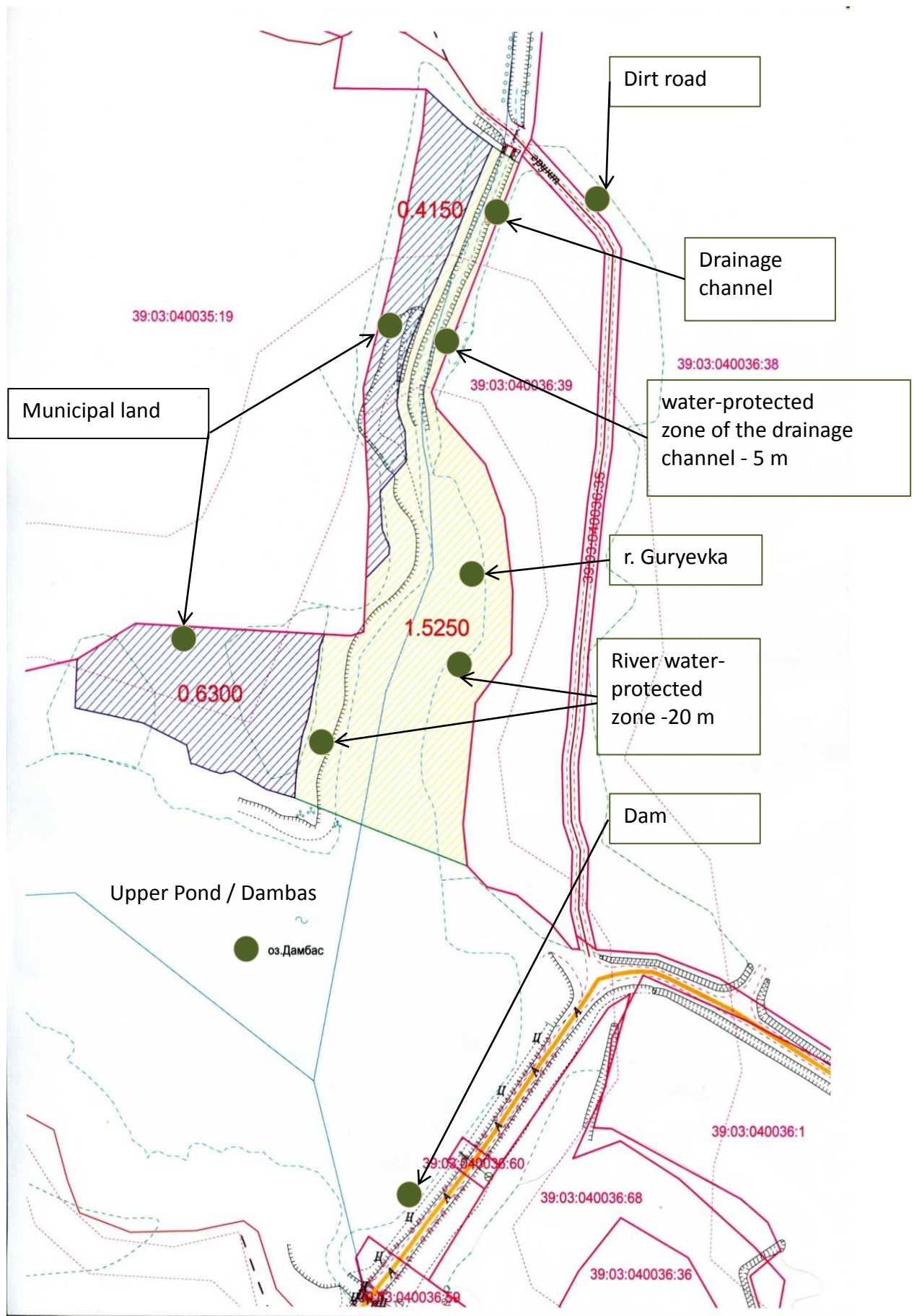
## CHARACTERISTICS OF WETLAND AREAS



## Surface-flow constructed wetland

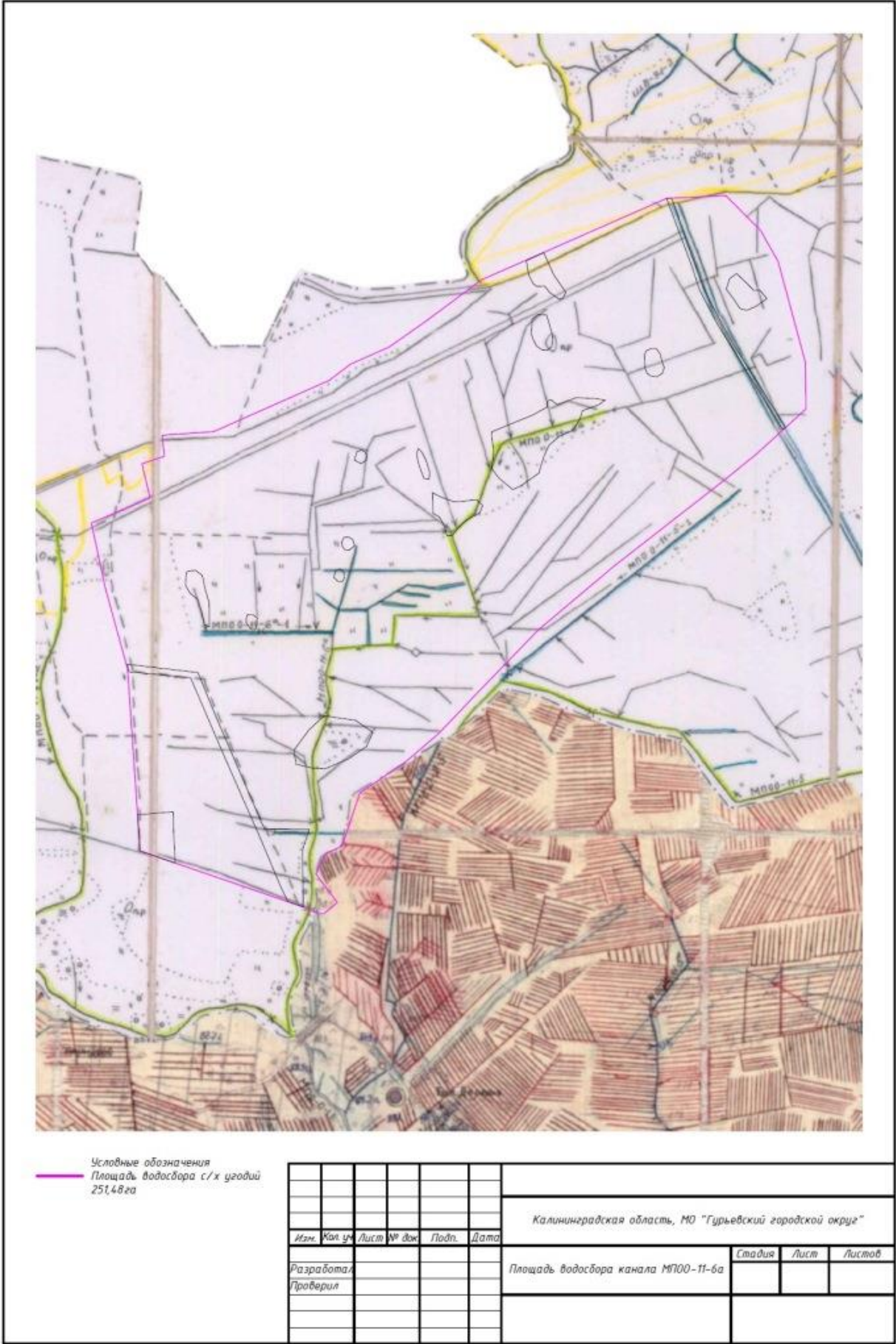


## CASE AREA CADASTRAL PLAN





AGRICULTURAL LAND IN CA  
 The total area of agricultural lands in CA251,48 ra



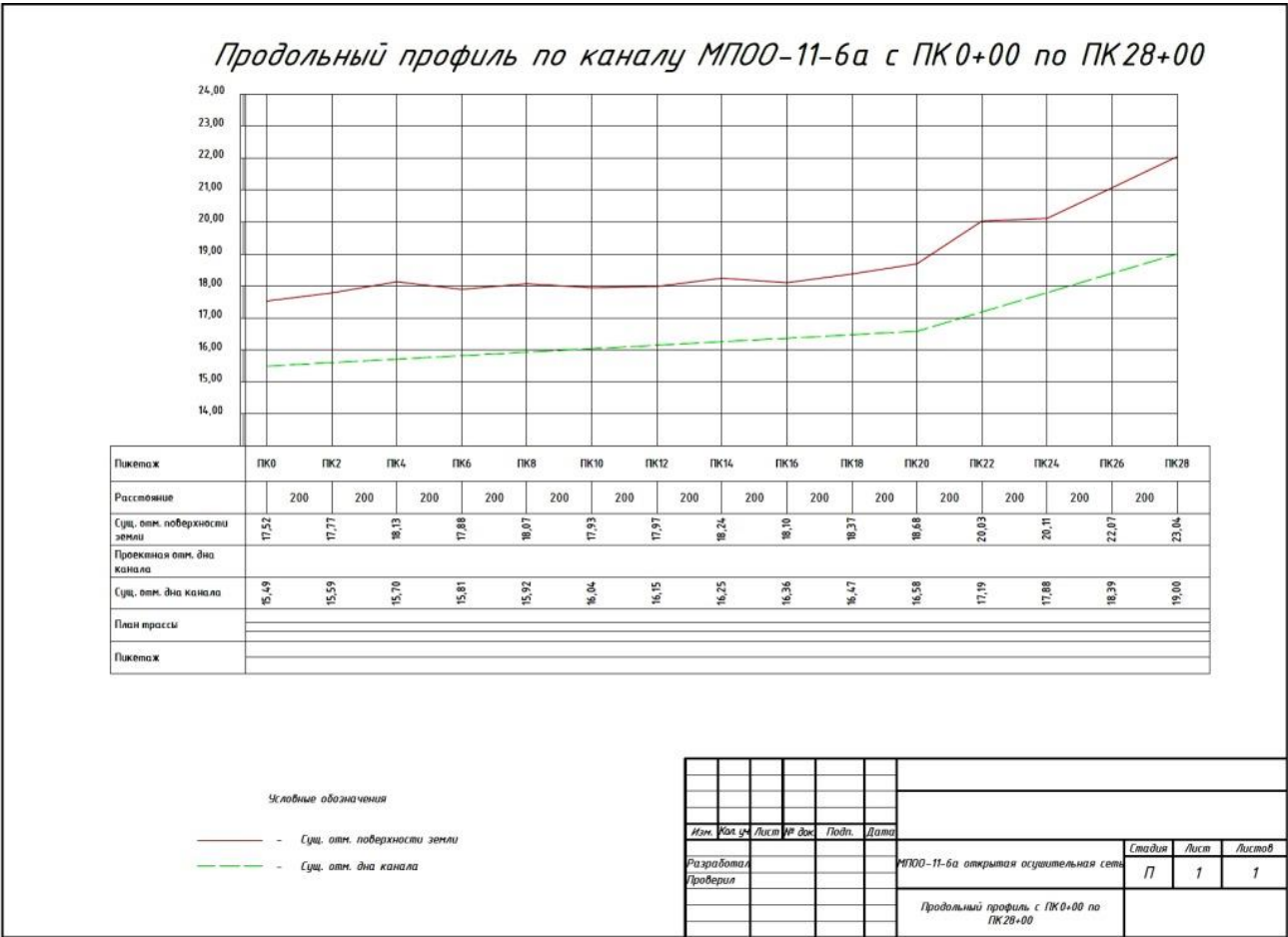


Wetland consists of settling pond (sedimentation basin) and 8-alternating deep and shallow basins.

In the process of construction of wetland, planned to change in the riverbed Guryevka, at the site of the confluence of the MPO-11-6a drainage channel to the main channel of the river.

And also, the drainage channel bed will be changed (in the area from the country road to the confluence with p. Guryevka). This will entail changes to the technical characteristics of the channel.

**Longitudinal profile of drainage channel 3**



**IDENTIFIED PROBLEMS**

Estimated area wetland location falls into the protected zone Guryevka River. All activities carried out in the protected zone should be coordinated with the Ministry of Natural Resources of the Kaliningrad region.

Drainage channels and river Guryevka are in the operational management of Federal state institution" Kaliningradmeliovodkhoz".

All actions related to the reconstruction of the drainage channels should be coordinated with the structure.



According to information Rossreestra Office in the state cadastre of a real estate considered guard band Guryevka River (MPOO-11) and water protection Guryevka River area (MPOO-11) established on the basis of the Order of the Ministry of Natural Resources and Ecology of the Kaliningrad region on November 24, 2017 № 187 "On approval of the boundaries of water protection and coastal shelterbelts river watercourses Pregel of the Kaliningrad region. "The legal mode of use in accordance with the Federal Law №74 from 03.06.2006, the "Water Code of the Russian Federation"

**CURRENTLY, IN ORDER TO START THE DESIGN WORK, WE NEED TO COMPLETE THE FOLLOWING PROCEDURES:**

- To put on cadastral registration two municipal lands (Municipality Guryevsky District);
- Execution period 14 day, ( May- June 2020).Get permission to use the drainage channel MPO-11-6a for construction work (Kaliningradmeliovodhoz);  
Deadline 30 days, (June 2020).
- Obtain a decision on the allocation of a water object (part Guryevka River) (Ministry of Natural Resources)  
Deadline 60 days, (July 2020).
- To hold a tender for the development of project documentation  
Deadline 14 days, (July 2020).
- To Develop design documents (including examination)  
deadline 60 days, ( Aug. Sept.2020).

The order and timing of the construction work will be determined by the design and estimate documentation (possible is start November 2020 or spring 2021).

The most optimal time for field works (excavations etc) in order to minimize sediment runoff is during the dry summer season.

