



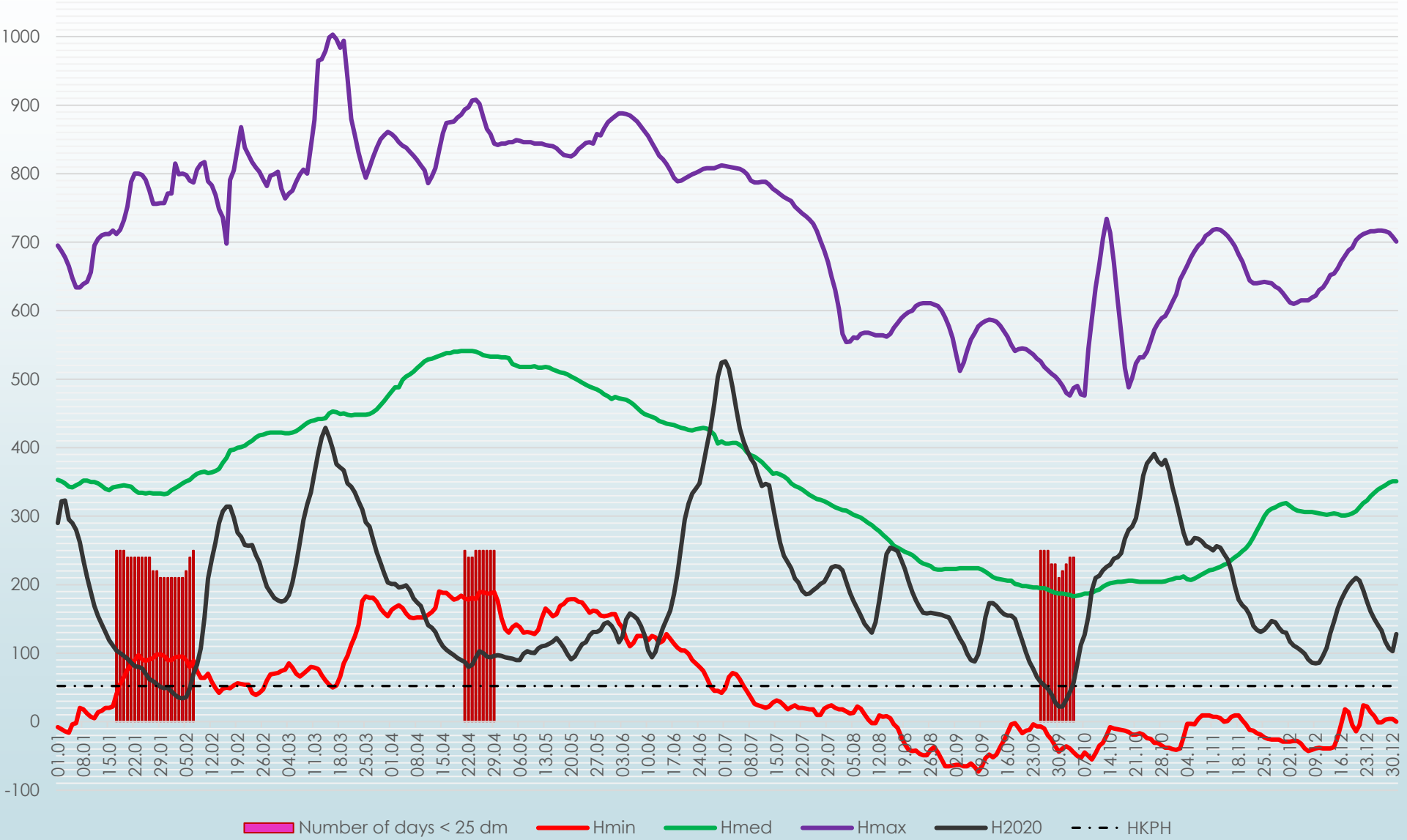
HYDROTECHNICAL EXPERT GROUP WORKSHOP

Danube Commission, Budapest

29th of February 2024

Status of the main critical sections in the period 2020-2023 and hydrological information, Bulgaria

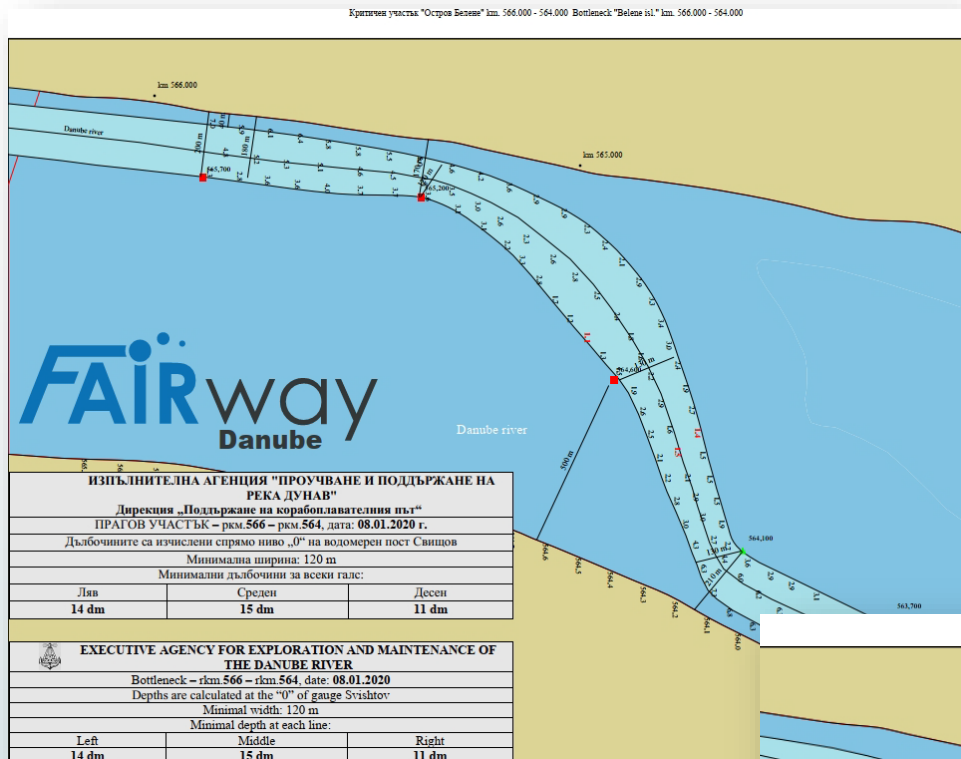
Hydrological conditions for Ruse 2020



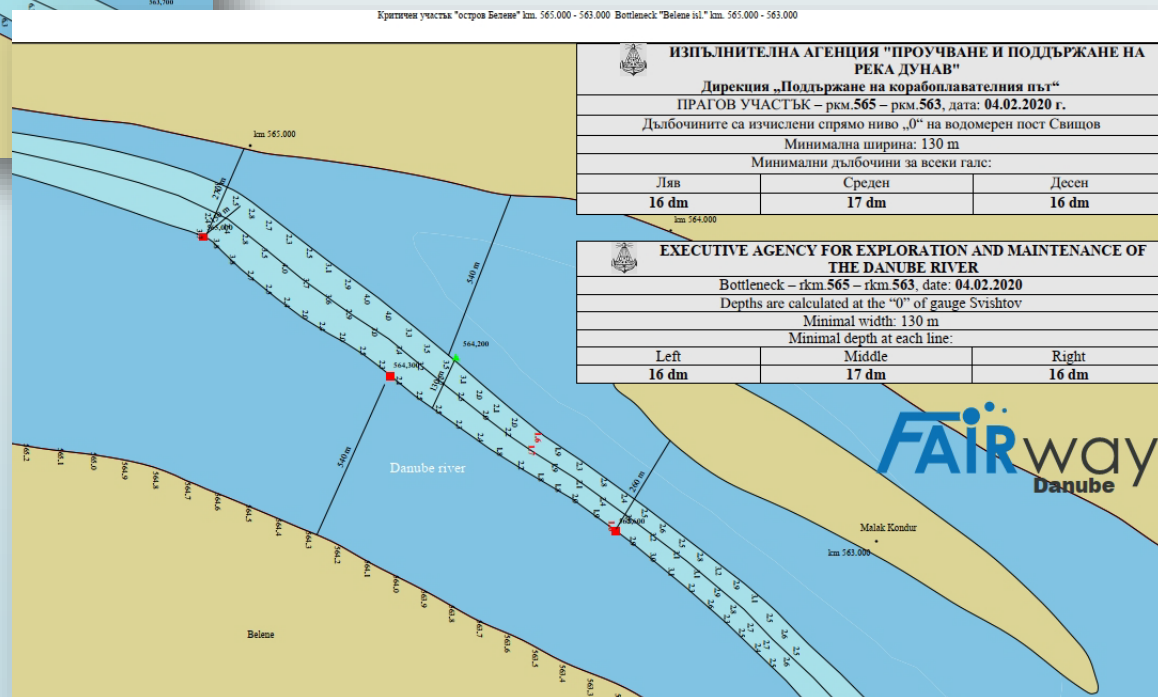
In 2020, permanently change the fairway alignment at the following critical sections:

- rkm 565.000 – rkm. 563.000 от 04.02.2020;
- rkm 458.000 – rkm. 455.000 от 06.02.2020;
- rkm. 422.000 – rkm. 420.000 от 29.04.2020;
- rkm. 412.000 – rkm. 410.000 от 09.06.2020;
- rkm. 576.000 – rkm. 573.000 от 22.07.2020;
- rkm. 576.000 – rkm. 573.000 от 02.09.2020

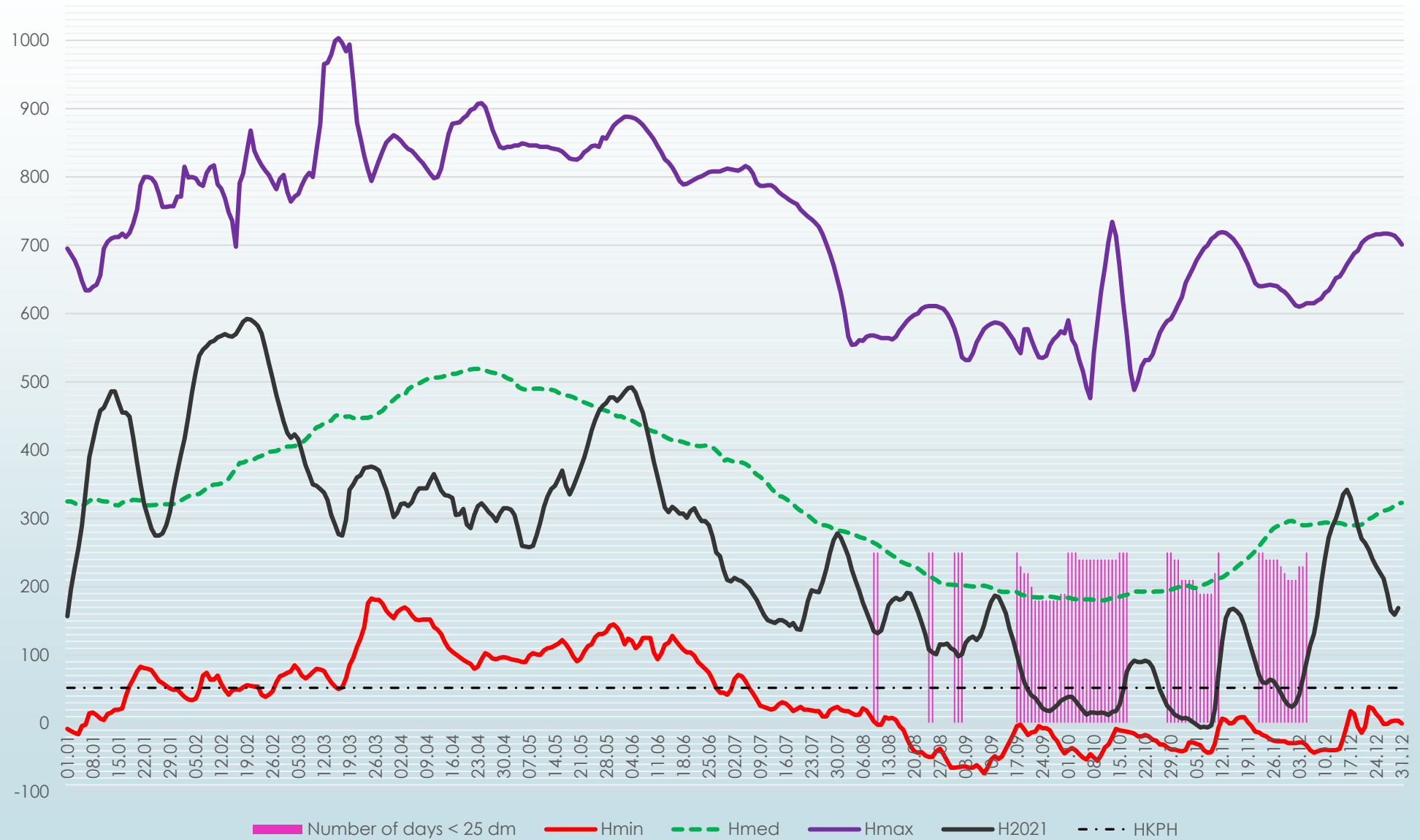




Belene Island rkm565 - rkm563



Hydrological conditions for Ruse 2021

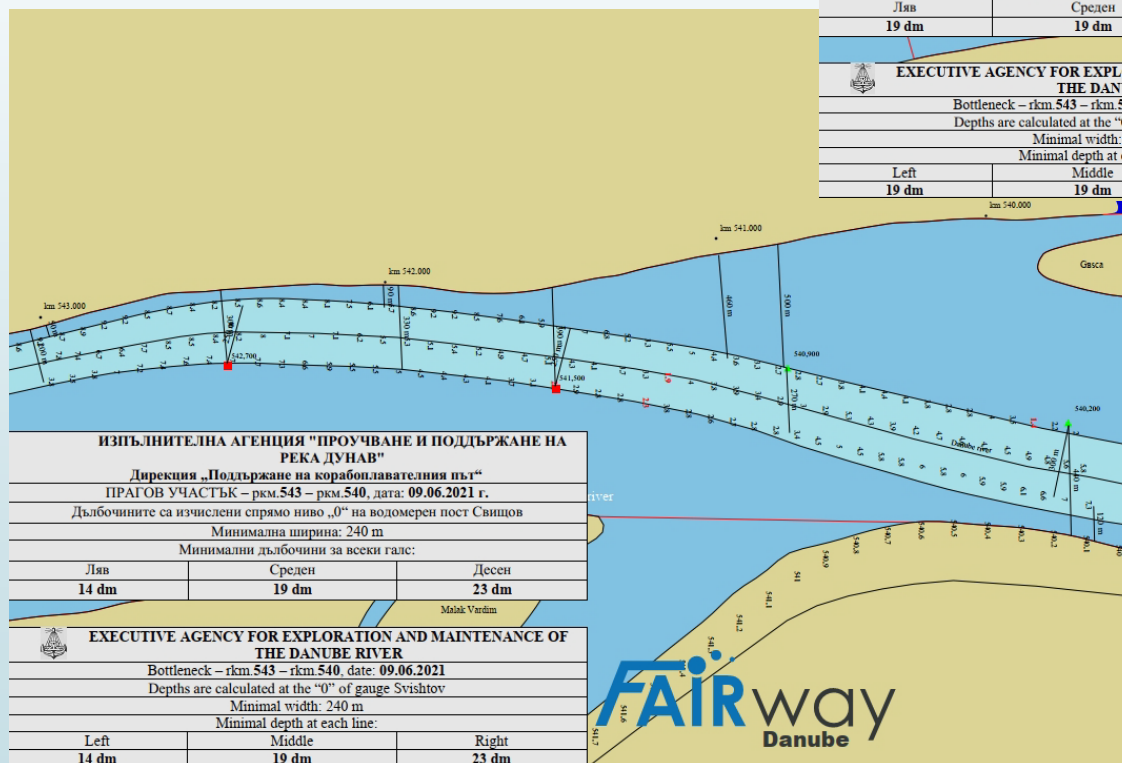
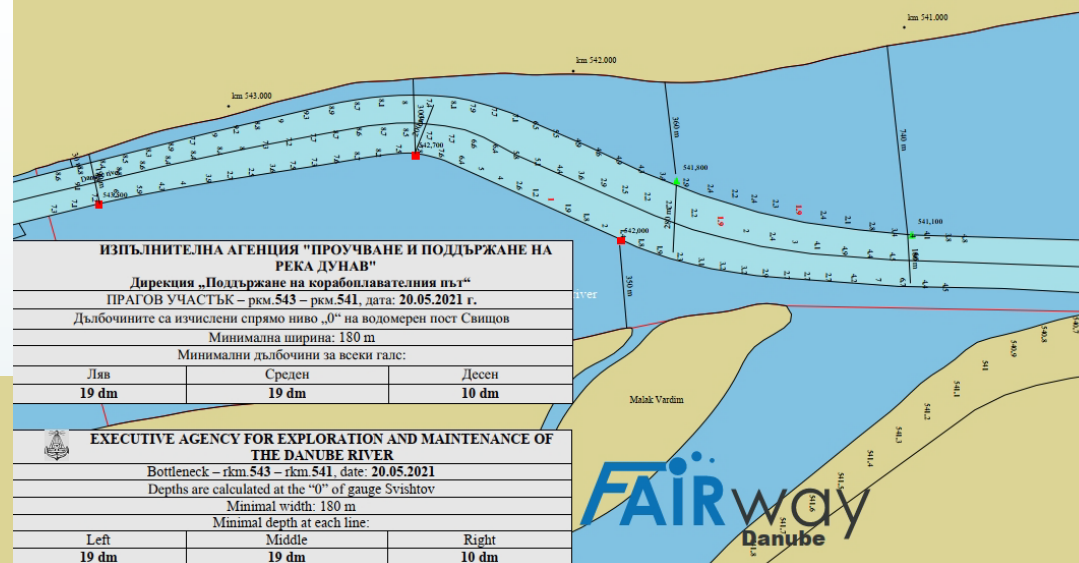


The trajectory of the fairway was permanently changed at the following critical sections:

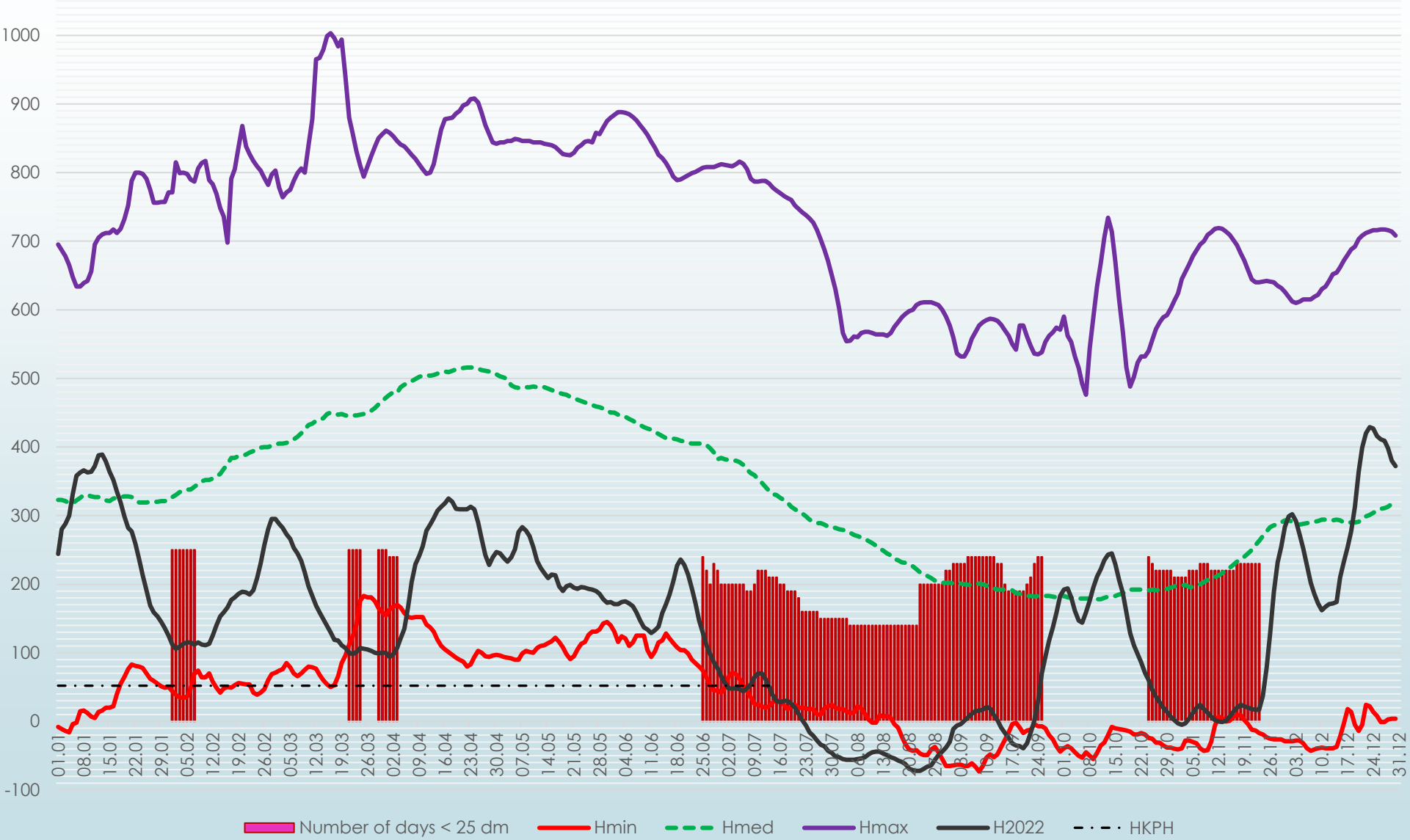
- rkm. 547.000 – rkm. 545.000 от 11.03.2021;
- rkm. 543.000 – rkm. 540.000 от 09.06.2021;
- rkm. 533.000 – rkm. 530.000 от 22.06.2021;
- rkm. 565.000 – rkm. 563.000 от 13.08.2021;
- rkm. 406.000 – rkm. 404.000 от 02.09.2021;
- rkm. 406.000 – rkm. 404.000 от 28.09.2021;
- rkm. 396.000 – rkm. 392.000 от 11.11.2021;
- rkm. 386.000 – rkm. 382.000 от 11.11.2021;
- rkm. 565.000 – rkm. 563.000 от 18.11.2021;
- rkm. 414.000 – rkm. 412.000 от 24.11.2021;
- rkm. 531.000 – rkm. 529.000 от 27.11.2021;



Vardim Island rkm 543 – rkm 540



Hydrological conditions for Ruse 2022



- In 2022, the most critical bottleneck for navigation was again the section in the Belene Island area /rkm 565.000 – rkm 563.000/ with a depth of 19 to 14 dm and a fairway width of 60 m, with the number of days with depth ≤ 25 dm being 141 days.
- Another particularly difficult bottleneck for navigation was the Vardim Island threshold /rkm 547.000 – rkm 544.000/ with the number of days with depth ≤ 25 dm being 123 days and the fairway width reaching 80 m.
- Problems were also caused by the sections in the areas of Golyama Barzina Island /rkm 576.000 – 573.000/, Batin Island /rkm 523.000 – rkm 520.000/, Brashlyan Island /rkm 457.000 – rkm 455.000/, Popina area /rkm 407.000 – rkm 405.000/, Vetren Island area /rkm 394.000 – rkm 390.000/ and the area of Chayka Island /rkm 385.000 – rkm 382.000/.

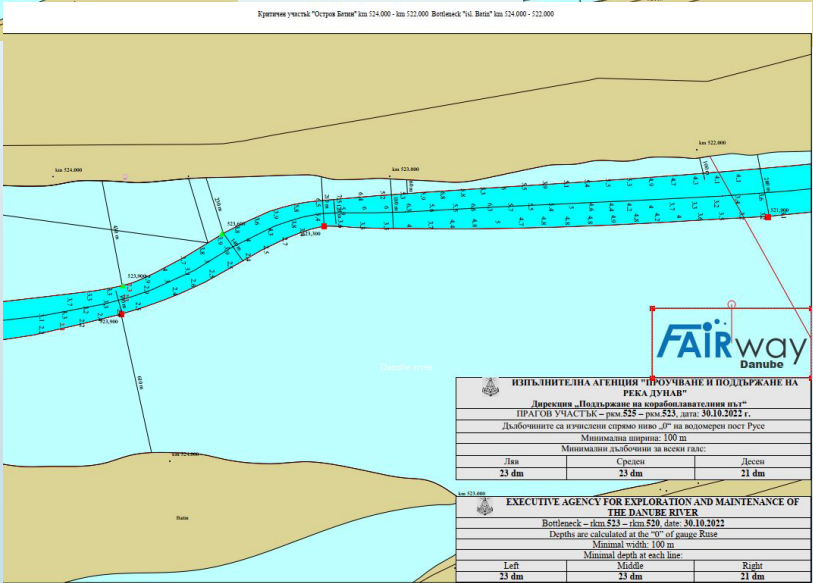
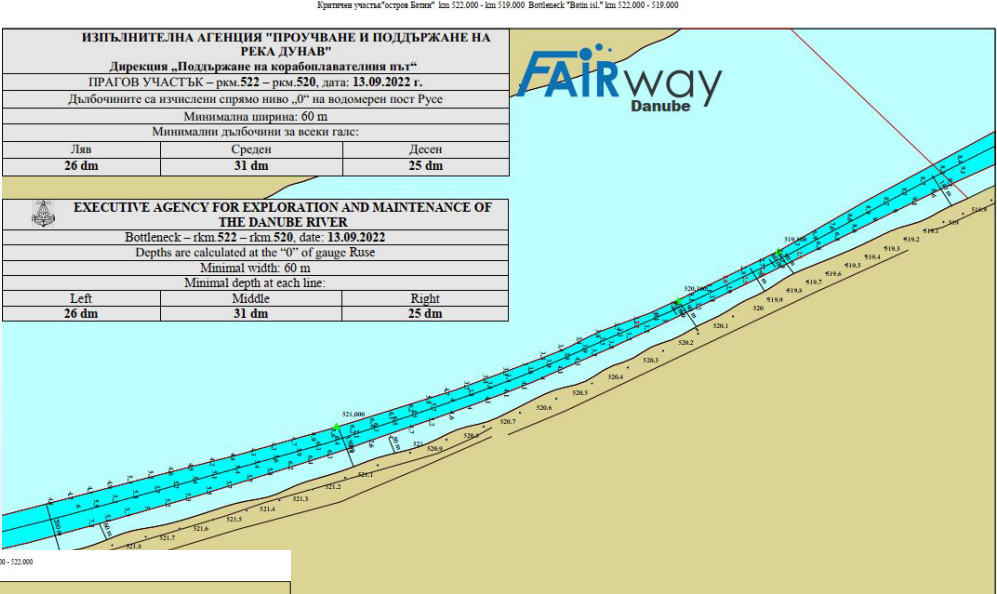
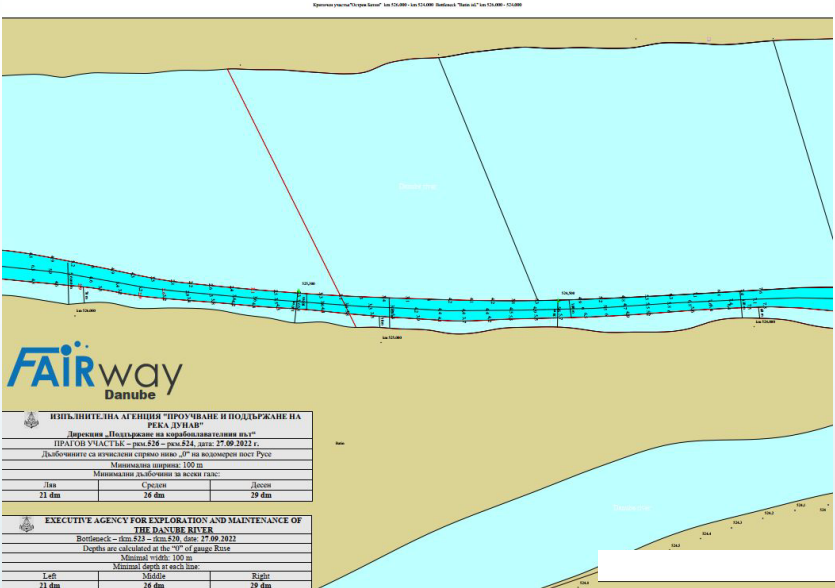
The trajectory of the fairway was permanently changed at the following critical sections:

- rkm. 531.000 – rkm. 529.000 от 02.06.2022;
- rkm. 565.000 – rkm. 563.000 от 08.07.2022;
- rkm. 565.000 – rkm. 563.000 от 26.07.2022;
- rkm. 396.000 – rkm. 392.000 от 09.08.2022;
- rkm. 565.000 – rkm. 563.000 от 23.08.2022;
- rkm. 423.000 – rkm. 421.000 от 29.08.2022;
- rkm. 423.000 – rkm. 421.000 от 20.09.2022;
- rkm. 407.000 – rkm. 404.000 от 20.09.2022;
- rkm. 525.000 – rkm. 523.000 от 29.10.2022;
- rkm. 609.000 – rkm. 607.000 от 15.11.2022;



Batin Island

rkm 525 – rkm 522



Belene isl.

09.2009



Персински блата

Belene isl. 10.2013



Персински блата

Belene isl.

04.07.2022

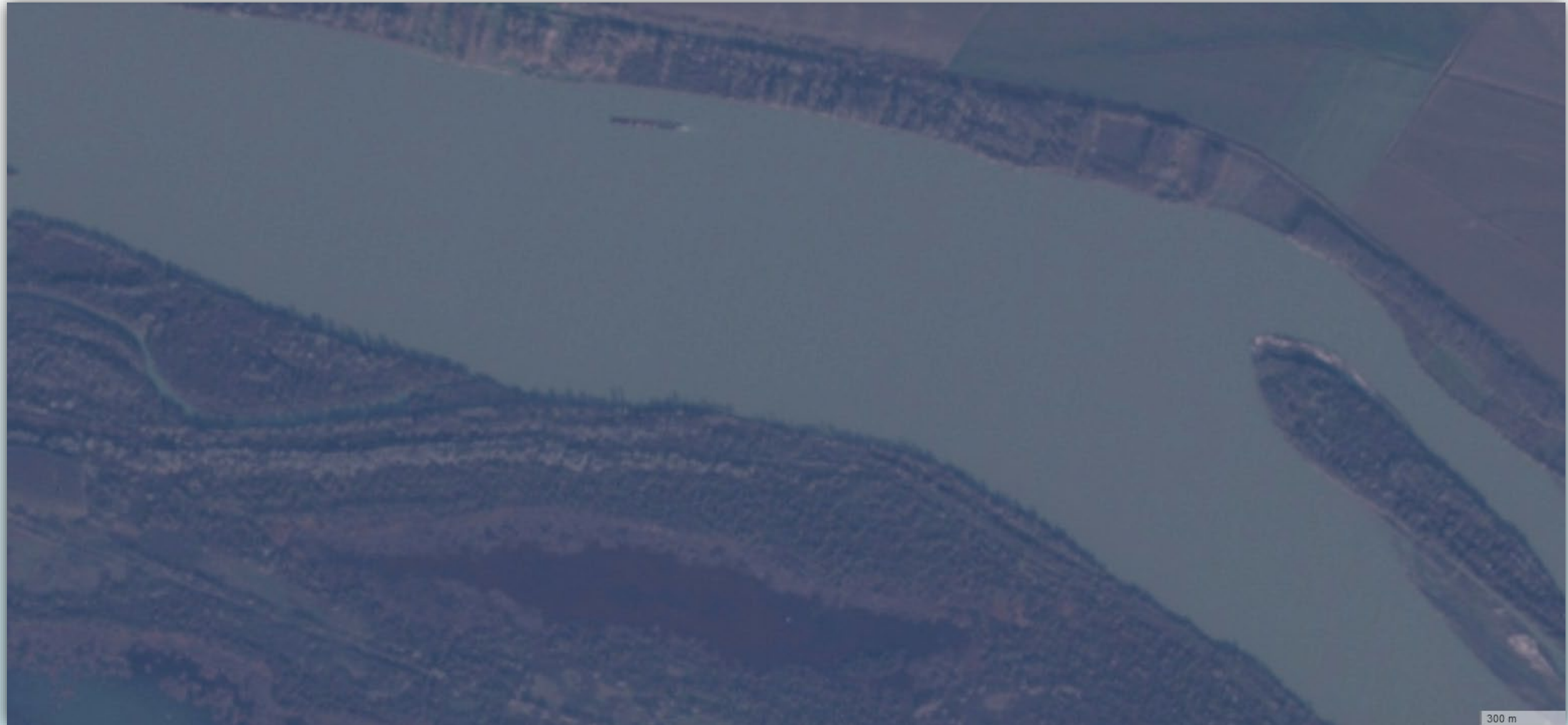


Belene isl.
23.08.2022



Belene isl.

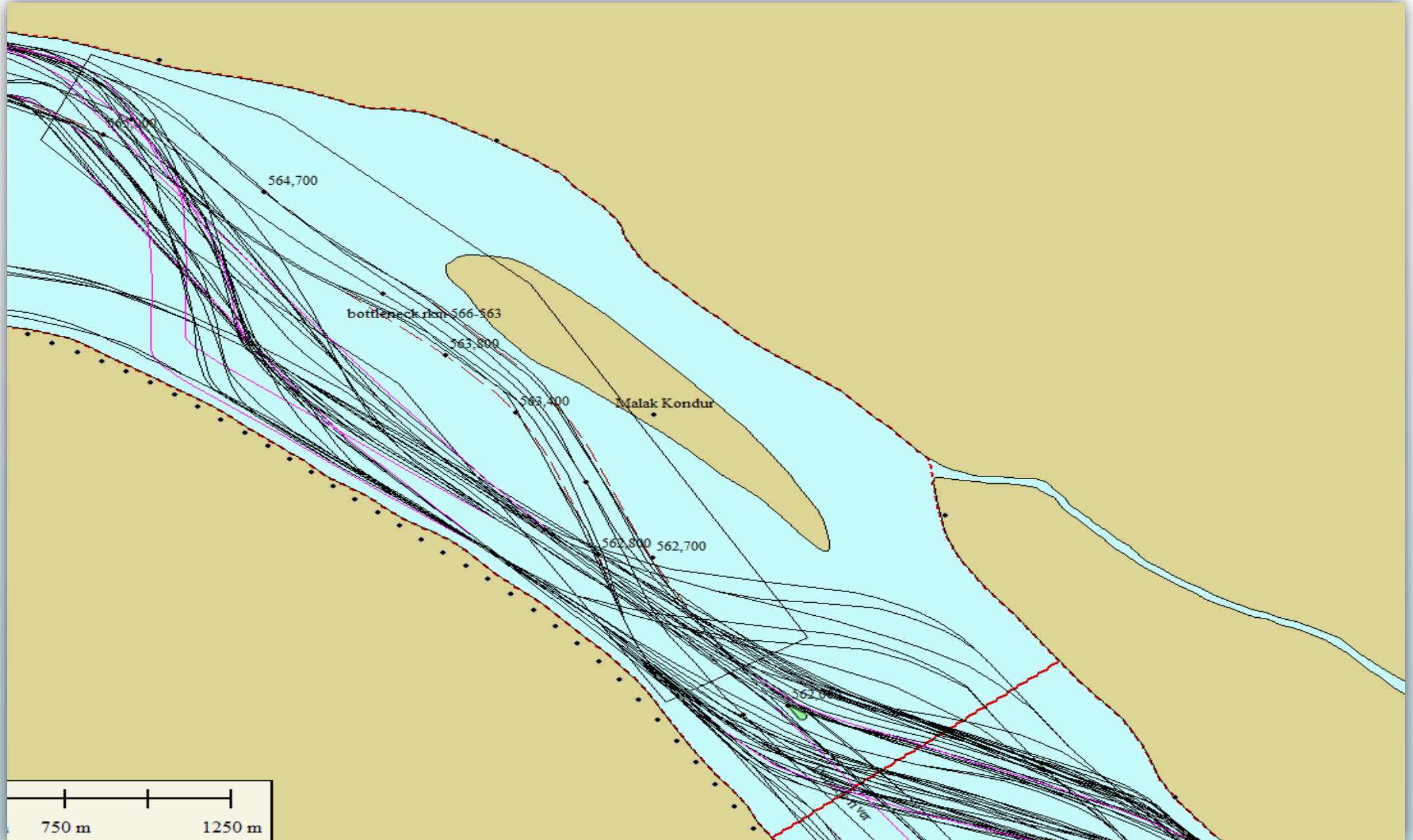
31.12.2022



Belene critical area rkm570 - rkm560

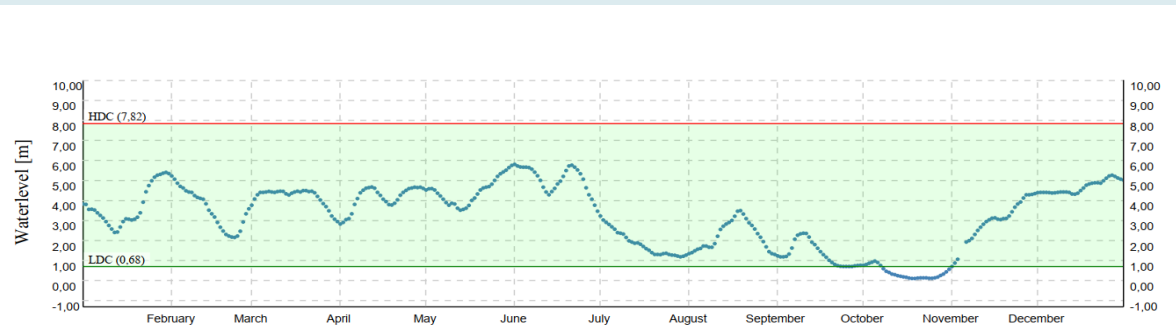
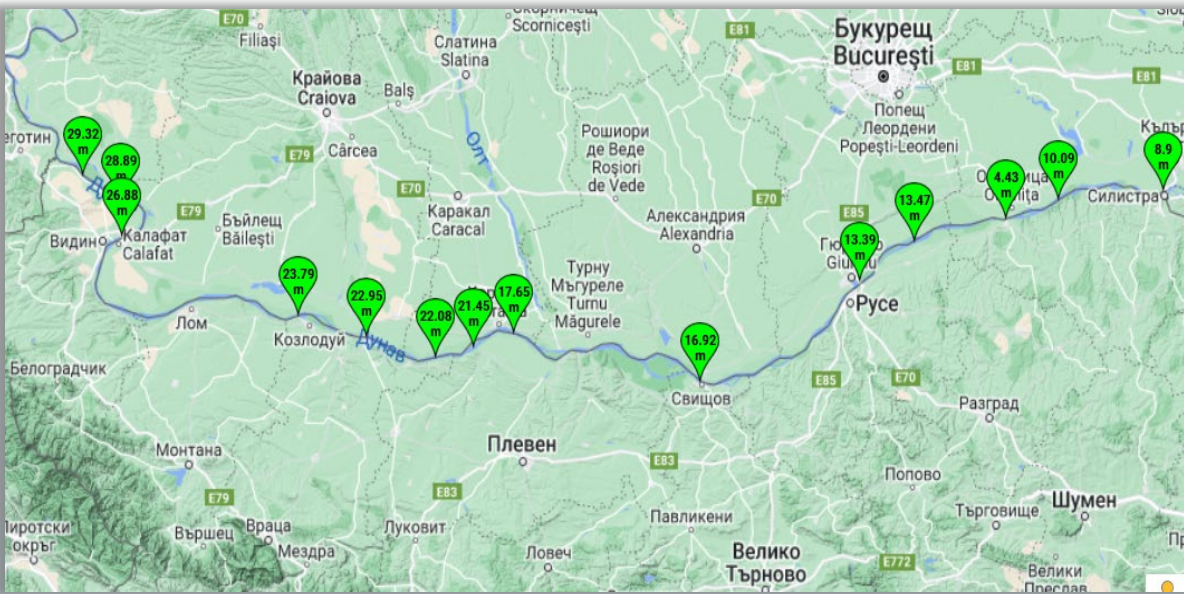


Belene critical area rkm565 - rkm560



Monitoring, rehabilitation and
technical maintenance in 2023

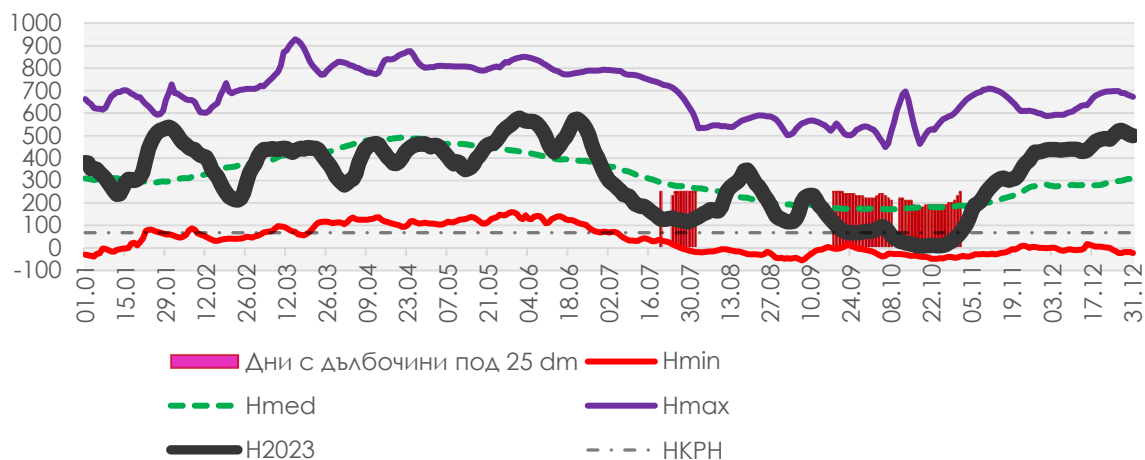
Hydrological conditions



From a hydrological point of view, 2023 can be considered unexceptional, without particular deviations from the typical multiyear average norms. The average annual water discharge is close to the multiyear average. There is a normal seasonality. It is characterized by spring high water in May, June and low water in September, October. Due to the sharp decrease in the water level from 574 cm on 21.06 to 116 cm on 29.07 and the impossibility of the riverbed to adapt in such a short time, in the most critical sections for navigation on 20.07.2023 depths of parts of the fairway were recorded 25 dm at a level of 128 cm on a water gauge in Svishtov with LNWL 68 cm. After 21.09.2023, depths of 25 dm were again recorded at a water level of 78 cm in Svishtov.

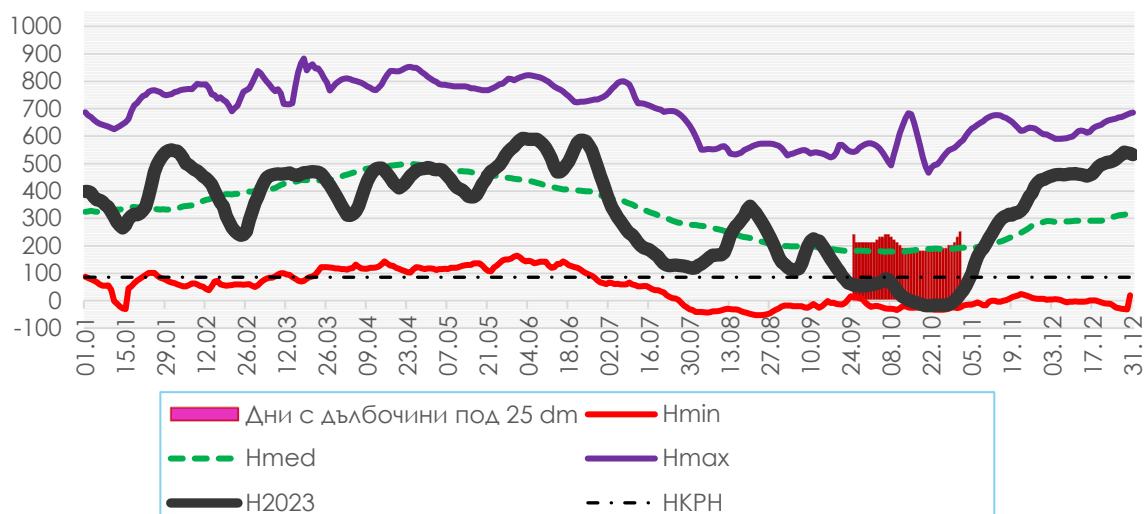
Water levels 2023

Water levels in Svishtov rkm 554,300 - 2023r.

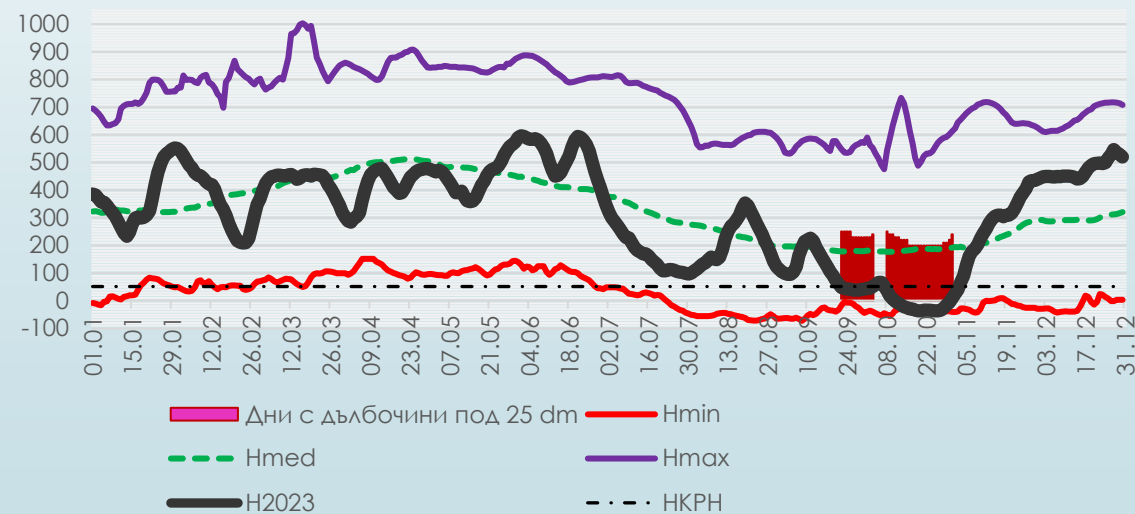


2023 г.	Number of days below LNWL	Number of days with depths under 25 dm	Min. water level	Mid. water level	Max. water level
Svishtov	29	53	8	317	578
Ruse	38	45	-36	316	597
Silistra	44	38	-18	329	592

Water levels in Silistra, rkm 375,500 - 2023r.



Water levels in Ruse, rkm 495.6 - 2023



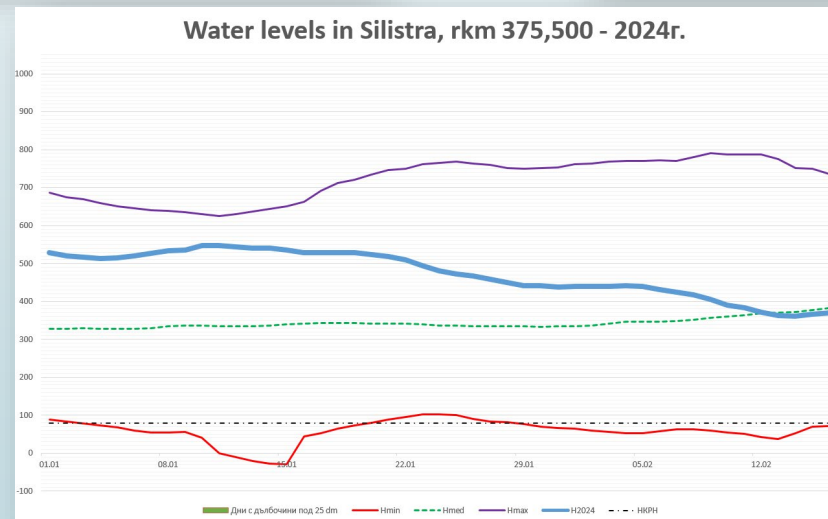
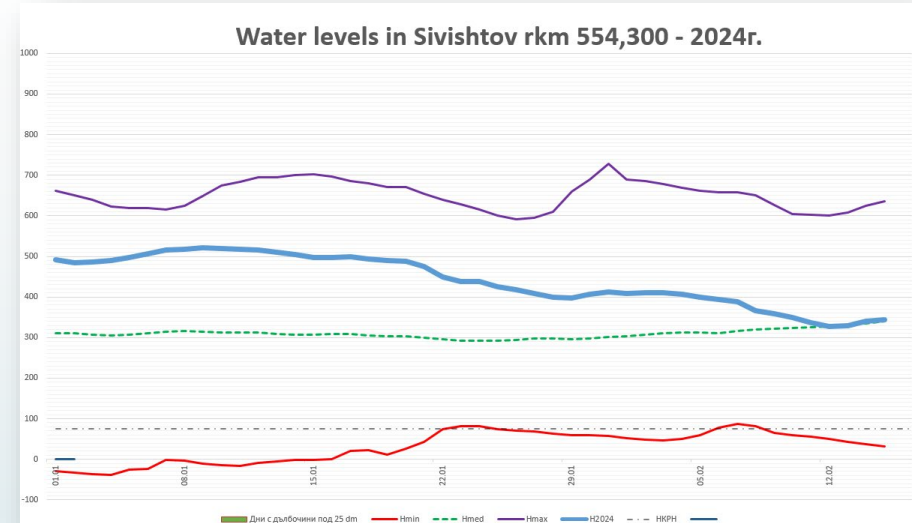
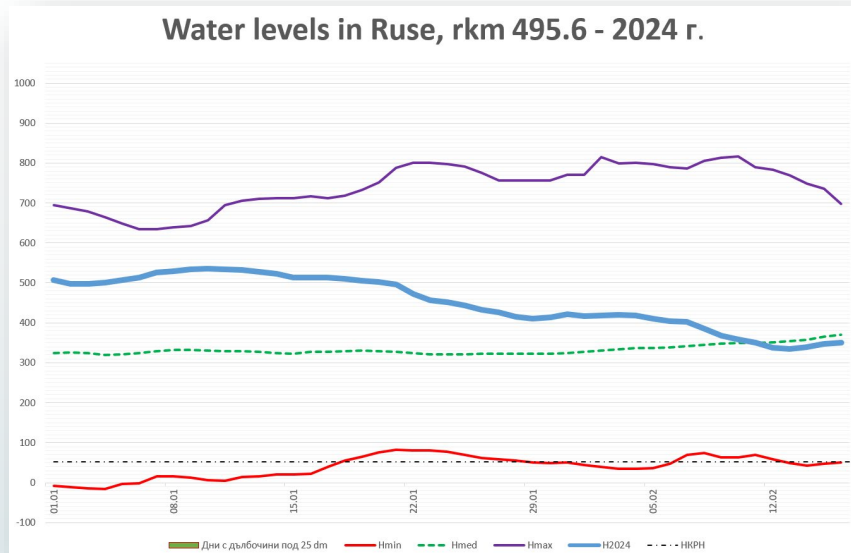
Number of days below LNWL and number of days with bottlenecks

km	610	536	536	445	445	375
Year	Svishtov		Ruse		Silistra	
	№ of days below LNWL	№ of days with bottlenecks	№ of days below LNWL	№ of days with bottlenecks	№ of days below LNWL	№ of days with bottlenecks
2011	73	195	76	95	78	83
2012	28	83	25	29	41	39
2013	36	90	35	51	38	24
2014	0	28	0	13	0	0
2015	80	150	77	115	72	71
2016	18	93	18	74	18	74
2017	32	143	28	113	23	52
2018	75	107	71	94	78	76
2019	68	96	64	72	75	59
2020	17	26	16	15	24	19
2021	50	68	49	65	55	68
2022	105	141	111	112	120	108
2023	29	53	38	45	44	38

Number of days during which the DC recommendations were not fulfilled

Year	Area		
	Svishtov	Ruse	Silistra
2011	122	19	5
2012	55	4	0
2013	54	16	0
2014	28	13	0
2015	70	38	0
2016	75	56	56
2017	111	85	29
2018	32	23	0
2019	28	8	0
2020	9	0	0
2021	18	16	13
2022	36	1	0
2023	24	7	0

Water levels 2024



Forecasts

Forecasts

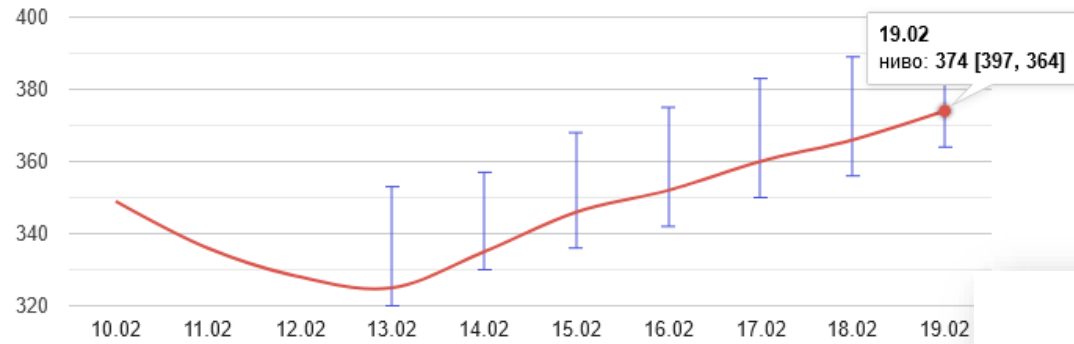
Oryahovo

Nikopol

Svishtov

Ruse

Silistra



Forecasts

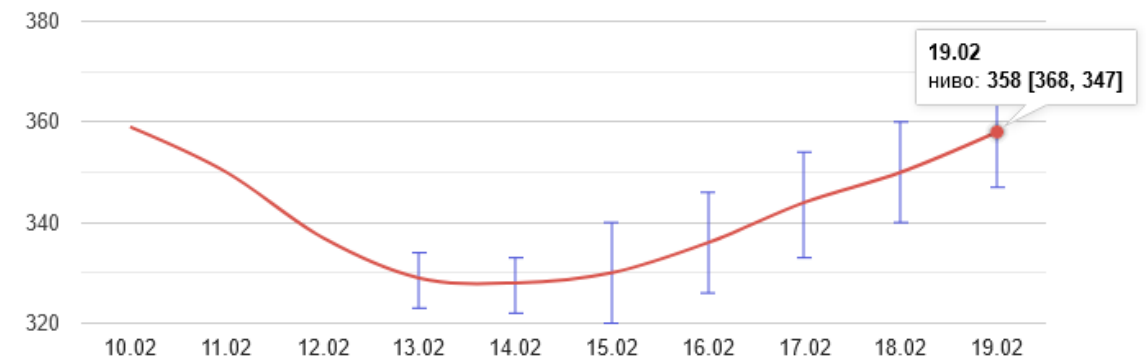
Oryahovo

Nikopol

Svishtov

Ruse

Silistra



Temperature characteristics from HMS Ruse

December 2023 / January 2024

Daily and monthly average air temperatures

Дата	Декември	Януари	Февруари
1	4.8	6.0	2.2
2	9.3	7.9	3.0
3	5.5	8.9	6.6
4	1.1	10.7	8.8
5	2.1	9.2	13.0
6	5.5	8.7	14.5
7	1.0	10.0	14.0
8	1.2	0.5	13.6
9	1.1	-3.8	11.3
10	0.5	-3.3	13.4
11	1.5	-1.5	17.4
12	5.0	0.5	12.5
13	5.3	-0.5	
14	7.3	3.5	
15	4.0	6.6	
16	3.0	4.0	
17	3.6	2.4	
18	6.8	5.1	
19	5.8	8.3	
20	5.1	2.1	
21	4.0	-1.8	
22	5.9	-5.3	
23	5.6	-5.4	
24	8.5	-1.6	
25	14.6	4.8	
26	12.0	5.3	
27	10.9	3.8	
28	5.6	2.7	
29	8.9	1.9	
30	9.9	1.9	
31	7.4	1.1	
Месец	Декември	Януари	Февруари
t min	-2.1	-8.7	-3.2
t med	5.6	3.0	4.6
t max	19.8	18.5	20.4

From 01/12/2023 to 12/02/2024 the weather is much warmer than normal for the period. At the average monthly temperature for HMS - Ruse for December-February 2.7°C, until 12.02.2024 it is 4.4°C.

The highest maximum temperature is 20.4°C, measured on 11/02/2024, and the lowest minimum temperature is -8.7°C, measured on 23/01/2024.

The maximum sum of days with negative average daytime temperatures is -14.0°C, with an average daily temperature of 3.5°C.

The number of frosty days is 25, and the number of icy days:

5

Meterological forecast

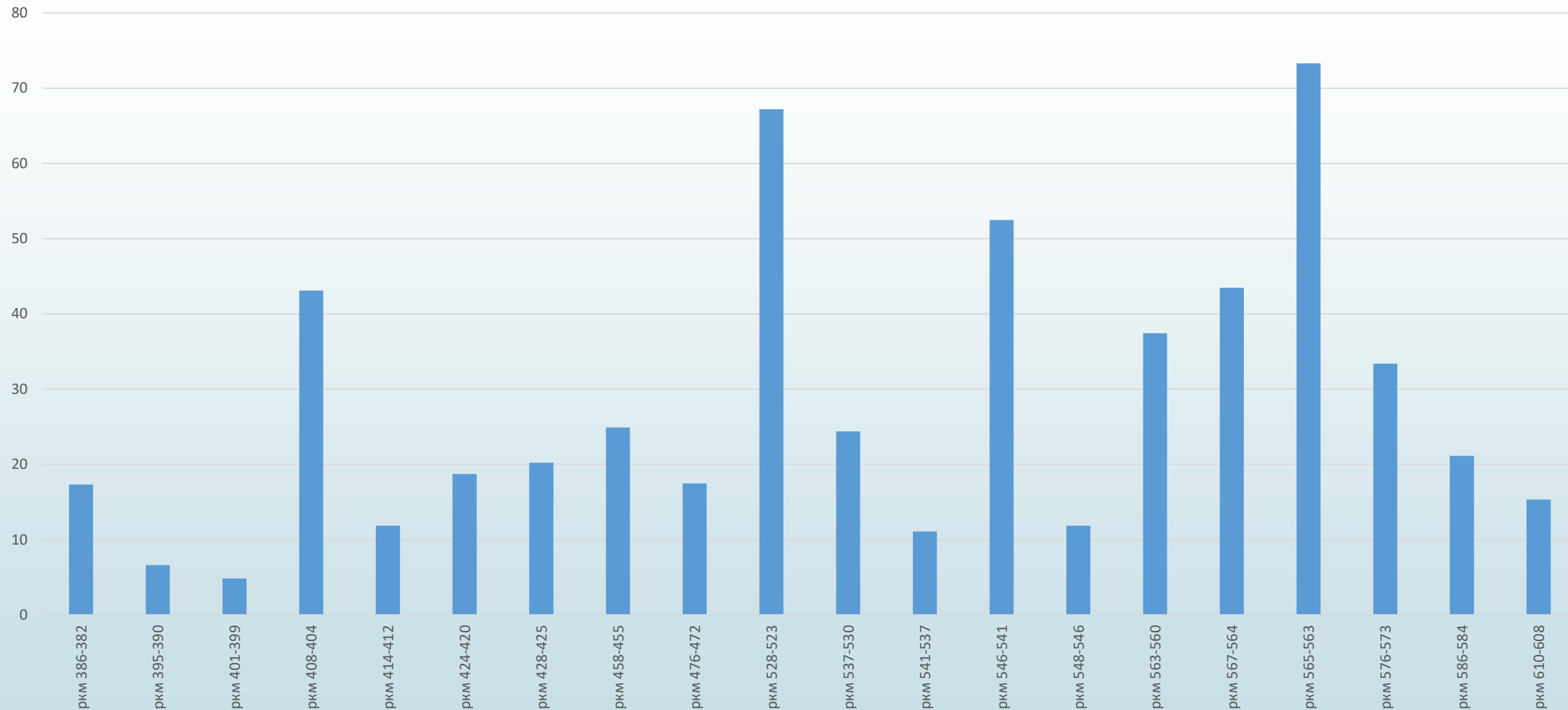
Seasonal forecast	10-days period			Month		Season	
Winter 2023/24 – spring 2024		temperature	precipitation	temperature	precipitation	temperature	precipitation
December (assessment)				1.96	0.02		
January (preliminary assessment)					0.04		
February	01-10						
	11-20						
	21-29						
March							
April							
May							

Forecast for February 21-29 - cold or normal for the season

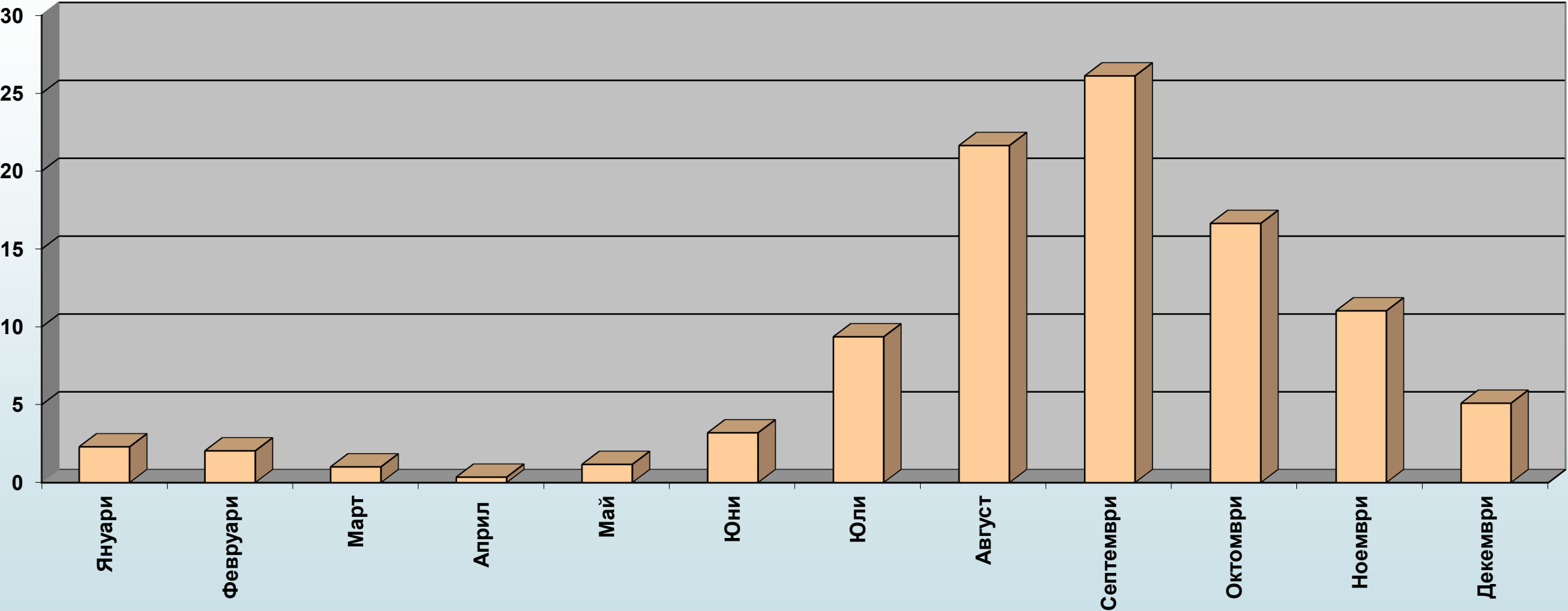
Forecast for March – warm or normal for the season

			Probability forecast for				
			Index	Color	below normal	around normal	above normal
Temperature	+2	warm		17-2%	33%	50-65%	
	+1	warm or normal		32-17%	33%	35-50%	
	0	normal		32-25%	36-50%	32-25%	
	-1	cold or normal		35-50%	33%	32-17%	
	-2	cold		50-65%	33%	17-2%	
Precipitation	+2	wet		22-7%	33%	45-60%	
	+1	wet or normal		32-22%	33%	35-45%	
	0	normal		32-27%	36-46%	32-27%	
	-1	dry or normal		35-45%	33%	32-22%	
	-2	dry		45-60%	33%	22-7%	
				33.3%	33.3%	33.3%	
				no forecast			

Frequency of occurrence of bottlenecks in identified critical sections



Influence of the months in which there were bottlenecks, expressed as a percentage



NAVIGATIONAL CONDITIONS

During 2023 in the common stretch 25 bottlenecks were active.
For the sector between Ruse and Somovit limiting were bottlenecks Belene and Vardim (rkm. 565.000 – 563.000 and rkm. 547.000 – 544.000), while for the sector between Ruse to Silistra limiting were bottlenecks Mishka and Brashlyan (rkm. 463.000 – 460.000 and rkm. 458.000 – 455.000).

Схеми на всички критични райони в българския участък (от км.374.10 до км. 610.00)



387.00 – 385.00
425.00 – 423.00
525.00 – 522.00
556.00 – 554.00

395.00 – 392.00
428.00 – 425.00
529.00 – 527.00
562.00 – 560.00

400.00 – 398.00
458.00 – 455.00
533.00 – 530.00
565.00 – 563.00

406.00 – 403.00
463.00 – 460.00
539.00 – 536.00
576.00 – 573.00



414.00 – 412.00
476.00 – 472.00
545.00 – 543.00
586.00 – 584.00

423.00 – 421.00
489.00 – 486.00
547.00 – 545.00
591.00 – 589.00

609.00 – 554.00

NAVIGATIONAL CONDITIONS

Fairway maintenance in the Bulgarian part of the river is performed by marking vessel “Osam”, surveying vessels “Rs 2070” and “Dunav-1”. While doing so more than 5 000 km were traveled by marking vessel “Osam” with usage of 120 days/year. The fairway optimization was implemented by maintenance of the navigational signals (floating and coastal), exploration and on-time corrections of the fairway. During the year the marking system was secured by (on position) 152 floating signals, out of which 38 illuminated, 734 (incl. kilometric) coastal signals, as well as 15 right river bank beacons.

Fairway corrections were made by:

- Mounting of floating signals 495
- Dismounting of floating signals 496
- Single beam measurements 152













The information is published on APPD’s web-site <https://appd-bg.org>

NAVIGATIONAL CONDITIONS

Bottlenecks ≤ 25 dm for 2023

Year	2023			
Quarter of the year	I	II	III	IV
rkm. 387-382	0	0	6	29
rkm. 396-390	0	0	6	32
rkm. 400-398	0	0	0	12
rkm. 407-404	0	0	0	22
rkm. 414-412	0	0	0	22
rkm. 424-420	0	0	0	21
rkm. 428-425	0	0	0	14
rkm. 458-455	0	0	10	30
rkm. 476-472	0	0	0	19
rkm. 528-523	0	0	9	27
rkm. 537-530	0	0	0	22
rkm. 545-540	0	0	10	26
rkm. 547-545	0	0	19	32
rkm. 565 – 563	0	0	13	30
rkm. 576-573	0	0	11	30
rkm. 586-584	0	0	5	30
rkm. 610-608	0	0	9	32

NAVIGATIONAL CONDITIONS

area	kilo- metre	sign	distance from coast [m]		depth [m]	water stage [cm]	observation post	coordinates [°]		date
			left	right				latitude	longitude	
Silistra	375.30									2017-05-21
Silistra	382.00									2017-05-21
Silistra	382.10		240	520	7.5	54	Silistra	44.1217500	27.1822666	2023-09-27
Chaika isl.	385.40		140	1080	2.7	54	Silistra	44.1385833	27.1536000	2023-09-27
Chaika isl.	385.80		130	980	2.6	54	Silistra	44.1401166	27.1487000	2023-09-27
Aidemir ps	386.10		110	900	2.3	54	Silistra	44.1408166	27.1450166	2023-09-27
Aidemir ps	386.60		480	340	5.3	80	Silistra	44.1378333	27.1364333	2023-10-06
Aidemir ps	386.80		340	420	4.8	54	Silistra	44.1390833	26.1349666	2023-09-27
Aidemir ps	388.00									2017-05-21
Aidemir ps	388.00									2017-05-21
Aidemir ps	388.00									2017-05-21
Aidemir ps	388.30							44.1364833	27.1190667	2016-07-14

Coastal beacon	15
Illuminated buoys	38
Non - illuminated buoys	114
Bridge signalization	4
Other coastal signalization	224
Total:	394

NAVIGATIONAL CONDITIONS

Number of single- and multibeam surveys

2023		
	MB	SB
January	4	10
February	8	17
March	5	12
April	6	11
May	8	8
June	1	10
July	10	17
August	6	21
September	6	13
October	6	21
November	1	13
December	7	12
	68	165

Hydrographic surveys

2023 → 68 locations with approx. area 86 968 060m²;
 2022 → 38 locations with approx. area 31 821 874 m²;
 2021 → 59 locations with approx. area 55 039 626 m²;
 2020 → 51 locations with approx. area 45 987 863 m²;
 2019 → 36 locations with approx. area 33 658 225 m²;
 2018 → 48 locations with approx. area 50 283 513 m²;
 2017 → 25 locations with approx. area 11 070 000 m²;
 2016 → 10 locations, SB-190 cross-profiles and 35 longitudinal profiles-616.31 km;
 2015 → 11 locations, SB-628 cross-profiles - 552 km;
 2014 → 16 locations, SB-1 988 cross-profiles - 2 227.27 km;
 2013 → 4 locations, SB-103 cross-profiles - 100 km.

MAINTENANCE ACTIVITIES

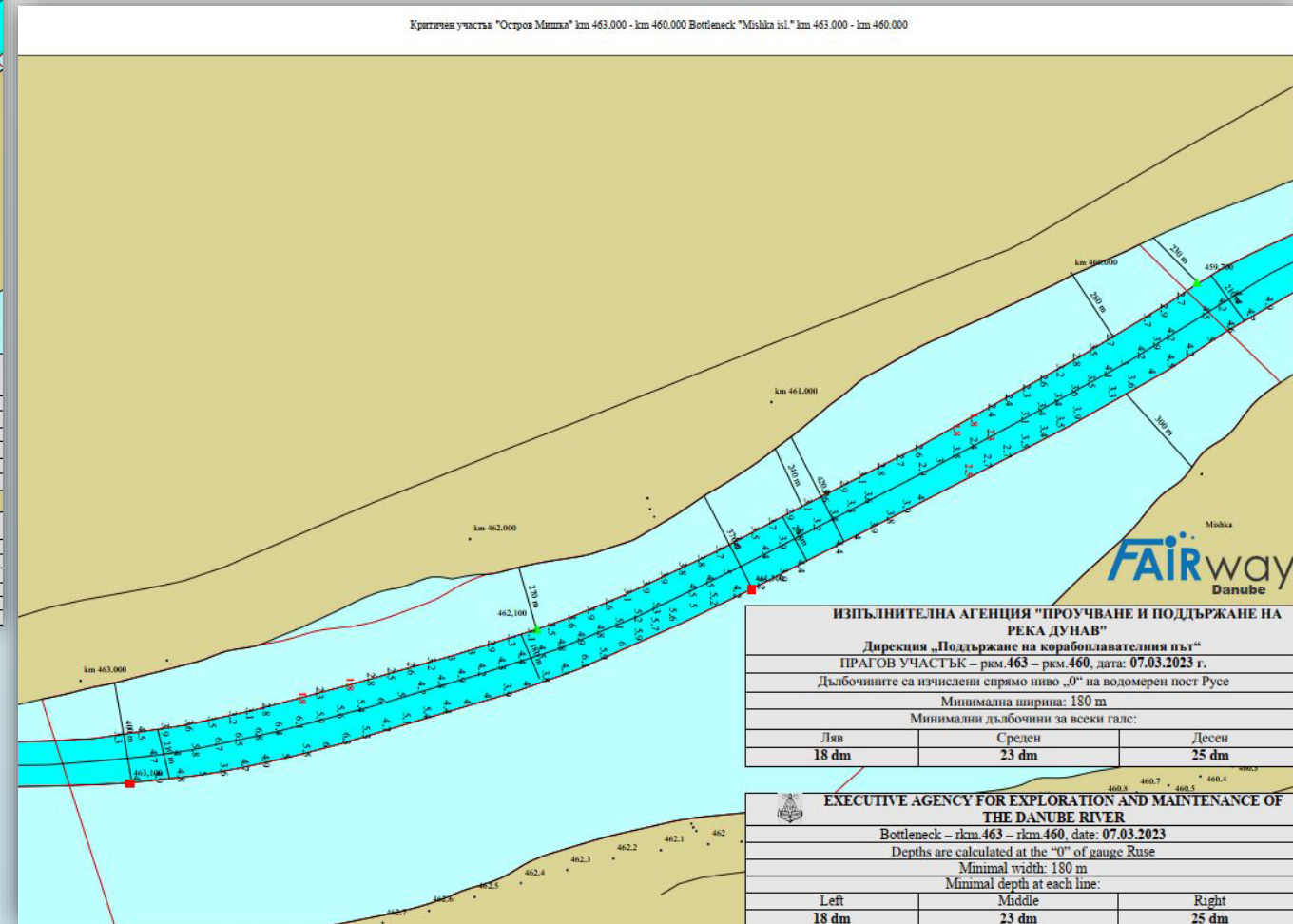
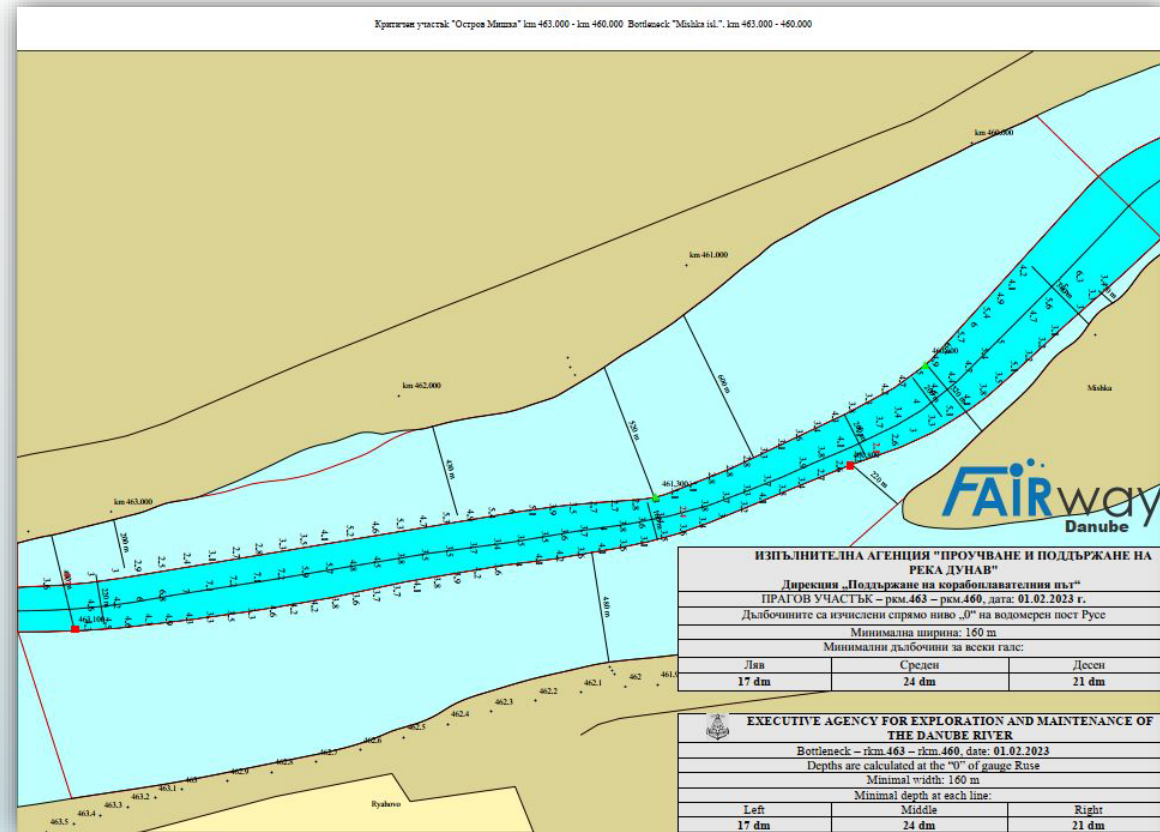
During the period marking vessel “Osam”, surveying vessels “Dunav-1” and “Rs 2070” performed 62 trips in total.

In 2023 the fairway trajectory stably changed on the following bottlenecks:

- km 531.000 – km 528.000 as of 24.01.2023;
- km 395.000 – km 392.000 as of 15.02.2023;
- km 463.000 – km 460.000 as of 07.03.2023;
- km 458.000 – km 455.000 as of 07.03.2023;
- km 407.000 – km 404.000 as of 08.03.2023;
- km 530.000 – km 527.000 as of 14.03.2023;
- km 423.000 – km 421.000 as of 21.03.2023;
- km 544.000 – km 542.000 as of 06.04.2023;
- km 423.000 – km 421.000 as of 18.05.2023;
- km 565.000 – km 563.000 as of 31.05.2023;
- km 525.000 – km 522.000 as of 06.07.2023;
- km 547.000 – km 545.000 as of 07.07.2023;
- km 387.000 – km 385.000 as of 27.09.2023.
- km 545.000 – km 543.000 as of 14.12.2023;

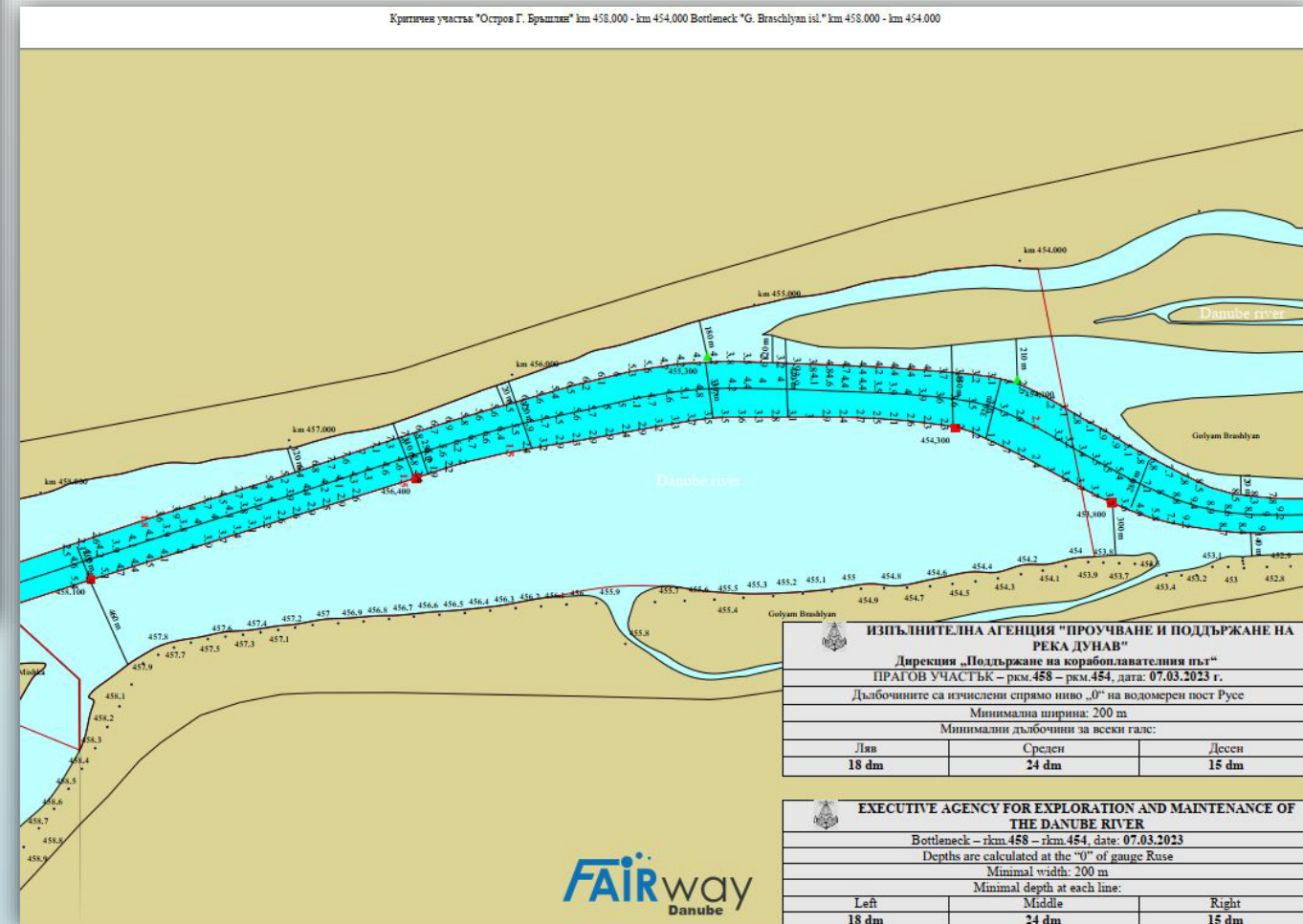
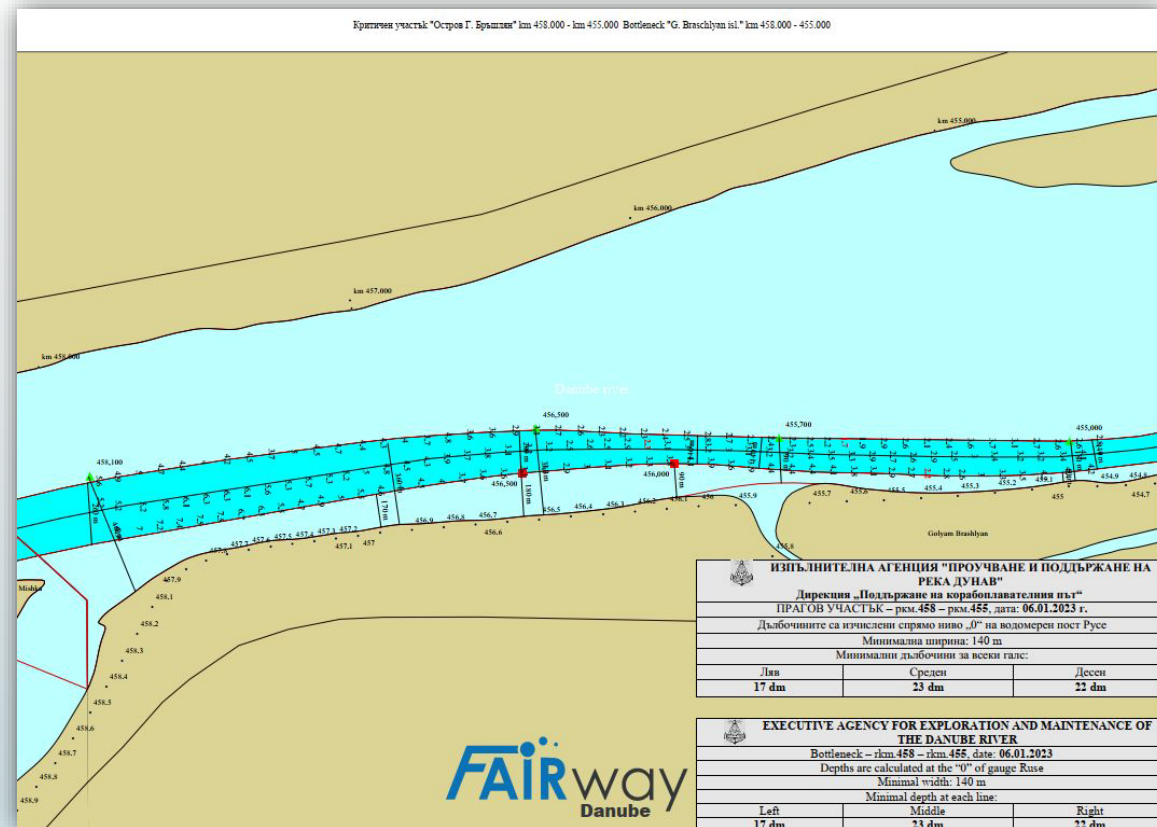
MAINTENANCE ACTIVITIES

Island Mishka rkm 463.000 – rkm 460.000



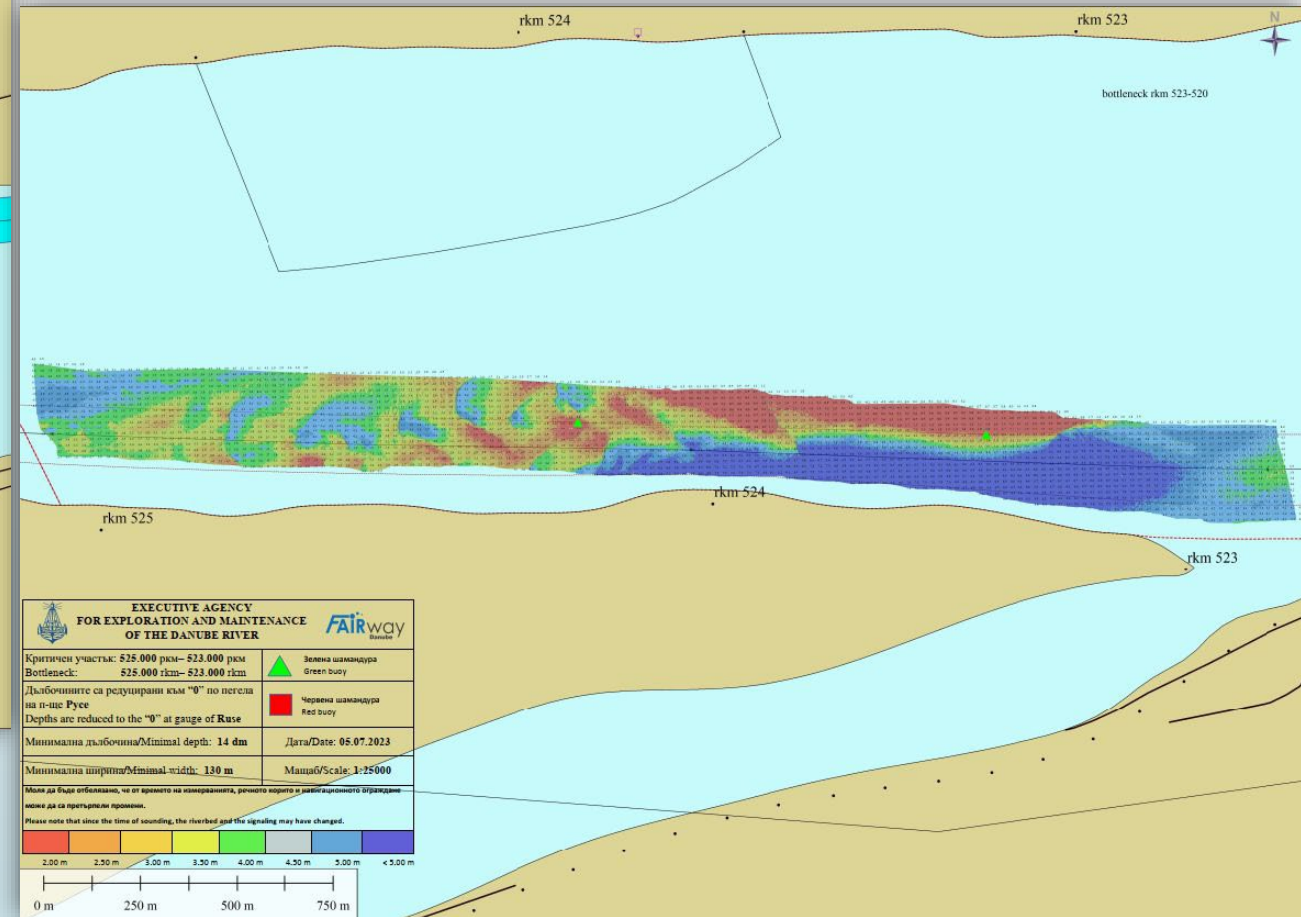
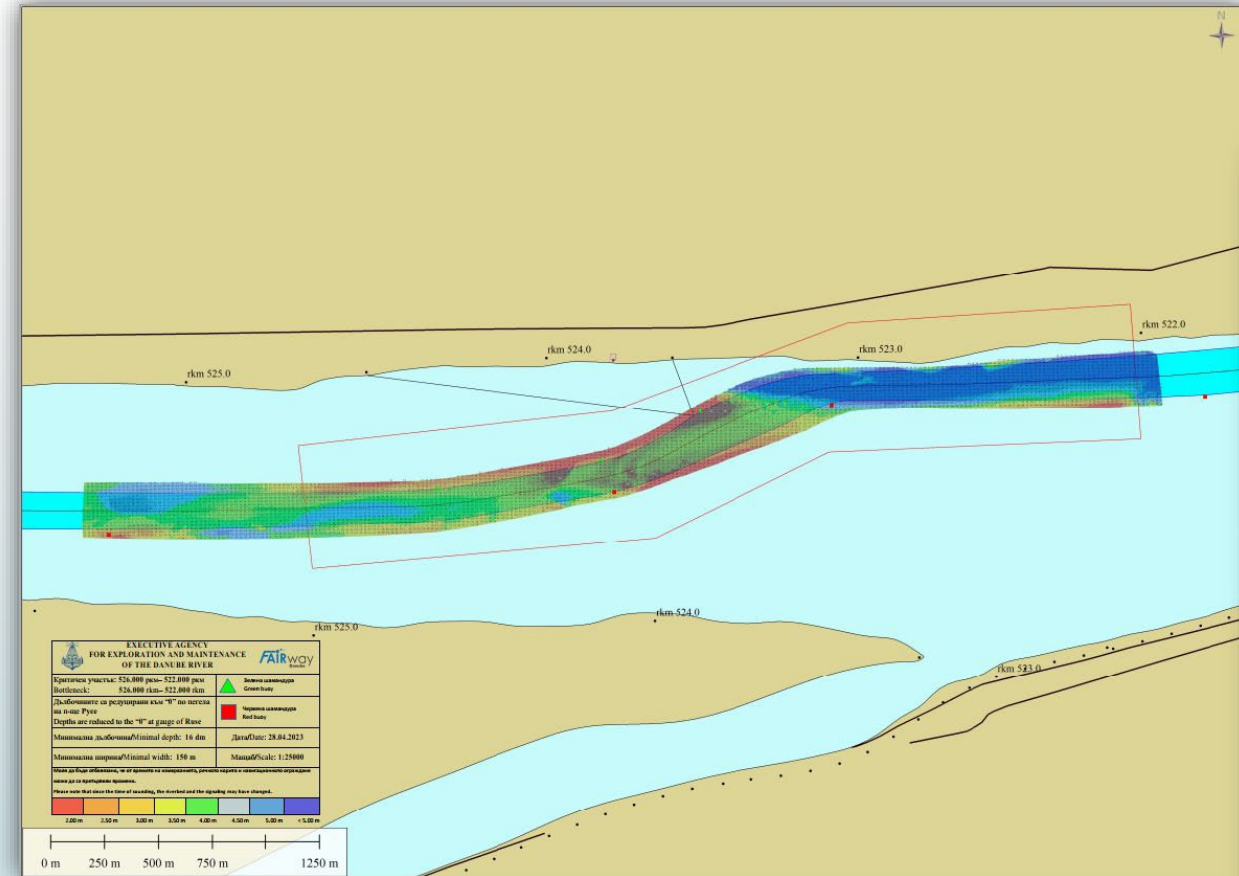
MAINTENANCE ACTIVITIES

Island G. Barzina rkm 576.000 – rkm 573.000



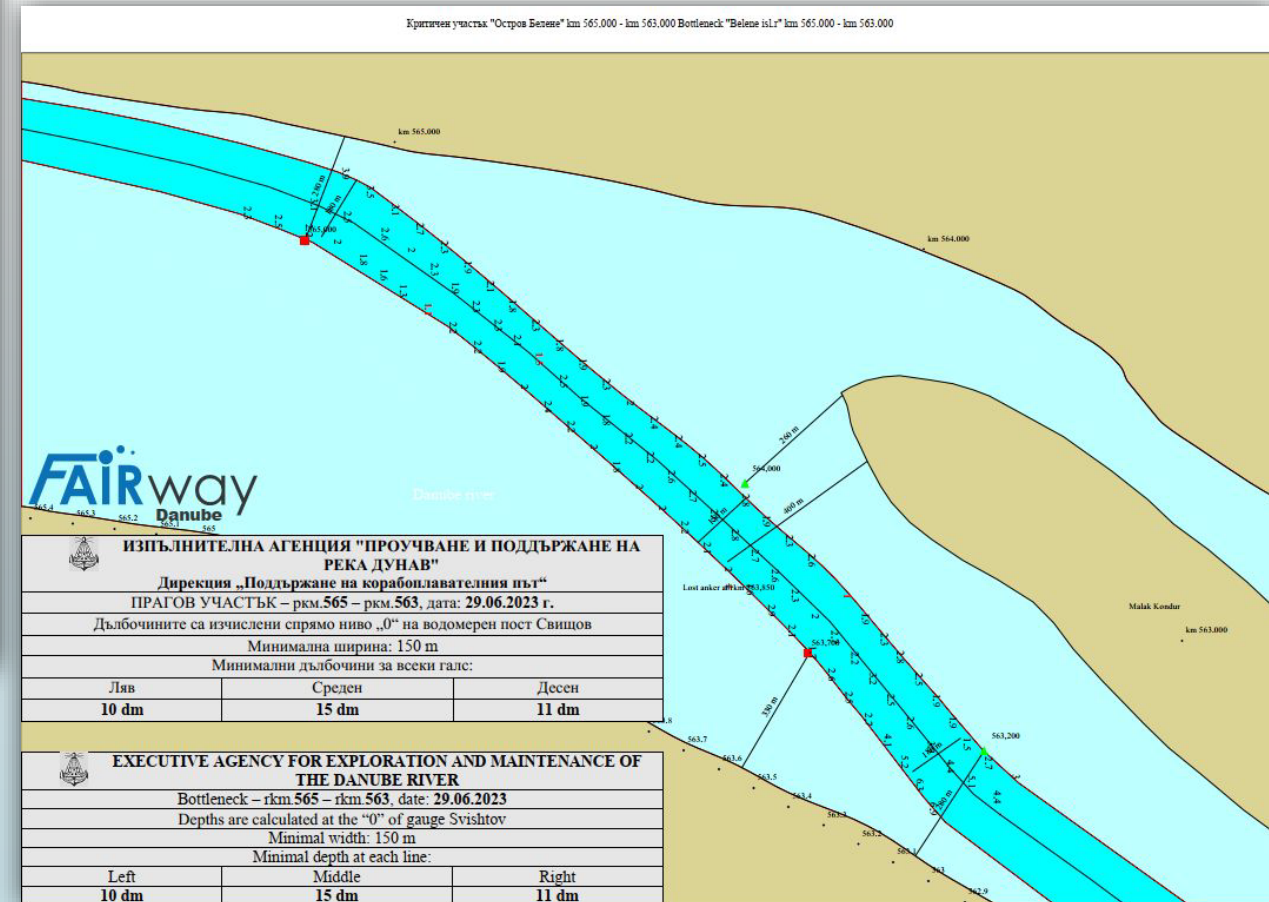
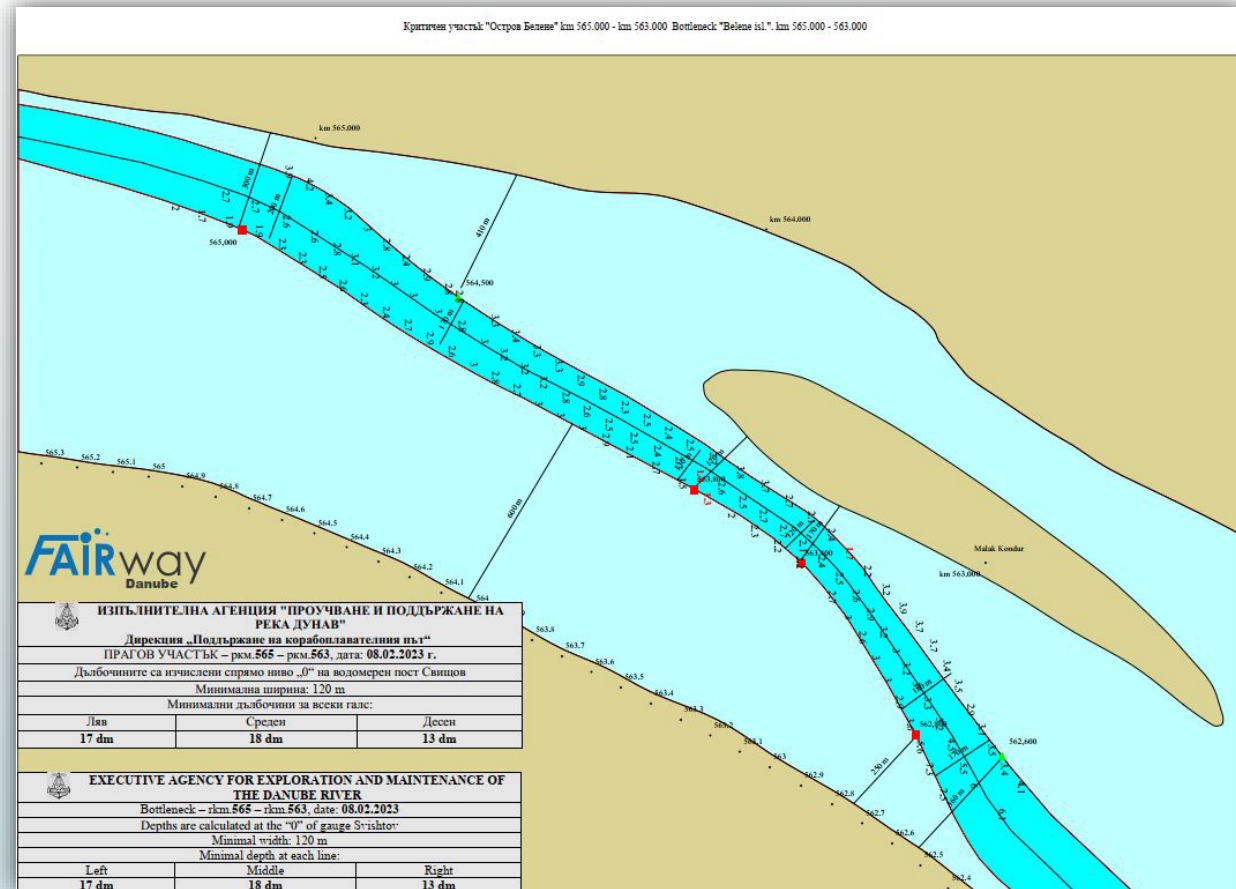
MAINTENANCE ACTIVITIES

Island Batin rkm 525.000 – rkm 523.000



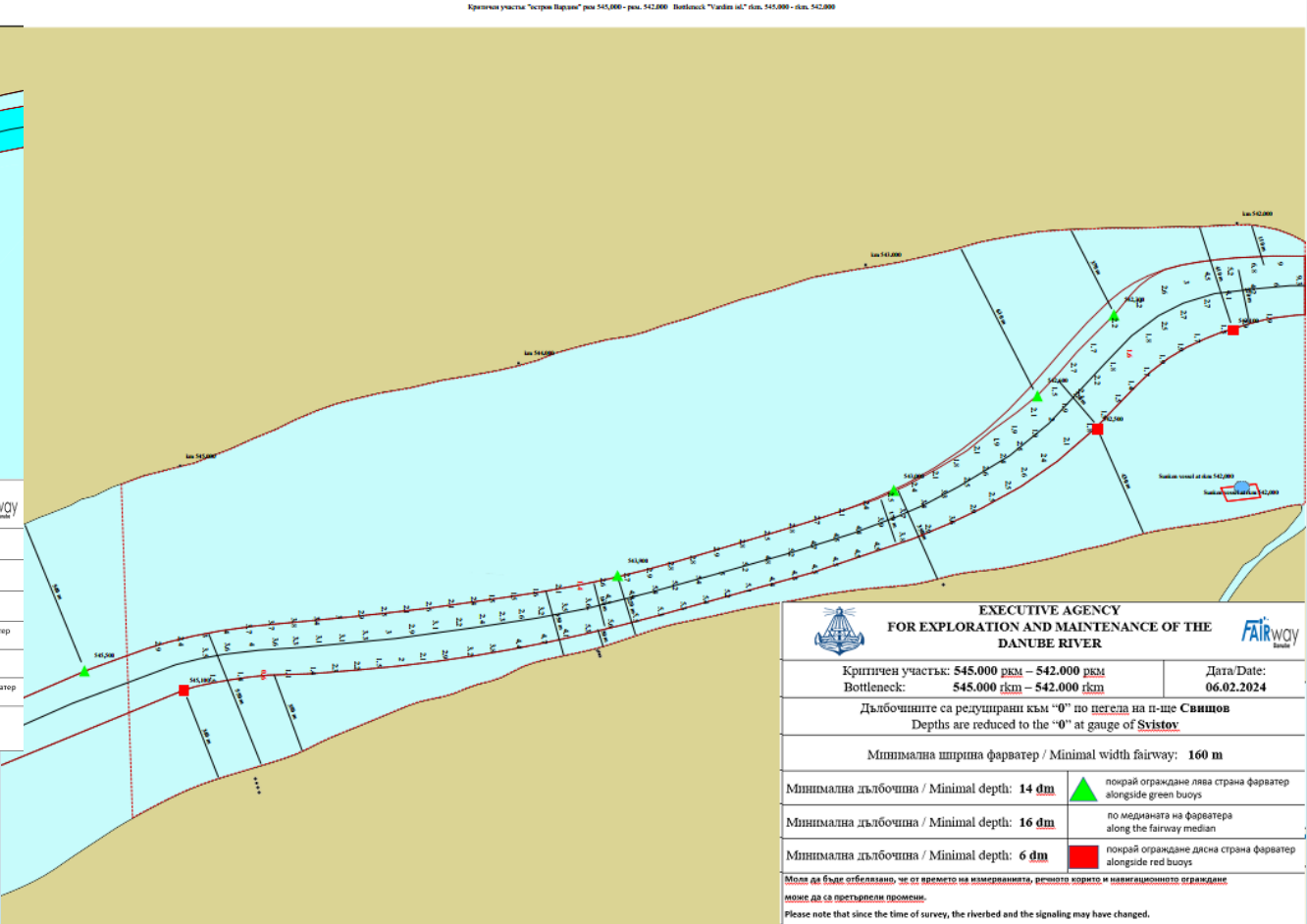
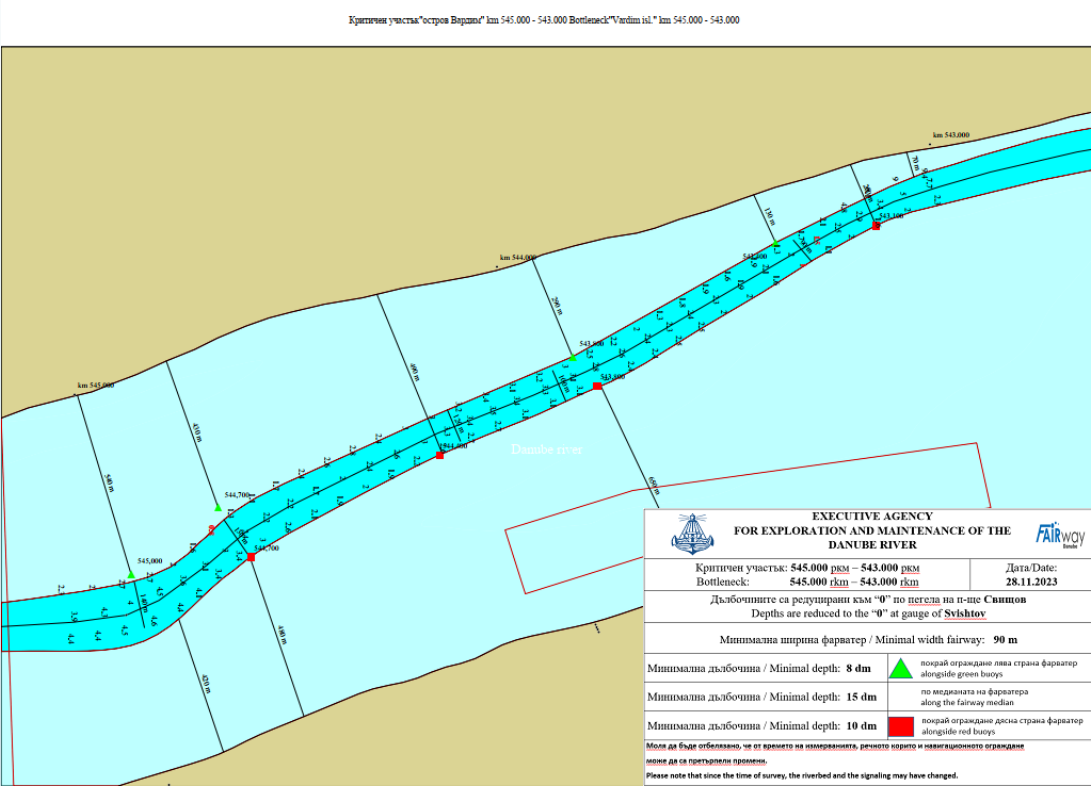
MAINTENANCE ACTIVITIES

Island Belene rkm 565.000 – rkm 563.000



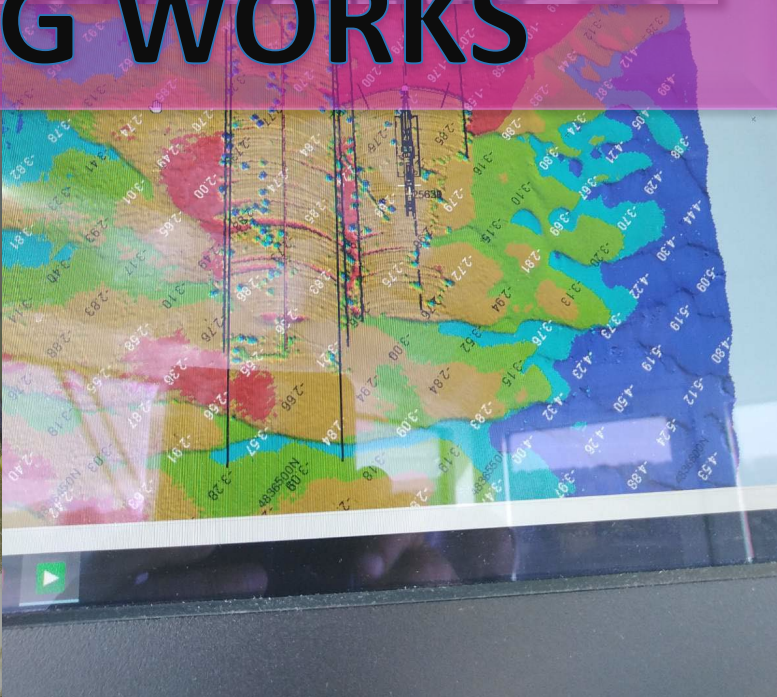
MAINTENANCE ACTIVITIES

Island Vardim rkm 545.000 – rkm 542.000





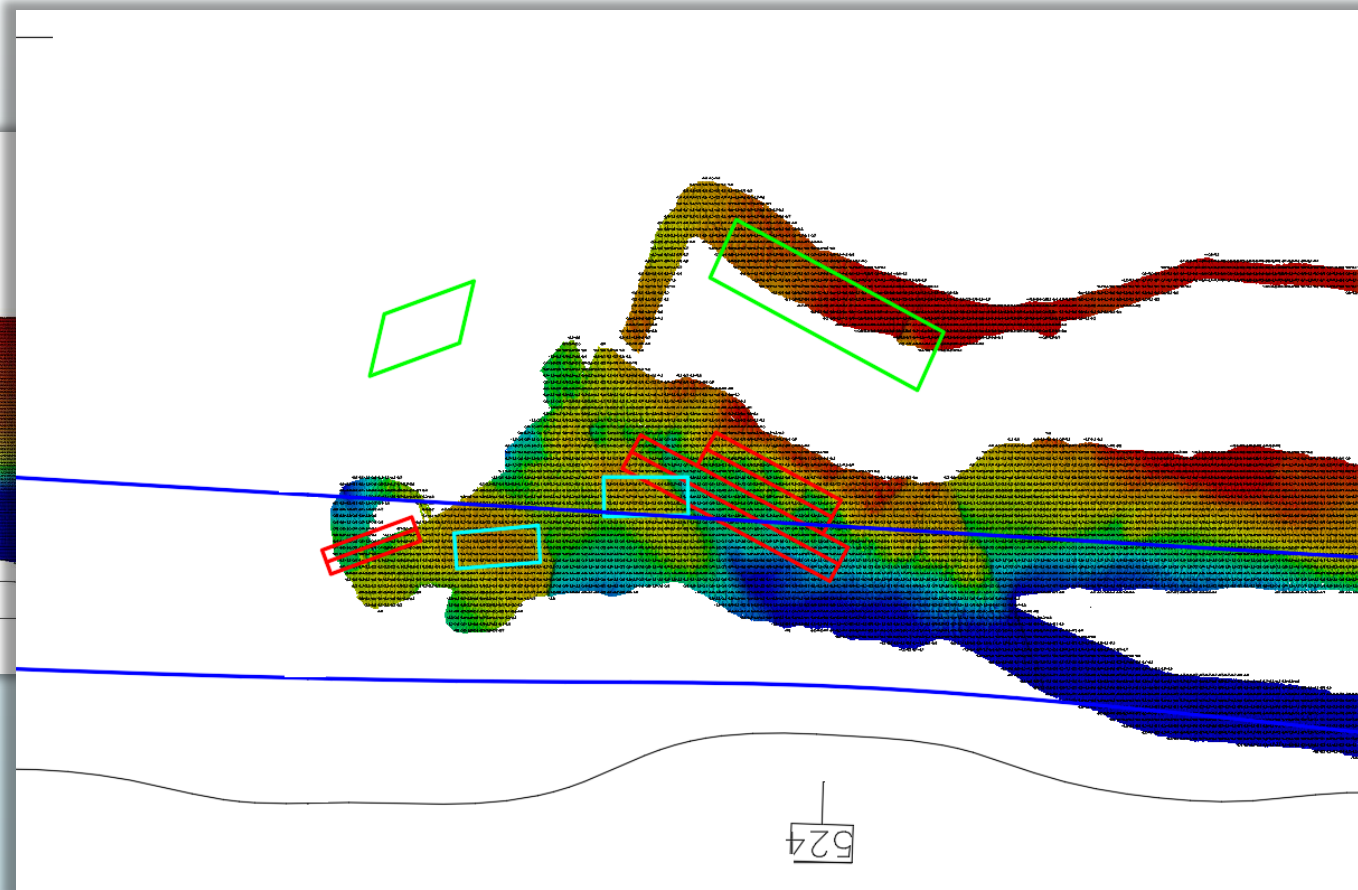
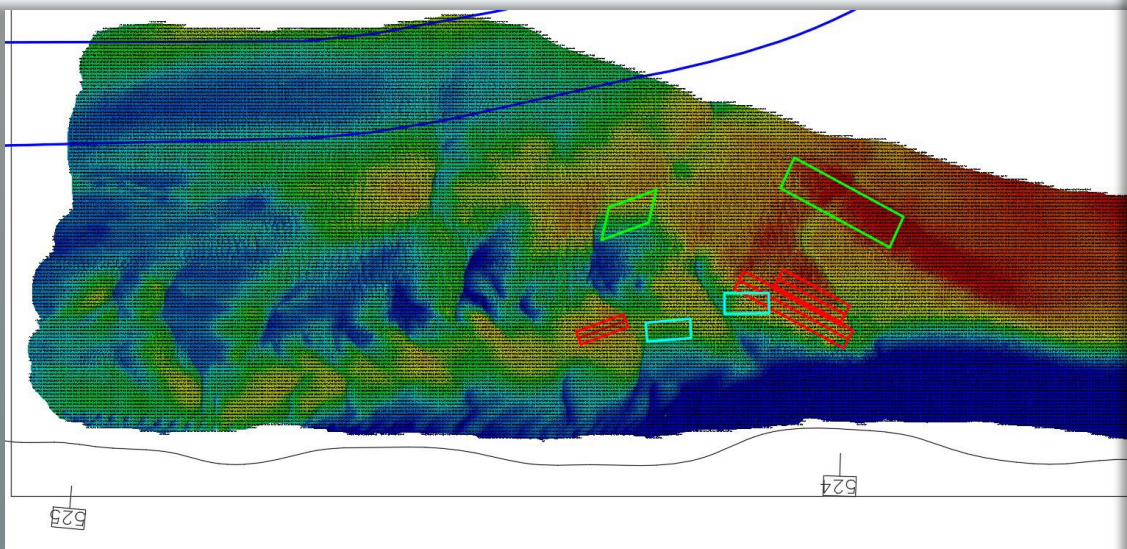
DREDGING WORKS



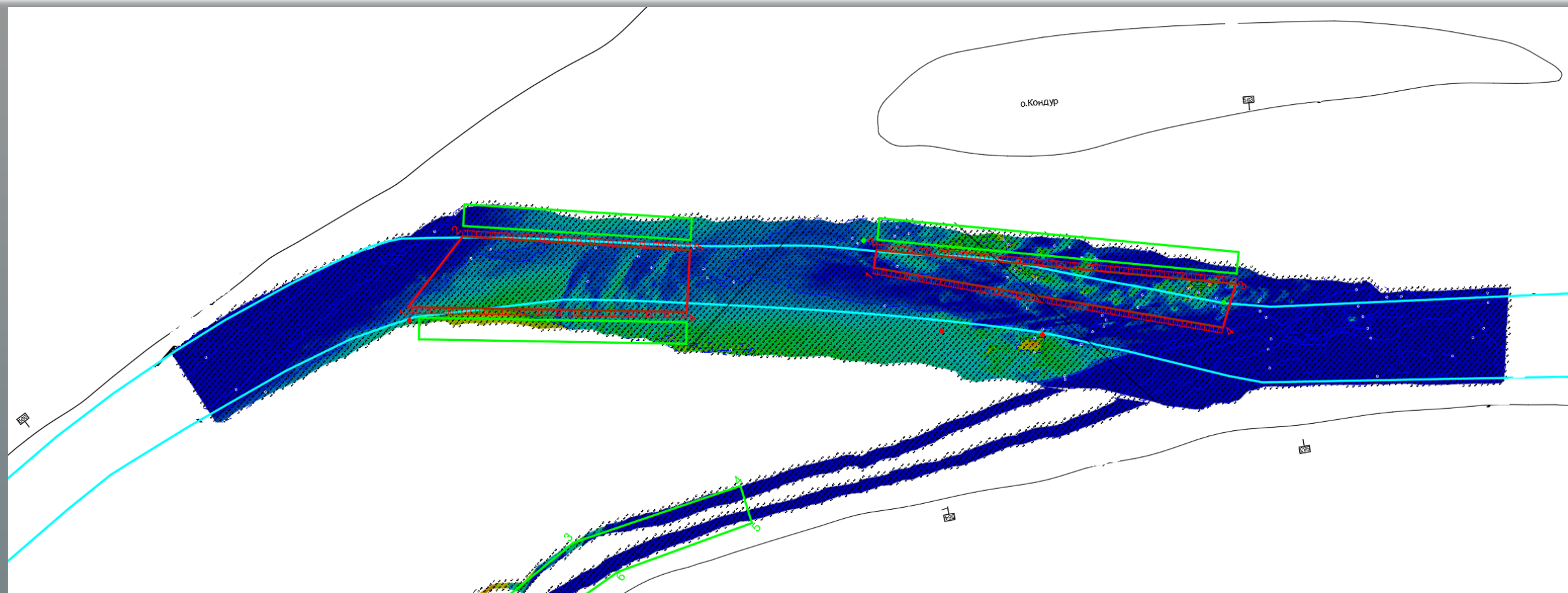
Executed dredging activities

Dredging activities on the fairway in the area rkm 610 – rkm 375				
Year	quantity, m³	location, rkm	Total	Executed by:
2012	45400	562	45400	EAEMDR – AFDJ
2018	101011	546	256650	EAEMDR
2018	155639	565		EAEMDR
2019	69992	565	300220	EAEMDR
2019	116059	545		EAEMDR
2019	114169	521		EAEMDR
2020	71095	564	297289	EAEMDR
2020	138780	545		EAEMDR
2020	47637	575		EAEMDR
2020	39777	545		EAEMDR
2021	94596	455	265841	EAEMDR
2021	92144	537		EAEMDR
2021	57077	545		EAEMDR
2021	22024	564		EAEMDR
2022	50000	564	199453	EAEMDR
2022	20000	524		EAEMDR
2022	92677	545		EAEMDR
2022	36776	524		EAEMDR
2022	117216	564	183254	AFDJ
2022	36988	545		AFDJ
2022	29050	520		AFDJ
2022	106364	553	~200000	R Serbia
2022		575		R Serbia
2022		530		R Serbia
2023	93636	563	289349	R Serbia
2023	16209	524		EAEMDR
2023	65493	565		EAEMDR
2023	77938	544		EAEMDR
2023	4424	531		EAEMDR
2023	59490	543		EAEMDR
2023	40712	564		EAEMDR
2023	25083	393		EAEMDR

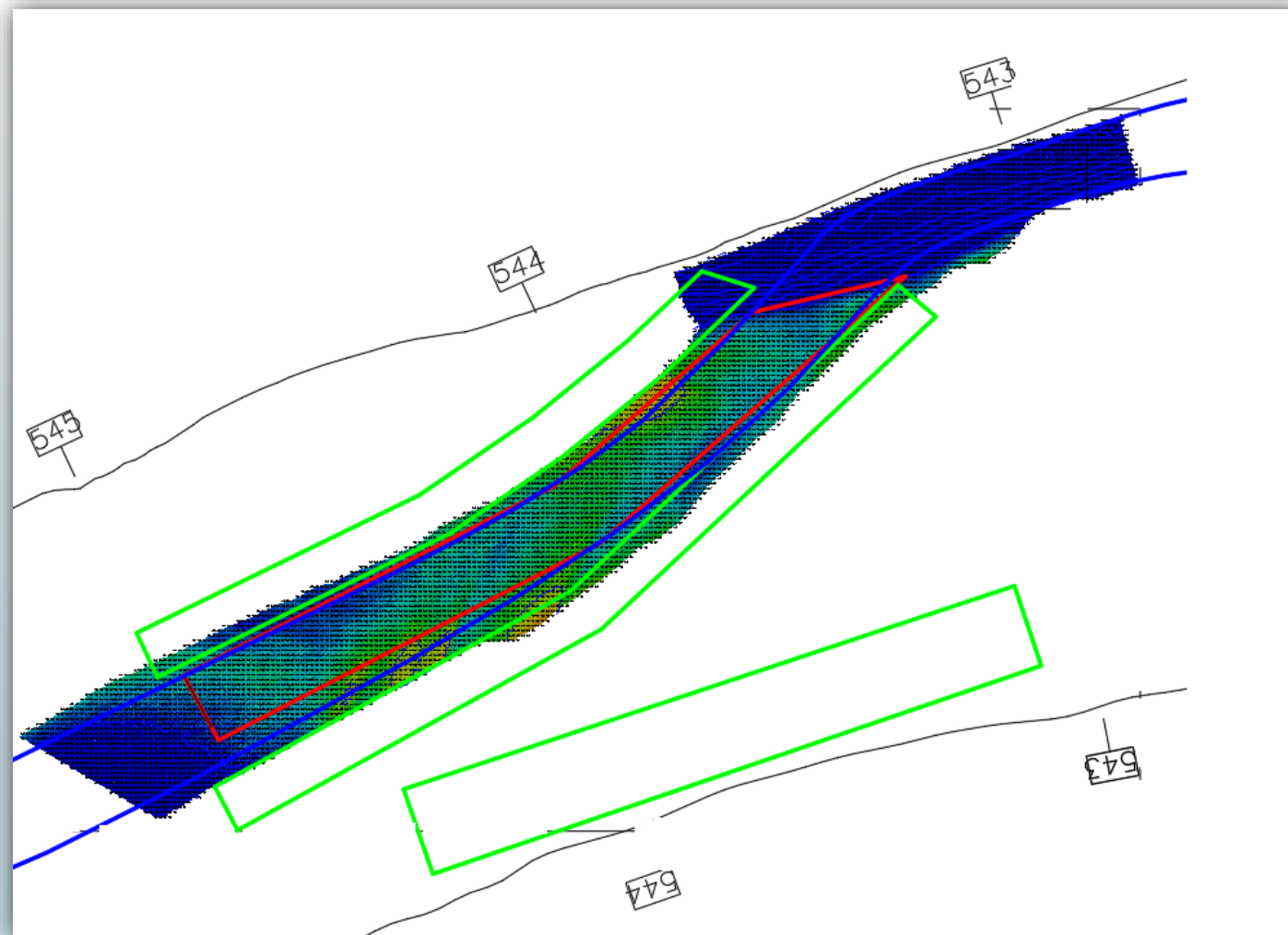
From 08.06.2023 r. till 30.06.2023 r. with dredger “Yantra” dredging works in the bottleneck **Batin** **rkm 524.300 – rkm 523.900** were executed. Total volume of dredged material **16 209 m³**. Fairway trajectory drastically changed. Minimum width of 130 m and depths of 2,5 m under LNWL were achieved.



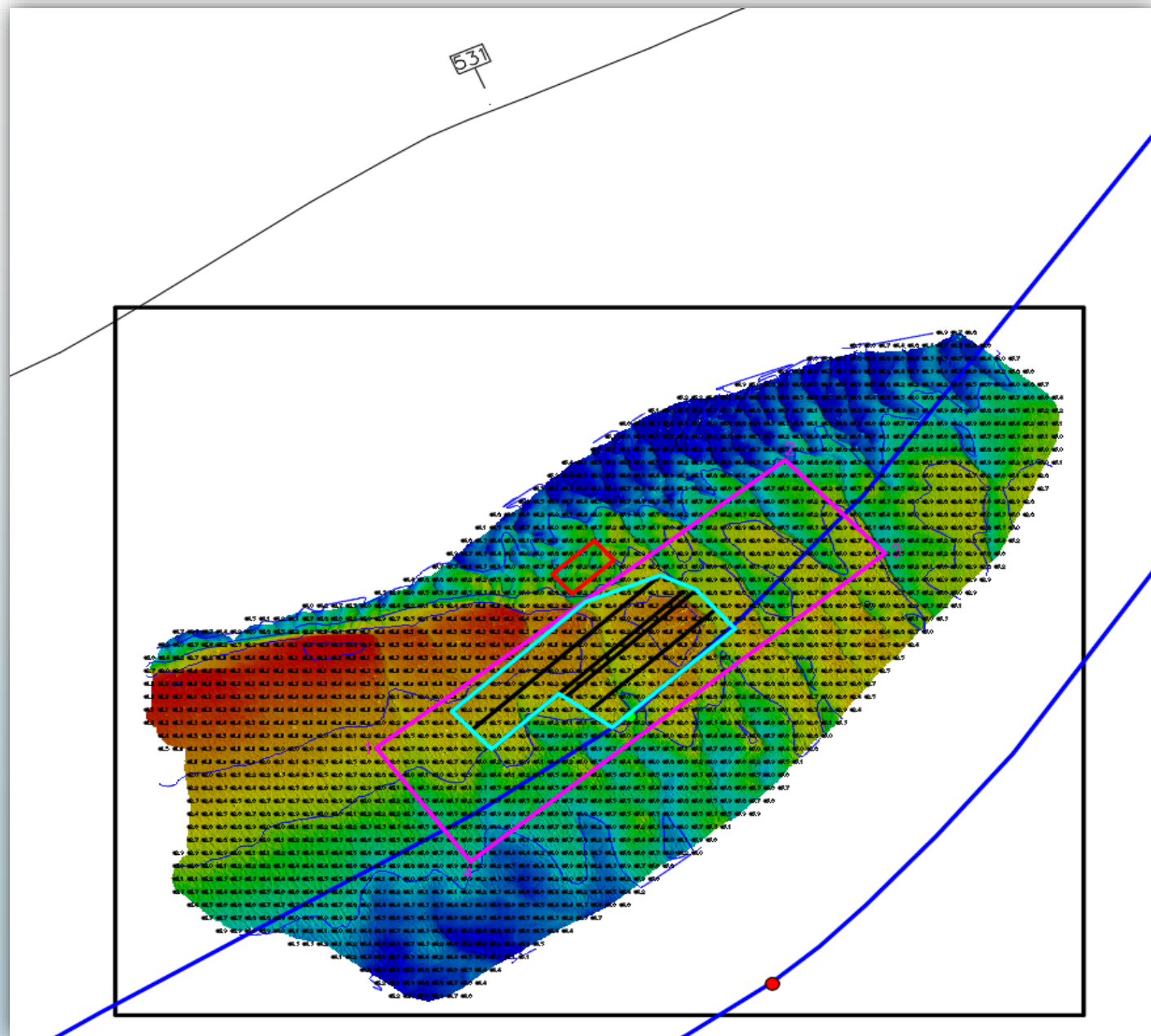
From 21.07.2023 г. till 28.07.2023 г. maintenance dredging works were performed under the framework contract in Belene area rkm 565.000 - rkm 564.500. Total volume of dredged material **65 493 m³**. Minimal fairway width of 150m and minimal depths on ENR of 3,5 m were achieved.



From 01.08.2023 r. till 10.08.2023 r. maintenance dredging works were performed under the framework contract in Vardim area rkm 544.500-rkm 543.200. Total volume of dredged material **77 938 m³**. Minimal fairway width of 130m and minimal depths on ENR of 2,5 m were achieved.

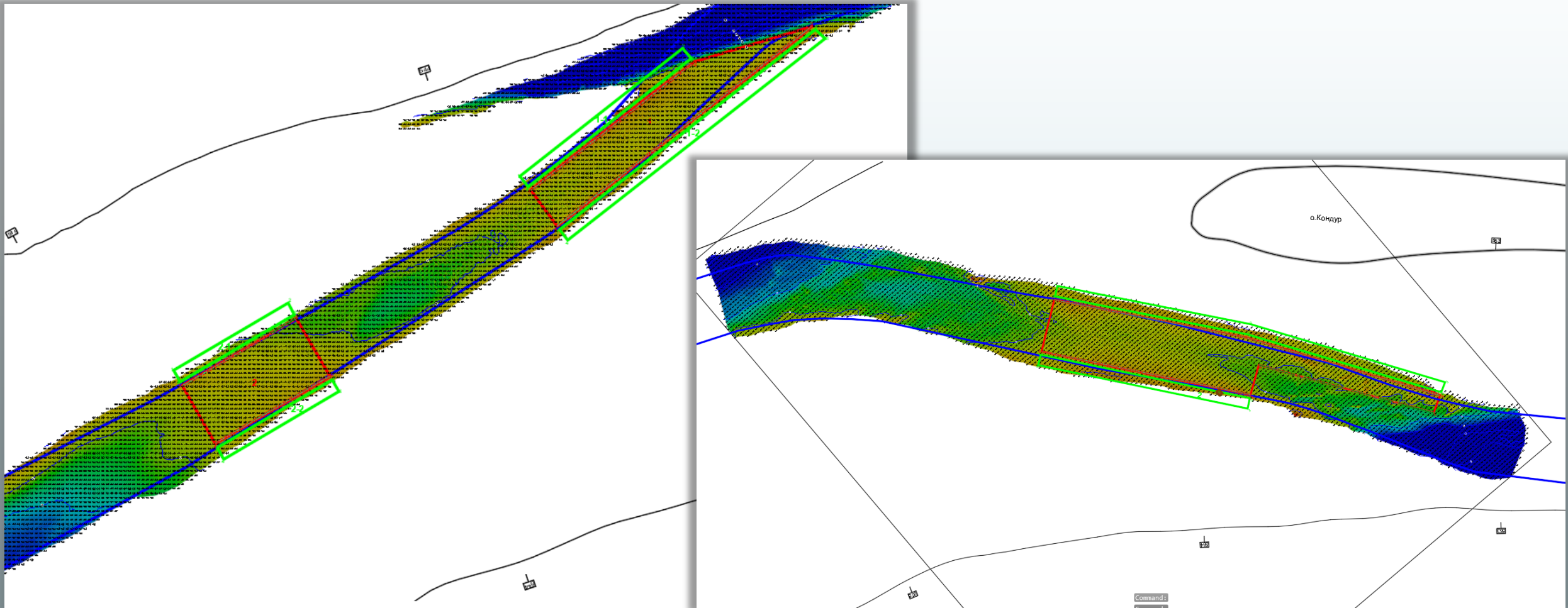


On 07.09.2023 maintenance dredging with dredger “Yantra” started in Batin area rkm 531. Estimated volume of material to be dredged **7 000 m³**

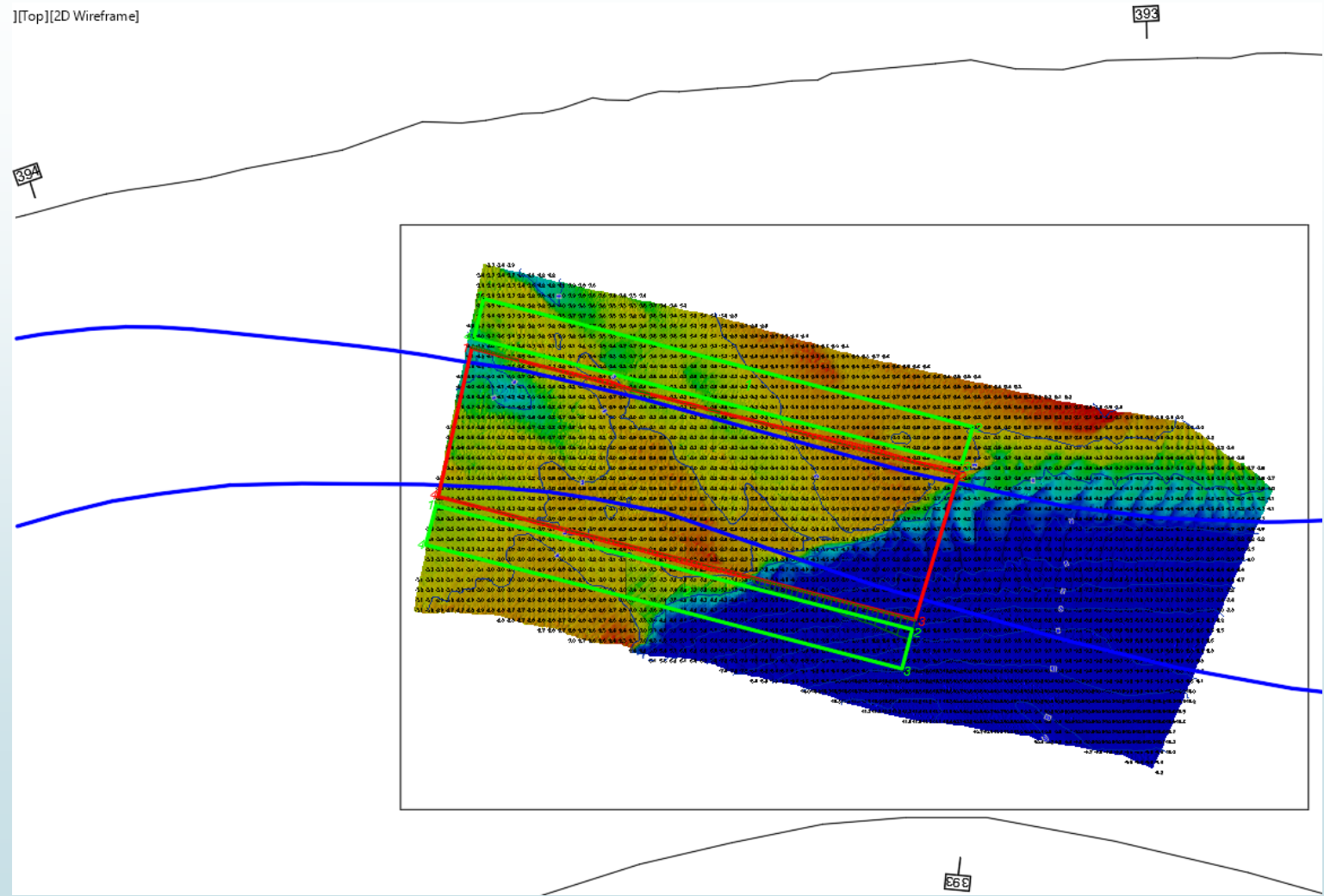


On 26.09.2023 till 02.10.2023 maintenance dredging works are to be performed under the framework contract :

- In Vardim area rkm 543 – 545 – two zones, estimated volumes 29 034m³ and 19 138m³.
- In Belene area rkm 564.500 – 563.100, estimated volume 39 076m³



From 16.10.2023 r. till 24.10.2023 r. maintenance dredging works were performed under the framework contract in Vetren area rkm 393.500-rkm 392.800. Total volume of dredged material 25 083m³. Minimal fairway width of 100m and minimal depths on ENR of 3,0m were achieved.



Measures planned to secure navigation in 2024

Necessary measures for the improvement of the navigation conditions (incl. execution of dredging works) during 2024

In 2024, EAEMDR plans to carry out dredging activities:

under the framework contract $\sim 300\,000\text{ m}^3$

with own equipment $\sim 50\,000 - 100\,000\text{ m}^3$

Following the multiannual data, dredging activities are expected to start in May in the most critical section - Vardim area rkm 543 – 545. Estimated quantity approx. $100\,000\text{ m}^3$. Another area where dredging works are foreseen in June is Belene rkm 563 – 565 with an estimated volume of about $80\,000\text{ m}^3$.

Dredging works will be performed only after analysis of bathymetric surveys, water level forecasts, water current data and meteorological forecasts in Upper and Middle Danube.

Potential bottlenecks to be dredged in 2024:

- Somovit (km610-km609);
- Belene (km577-km574.800);
 - Belene (km566-km562);
 - Batin (km523-km520);
 - Batin (km531-km529);
 - Batin (km526-km524);
- Bryshlan (km458-km455);
 - Vardim (km547-km546);
 - Vardim (km545-km543);
 - Vardim (km543-km540);
- Popina (km407-km404);
- Yantra (km538-km537)
- Vetren (km394-km392)

Operating costs of the activity in 2023 and estimated budget for 2024

Areas	Operational expenditures 2023	Required operational budget 2024
Minimum fairway parameters (width/depth)	2 517 663	2 315 343
Surveying of the riverbed	149 902	117 617
Water level gauges, Information on water levels and forecasts, Meteorological information	133 246	104 549
Marking of the fairway	416 394	326 715
Other	49 966	39 206
Sum (Euro)	3 267 171	2 903 430



THANK YOU FOR YOUR ATTENTION

Ivelin Zanev

Executive Director, EAEMDR Bulgaria