

The results of physico – chemical and microbiological testing of watercourses around the municipality of Gdańsk in 2011

The main objective of this study was to conduct a monitoring research of selected watercourses around the municipality of Gdańsk.

Research material and methods

The research included 16 watercourses (5 rivers, 6 streams, 2 storm water sewers, 1 artificial canal, 1 artificial arm of a river and 1 drainage trench) flowing directly into the Gulf of Gdańsk, or indirectly, through Martwa Wisła river tributary system. The research material constituted of water samples collected at 24 measurement stations, from the depth of around 24 centimetres under the water surface.

The following watercourses were researched:

1. Martwa Wisła river 2 measuring stations,
2. Motława river and an artificial arm 3 measuring stations in total; (2 at the river, 1 at the artificial arm)
3. Radunia river 1 measuring station– outlet into Motława,
4. Czarna Łacha river 1 measuring station– outlet into Motława,
5. Rozwójka river 1 measuring,
6. Radunia canal 2 measuring stations,
7. Oruński stream 2 measuring stations,
8. Siedlicki stream 2 measuring stations
9. Strzyża stream 2 measuring stations,
10. Jelitkowski stream 2 measuring stations,
11. Rynarzewski stream 1 measuring station – outlet into Jelitkowski stream
12. „Kołobrzaska” storm water sewer 2 measuring stations, (outlet and inlet of a retention basin)
13. Artificial arm of the Motława river see point 2
14. Brzeźno storm water sewer 1 measuring station; outlet into „Kołobrzaska” storm water sewer
15. Drainage trench, draining water from ponds located in coastline area 1 measuring station
16. Strzelniczka stream 1 measuring station

The water samples were analysed for the following:

- Total amount of suspensions – weighting method, using filtration through fiberglass filters (0,45 µm diameter pores), drying in 105 °C and weighing; in accordance with PN-EN8872:2002 norm,
- Biological oxygen demand – using dilution and seeding method with elimination of nitrification process by addition of allylthiourea and initial filtration through fiberglass filters (0,60µm pore diameter), in accordance with PN-EN 1899-1:2002 and PN-EN 1899-2:20002 norms,

- Chemical oxygen demand – determination of permanganate index in acidic environment, in accordance with PN-85/C-04578.02. norm,
- Concentration of dissolved oxygen – iodometric method, in accordance with PN-EN 25813:1997 norm,
- Water temperature – using a thermistor thermometer with an accuracy of 0,01°C,
- Total nitrogen – oxidizing phosphorus compounds with potassium persulfate, reduction of nitrates to nitrites with metallic cadmium and identifying nitrites using spectrophotometric method (Bendschneider and Robinson), in accordance with PN-EN ISO 13395:1996 norm,
- Total phosphorus – oxidizing phosphorus compounds with potassium persulfate and identifying phosphates using spectrophotometric method, conducted with ammonium molybdate and ascorbic acid as a reductor, in accordance with PN-EN 1189:2002 norm,
- pH – electrometric method,
- Chlorides – Mohr method, in accordance with PN-ISO 9297:1994 norm,
- Conductivity – conductometric method, in accordance with PN-ISO 27888:1999 norm,
- Cadmium and lead – atomic emission spectrometry, with inductively coupled plasma, using PERKIN-ELMER OPTIMA 2000 DV spectrometer, in accordance with PN-ISO 11885:2001 norm,
- Mercury – cold – vapor atomic absorption spectrometry, using VARIAN AA -2000/50 PLUS spectrometer with VGA 77 agilent vapor generation accessory, in accordance with PN-EN 1483 norm,
- Petroleum hydrocarbons – gas chromatography after extraction with n-pentane, in accordance with PN-EN ISO 9377-2:2002 norm,
- Polycyclic aromatic hydrocarbons – isolation and enrichment, using solid phase extraction (SPE) method and subsequently identifying PAH using gas chromatograph and mass spectrometer (GC-MS method),
- Copper and nickel - atomic emission spectrometry, with inductively coupled plasma, using PERKIN-ELMER OPTIMA 2000 DV spectrometer, in accordance with PN-ISO 11885:2001 norm,
- Total organic carbon (TOC) – high-temperature catalytic oxidation in sulfuric acid and potassium persulfate environment, which leads to carbon being released from organic compounds. Non organically-bound carbon was removed from the sample in gas form, as a result of acidification. Carbon released from organic compounds reacted with an indicator solution by causing it to change colour, which was then analysed spectrophotometrically,
- Total dissolved substances (TDS) – electrometric method,
- Most probable number of *Escherichia coli* and coliform bacteria – dilution method, in accordance with PN –ISO 9308-1:1999, PN-75/C4615.05 and PN-ISO 9308-1:1999, PN-77/C4615.07 norms,
- Number of intestinal *Enterococci* – filtration method, using Slanetz-Bartley medium, in accordance with PN-EN ISO 7899-2 norm,
- Chlorophyll a – spectrophotometric method, after 24-hour extraction using 96% ethanol, in accordance with HELCOM 1988 (with later adjustments),
- Water flow rate – using methods implemented by IMGW (Institute of Meteorology and Water Management). The water was sounded every 0,2 meters with stream cross-section width up to 2 meters, and every 0,5 meters with cross-section width between 2 and 10 meters. Flow rate was measured using hydrometric turbine submerged at 0,4

h when $h < 0,2\text{m}$, and at $0,2h$, $0,4h$ and $0,8h$ in larger depths. The measurement time at each station was 60 seconds or time equivalent of 100 rotations of the hydrometric turbine. In case of very small water flow rate, float method was used.