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MUHA



D.T.2.2.2. PARTNER-SPECIFIC PILOT ACTION DOCUMENTATION IN THE PILOT AREAS NIKŠIĆ PILOT AREA

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T2.2.2 Partner-specific pilot documentation in the pilot areas

1. INTRODUCTION

Pilot action of PP8 – Public Utility Company Nikšić (PUCN) and PP3- Jaroslav Cerni Water Institute (JCWI) are mainly joint for MUHA project and could be split in two groups of activities:

- A. First activity is related to main water source in Nikšić water supply system (WSSN) – Vidrovan. It was planned to make investigations which will help to minimize potential AP hazard (the main regional road passes just close to this water source), and E hazard (much better structure), and primarily estimate the possibility to increase the amount of spring water – what is important during low flow period, especially in dry years (D). This activity is main obligation of PUCN in MUHA project, and JCWI has a role of Consultant.
- B. Second activity is related to possible adaptation in the net, in the cases of possible hazard situation in WSSN: drought (D), accidental pollution (AP) and earthquake (E). The aim is to try to find relevant answers in such cases. This activity is primarily obligation of JCWI, and PUCN has a role of Assistant or Consultant.

PP8 and PP3 have planned administrative, field and office activities. Administrative activities comprise tenders conduction for some investigations and purchases. Field activities comprise investigations on location of water sources. Office activities comprise measurements of the flow at important places in the net, as an enter for model simulation of the characteristic situations in WSS.

2. PP8 AND PP3 ADMINISTRATIVE ACTIVITIES

2.1 PP8 Administrative activities

For the implementation of activities in the Pilot area Nikšić, it was planned to announce three tender procedures. Tender for procurement of measuring equipment, ultrasonic flow meter, tender Procurement of services for construction, hydrogeological and seismic examination of water sources Gornji Vidrovan and Donji Vidrovan and tender for engagement of supervision and audit of research to be conducted at sources tender.

Procurement of ultrasonic flow meter was planned for the first period of project implementation, and for this purpose sum of 4250 EUR is planned. Due to the situation with the Covid 19 virus pandemic, as well as due to the ban on public procurement by government agencies in this period, we were unable to implement this procurement.

Hiring a consultant to conduct investigations at the sources of Gornji and Donji Vidrovan is planned in the II period of project implementation. The total funds planned, after the budget changes, amounted to EUR 74,395.00.

During the preparation of the terms of reference for this tender, colleagues from the Jaroslav Cerni Water Institute (PP3) have been consulted.



Tender Procurement of services for construction, hydrogeological and seismic examination of the water sources Gornji Vidrovan and Donji Vidrovan was announced on April 27, 2021, and the contract with the best bidder was signed on June 28, 2021. The contract was awarded to J.U. Department of Geological Research, from Podgorica. The contracted value is 57,300.00 EUR. The project task defines a set of activities to be carried out at the Gornji and Gornji Vidrovan water sources. After the conducted research, the final report will be made. The total planned period for the realization of this activity is 2 months.

According to the legislation in Montenegro, when conducting geological research, it is necessary to engage external supervision and audit, so we planned to hire a consultant. The preparation of tender documentation is in progress, and for the needs of this procurement we have planned funds in the amount of about 2,000.00 EUR.

2.2 PP3 Administrative activities

It was planned to purchase Handheld XRF analyzer and Ultrasonic portable flowmeter, accompanied with three Lap-tops. Total planned funds were 30,100.00 EUR.

Handheld XRF analyzer was planned to be used to determine content of some elements (heavy metals and others) in the close neighborhood of water sources - especially "Poklonci". Ultrasonic portable flowmeter was planned to be used to measure flow in some pipes, important for net model in different cases.

Due to covid situation in the first year of project implementation, for PP3 was not possible to travel to Montenegro, on the Pilot area Nikšić. So, we gave up from this purchase, and we have decided to use results of the old and new measurements done by PUCN (LLC "Vodovod i kanalizacija" Nikšić). So, PP3 did not have any tender.

3. PP8 AND PP3 FIELD ACTIVITIES

Basic activities are related to:

- collecting existing documentation related to sources (Hydrological and geological research, construction projects...),
- Monitoring the condition of the springs (yield in different periods, water quality parameters, etc.),
- Conducting construction, hydrological and geological research with a special goal to consider the possibility of obtaining additional quantities of water,
- Joint PP8 and PP3 field activities.

Collection of existing documentation on sources

At the beginning of the project implementation, the collection and analysis of all existing technical documentation related to the sources of G. and D. Vidrovan was performed. This



documentation is given for inspection to the hired consultant (chosen in tender procedure) whose task is to perform the mentioned research.

Monitoring the condition of the springs

The condition of the source was monitored throughout the duration of the project. A continuous tour of the terrain was performed and the condition of buildings on water intakes was checked.

Although we were not able to obtain an ultrasonic flow meter that was supposed to measure the amount of water leaving the source, we performed the measurement through existing meters, as well as by measuring with an ultrasonic portable flow meter. These data were systematized and analyzed.

The quality of water at springs is regularly monitored. These data, especially in cases of deviations from the allowed values, were systematized and analyzed.

In addition to the above, data were collected on the amount of precipitation in the area of Nikšić, temperatures, number of sunny hours ... and all other parameters that could affect the state of water intake.



Figure 1. Spring Gornji Vidrovan



Figure 2. Spring Donji Vidrovan

Conducting construction, hydrological and geological research

The main goal of this activity is the development of the Project of geological research of the Vidrovan water source, as well as the Study on hydrogeological research, engineering geological characteristics and geophysical research. The purpose of the research of the subject terrain is the possibility of obtaining additional quantities of drinking water on the territory of the Municipality of Nikšić, as well as protection and security of buildings from earthquakes.

The activities that will be carried out for the purpose of research are:

1. Reconnaissance of the terrain and analysis of previous research,
2. Development of the Terms of Reference,
3. Development of the Project and obtaining approval for conducting geological exploration works,
4. Detailed hydrogeological mapping of the exploration area,
5. Detailed engineering geological mapping of the exploration area,
6. Location, construction and testing of wells,
7. Sampling of rocks and soil samples,
8. Sampling of water,
9. Geophysical investigative space testing,
10. Supervision of exploration works: geophysical surveys, drilling and testing of wells and sampling,
11. Laboratory testing of rock and soil samples,



12. Laboratory testing of water samples,
13. Preparation of Hydrogeological Study,
14. Preparation of Engineering Geological Study,
15. Preparation of Study on Microseismic Rheonization with Report on Geoelectric Tests,
16. Preparation of the final Study on the results of the performed research.

Activities for the implementation of this research are ongoing and we hope that they will be completed by the end of October 2021.

Joint PP8 and PP3 field activities

All activities carried out by PP8 were carried out in consultation with PP3. Communication and joint field activities were significantly hampered by the COVID virus pandemic. Communication was done online or by phone.

The first joint (physical) meeting was held on August 26, 2021 in Nikšić. On that day, in addition to the meetings that were held in the premises of Waterworks company Nikšić, a tour of the springs and an insight into their condition was performed. One review of the done activities has been done, and the activities in the next period have been agreed.



Figures 3, 4 and 5. Work at office and field detour during the meeting on 26.08.2021. in Nikšić

4. PP3 AND PP8 OFFICE ACTIVITIES

For the purpose of net model analyses, measurements of the flow at important places in the net have been done. The results are as follows:

- **Location Poklonci (exit flow – sum of all wells).**

This source is used only during low water months – in the time of maximum daily consumption.

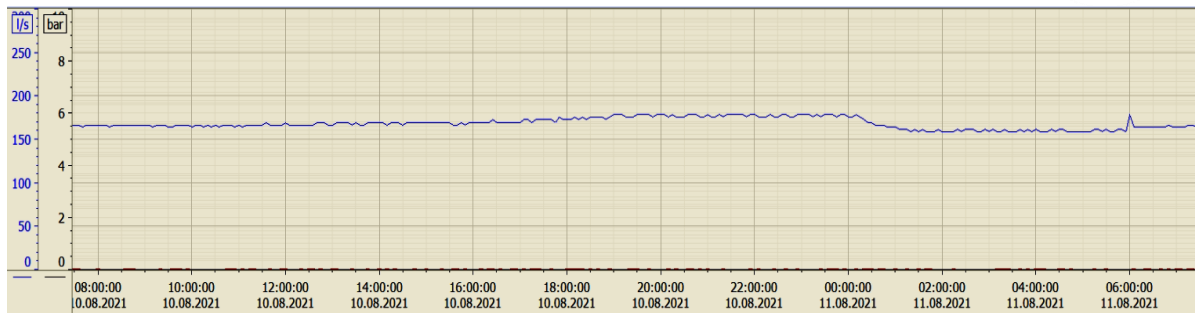
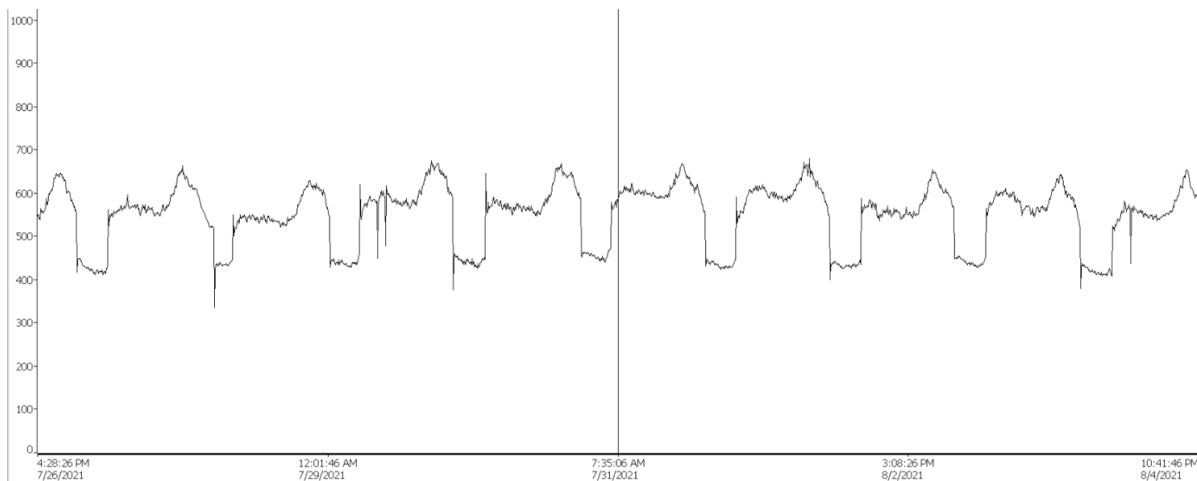


Figure 6. Exit flow from Poklonci source in the days of maximum consumption

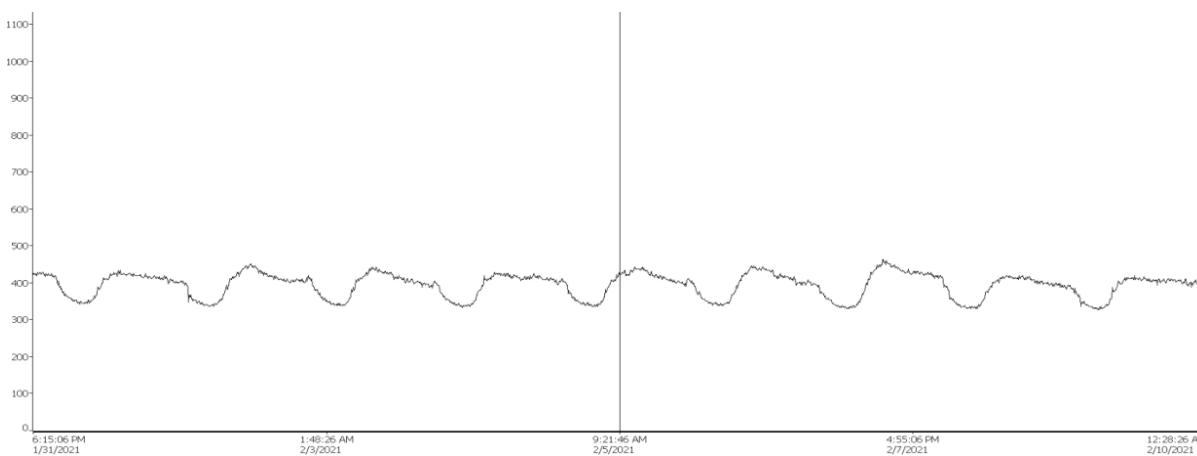
- **Location B.P.S. Duklo (total exit flow – sum of two exit pipes, both Ø700).**

In the time of maximum daily consumption



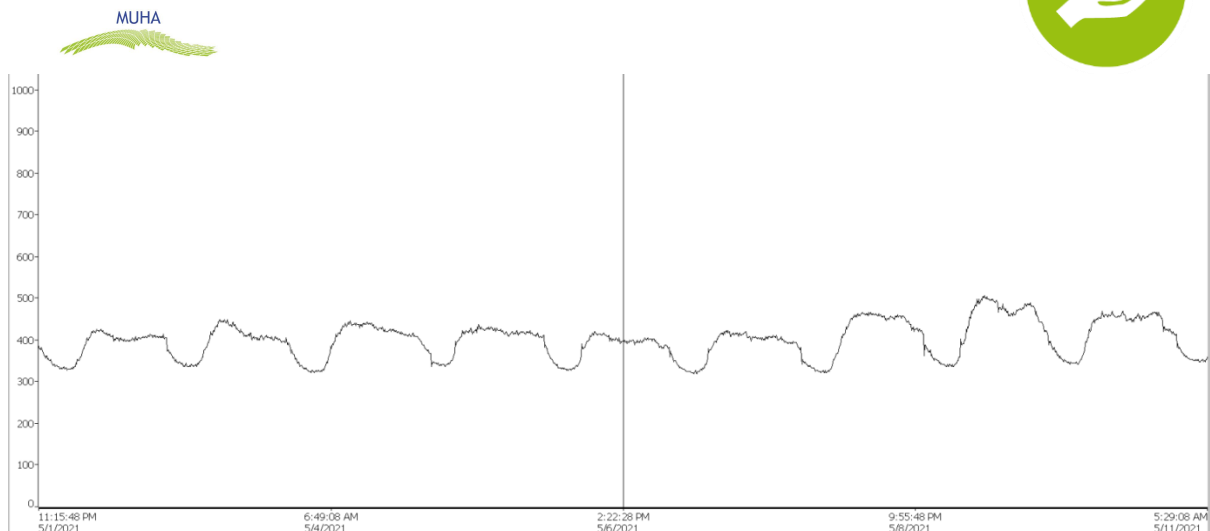
Figures 7. Exit flow of B.P.S. Duklo from 26. July 2021. to 04. August 2021.

In the time of average daily consumption



Figures 8. Exit flow of B.P.S. Duklo from 31. January 2021. to 10. February 2021.

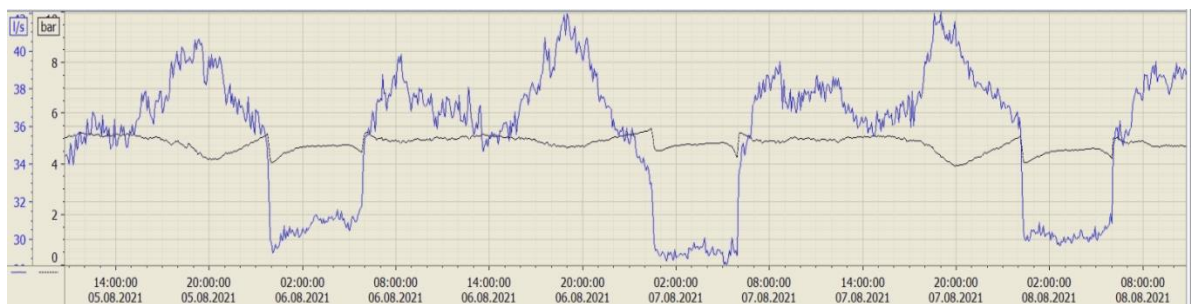
In the time of minimum daily consumption



Figures 9. Exit flow of B.P.S. Duklo from 05. May 2021. to 11. May 2021.

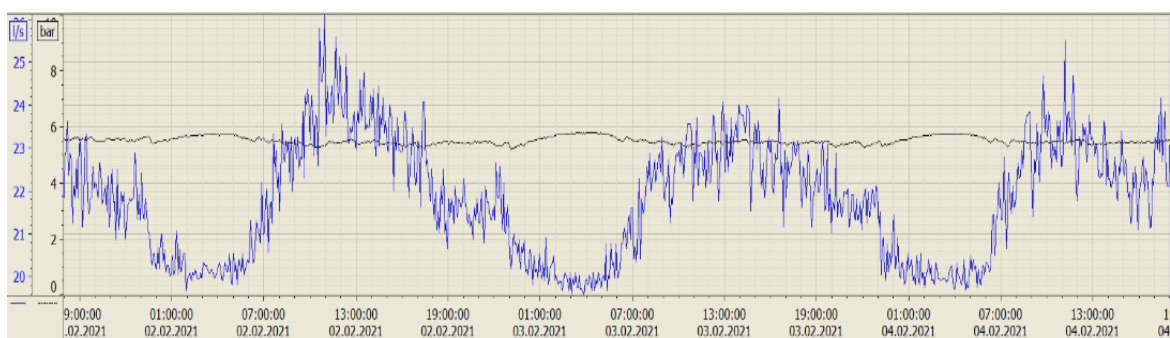
- Location Enter in DMA Kočani

In the time of maximum daily consumption



Figures 10. Enter flow and pressure in DMA Kočani from 05. August 2021. to 08. August 2021.

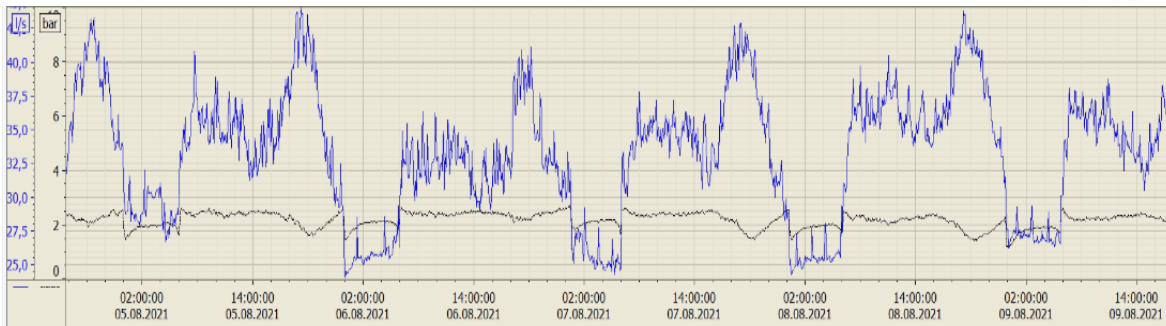
In the time of minimum daily consumption



Figures 11. Enter flow and pressure in DMA Kočani from 02. February 2021. to 04. February 2021.

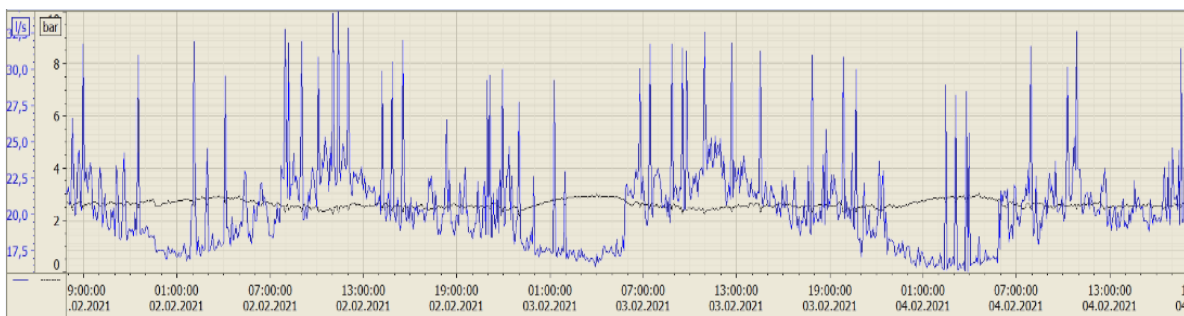
- Location Enter in DMA Ozrinići

In the time of maximum daily consumption



Figures 12. Enter flow and pressure in DMA Ozrinići from 05. August 2021. to 09. August 2021.

In the time of minimum daily consumption



Figures 13. Enter flow and pressure in DMA Ozrinići from 02. February 2021. to 04. February 2021.

Large values of the minimum night flow indicate a significant level of real losses, both in the overall water supply system and in the DMA Ozrinići and Kočani. This situation is similar in other formed DMAs.