

# **SPRING WATER BOTTLING PLANT**

## **LJESKOVAC**

**WATER SOURCE MAREZA - CAPITAL CITY PODGORICA**



## INTRODUCTION

PE Water & Sewerage Podgorica intention is to construct spring water plant on watersource Mareza near Capital city of Podgorica. Location of the future factory is situated in the first protection zone of watersource Mareza. Public enterprise provides all necessary infrastructure and try to provide concession for drinkable water capacity of 15 l/sec. Intention of PE Water & Sewerage Podgorica is to find partner on this matter.



## COMMUNICATION

Land with complete infrastructure for the factory building is situated nearby Capital city of Podgorica, 9 kilometers away. Location is completely connected with modern roads, with network of regional roads; railway Beograd-Bar is 10 kilometers away from watersource while Bar port is 60 kilometers away from there.

## SPRING AND FACTORY LOCATION

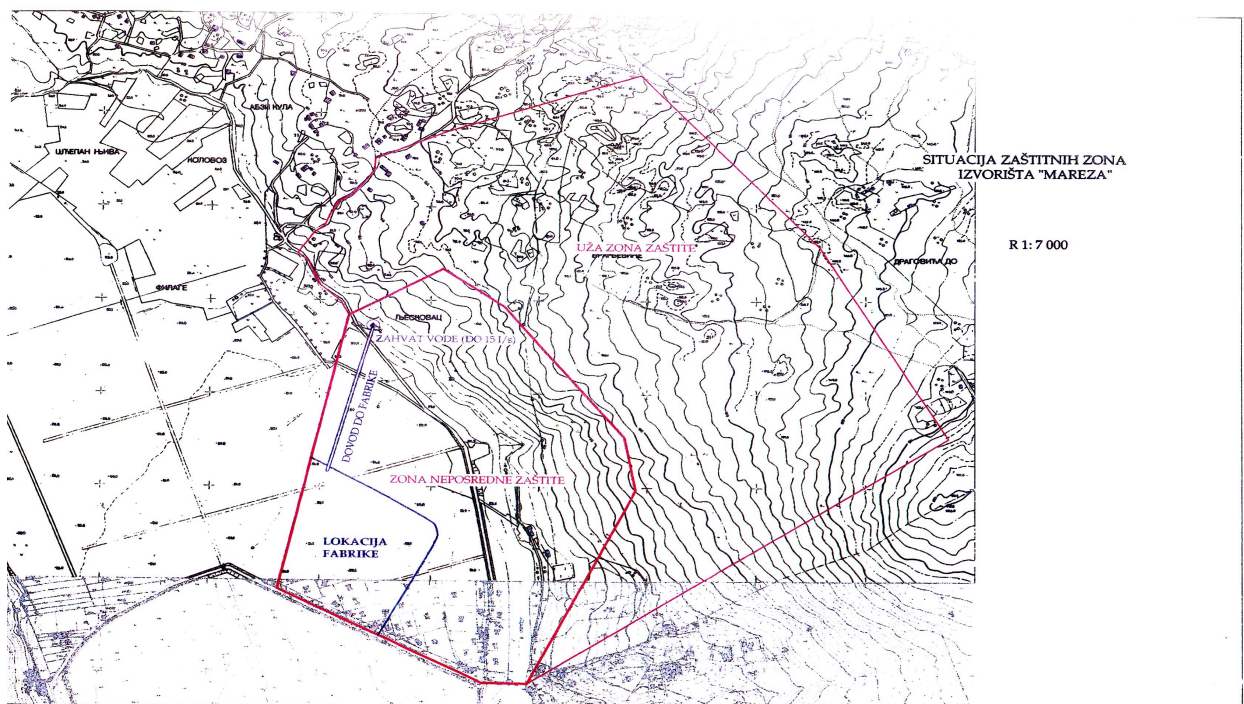
Spring zone Mareza is of the length of about 1000 meters. Watersource capacity is in the range from 1.8-10 m<sup>3</sup>/sec. This watersource is characterized by high number of sources where bigger sources are capped, while huge number of little sources flows free in operation zone. Zone Ljeskovac is situated in absolute elevation of 32,68 (mnm). Water analyses which were done in the past 10 years show an outstanding quality with favour composition of minerals having temperature of 9-11°C.

Factory location is provided within the protected zone of Mareza source on flat ground with peaks about 33 mnm, next to an asphalt road.

From water intake water will be able to go through the pipeline to the location of spring water bottling plant.

Water supply is on the flat fields at the distance of about 800 meters. Position of the factory is provided next to asphalt road which would facilitate transport of the factory products.

Position of future factory does not make negative effects and does not provide development of a further catchment requested amounts of water on watersource Mareza. Amount of water which would be bottled is approximately 60-150 l/sec which presents insignificant amount when referring to minimum capacity of watersource Mareza.



## FINANCIAL MODEL

This project has full support of local authority. Proposed financial model is public-private partnership (PPP):

- Proposed portion of PE Water & Sewerage Podgorica will be land-location for the factory with necessary infrastructure and concession for water use.
- Portion of partner will be construction of the factory for water bottling.
- Percentage of ownership will be determined by the investment share between both sides.

## WATER QUALITY TESTING RESULTS

### PERIOD 2006-2007

Water quality was tested by Institute for Public health of Montenegro and CETI ( Center for Ecotoxic investigation )

Physical-chemical properties of analysed water

| Parameter                               | minimum value | maximum value | Maximum permissible value of drinking water | Maximum permissible value of bottled water (Official gazzete Montenegro 42/98) | Maximum permissible value of bottled water (Official gazzete Montenegro 53/05) |
|---|---------------|---------------|---|--|--|
| T <sub>water</sub> , °C                 | 10            | 10,1          | -   | -  | -  |
| T <sub>air</sub> , °C                   | 11,5          | 21,5          | -   | -  | -  |
| turbidity, NTU                          | 0,24          | 0,28          | 1   | <0,6   | -  |
| pH                                      | 7,4           | 7,6           | 6,8-8,5                                     | 6,8-8,5  | 6,5-9,5  |
| conductivity, µS/cm                     | 242           | 252           | 1000  | <500   | 2500   |
| alkalinity                              | 130           | 140           | -   | -  | -  |
| Suspended matter, mg/l                  | 1             | 2             | without                                     | without  | -  |
| Dry residual, mg/l                      | 123           | 132           | -   | <500   | -  |
| Oxygen saturation %                     | 123           | 124           | -   | -  | -  |
| Consumption of KMnO <sub>4</sub> , mg/l | 2,8           | 4,7           | <8  | <5   | -  |
| COD mg O <sub>2</sub> /l                | 0,57          | 0,96          | -   | <1   | <5   |

**Composition of chemical elements of analysed water**

| <b>Parameter<br/>( mg/l )</b> | <b>minimum<br/>value</b> | <b>maximum<br/>value</b> | <b>MAC of<br/>drinking<br/>water</b> | <b>MAC of bottled<br/>water<br/>(Official gazzete<br/>SRJ 42/98)</b> | <b>MAC<br/>(Official<br/>gazzete<br/>SCG<br/>53/05)</b> |
|-------------------------------|--------------------------|--------------------------|--------------------------------------|--|---|
| chloride                      | 1,98                     | 2,27                     | 200                                  | 25   | 250   |
| sulphate                      | 1,0                      | 2,4                      | 250                                  | 25   | 250   |
| Phosphate                     | 0,01                     | 0,01                     | -                                    | 0,03   | -   |
| Nitrate                       | 0,25                     | 0,67                     | 50                                   | 5  | 0,05  |
| Nitrite                       | <0,001                   | <0,001                   | 0,03                                 | without  | 0,0001  |
| ammonium                      | <0,05                    | 0,01                     | 0,1                                  | 0,01   | 0,5   |
| silicate                      | 1                        | 1,87                     | -                                    | -  | -   |
| fluoride                      | 0,035                    | 0,04                     | 1,2                                  | 1,0  | 1,5   |
| cyanide                       | <0,005                   | <0,005                   | 0,05                                 | without  | 0,05  |
| Calcium                       | 42,72                    | 44,78                    | 200                                  | 100  | -   |
| Magnesium                     | 6,10                     | 6,56                     | 50                                   | 30   | -   |
| HCO <sub>3</sub> <sup>-</sup> | 158,6                    | 170,8                    | -                                    | -  | -   |
| hardness                      | 7,3                      | 7,7                      | -                                    | -  | -   |
| iron                          | 0,01                     | 0,01                     | 0,3                                  | 0,05   | 0,2   |
| aluminium                     | <0,02                    | <0,02                    | 0,2                                  | 0,05   | 0,2   |
| copper                        | 0,001                    | 0,023                    | 2                                    | 0,1  | 0,002   |
| sodium                        | 0,8                      | 1,15                     | 150                                  | 20   | 200   |
| potassium                     | 0,14                     | 0,29                     | 12                                   | 10   | -   |
| niel                          | 0,004                    | 0,004                    | 0,02                                 | 0,01   | 0,02  |
| Lead                          | <0,005                   | <0,005                   | 0,01                                 | 0,05   | 0,01  |
| mercury                       | <0,0005                  | <0,0005                  | 0,001                                | 0,001  | 0,001   |
| Total<br>chromium             | <0,01                    | <0,01                    | 0,05                                 | 0,05   | 0,05  |
| manganese                     | 0,001                    | 0,002                    | 0,05                                 | 0,02   | 0,05  |
| cadmium                       | <0,001                   | <0,001                   | 0,003                                | 0,005  | 0,003   |
| zinc                          | 0,002                    | 0,003                    | 3                                    | 0,1  | -   |
| arsen                         | <0,01                    | <0,01                    | 0,01                                 | 0,05   | 0,01  |
| phenol                        | Without<br>(<0.0005)     | Without<br>(<0.0005)     | 0,001                                | without  | -   |
| tenzide                       | Without<br>(<0.03)       | Without<br>(<0.03)       | 0,1                                  | without  | -   |
| PAH                           | <0,0001                  | <0,0001                  | 0,0002                               | without  | 0,1   |
| PCBs                          | <0,0001                  | <0,0001                  | 0,0005                               | without  | -   |
| Total fat and<br>oil          | <0,001                   | <0,001                   | 0,1                                  | without  | -   |
| mineral oil                   | <0,001                   | <0,001                   | 0,01                                 | without  | -   |
| pesticide                     | <0,00001                 | <0,00001                 | 0,01-0,5                             | without  | 0,0005  |

Results of microbiological analysis of water samples

| <b>Parameters</b>                  | <b>obtained values</b> | <b>MAC (drinking water)</b> | <b>MAC (bottled water)</b> |
|------------------------------------|------------------------|-----------------------------|----------------------------|
| Total number of Coliforme bacteria | 0                      | 100                         | 0                          |
| Total number of aerobic bacteria   | 1                      | 300                         | 10*                        |
| Fecal coliform                     | 0                      | 0                           | 0                          |
| Enterococcus sp.                   | 0                      | 0                           | 0                          |
| Proteus spp.                       | 0                      | 0                           | 0                          |
| Sulphit.reduct. Clostridium        | 0                      | 10                          | 0                          |
| Pseudomonas aeruginosa             | 0                      | 0                           | 0                          |

\*In bottled natural water that has been in circulation for more than 12 hours after filling allows aerobic bacteria to 50

#### Results of radiological analysis of water samples

| <b>Radionuclide</b>       | <b>Obtained values (mBq/l)</b> |
|---------------------------|--------------------------------|
| <sup>226</sup> Ra (mBq/l) | <16,7                          |
| <sup>232</sup> Th(mBq/l)  | <38,24                         |
| <sup>40</sup> K(mBq/l)    | <35,86                         |
| <sup>137</sup> Cs(mBq/l)  | <10,01                         |

Official gazzete 42/98 Regulation of sanitary drinking water quality  
 Official gazzete 53/05 Regulatino of quality and other requirements for natural mineral water, natural spring water and water having low contents of minerals