Artificial recharge: Mitidja plain in northern Algeria

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Overview

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- Water Resources
- Artificial recharge for Mitidja plain
- Artificial recharge method for Mitidja
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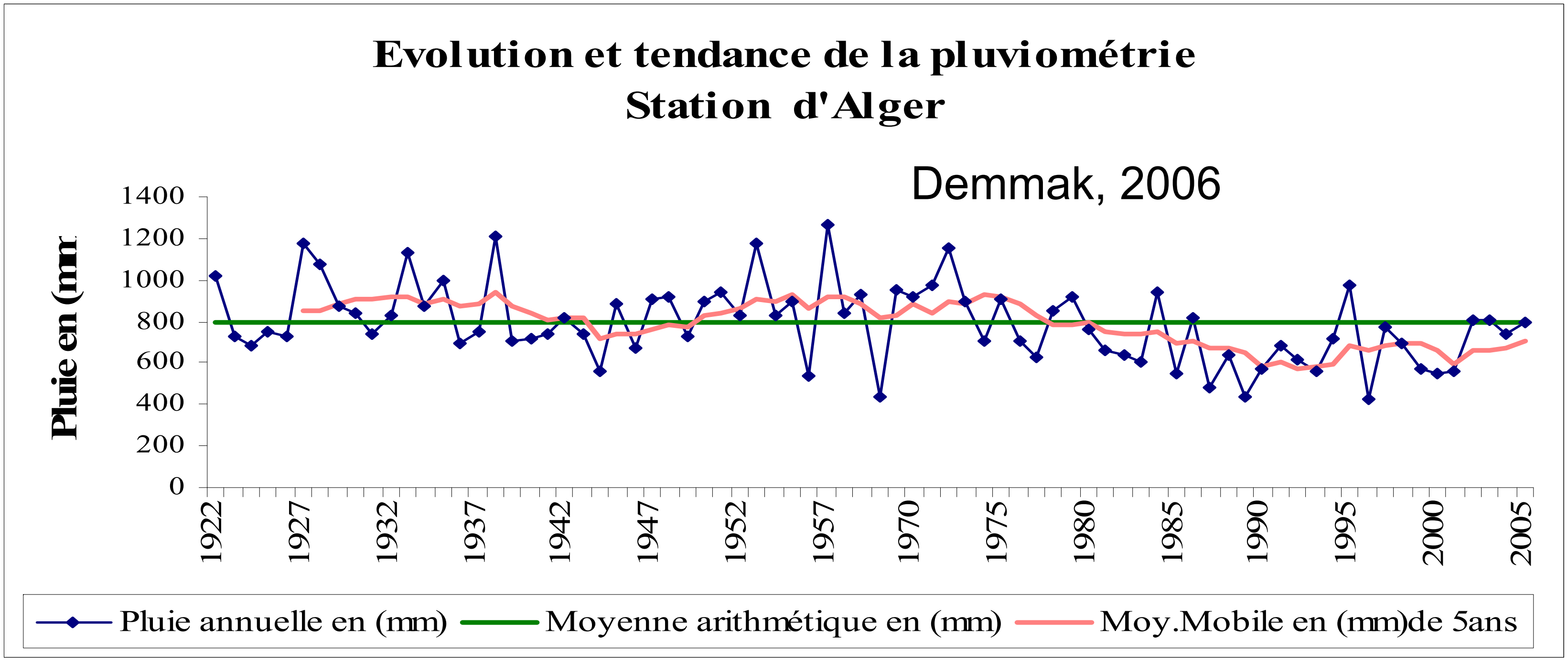
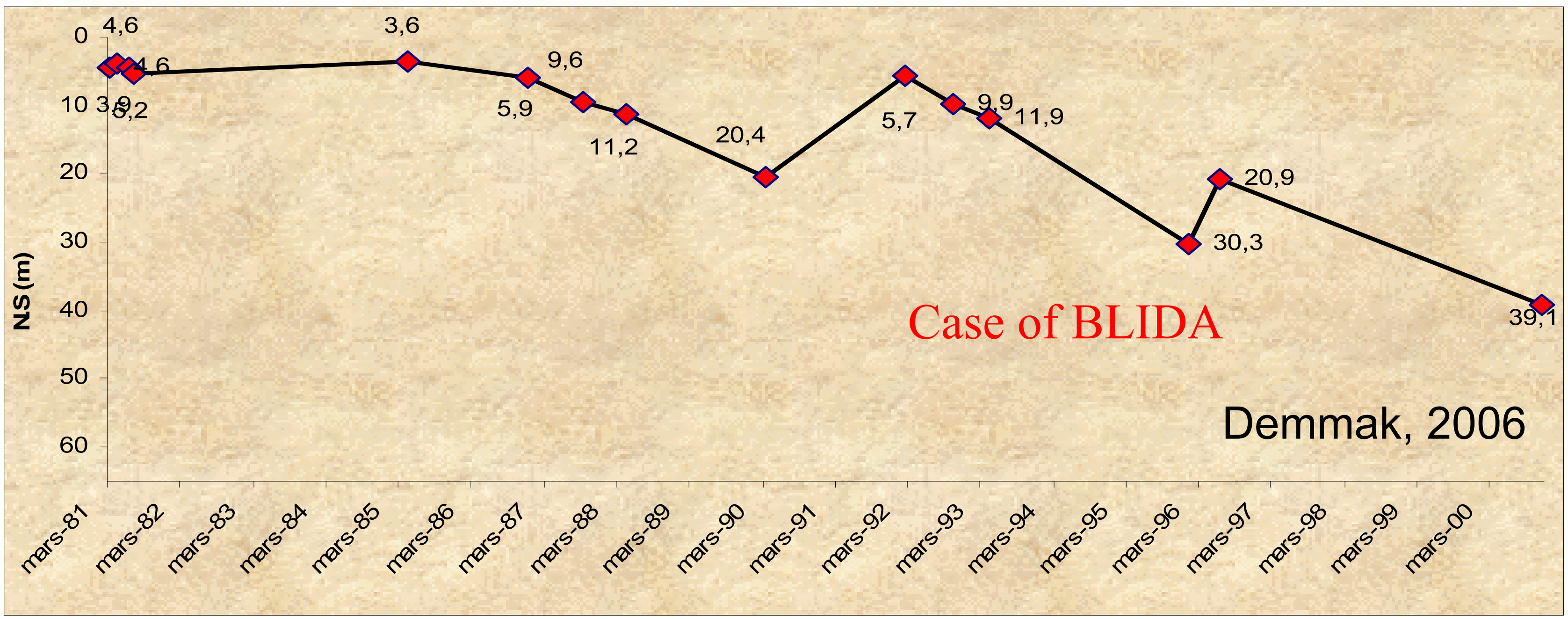
- Conclusion

Introduction

- Algeria experienced several major droughts during the last century, in the 40s and 70s
- Water deficiency in recent decades has negatively affected agricultural production as well as surface and underground reserves of water resources.
- Mitidja plain, the prolonged drought produced a decline in the static level up to more than 40 m in Larbaâ region, and more than 30 m in Blida region and a decline in drillings performance at the rate of 50%.
- We want to prove feasibility of the artificial recharge for Mitidja in its Southeast part, by enlarging on some digital simulation-based- scenarios.


Evolution et tendance de la pluviométrie
Station d'Alger
Demmak, 2006
Pluie en (mm
1400
1200
1000
800
600
400
200
0
1922
1927
1932
1937
1942
1947
1952
1957
1970
1975
1980
1985
1990
1995
2000
2005
Pluie annuelle en (mm)
Moyenne arithmétique en (mm)
Moy.Mobile en (mm)de 5ans


NS (m)
0
10
20
30
40
50
60
4,6
3,9
4,6
5,2
3,6
9,6
5,9
11,2
20,4
5,7
9,9
11,9
30,3
20,9
39,1
Case of BLIDA
Demmak, 2006
mars-81
mars-82
mars-83
mars-84
mars-85
mars-86
mars-87
mars-88
mars-89
mars-90
mars-91
mars-92
mars-93
mars-94
mars-95
mars-96
mars-97
mars-98
mars-99
mars-00

- Many infiltration basins have existed in the past in the region, but were abandoned. With this new project, we will examine the development of the best scenario to perform, in order to meet the project's objectives, i.e.; maintaining the balance and restoring the Mitidja aquifer.

Methodology

I - Geographical position

- Mitidja plain is the largest sub-coastal plain of Algeria. It covers an area of 1,450 km ^{2}

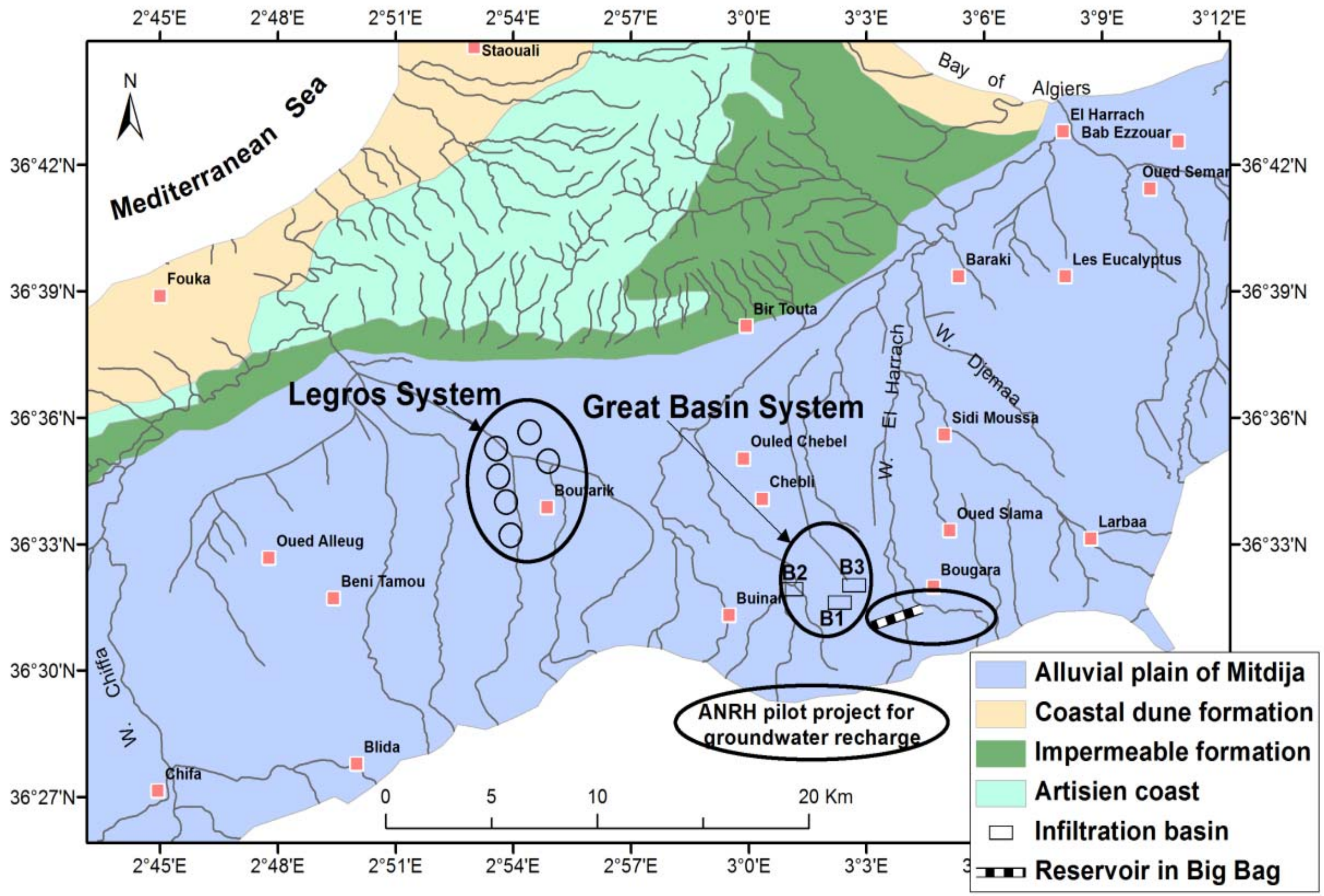
II - Water Resources

According to the ABH (Hydrographical Basins Agency, 2000) for Algiers region, Mitija groundwater resources of is 328 Hm ^{3},

View of the large settling basin (50x50x3m) (ANRH, 2012)	**View of the two infiltration basins (30x15x3m)** (ANRH, 2012)

III. Artificial recharge for Mitidja plain

- Seven infiltration basins were realized in Haouch Le Gros region southeast of Boufarik and a pilot project to supply artificially Mitidja in Bougara municipality



Evolution of Mitidja aquifer

- The evolution of Mitidja aquifer system shows a continuous drop since 1980. During the 1980-2000 period, one noted a significant and continuing drop in the aquifer level. It is at the rate of 30 meters in some points of the plain, while for the period from 2000 to 2012, a stabilization of the sheet level was recorded.
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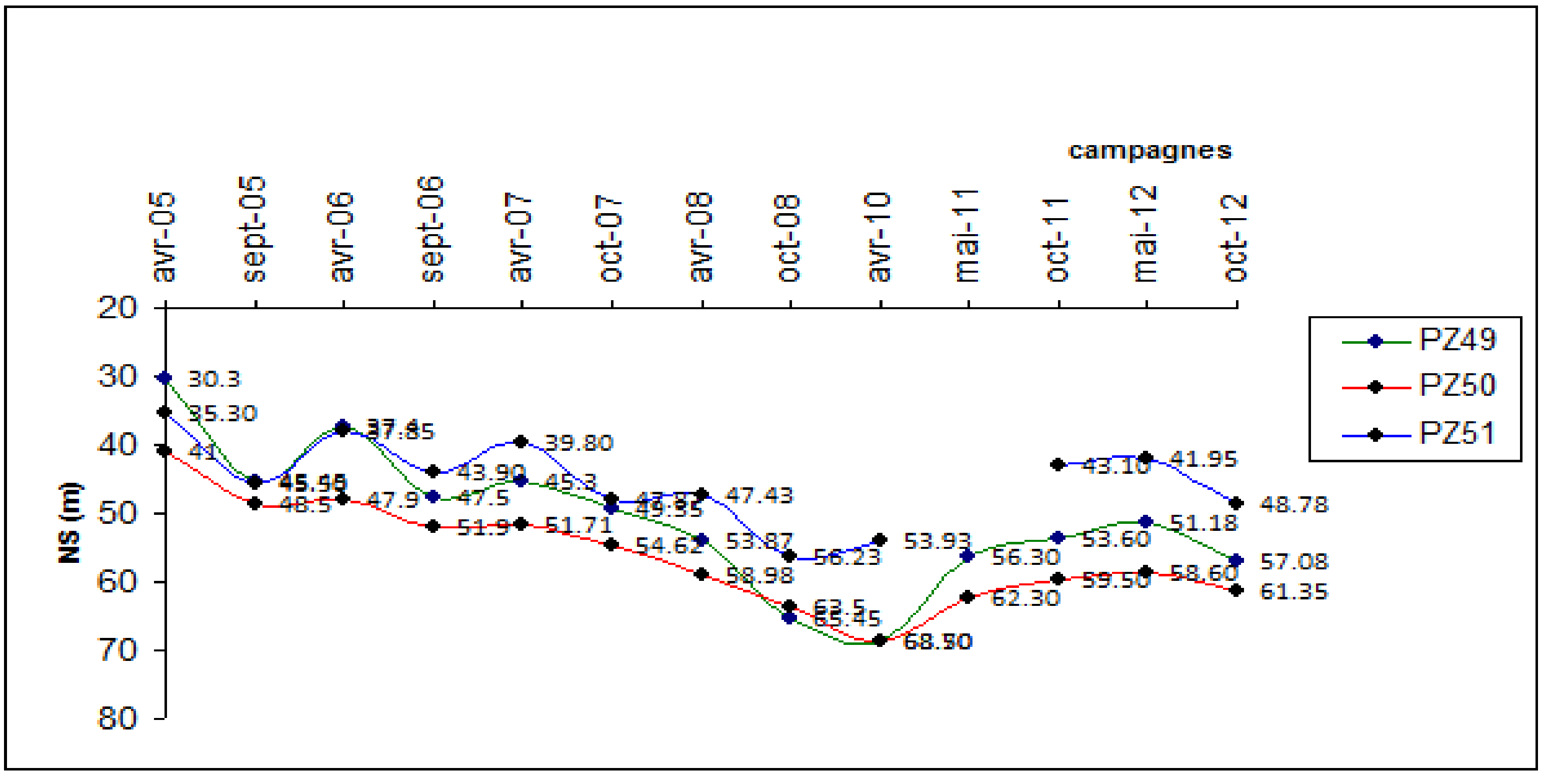


Presentation of the structure modeled

- **At present**, five (05) basins were realized in the region between Bouinan and Bougara and which recharge the aquifer :
- Basin 1 : with an infiltration flow ranging from 40 to 70 l/second .
- Basin 2 : with a flow of 306 l/second.
- The other basins receive from 20 to 40 l/second.
- A large basin have an inflow of 986 l/second.

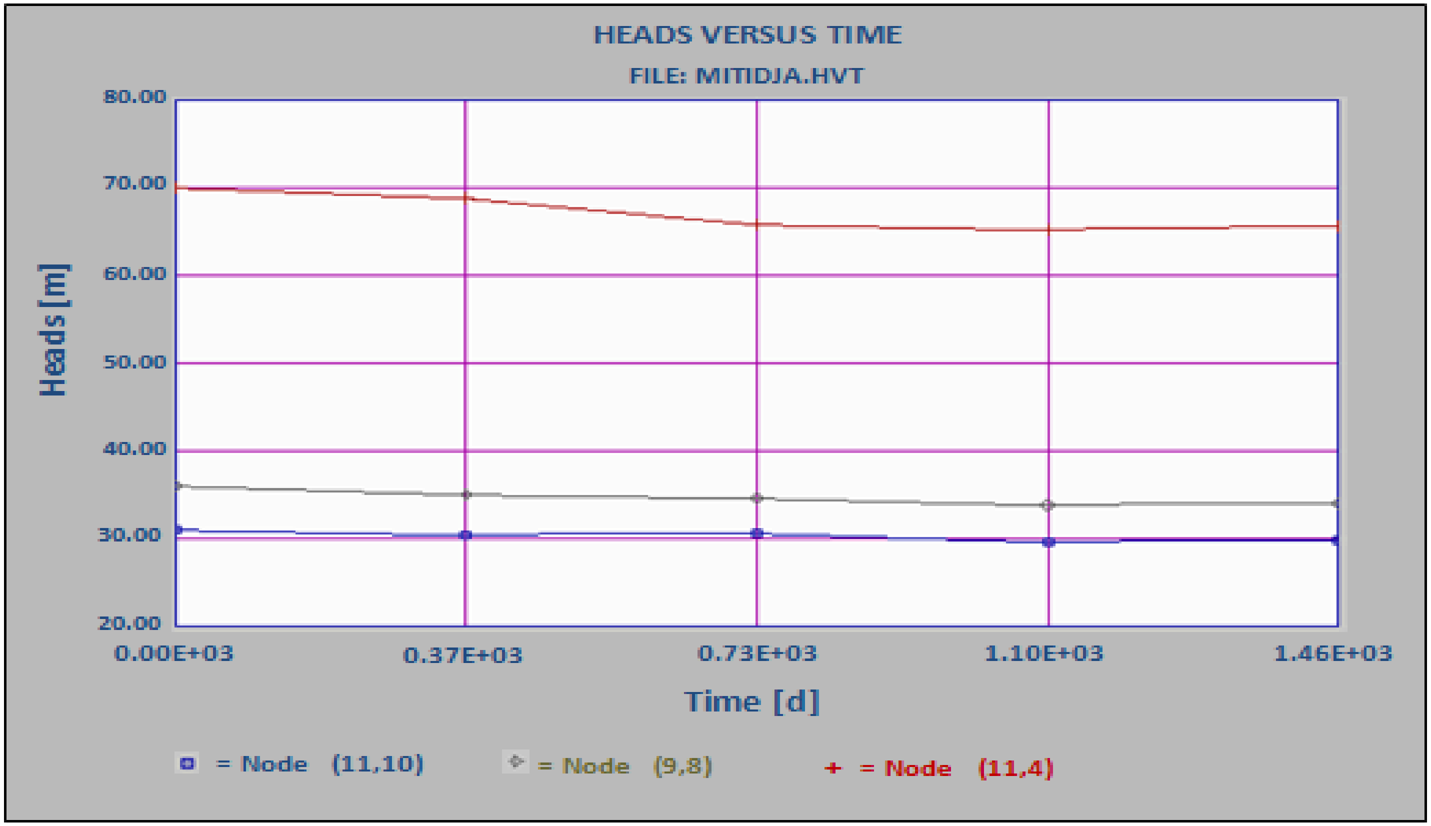
Modeling of Mitidja artificial recharge

The modeling's objectives are the monitoring and surveillance of the piezometric conditions in the experimental area before and after the use of artificial recharge technique and the risks that may be caused and the searching for a better solution through the scenarios proposed. we performed a simulation over a-four (04) year period

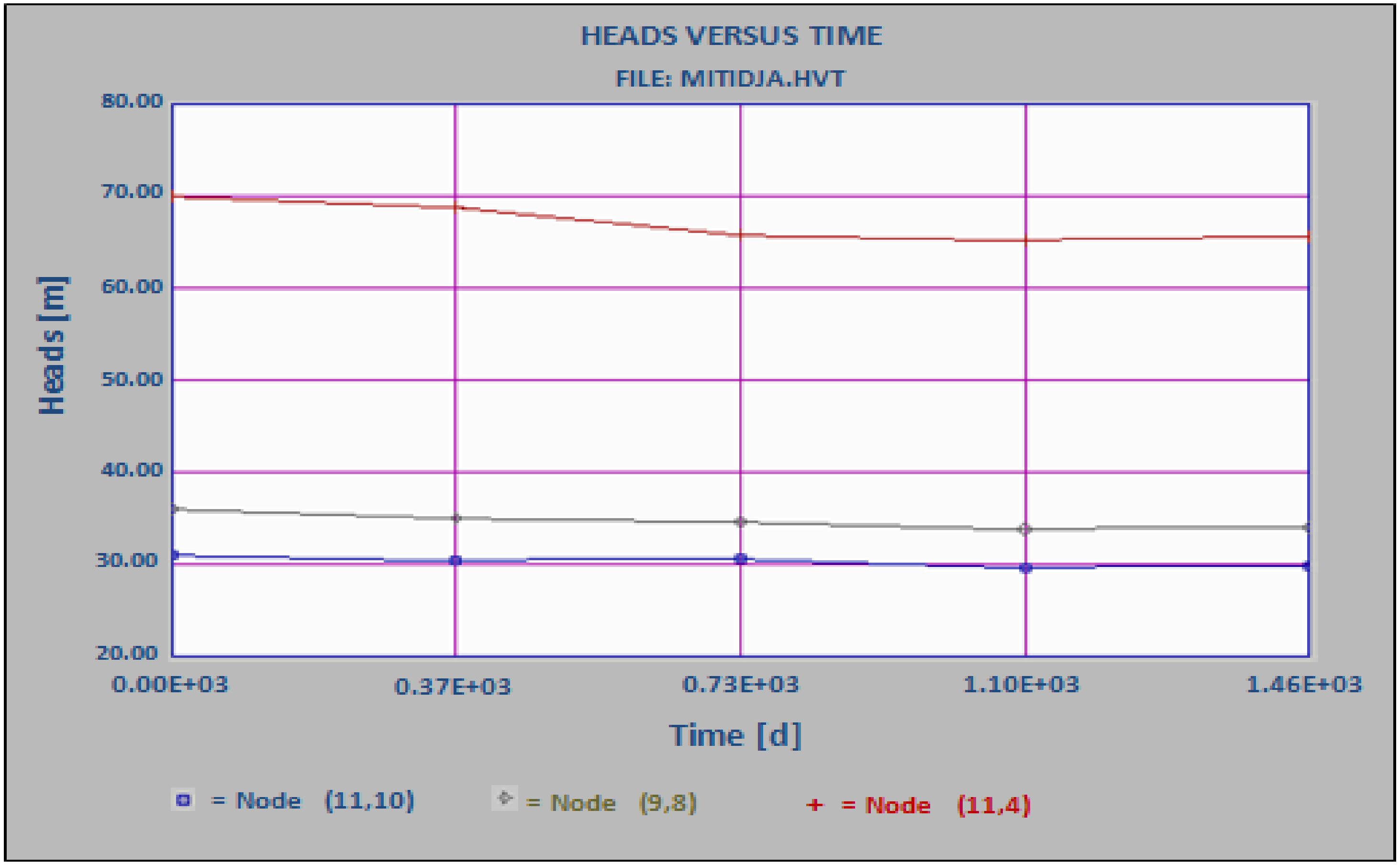
Results

- ***First scenario***

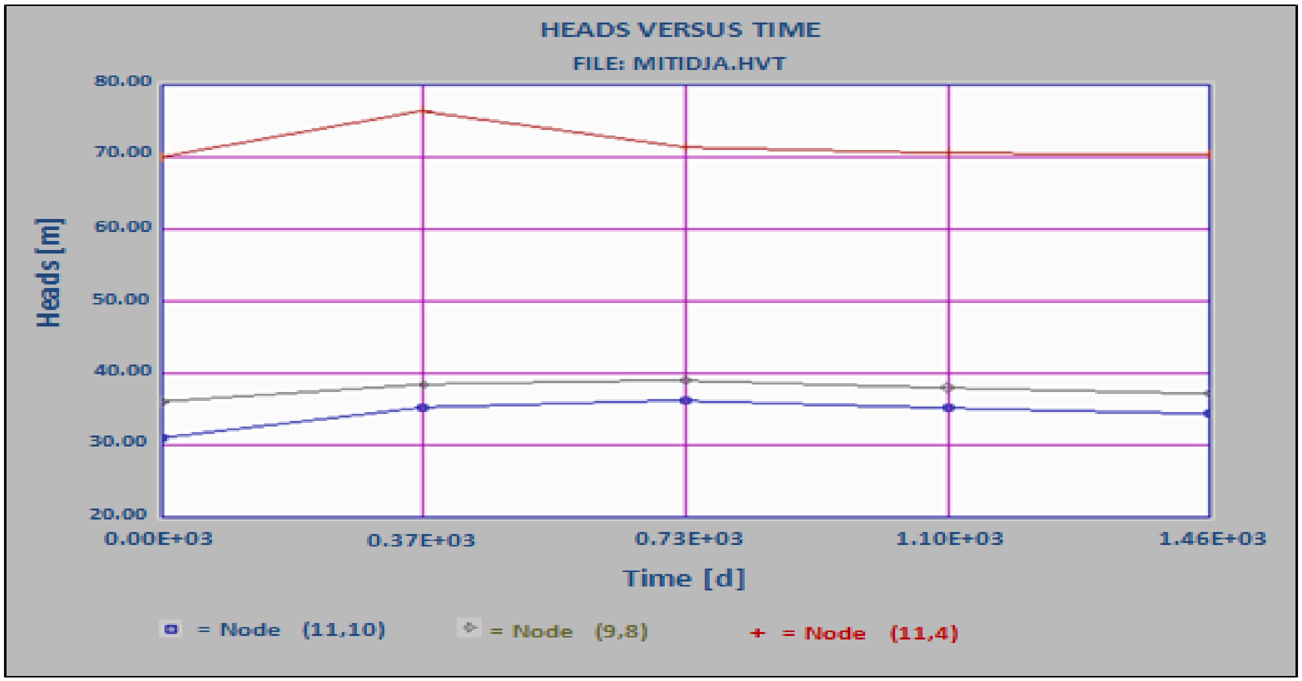
- without infiltration basins inflow. And persistence of Drought
- evolution over time shows a slight lowering (0.35 to 0.76 m) in the downstream part and a significant lowering (1.80 m) in the upstream part.



- ***Second scenario***
- Persistence of drought. T
- increase the aquifer’s operating flow with 35% (from 1.20 to 1.62 m^3/s
- reduce inflows in the aquifer by 15% (from 2.21 to 1.88 m^3/s.
- The balance showing a **negative** "surplus" **: - 0.34 m^3/s.**

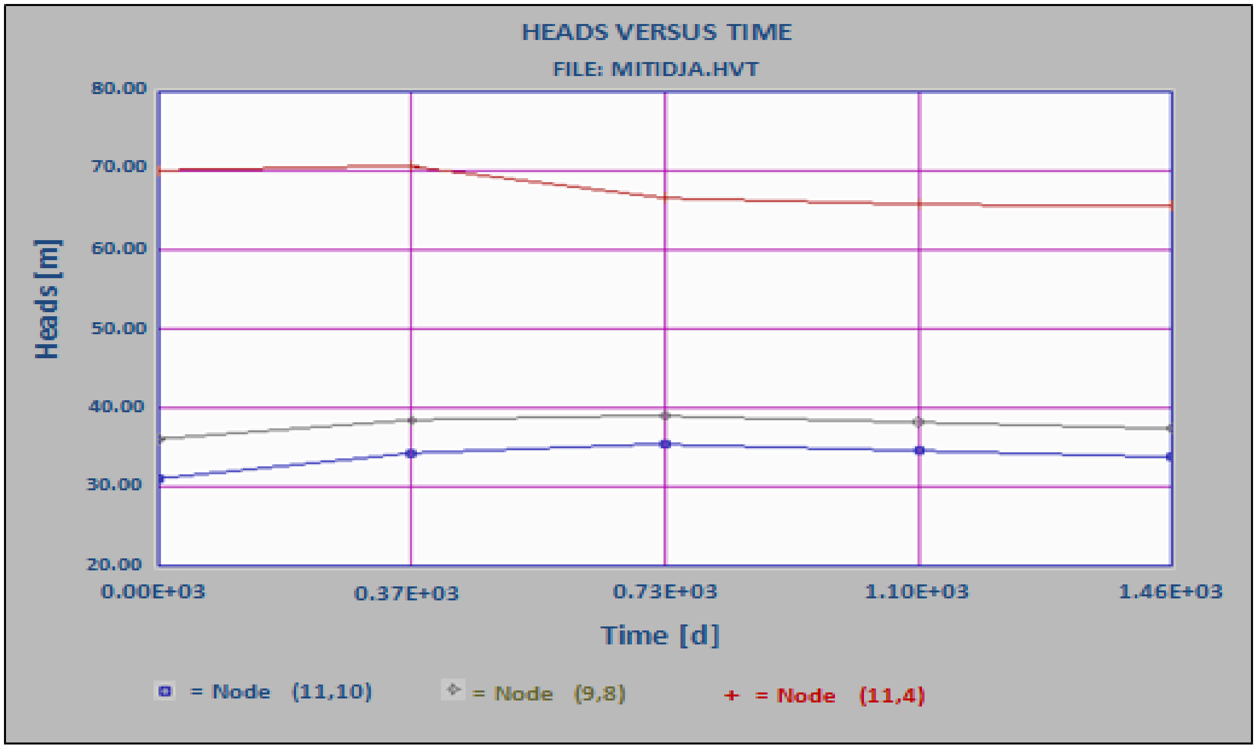


- ***Third scenario***
- The objective of this scenario is to see the effect of infiltration basins in pilot project.
- For this, we keep the same current operating flow of (1.20 m^3/s) and we relaunch infiltration basins activity with an infiltration rate of **0.22 m^3/s.**
- In this case, a surplus of **0.61 m^3/s enregistred.** In the southern part, increase during the first year by 3.15 m. In the north, fluctuations are more marked (from 2.0 m to 1.05 m). but this case is not sufficient.



Fourth scenario

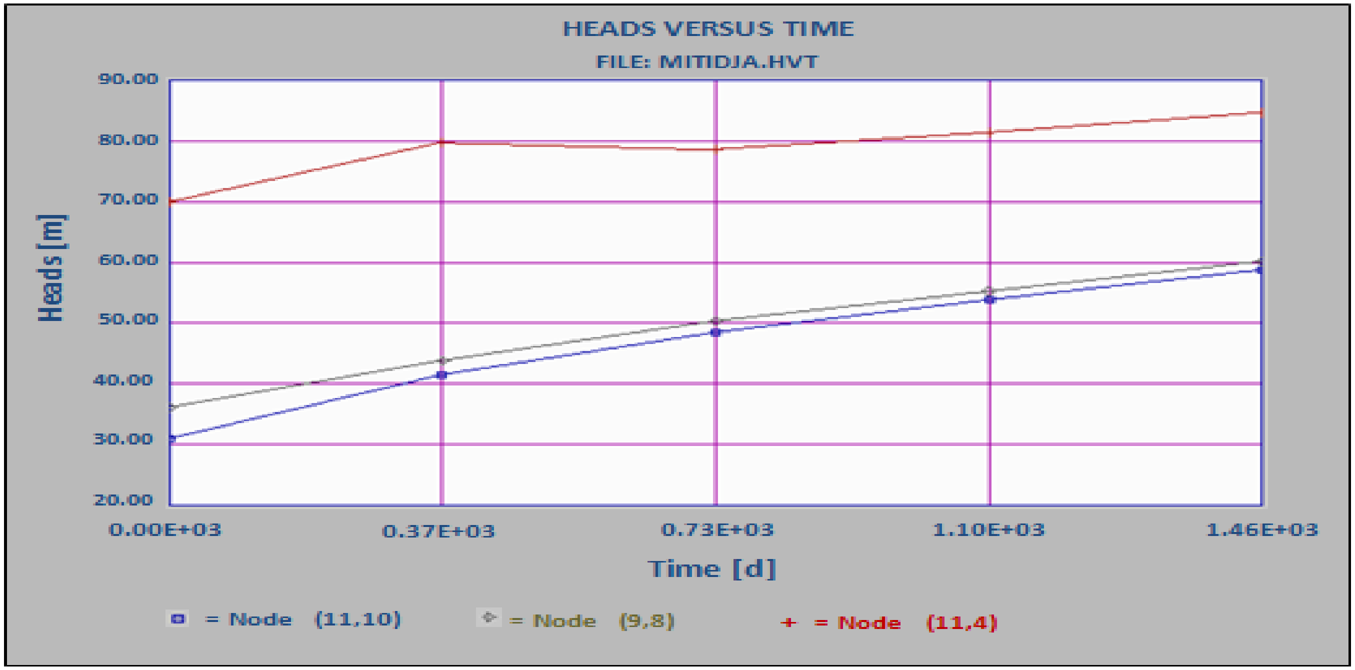
We increase by 1.20 to **1.50 m ³/s** the aquifer's operating flow due to the growing water resources demand. The additional 0.30 m³/s are distributed on wells of the study area. The infiltration basins are in service (**0.22 m ³/s**). **We** records smaller underground water reserve: 0.11 m³/s. In northern part, The rise varies form 1.13 m to 0.71 m. In the southern part, a piezometric stability is enregistred.



- ***Fifth scenario***

For this scenario, we propose the folowing solutions:

- Keep the same recharge through the current infiltration basin (**0.22 m^3/second**).
- Adding a new site (infiltration basins in the median part of the study area) with a flow rate of **0.25 m^3/s**.
- Using three drillings already existing in the downstream part with a flow rate of **0.15 m^3/second**.
- Pizometric values rise. This rise varies between 14.70 and 29.50 m.



Conclusion & Recommendations

- Both demands have risen in recent years because of population growth and irrigation areas development.
- Therefore, an induced inflow to the replenishment of water underground reserves has become an imperative.
- This inflow can be done through artificial recharge of the aquifer as it has been proven by the scenario 5.
- within the three observation piezometers, produce satisfactory results in terms of piezometric level rise.
- This rise varies between 14.70 and 29.50 m.

THANK YOU FOR YOUR ATTENTION!