دانشگاه شهید باهنر کرمان

# *Future Domestic Water Supply Provision*
# *Case study: City of Kerman*

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# ABSTRACT:


- At the present time the water supply in general, especially the domestic water supply, in arid and semi-arid regions is an important subject of domestic water management. The need to increase the water supply to address Kerman City's growing population is mitigated by the dwindling groundwater supply due to long-term drought. Potential solutions to address this demand include:
  - Separate the networks of good quality water for human consumption from water suitable for commercial, agricultural, and other uses
  - Artificial groundwater recharges or
  - Transfer water from adjacent regions
- In this study, the future water supply for Kerman City, located in a semi-arid region, has been considered, and the best option, including transfer of water from Hallil River Basin, was suggested.

# Kerman City and its present water supply system:

- Mean annual precipitation: 130-mm
- Mean annual evaporation: 2050-mm
- Present population: 550,000
- Annual water usage: 40 MCM
- Main sources:
  - groundwater of the Mahan and Joupar plains by pumping wells
- Small fraction:
  - Hoseinabad Qanat and pipelines from Gharietolarab region

# Continued:

- This amount of water is not sufficient to satisfy the demand of the present population.
- Kerman City is faces regular water shortages, especially during the late spring and summer seasons.
- Continuation of the a decade-long drought is causing this water shortage to become even more severe.

## Continued:

- The groundwater aquifers of the Mahan & Joupar Plains have declined about 0.7 m/year over the past two decades.
- Current demands are estimated to draw as much as 4.2 m/year from the water table by the year 2025.
- Low quality of the present water supply is another problem.

# Kerman City water supply possibilities:

1. Separate the water supply networks of water fit for human consumption from water fit for other uses.
   - This option can be helpful but it will not provide enough water to supply Kerman's growing demands over time.
2. Create artificial groundwater recharges in the Mahan & Joopar Plains.
   - This option is not possible due to lake-surface floods in these regions.
3. Convey water from adjacent basins and combine it with local groundwater.
   - This option is very expensive, but it seems that it should be the only choice.

# Estimate of Kerman Monthly Water Demand, 2025

| Months | Monthly flow rate ($m^3$/sec) | Monthly volume of water (MCM) | Months | Monthly flow rate ($m^3$/sec) | Monthly volume of water (MCM) |
|---|---|---|---|---|---|
| Farvardin (March) | 2.676 | 7.17 | Mehr (September) | 3.683 | 9.55 |
| Ordibehesht (April) | 2.969 | 7.95 | Aban (October) | 3.141 | 8.14 |
| Khordad (May) | 3.743 | 10.03 | Azar (November) | 2.954 | 7.76 |
| Tir (June) | 4.827 | 12.93 | Dey (December) | 2.907 | 7.53 |
| Mordad (July) | 4.966 | 13.30 | Bahman (January) | 2.812 | 7.29 |
| Shahrivar (August) | 4.421 | 11.84 | Esfand (February) | 2.798 | 7.25 |
| Total | 110.74MCM | | | | |
| Mean | 3.489$m^3$/sec | | | | |

# Proposed Dams:

1. Safa Dam:
   - 81m height and capacity of 1.8 $m^3$/sec water supply
2. Saied Morteza Dam:
   - 41m height and capacity of 0.7 $m^3$/sec water supply
3. Sarmashk Dam:
   - 88m height and capacity of 1 $m^3$/sec water supply

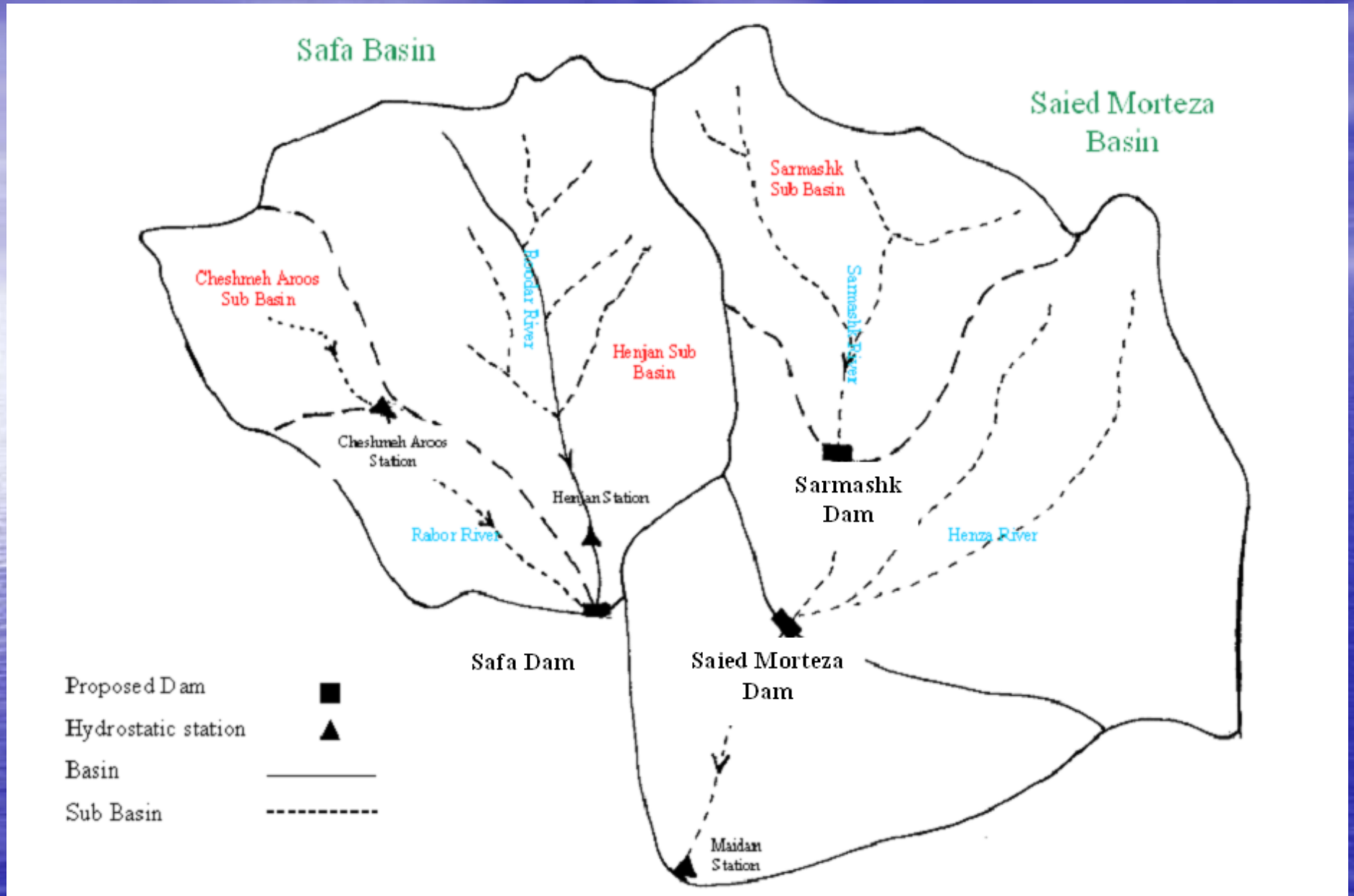


***Fig. 1- Maps of Saied Morteza, Sarmashk, and Safa Dams and Basins***

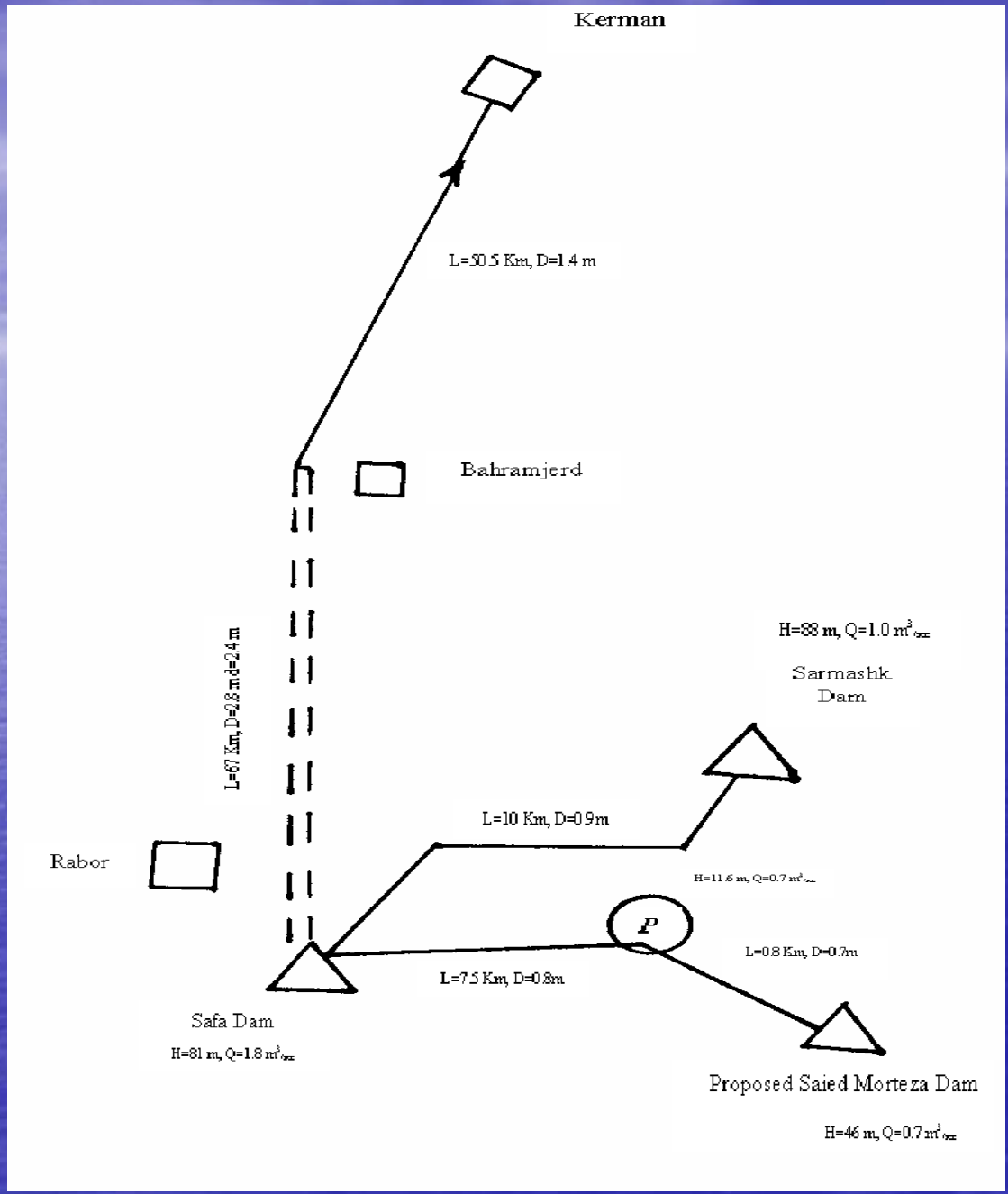


***Fig. 2. The layout of the selected option***

# Proposed conveyance system:

1. A pressure conveyance system 800m long and 0.6m in diameter with a pump station of 120m head with 0.7 $m^3$/sec capacity transfers water from the Saied Morteza Dam reservoir to the Safa Dam reservoir to an elevation of 2180m above sea level.
2. A gravity conveyance system 7500m long and 0.8m in diameter to transfer water from an elevation of 2180-2155m to the Safa Dam reservoir.
3. A connection line with a gravity conveyance system of 10,000m long and 0.9m in diameter to transfer water from the Sarmashk Dam reservoir to the Safa Dam reservoir.
4. A 67Km long and 3m diameter wide pipeline will transfer water from the Safa Dam reservoir to the Bahramjerd village by gravity.
5. A conveyance system of 50.5Km long and 1.4m diameter wide will transfer water from the Bahramjerd village to the city of Kerman.

# Conclusion:

1. Short term water supply system:
   - Continuation of present water supply system with decreasing pumping hours.
   - Separation of good quality water from water fit for nonhuman uses can be recharged by pumping some wells throughout the city
     - at the present time, wastewater is injected into the wells
2. Long term water supply system:
   - Reduce the discharge of Mahan & Joopar Plains wells
     - especially wells of low quality water
   - Construction of proposed system of dams & conveyance structures

***Thank You Very Much***
***For Your Attention***