

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

**MINISTRY OF ENERGY
TEHRAN REGIONAL WATER BOARD
THE ISLAMIC REPUBLIC OF IRAN**

**THE STUDY
ON WATER MANAGEMENT IN THE WESTERN AREA OF THE CAPITAL TEHRAN
IN THE ISLAMIC REPUBLIC OF IRAN**

**FINAL REPORT
DATABASE MAPS**

NOVEMBER 2001

SANYU CONSULTANTS INC.

LIST OF DATABASE MAPS (1/2)

Chapter 1. Introduction		
No.	Title of Drawings/Figures/Tables	Page
	General Location Map and Typical Scenary	1-1
	What is JICA's Role ?	1-2
1.3.1	Study Area Boundary	1-3
	Project Facility Location Map	1-4
Chapter 2. Present Conditions of the Study Area		
2.1.1.1	Division of the Study Area for Water Resources Planning	2-1
2.2.1.1	Topographic Conditions	2-2
2.2.2.1	Geologic Map of the Study Area	2-3
2.2.2.2	Geologic Map of Taleghan - Almount Basin	2-4
2.2.2.3	Legend of Geologic Map	2-5
2.3.1	Micro-economic Indicator at National Level	2-6
2.3.2	Regional Administration	2-7
2.3.3	Regional Demography	2-8
2.3.4	Regional Industry	2-8
2.3.5	Regional Agriculture	2-9
2.3.6	Regional Food Supply	2-9
2.4.4.1	Surface Water Supply in Tehran City	2-10
2.4.4.2	Water Allocation Plan of Tehran City	2-11
2.4.4.3	Groundwater Supply by Wells in Tehran City	2-12
2.4.4.4	Water Service Classified by Overhead Water Tank	2-13
2.4.4.5	Raw Water Supply to Tehran City	2-14
2.4.5.1	Tehran Sewage Plan	2-15
2.5.1	Land Use Condtion	2-16
2.5.2.1	Monthly Irrigatin Water Requirement	2-17
2.5.2.2	Irrigation Water Demand	2-18
2.5.3	Irrigation Canal System in North Qazvin	2-19
Chapter 3. Water Resources		
3.2.1	Isolines of Precipitaion over the Study Area	3-1
3.2.2	Monthly Precipitation at Major Stations in the Study Area	3-2
3.2.3	Long-term Fluctuation of Precipitation at Mehrabad in Tehran City	3-3
3.3.1	Specific Runoff Yield	3-4
3.3.2	River Systems Related to the Study and Potential Surface Water Resources	3-5
3.3.3	Monthly Runoff of Major Rivers in the Study Area	3-6
3.3.4	Seasonal Flow of Major Rivers in the Study Area	3-7
3.3.5	Flow Regime of Three Rivers, Taleghan, Almount and Shah-rud Rivers	3-8
3.3.6	Daily Discharge of Taleghan River at Galinak	3-9
3.3.7	Daily Discharge of Almount River at Baghkalyeh	3-10
3.3.8	Daily Discharge of Shah-rud River at Siadasht	3-11
3.3.9	Rating Curve of Suspended Sediment of Taleghan River at Galinak and Shah-rud River at Loshan	3-12
3.4.1.1	Hydrologic Map of Groundwater Basin (West of Tehran Capital Area)	3-13

Chapter 3. (continued)		
No.	Title of Drawings/Figures/Tables	Page
3.4.1.2	Alluvial Aquifer Depth	3-14
3.4.1.5	Distribution of Monitoring Wells	3-15
3.4.1.6	Contour of Groundwater Level (October 1994)	3-16
3.4.1.7	Contour Map of Depth to Groundwater Table	3-17
3.4.1.8	Groundwater Table in TRWB's Observation Wells (Selected wells, Oct.1990 – Sep.2000)	3-18
3.4.2.1	Potential Storage Capacity of Saturated Aquifer	3-19
3.4.3.1	Distribution of Existing Production Wells	3-20
3.4.3.2	Distribution of Existing Production Wells (Tehran City/Tehran)	3-21
3.4.3.3	Distribution of Existing Production Wells at Karaj and Hashtgerd	3-22
3.4.3.4	Distribution of Existing Production Wells at Qazvin Plain	3-23
3.4.4.2	Extracted Groundwater Volume	3-24
3.4.5.2	Storage Change of Groundwater Resources (Oct./1990 - Sep./2000)	3-25
3.4.5.3	Groundwater Balance (1996/1997 Current Condition)	3-26
3.4.5.4	Groundwater Balance (1999/2000 Current Condition)	3-27
3.4.6.1	Contour Map of Electric Conductivity (EC) Observed in 1995	3-28
Chapter 5. Water Operation and Allocation		
5.1.1	Karaj Dam Operation (Past Operation , Future Operation without Rule and Future Operation with Rule)	5-1
5.1.2	Operation Record of Karaj Dam (Total Storage, Inflow and Outflow)	5-2
5.1.3	Annual Change of Volume of Water Released from Karaj Dam	5-2
5.1.3.1	Existing Operation of Taleghan Diversion Dam	5-3
5.1.3.2	Water Balance at the Existing Sangban Diversion Dam (Priority : Water Supply)	5-4
5.1.3.3	Water Balance at the Existing Sangban Diversion Dam (Priority : Irrigation)	5-5
5.1.4	Past Operation of Karaj Dam (Outflow for Water Supply, Outflow for Irrigation and Total Outflow)	5-6
5.1.4.1	Operation of Taleghan Storage Dam (Future Operation without and with Rule)	5-7
5.1.4.2	Future Operation of Taleghan Storage Dam (without and with Rule)	5-8
5.1.5.1	Outline Location of Almount Water Diversion Plan (Final Plan)	5-9
5.4.2.1	Projected Water Demand by Region	5-10
5.4.2.2	Water Demand and Water Sources (1/3)	5-11
5.4.2.3	Water Demand and Water Sources (2/3)	5-12
5.4.2.4	Water Demand and Supply by Source of Water (3/3)	5-13
5.4.3.1	Scenario-0 : Present Situation	5-14
5.4.3.2	Scenario-1 : Short-term Plan (at Present Undergoing)	5-14
5.4.3.3	Scenario-2 : Medium-term Plan (for the Year 2011)	5-15
5.4.3.4	Scenario-3 : Long-term Plan (at the Year 2021)	5-15
Chapter 6. Water Resources and Water Conveyance Development Project		
6.1.2.1	Karaj Water Development	6-1
6.1.3.1	Taleghan Water Development	6-2
6.3.1	Existing North Qazvin Irrigation Project	6-3
6.3.2	Existing Karaj Irrigation Project	6-4
6.3.3	Existing Kordan Irrigation Project	6-5

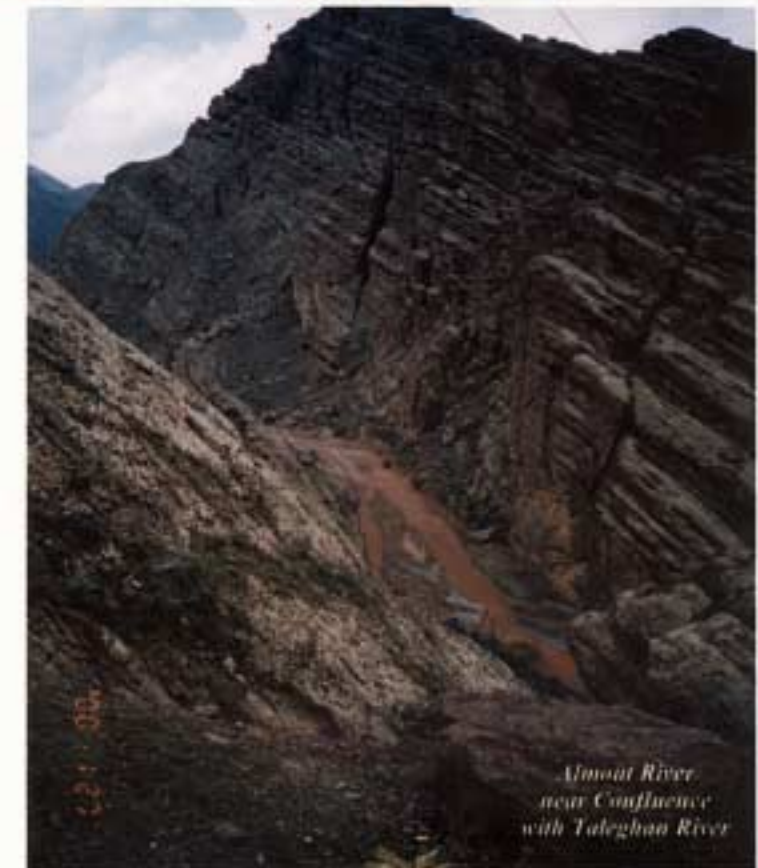
LIST OF DATABASE MAPS (2/2)

Chapter 8. Almort Water Diversion Project		
No.	Title of Drawings/Figures/Tables	Page
8.2.1.1	Features of Almort and Taleghan Rivers	8-1
8.2.1.1	Almort and Taleghan River Systems	8-2
8.2.2.1	Geologic Conditions of Almort River Basin	8-3
8.3.2.1	Alternative Almort Water Diversion Plans (1)	8-4
8.3.2.2	Alternative Almort Water Diversion Plans (2)	8-5
(Almort Diversion Dam Work)		
8.4.1.1	Geologic Conditions of Almort Diversion Damsite	8-6
8.4.1.2	Location of Borrow Areas	8-7
8.4.1.3	Location Map	8-8
8.4.1.4	Site Plan	8-9
8.4.1.5	Elevation of Diversion Dam and Intake	8-10
8.4.1.6	Sluiceway Section and Roller Gate Section	8-11
8.4.1.7	Fish Ladder Section and Overflow Dam Section	8-12
8.4.1.8	Profiles of Intake and Settling Basin	8-13
8.4.1.9	Alternative Spillway Plan (Rubber Dam Plan)	8-14
(Pipeline & Tunnel Work)		
8.4.2.1	Geological Map of Almort Diversion Tunnel	8-15
8.4.2.2	Almort Diversion Pipeline (1/2)	8-16
8.4.2.3	Almort Diversion Pipeline (2/2)	8-17
8.4.2.4	Almort Diversion Tunnel	8-18
8.4.2.5	Regulating Pond	8-19
8.5.2.1	Tunnel Boring Machine (1/2) (For Reference)	8-20
8.5.2.2	Tunnel Boring Machine (2/2) (For Reference)	8-21
8.5.2.3	Tunnel Steel Foam	8-22
8.5.2.4	Tunnel Muck Yard at Taleghan River	8-23
Chapter 9. EIA for Almort Water Diversion Project		
9.2.2.1	Ecological Environment	9-1
9.2.2.1	List of Flora by Red Data List of IUCN in the Almort River Basin	9-2
9.2.2.12	List of Mammal Species in the Almort Basin	9-3
9.2.2.13	List of Birds Species in the Almort Basin (1)	9-4
9.2.2.14	List of Birds Species in the Almort Basin (2)	9-5
9.2.2.15	List of Reptile Species in the Almort Basin	9-6
9.2.2.16	List of Fish Species in the Almort River Basin	9-7
9.4.1.1	Location Map of Existing and Proposed Dams in the Sefid-rud River Basin	9-8
9.4.1.2	Monthly Distribution of Water Demand from the Sefid-rud Dam	9-9
9.4.4.1	Manjil Dam Operation (w/o and with Taleghan/Almort Water Diversion Plan)	9-10
9.4.5.1	Manjil Dam and Astur Dam (with Taleghan/Almort Water Diversion Plan)	9-11
9.4.5.2	Manjil, Astur and Shah-rud Dams (with Taleghan/Almort Water Diversion Plan)	9-12
9.4.5.3	Comparison of Manjil Dam Operation (with and without Taleghan/Almort Diversion)	9-13

Chapter 10. Qazvin Irrigation Project		
No.	Title of Drawings/Figures/Tables	Page
10.1.2	Land Classification in the Qazvin Plain	10-1
10.2.1.1	Qazvin North Canal and Proposed Qazvin Central Canal	10-2
10.2.1.2	Flow Diagram in Existing Qazvin North Canal	10-3
10.2.2.1	Deteriorated Structures Requiring Rehabilitation	10-4
10.3.1	Irrigation Service Block under the Canal System	10-5
10.3.3.1	Conceptual Plan of Qazvin Irrigation Project	10-6
10.3.3.2	Route of Proposed Qazvin Central Canal	10-7
10.3.3.3	Proposed Qazvin Central Canal (1)	10-8
10.3.3.4	Proposed Qazvin Central Canal (2)	10-9
10.3.3.5	Proposed Qazvin Central Canal (3)	10-10
10.3.3.6	Proposed Qazvin Central Canal (4)	10-11
10.3.4.1	Typical Section of Qazvin Central Canal	10-12
10.3.4.2	Related Canal Structures (1)	10-13
10.3.4.3	Related Canal Structures (2)	10-14
10.3.4.4	Related Canal Structures (3)	10-15
Chapter 11. Conceptual Plan of Groundwater Recharge		
11.1	Groundwater Recharge Facilities Plan (1)	11-1
11.2	Groundwater Recharge Facilities Plan (2)	11-2
Chapter 12. Implementation Program of Water Management		
12.1.1	Implementation Program of Water Resources Development and Management	12-1

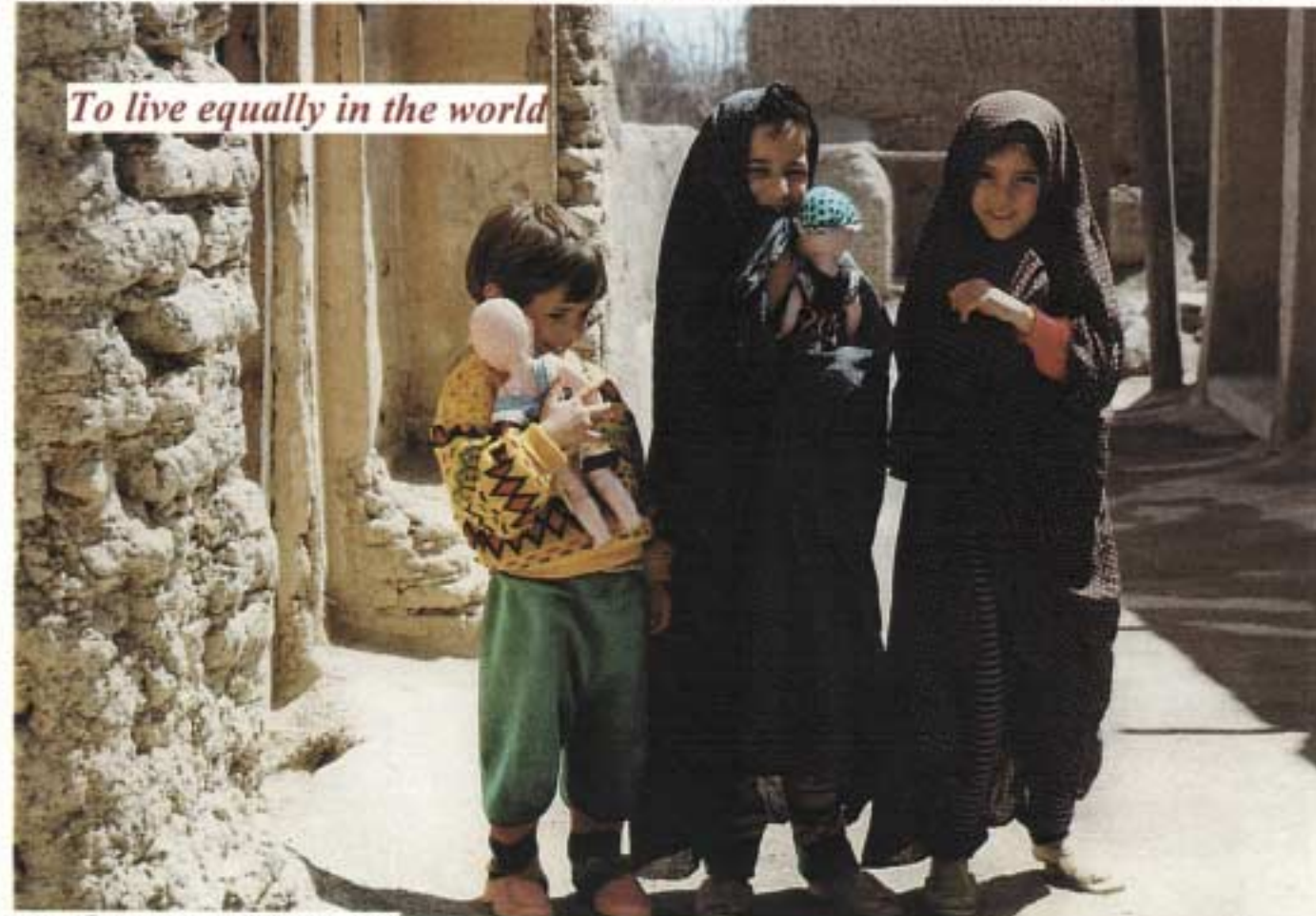
Chapter 1. Introduction		
No.	Title of Drawings/Figures/Tables	Page
	General Location Map and Typical Scenary	1-1
	What is JICA's Role ?	1-2
1.3.1	Study Area Boundary	1-3
	Project Facility Location Map	1-4

**General Location Map
and Typical Scenery**



What is JICA's Role ?

JICA (Japan International Cooperation Agency) is responsible for the technical cooperation aspect of Japan's ODA programs. JICA's programs include; (1) Technical Cooperation such as training in Japan, dispatch of experts, provision of equipment, project-type technical cooperation and **development study**, (2) dispatch of Japan Overseas Cooperation Volunteers, (3) Training and procurement of qualified personnel for technical cooperation, (4) survey and administration of Grant Aid Programs, and others.



How is This Study Going on ?

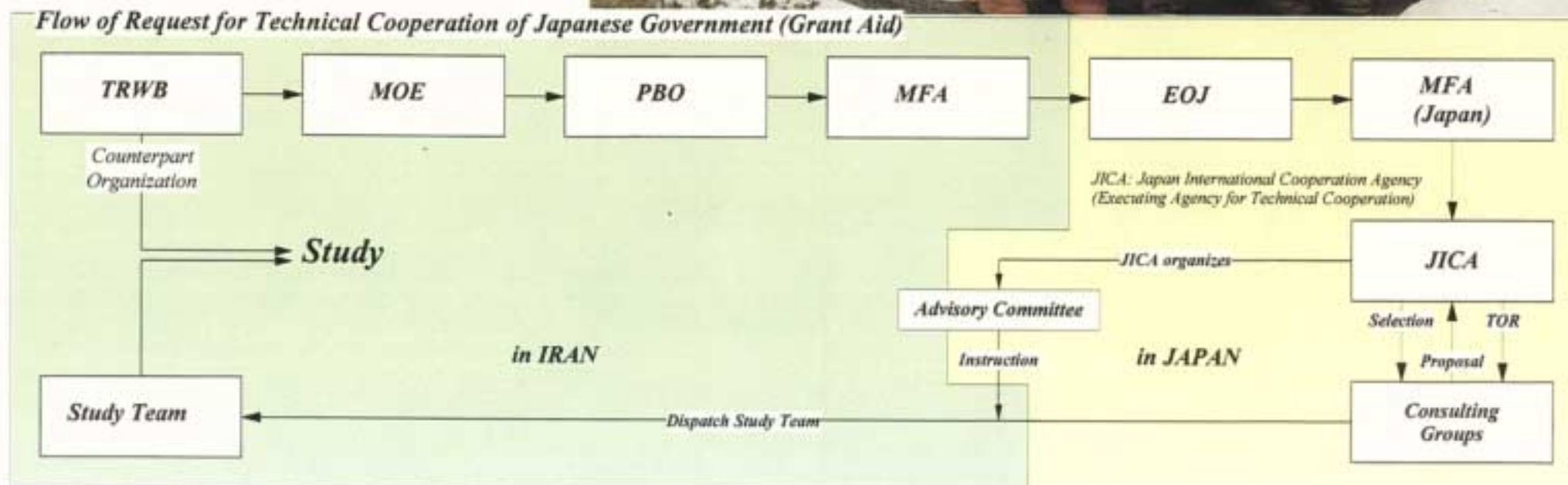
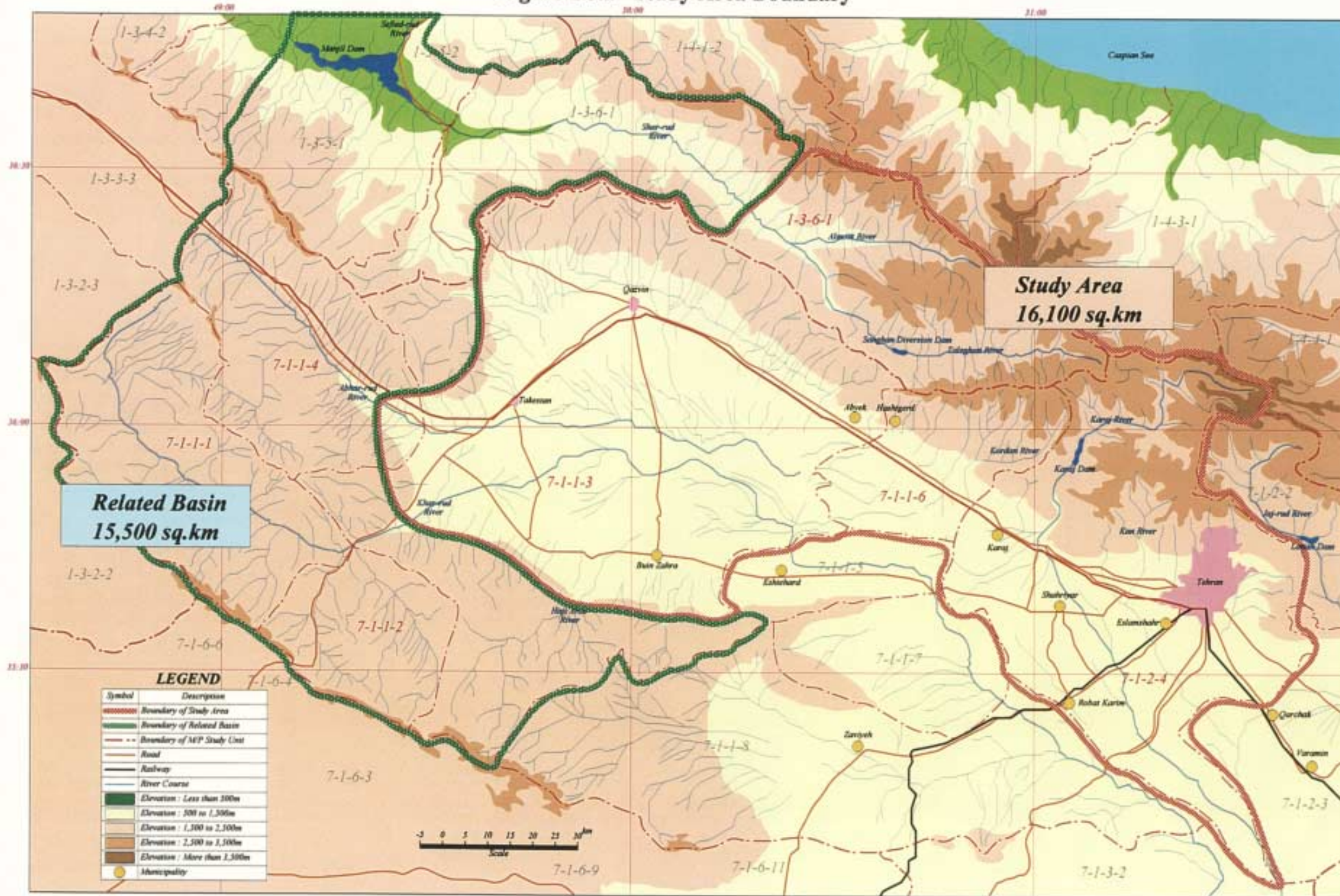
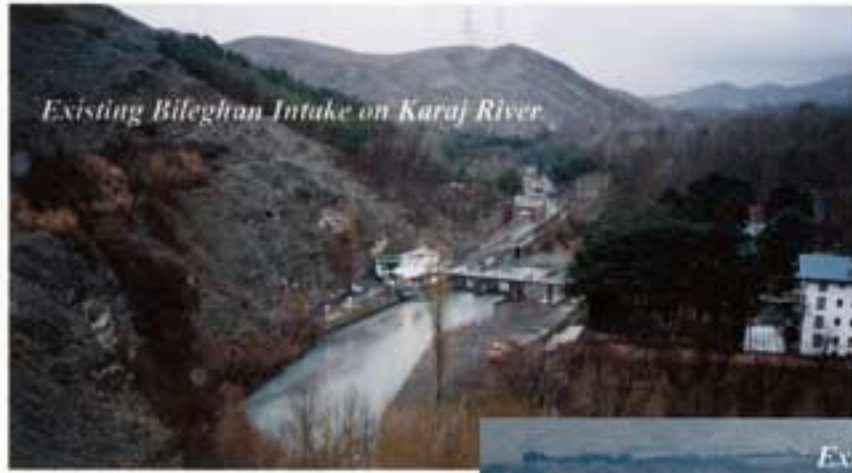


Figure 1.3.1 Study Area Boundary





Existing Bileghan Intake on Karaj River



Existing Taleghan Diversion Dam

Objective of the Study and Scope of Works

1 Objective of the Study

To establish a rational and practical water resources management plan in the western area of capital Tehran, in order to achieve effectively and smoothly the program proposed in the Master Plan

2 Scope of Works

- 1 To evaluate potential & available surface and groundwater resources
- 2 To evaluate water use plan based on the projected water demand and water allocation plan by water sources
- 3 To prepare scenarios of water resources development and allocation in short, medium and long terms
- 4 To conduct pre-feasibility study on Almut water diversion together with conceptual plan of Qazvin irrigation development
- 5 To prepare implementation program of water resources development and management

Project Facility Location Map



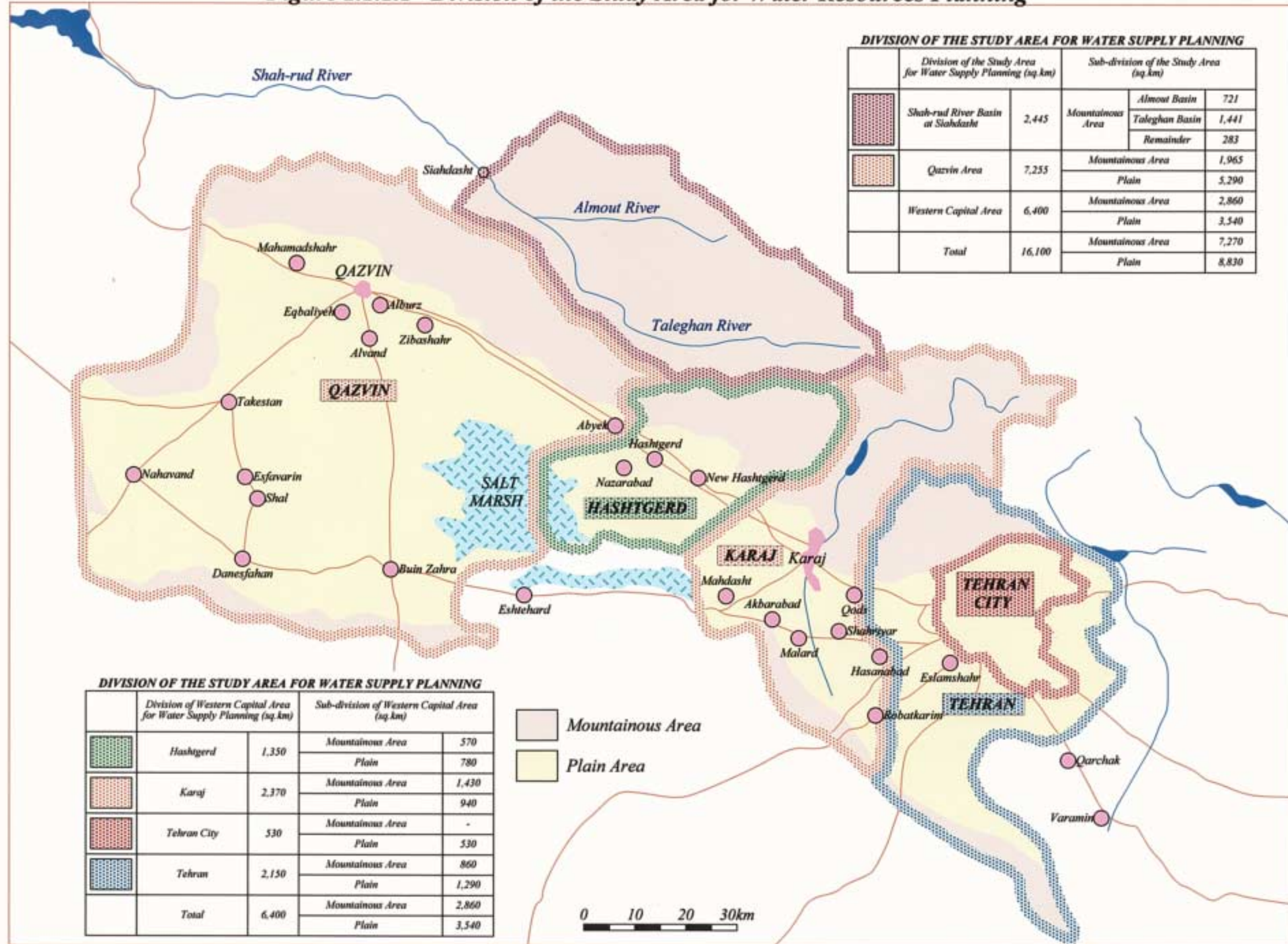
— Existing Project — Project under Construction — Proposed Project



Middle Reaches of Almut River Basin

Chapter 2. Present Conditions of the Study Area		
No.	Title of Drawings/Figures/Tables	Page
2.1.1.1	Division of the Study Area for Water Resources Planning	2-1
2.2.1.1	Topographic Conditions	2-2
2.2.2.1	Geologic Map of the Study Area	2-3
2.2.2.2	Geologic Map of Taleghan - Almut Basin	2-4
2.2.2.3	Legend of Geologic Map	2-5
2.3.1	Micro-economic Indicator at National Level	2-6
2.3.2	Regional Administration	2-7
2.3.3	Regional Demography	2-8
2.3.4	Regional Industry	2-8
2.3.5	Regional Agriculture	2-9
2.3.6	Regional Food Supply	2-9
2.4.4.1	Surface Water Supply in Tehran City	2-10
2.4.4.2	Water Allocation Plan of Tehran City	2-11
2.4.4.3	Groundwater Supply by Wells in Tehran City	2-12
2.4.4.4	Water Service Classified by Overhead Water Tank	2-13
2.4.4.5	Raw Water Supply to Tehran City	2-14
2.4.5.1	Tehran Sewage Plan	2-15
2.5.1	Land Use Condition	2-16
2.5.2.1	Monthly Irrigatin Water Requirement	2-17
2.5.2.2	Irrigation Water Demand	2-18
2.5.3	Irrigation Canal System in North Qazvin	2-19

Figure 2.1.1.1 Division of the Study Area for Water Resources Planning



DIVISION OF THE STUDY AREA FOR WATER SUPPLY PLANNING

Division of the Study Area for Water Supply Planning (sq. km)		Sub-division of the Study Area (sq. km)		
Shah-rud River Basin at Siahdasht	2,445	Mountainous Area	Almot Basin	721
			Taleghan Basin	1,441
			Remainder	283
Qazvin Area	7,255	Mountainous Area	1,965	
		Plain	5,290	
Western Capital Area	6,400	Mountainous Area	2,860	
		Plain	3,540	
Total	16,100	Mountainous Area	7,270	
		Plain	8,830	

DIVISION OF THE STUDY AREA FOR WATER SUPPLY PLANNING

Division of Western Capital Area for Water Supply Planning (sq. km)		Sub-division of Western Capital Area (sq. km)	
Hashitgerd	1,350	Mountainous Area	570
		Plain	780
Karaj	2,370	Mountainous Area	1,430
		Plain	940
Tehran City	530	Mountainous Area	-
		Plain	530
Tehran	2,150	Mountainous Area	860
		Plain	1,290
Total	6,400	Mountainous Area	2,860
		Plain	3,540

Mountainous Area
 Plain Area



LEGEND

Color	Elevation
Green	G.L. , EL. 1,500 m
Yellow	1,500 m < G.L. < EL. 2,000 m
Dark Green	2,000 m < G.L. < EL. 2,500 m
Orange	2,500 m < G.L. < EL. 3,000 m
Pink	3,000 m < G.L. < EL. 3,500 m
Blue	3,500 m < G.L. < EL. 4,000 m
White	4,000 m < G.L.

DIVISION OF STUDY AREA

No.	The Study Area	Area (km ²)
①	Shah Rud River Basin at Siahdasht	2,445
②	Qazvin Area	7,255
③	Hashtgerd	1,350
④	Karaj	2,370
⑤	Tehran City	530
⑥	Tehran	2,150
	Total	16,100

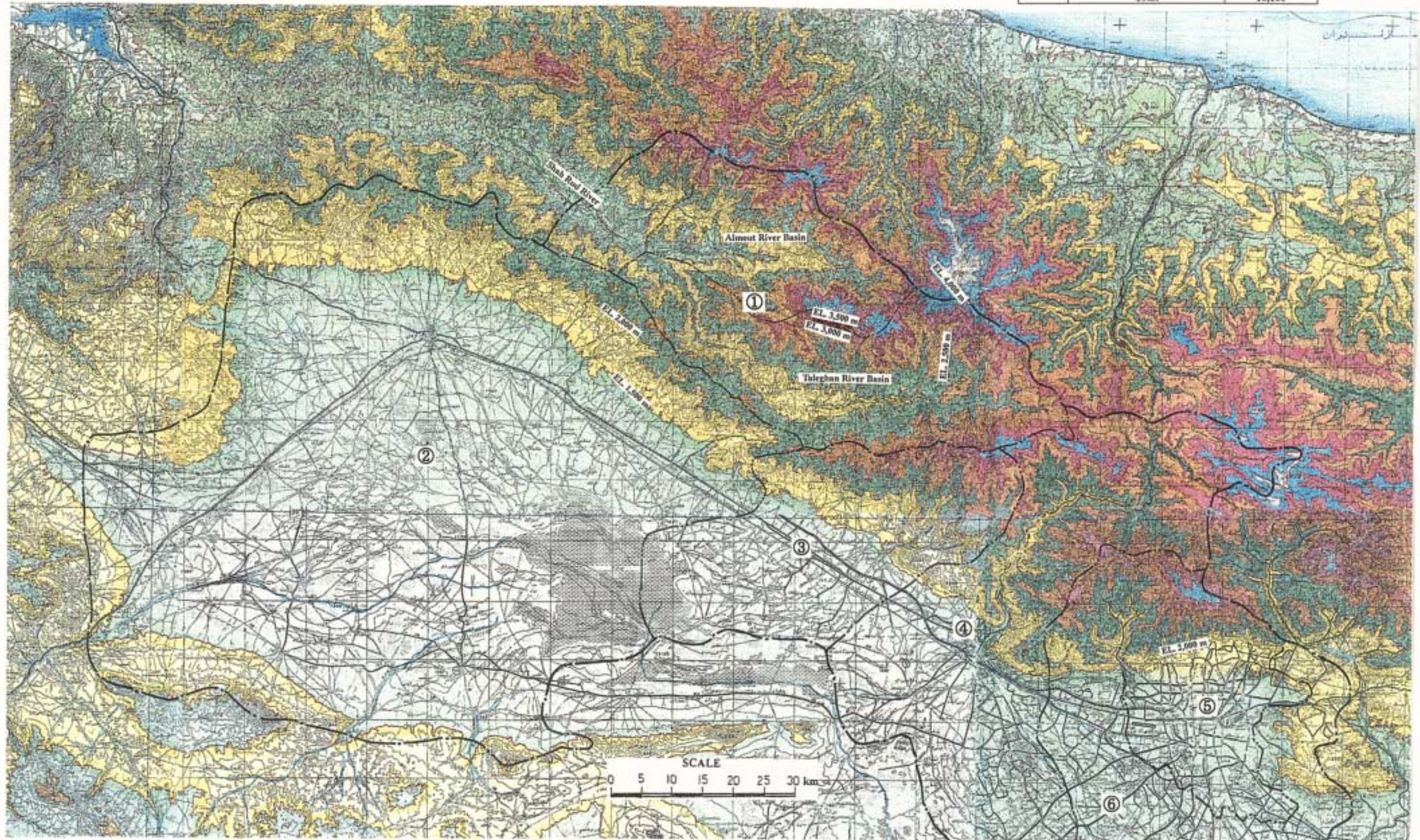
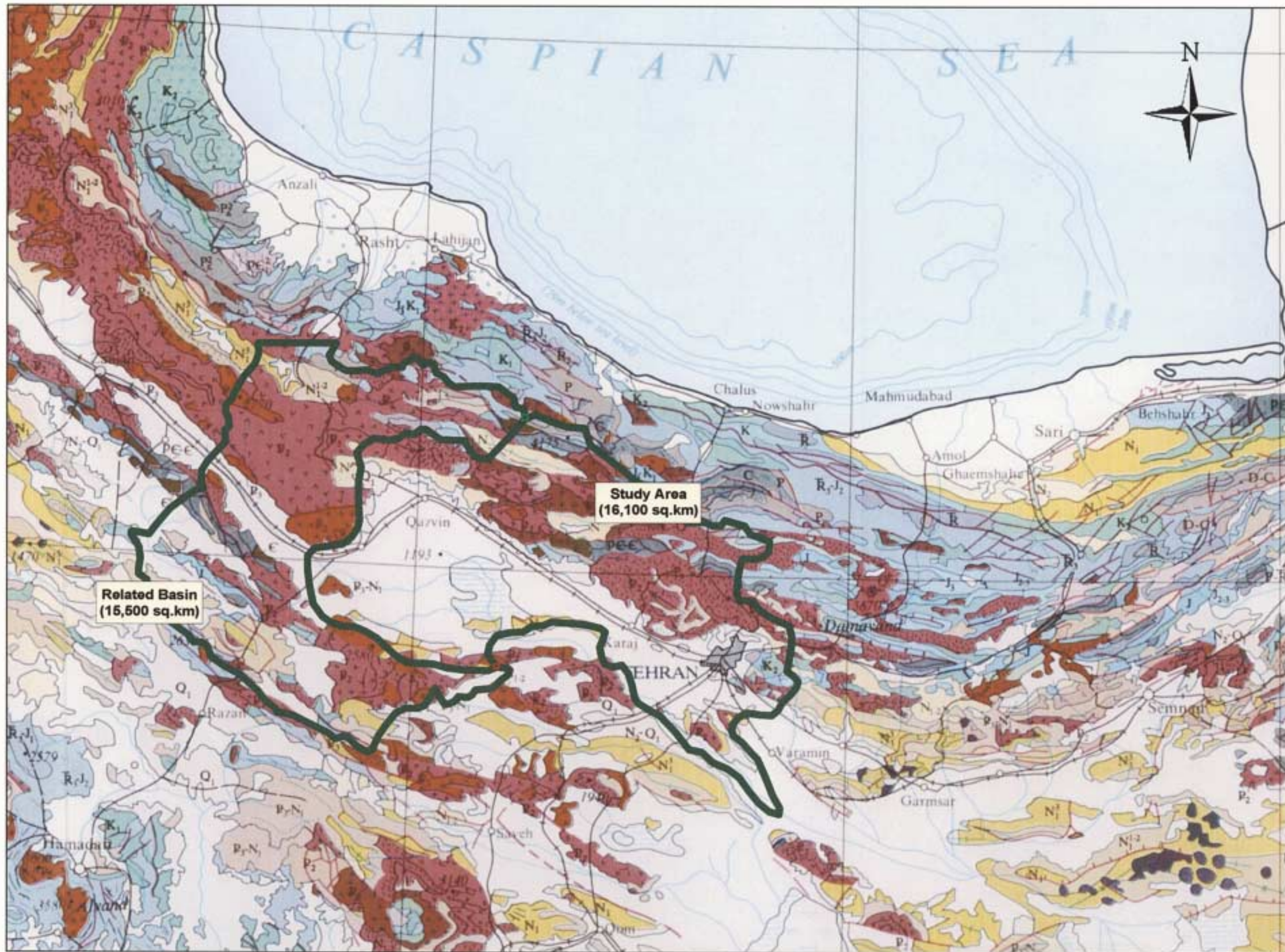


Figure 2.2.1.1 Topographic Conditions



Note: The geologic classification used in Map is referred to the "Geological Map of Iran (1989, SC=2,500,000)" prepared by Geological Survey of Iran

Figure 2.2.2.1 Geologic Map of the Study Area

Figure 2.2.2.2 Geologic Map of Taleghan-Alamout Basin

