

Disposal of the Water Accompanying Masila Oil in Yemen

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**Water is scarce and vital to all
aspects of development in
the Yemen**

Water Resources

Water Resources

1.1 Rain water:

Rainfall is the basic water resource. It varies from less than 50 mm up to 1500 mm per year.

Water Resources

1.1 Rain water:

Spate irrigation schemes are threatening by poor management.

Water Resources

1.2. Underground water:

Yemen's water crisis in relation to the agriculture sector is characterized by an intense mining of groundwater at such a rate that large parts of the rural economy could disappear within a generation

Water Resources

1.3 Demand for water has risen with population growth.

The population has doubled in the last twenty years .

Water Resources

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Yemen currently has one of the highest rates of increase in the world (3.2 percent), which implies a doubling of the population again in twenty years.

**East Part of Yemen is among
the driest areas on Earth,
adjacent to the so-called
Empty Quarter of the
Arabian Peninsula .**

Oil is now being produced at Masilah, close to (but higher than) Wadi Hadramout, an area that does support marginally viable agriculture.

Typical Rock Formations In Masila Block

No.	Aquifers	Aquifers Depth By Meter	Water by Millions Barrel In a square Mile	Water Quality
1	Jeza	0 - 120		
2	Umm Eradhuma	180 - 270	Un-Know	Potable
3	Sharwayn	25 -50		
4	Mukalla	300 - 600	640	Potable
5	Fartaq	40 - 55		
6	Harshiyat	700 - 900	742	Potable
7	Qishn		96	Water & Oil

DISPOSAL OF THE WATER ACCOMPANYING OIL 1 to 4



**3 ponds of the size 1 80 40 m &
2 150 200 m**



The ratio of oil to water is 1:4

**The quantity of water will be
4 x (quantity of oil produced per day)**

$$QW/day = 4 \times QO/day$$

Injection Schedule For Canadian Occidental Petroleum Only

Years	Injection Rate (BWPD)	Years	Injection Rate (BWPD)	Years	Injection Rate (BWPD)
1994	47.000	2001	369.000	2008	125.000
1995	144.000	2002	377.000	2009	109.000
1996	216.000	2003	366.000	2010	73.000
1997	266.000	2004	240.000	2011	71.000
1998	317.000	2005	172.000	2012	47.000
1999	338.000	2006	157.000		
2000	358.000	2007	131.000		

The growing awareness among the intellectuals and members of the Hadramout welfare and social society (HWSS) Non Governmental Organization (NGO) have risen up the issue

**The follow up of this issue
has gone through four steps**

1 – The oil company used to dispose the water accompany the oil into an earth made ponds. The water was to evaporate and / or dissipate into the ground .

This fact create environmental pollution and some animals had died, also the malaria had spread in the area.

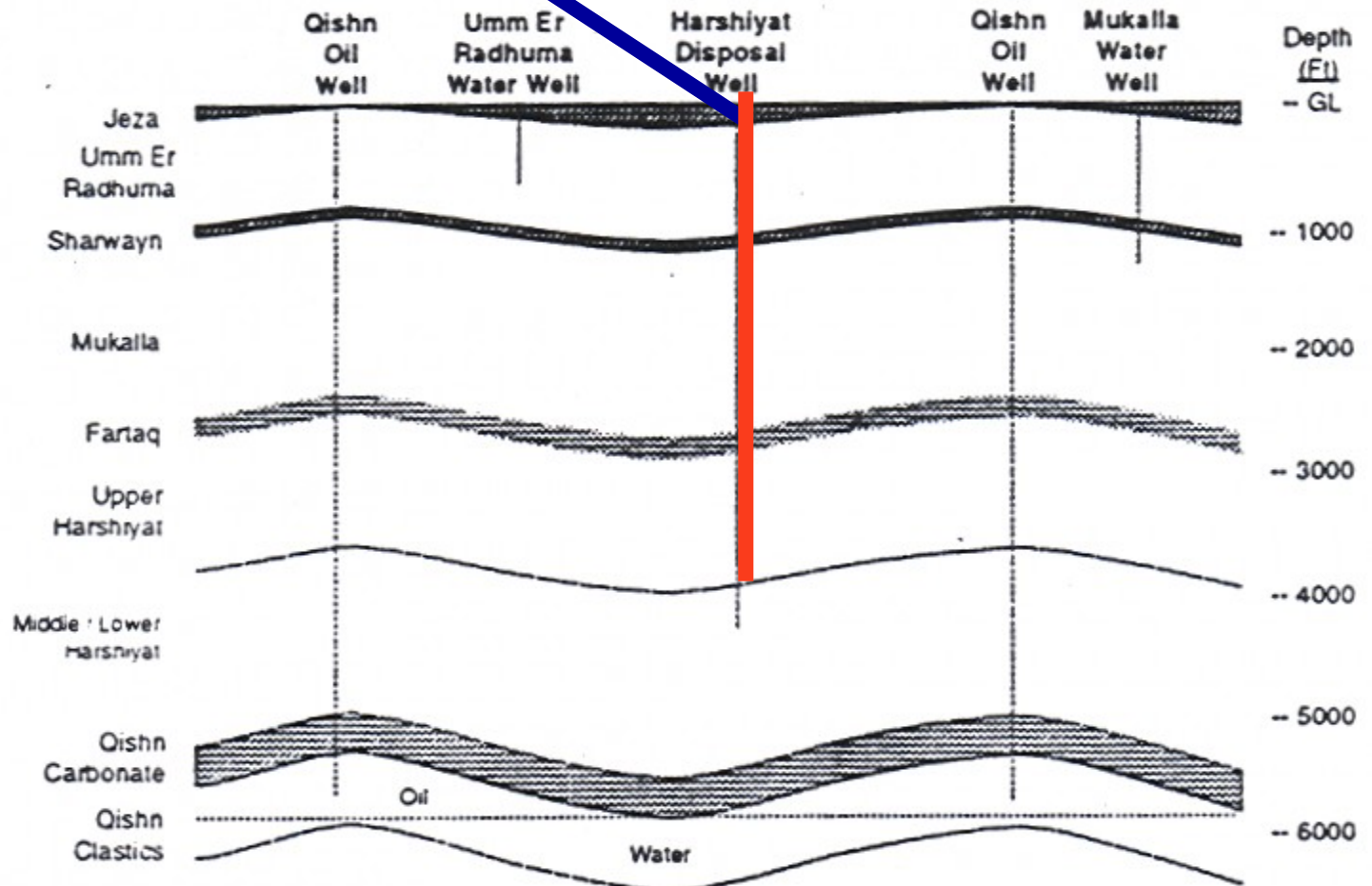
2 – The company had sealed the ponds ground and sides with plastic sheet seal which solve the problem of soil and ground water pollution.

**Which solve the problem of
soil and ground water
pollution .**

3. Under the pressure of the follow up the company started to inject the disposed water into Harshiat aquifer which contains potable water .

Harshiyat Disposal Well

Typical Rock Formations Masila Block



4 – Also under the follow up pressure, and the democratic margin in the country

**The officials in the concern
ministry and the company
informed the concerned
people that they used the
disposed water to gain
pressure for oil production**

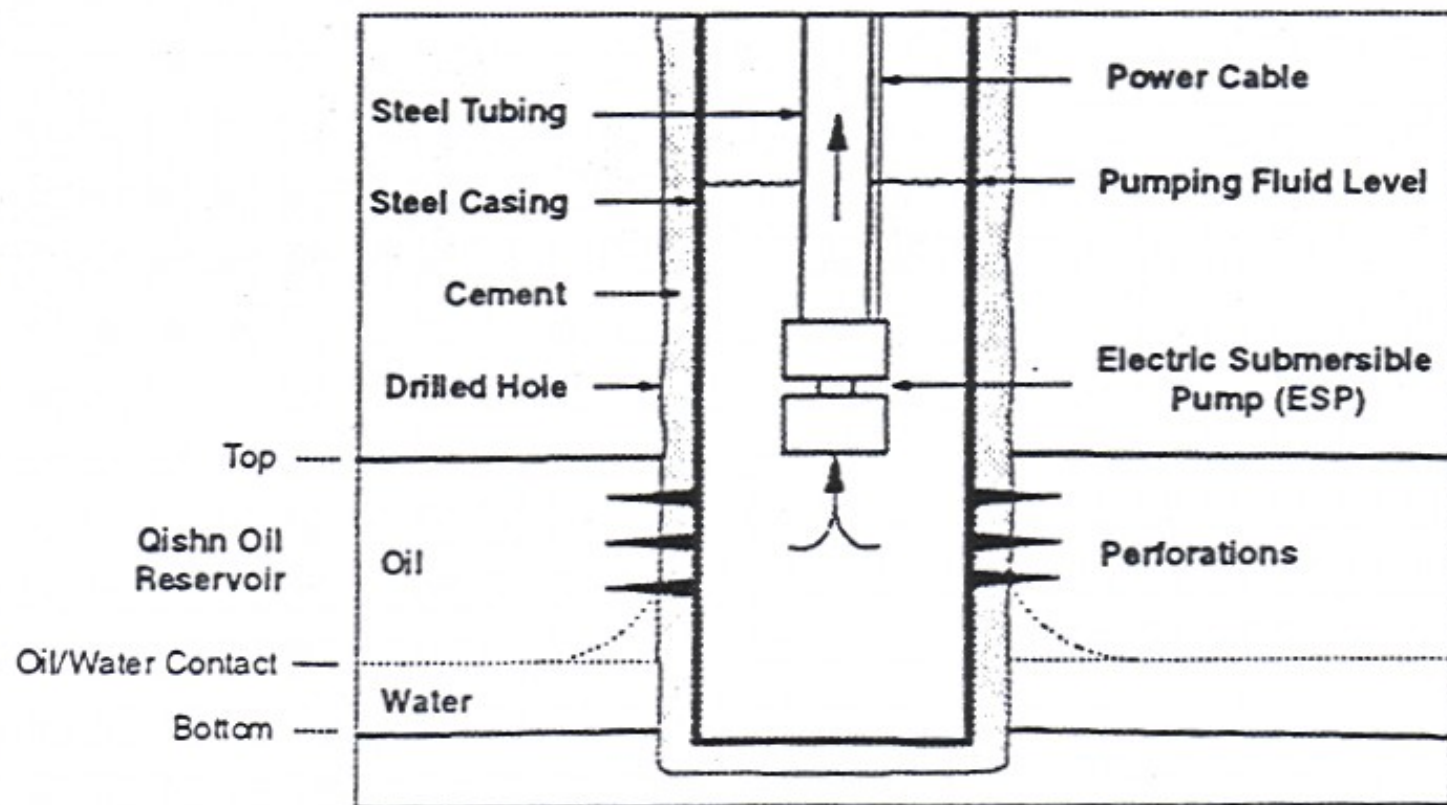
**They are injecting it to the
production oil field
(Quashan Aquder)**



YEMEN

Sayhad

Simplified Diagram Typical Qishn Oil Well



The Cost of Injection + Opportunity Costs of Masila WATER DISPOSAL

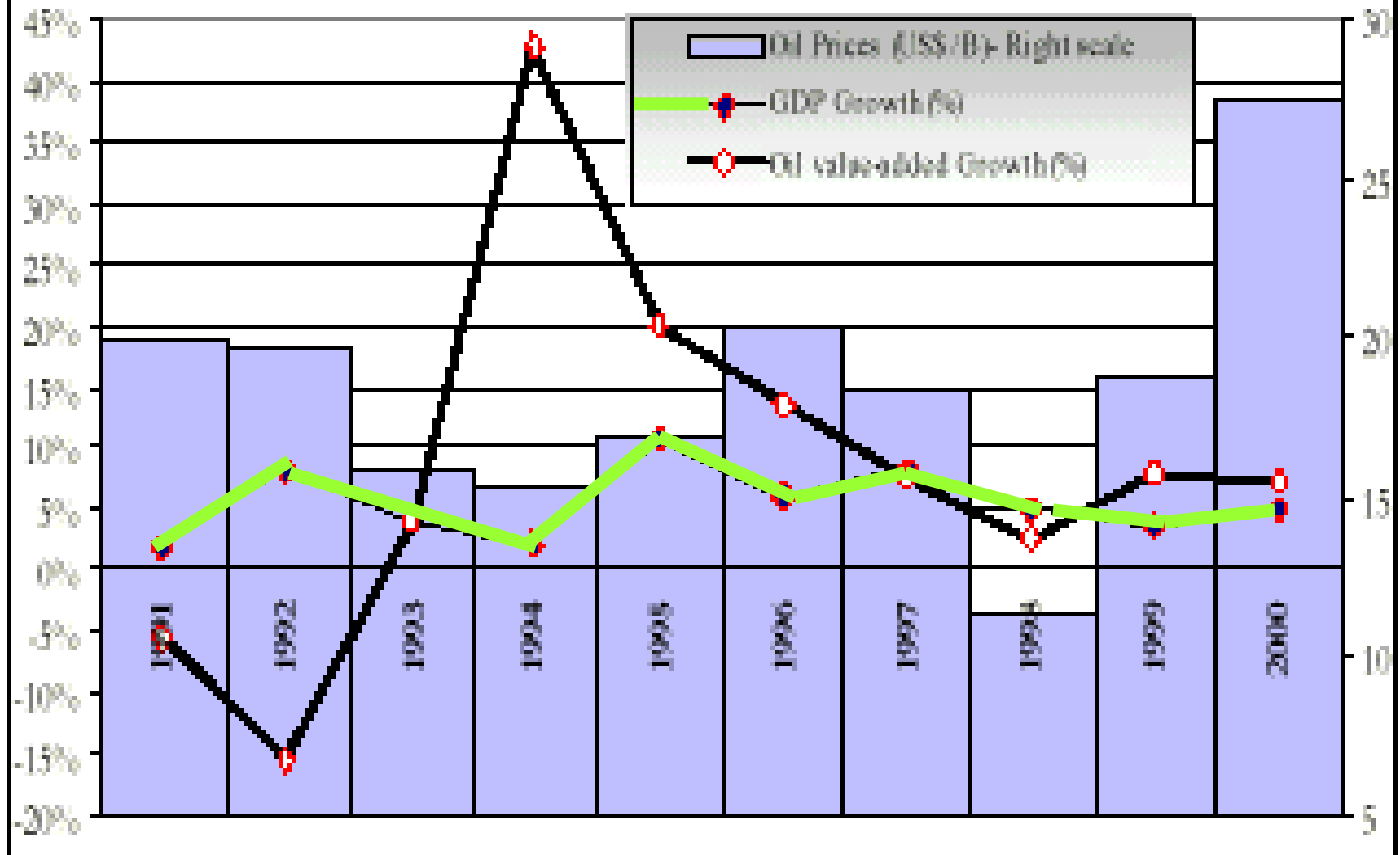
Per day * by 365 Injection per Year

- Estimated Cost of injection by 40 YR Per Barrel**
- Opportunity cost per Barrel of Water is estimated by 20 YR**

The Cost of Injection & Opportunity Costs of Masila WATER DISPOSAL

Total Cost	Costs	Cost of Injection	Quantity Per Year	Injection Rate (BWPD.000)	Years
1029300	343100	686200	17155	47	1994
3153600	1051200	2102400	52560	144	1995
4730400	1576800	3153600	78840	216	1996
5825400	1941800	3883600	97090	266	1997
6942300	2314100	4628200	115705	317	1998
7402200	2467400	4934800	123370	338	1999
7840200	2613400	5226800	130670	358	2000
8081100	2693700	5387400	134685	369	2001
8256300	2752100	5504200	137605	377	2002
8015400	2671800	5343600	133590	366	2003
5256000	1752000	3504000	87600	240	2004
3766800	1255600	2511200	62780	172	2005
3438300	1146100	2292200	57305	157	2006
2868900	956300	1912600	47815	131	2007
2737500	912500	1825000	45625	125	2008
2387100	795700	1591400	39785	109	2009
1598700	532900	1065800	26645	73	2010
1554900	518300	1036600	25915	71	2011
1029300	343100	686200	17155	47	2012

Figure 2.1: Oil Sector, Oil Prices and GDP, 1991-2000



**The loss in the productive value
of the economy is not reflected
in national accounts**

May 2004

UN Department of Economic & Social Affairs
(UNDESA)

**Sustainable Water Resources
Management Program (YEM/97/200)**

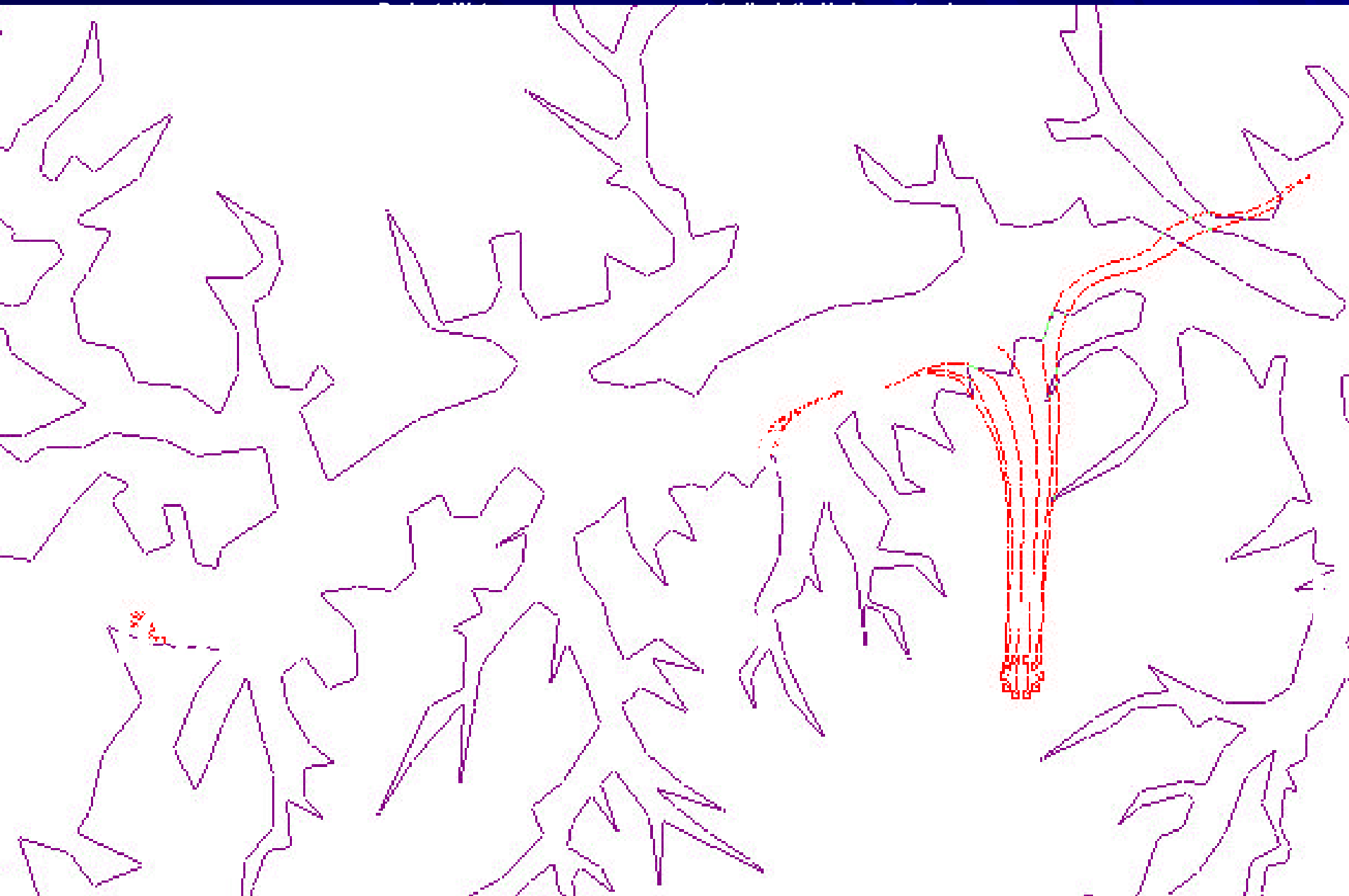
Supported by
UNDP and the Netherlands Government

Contaminant Pathways From Potential Pollutant Sources- Figure VII-15

National Water Resources Authority

SustainableWaterResourcesMangement:YEM97/200

A joint program of UNDP The Netherlands and the Government of Yemen



**The present gain may create
future losses several times
greater than it.**

Thanks