Water Reuse Pilot Project JUST

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Assoc. Prof. and Director

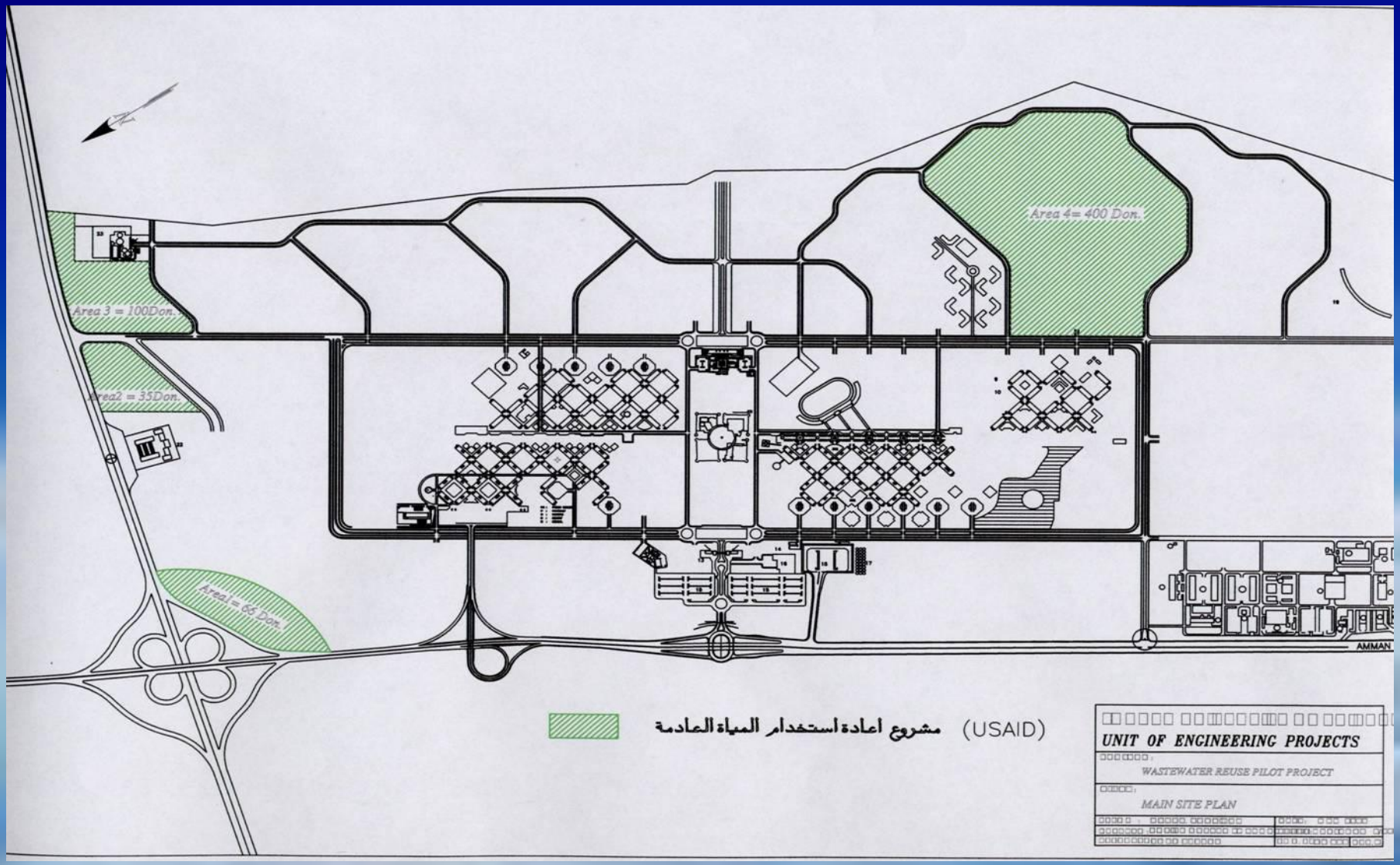
February, 2007

Water Reuse Pilot Project had land allocation

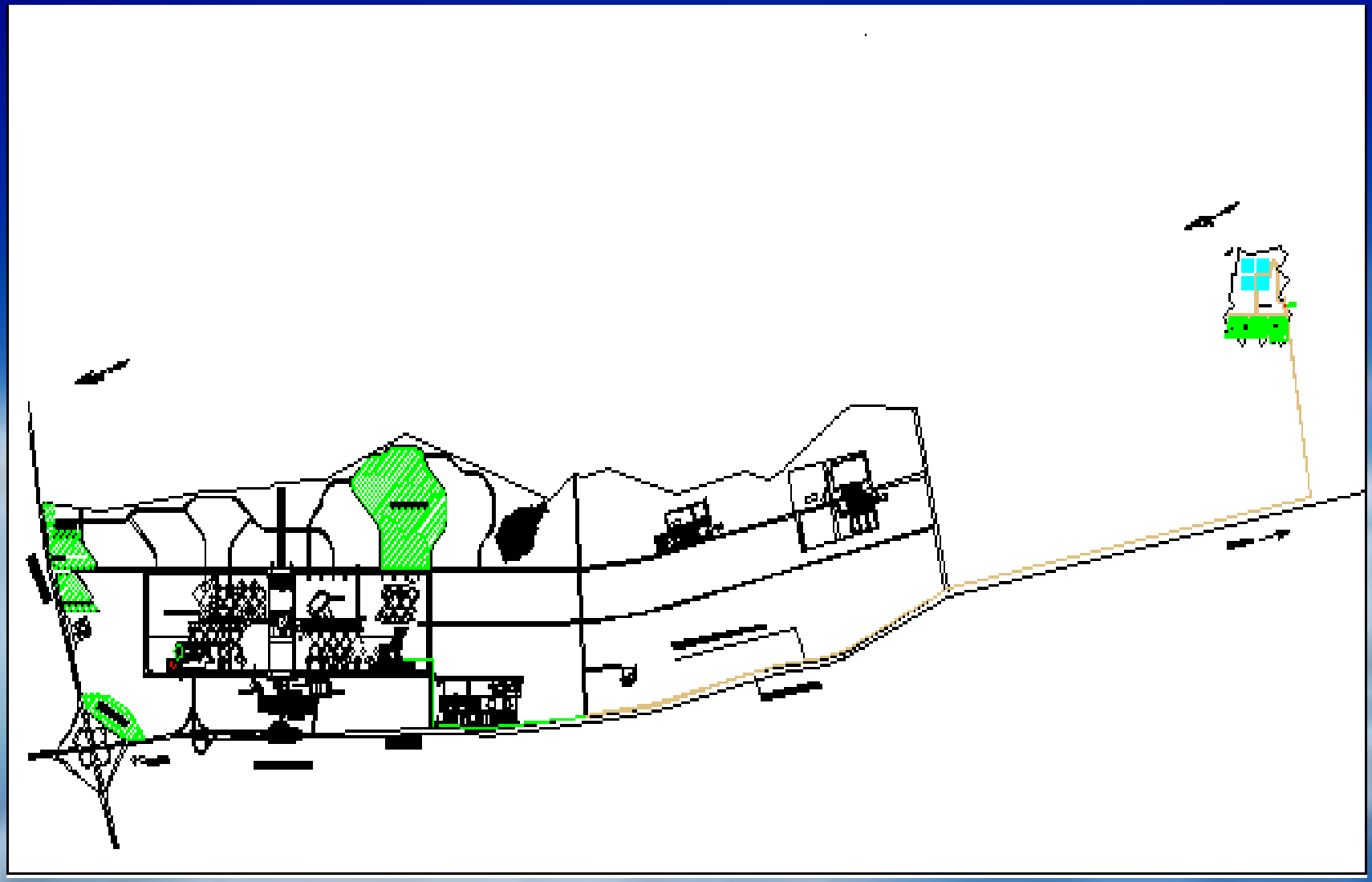
At Jordan University of Science & Technology and at Wadi Hassan.

Sites and their areas

- Site 1: 100 donums (Demonstration site)
- Site 2: 400 donums (Production site)
- Site 3: 35 donums (Memorial site)
- Site 4: 66 donums (Orchard site)
- Site 5: 120 donums at Wadi Hassan



General View of the four Sites inside JUST



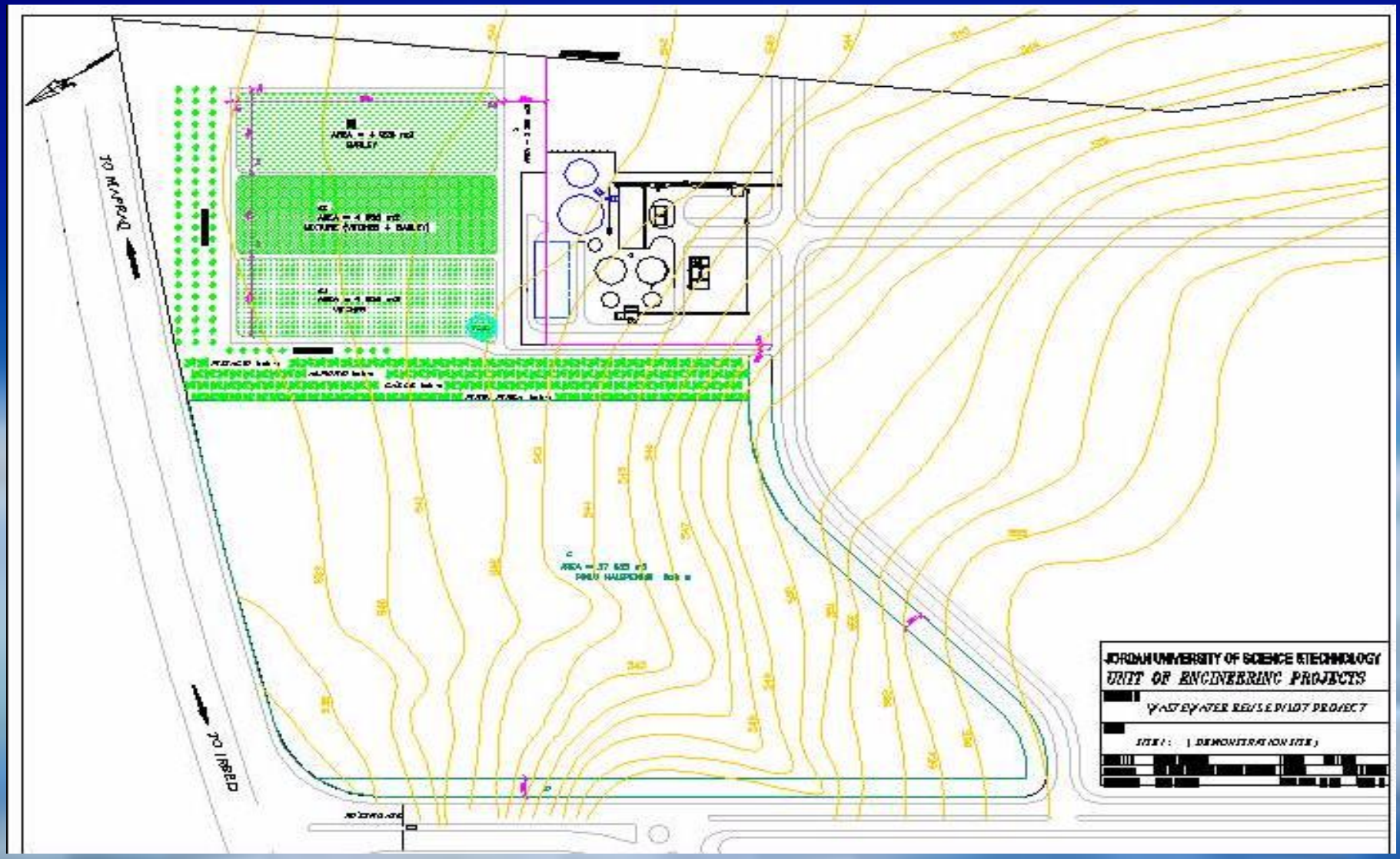
General View of all Sites including Wadi Hassan

Site 1 : Demonstration Site

Implementation started in December, 2002 by preparing surveying works and topography mapping.

Site 1

- Total area 100 Du. including 65 Du of Rehabilitation Area
- 35 remaining Du planted with different types of trees (Carob, Pistachio, Pine, Almond), Field Crops and Cactus.
- Number of trees 981



Site 1 – Demonstration Site

Site 1

Plowing the Land

Site 1

Digging the Pond

Site 1

The Reclaimed Water Pond

Site 1

Sprinkler Irrigation System Installation

Water Reuse Pilot Project / JUST

Site 1

Last View Of the Irrigation System

Trickle Irrigation System Installation

Water Reuse Pilot Project / JUST

Site 1

General View of Planted Trees

Site 1

Last View of Planted Trees

Site 1

Field Crops before Harvesting

Site 1

Harvesting of Field Crops

Site 1

Baling of Field Crops

Water Reuse Pilot Project / JUST

Site 1

Field Crops After Baling

Water Reuse Pilot Project / JUST

Site 1

Cactus Planting

Water Reuse Pilot Project / JUST

Site 1

Site 1

Water Marks Installation

Water Reuse Pilot Project / JUST

Site 1

Head Unit Room Installation

Water Reuse Pilot Project / JUST

Head Unit Room

Site 2: Production Site

- Total area 400 Du.
- 300 Du. (Including 120 Du. research area) planted with different types of trees (Almond, Apple, Figs, Carob, Cherry, Walnut, Pecan, Pine, Loquat and Pomegranate)
- 100 Du planted with Cactus.
- Number of trees 7426

Site 2

Site 2: Production Site

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Site 2

Trickle Irrigation System

Water Reuse Pilot Project / JUST

Site 2

Reclaimed, Fresh and Mixed Water Ponds

Site 2

Cactus Planting

Trees Planting

Site 2

Last View of Planted Trees

Site 2

Transfer Line

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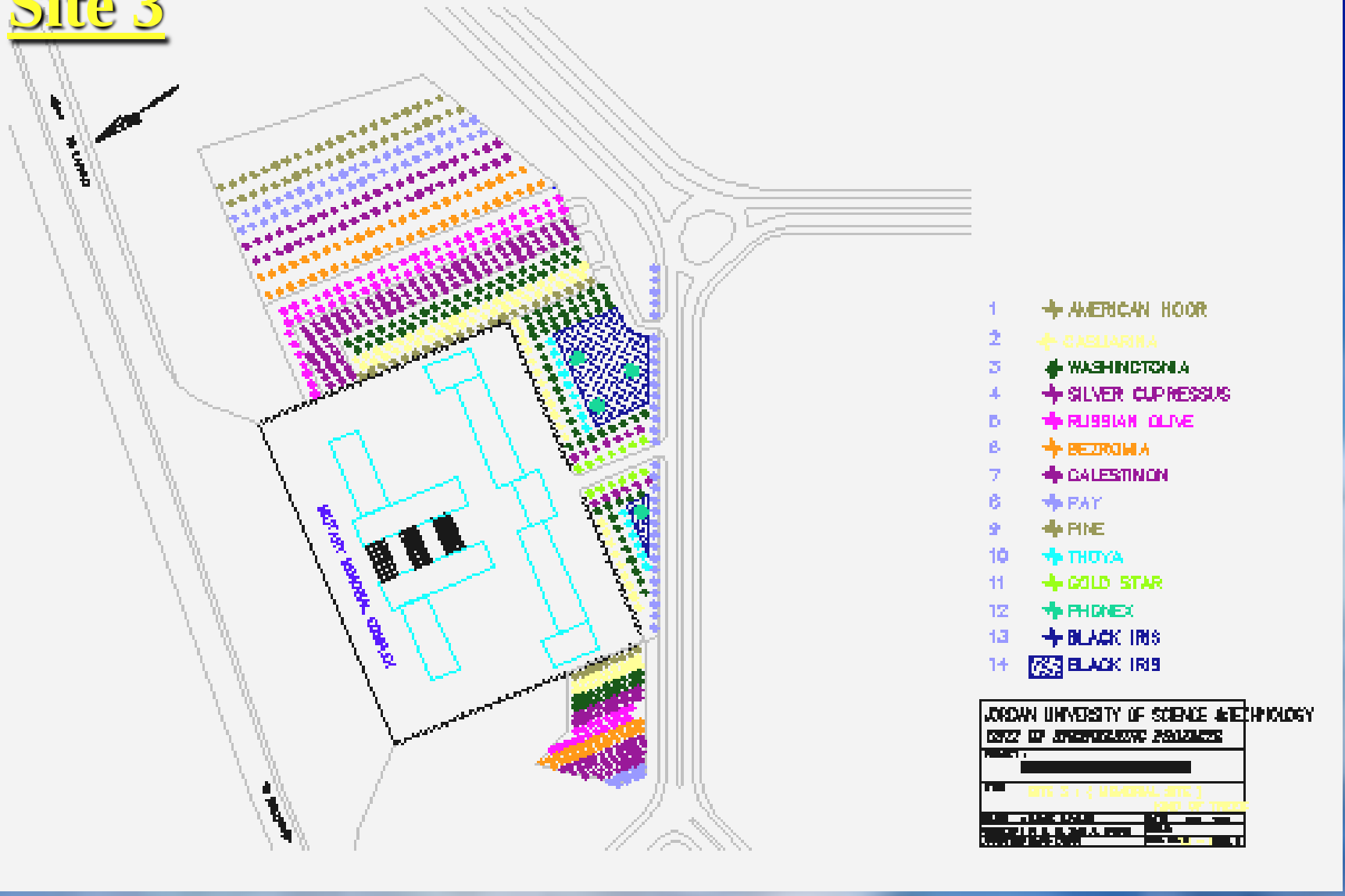
Site 3: Memorial Site

- Total area 35 Du.
- Planted with variety of Ornamental trees and Shrubs such as Hoor, Pine, Cupressus, Pay, Washingtonia, Thoya, Goldstar, Black Iris, Bezromia, Calestimon , Tilia, Palm and Casuarina.
- Number of trees and shrubs 450

Site 3



Site 3: Memorial Site

Water Reuse Pilot Project / JUST

Site 3

Trickle Irrigation System

General View of Trees

Water Reuse Pilot Project / JUST

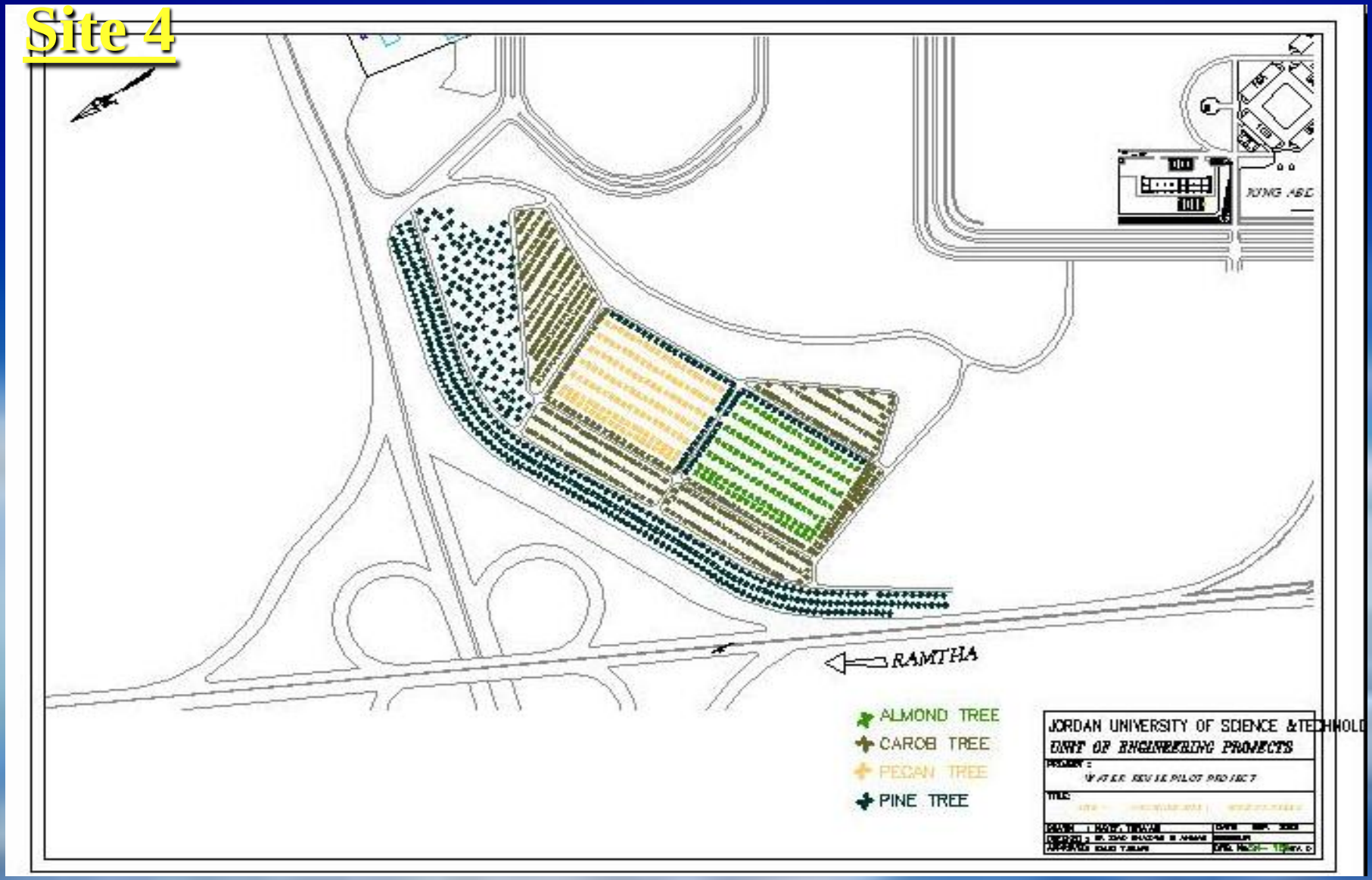
Site 3

Last View of Planted Tress

Site 4: Orchard Site

- Total area 66 Du.
- Planted with Walnut, Pine, Almond, and Carob .
- Number of trees 1130

Site 4



Site 4: Orchard Site

Site 4

Trickle Irrigation System

Water Reuse Pilot Project / JUST

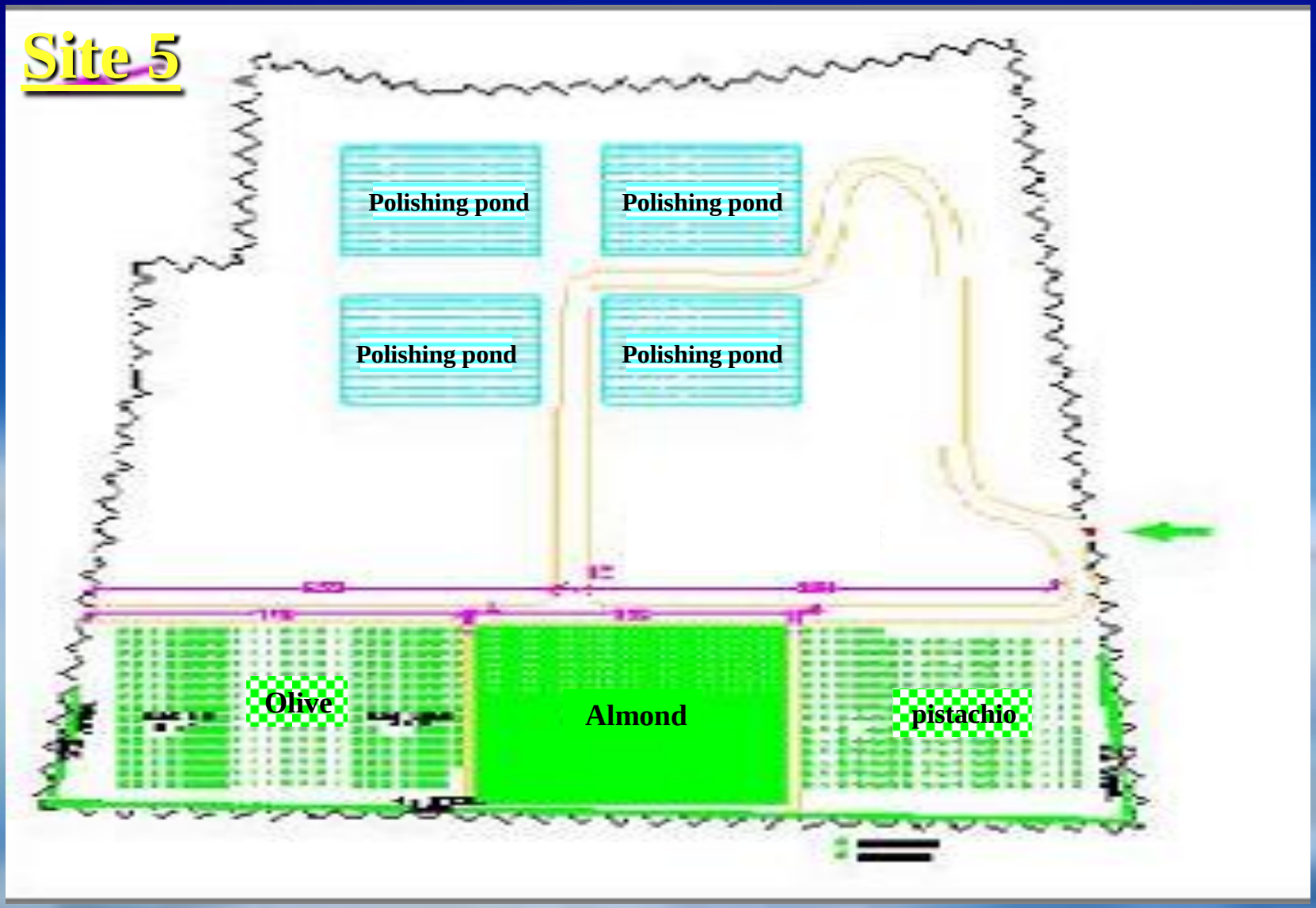
Site 4

Last View of Planted Trees

Site 5 : Wadi Hassan Site

- Total area 120 Du.
- Planted with Pine, Pistachio, Olives (K18, Baladi, and Nabali), Almond, Figs, Pomegranate and Carob.
- Number of trees 2065

Site 5



Plan View for Planted Area

Site 5

Before Any Implementation

Site 5

Land Harrowing

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Site 5

Land Plowing

Site 5

Cash Crops Planting

Site 5

Last View of Trickle Irrigation System

Water Reuse Pilot Project / JUST

Site 5

Sand and Screen Filters

Environmental Data

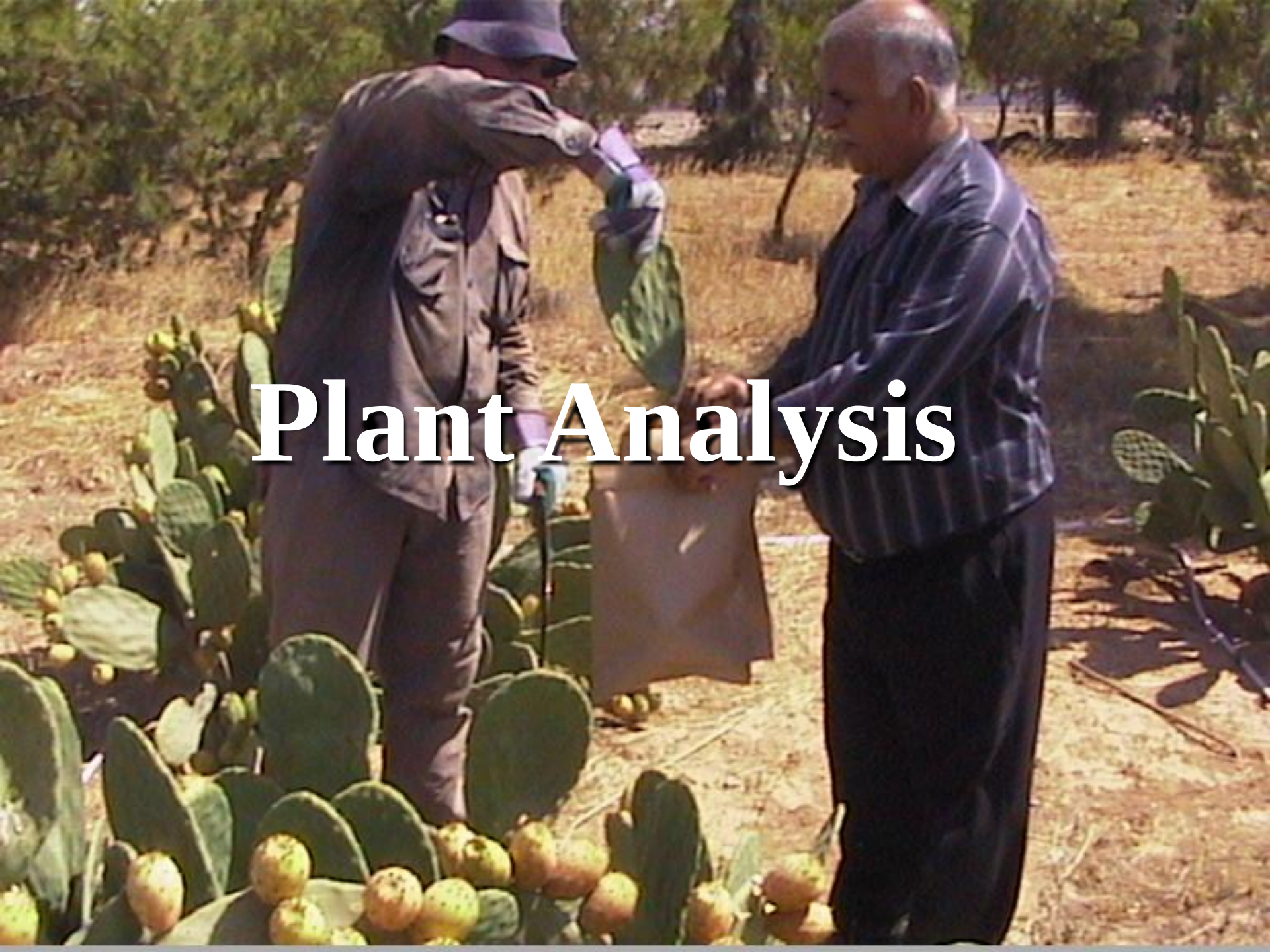

Water Quality Data

JUST Wastewater treatment plant

ITEM	Standard for Irrigation	July, 2005	Dec.,2005
pH-Eff	6.0-9.0	7.6	7.3
DO-Eff (mg/L)	Not below 2mg/L	3.1	3.1
TDS.EFF (mg/L)	0-1500	845	740
BOD_5-EFF (mg/L)	0-200	10	10
COD-Eff (mg/L)	0-500	25	20
NO_3-N EFF (mg/L)	0-45	30	25
CL (mg/L)	0-400	134	155
PO_4-P -EFF (mg/L)	0-30	4.1	5.4

Wadi Hassan Wastewater Treatment Plant

ITEM	Standard for Irrigation	July, 2005	Dec., 2005
pH-Eff	6.0-9.0	7.5	7.6
DO-Eff (mg/L)	Not below 2 mg/L	5.8	6.5
TSS-Eff (mg/L)	0-150	19.17	18.8
TDS.EFF (mg/L)	0-1500	1100	1286
BOD_5-EFF (mg/L)	0-200	4.33	4.38
COD-Eff (mg/L)	0-500	79.18	69
NO_3-EFF (mg/L)	0-45	4.5	3.54


Plant Analysis

Plant sample		N%	P%	K%	Na %	Cl%	Ca %	Mg %	Zn*	Cu*	Mn*	B*
Mixture**	Control	1.12	0.08	1.38	0.44	0.44	0.88	0.22	8	2	68	0.64
	Treated	1.2	0.069	1.66	0.5	0.71	0.85	0.23	5	2	52	0.78
Vetch	Control	2.52	0.07	2.4	0.36	0.36	1.37	0.35	9	4	32	1.16
	Treated	2.28	0.1	2.4	0.35	0.71	1.36	0.33	6	3	31	1.07
Barley	Control	0.78	0.05	0.94	0.31	0.71	0.58	0.16	6	1	56	0.25
	Treated	1.68	0.07	1.25	0.69	0.71	0.57	0.19	5	2	45	0.47
GUIDELINES		2-5	0.2-0.5	1-5	1-10	.2-2	.1-1	.1-.4	20-100	5-20	20-300	10-100

* Zn, Cu, and Mn are in ppm
** Mixture (vetch + barley)

Field Crops Testing Results

Results for Barley analysis done by WAJ laboratories, samples date: June 19th, 2005

Parameter	Unit	Barley
E-Coli	MPN/g	<0.3
Helminth Eggs		Pathogenic Helminth eggs were not seen

Analysis results for harvested fruits of olives

Type of Olives	Ash (%)	Moisture (%)	Protein (%)	Fat (%)
Nabaly Muhasan	1.79	58.44	5.57	14.19
Nabaly Balady	2.0	45.33	4.53	18.69
Large Black	1.95	58.00	4.94	16.85
Spanish variety	1.69	61.31	6.63	17.75


Soil Analysis

Baseline Soil properties Results

TEST	UNIT	Site 1 cash crops	Site 1 field crops	Site 5 cash crops	Site 5 forest crops
Moisture	%	9.23	6.11	7.76	9.17
NH3-N	mg/kg	3.00	2.00	1.00	< 1.0
T-N	mg/kg	965	1028	779	606
SO4	mg/kg	34.7	13.9	24.8	25.8
NO3-N	mg/kg	32.7	3.8	13.9	7.8
PO4-P	mg/kg	78.6	82.1	84.1	60.1
Cu	mg/kg	27.27	27.33	22.14	29.63
Zn	mg/kg	111.25	105.29	101.5	114.73
Fe	mg/kg	23400	23400	7601	28498
Mn	mg/kg	998	723	627	970
B	mg/kg	3.7	3.6	4.6	4.2
pH	-	8.3	8.6	8.3	8.6

TEST	UNIT	Site 1 cash crops	Site 1 field crops	Site 5 cash crops	Site 5 forest crops
EC	ds/m	1.12	0.55	0.8	0.58
Ca	meq/L	6.00	3.00	4.00	2.00
Mg	meq/L	10.00	3.5	3.0	2.0
Na	meq/L	2.48	1.73	2.73	2.22
Cl	meq/L	5.00	2.5	5.00	5.00
Total cation	meq/L	18.48	8.23	9.73	6.22
SAR		0.88	0.96	1.46	1.57
OM	%	3.92	3.51	3.65	2.68
CEC	meq/100 g	28.67	29.91	30.52	36.70
P	ppm	45.76	30.53	23.73	22.11
K	ppm	489.28	489.28	489.28	489.28
Texture	-	clay	Silty clay	Silty clay	clay

Public Awareness Activities and Training

Fig

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Agriculture Master Students visit (April, 2006)

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The Hashemite University student visit to the project Sites. (Jan. 4th, 2006.)

Jerash Private University Student visit to the Project (Site 1),November, 2005.

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Team Makeup

Consultants	7
Environmental/Wastewater Engineer	2
Agriculture Engineer	4
Training & PA Support	1
Driver	1
Full Time Laborer	1
Secretary	1

Capacity Building by Water Reuse Project

Activity	# of JUST beneficiaries
Technical visit to the US	2
Technical visit to Tunis	2
Technical visit to Morocco	2
Workshop in Egypt	4
Conference on salinity impacts of WW Reuse in Pakistan	2
Workshop in Amman (Reuse Management)	2
IPM workshop at Dead Sea	2
Knowledge Center Training at Dead Sea	3

Capacity Building Opportunities through TL

Activity	# of JUST beneficiaries
1 month Training on Pollution Control Technology in Tunis by JICA	1 (Head of O&M Department)
10 days training on Salinity & reuse in Pakistan by OIC	1 (Head of Agriculture Services Department)
2 weeks technical visit to the US by IALC	2 (Head of Agriculture Services Department and TL)
Training on Biosolids Reuse at RSS and by IALC	2

New Partnerships

gtz	Involvement in the Guidelines for irrigation water quality
InWent	International Training Workshops on Reuse issues
JICA	Training Opportunities
OIC	Training Opportunities
IALC	Training Opportunities
MWI	Grant for 9.2 KM pipeline
IDRC/NEF	Reuse in Ecohealth Research
IALC& BRDC	Extention program and Distant Learning Graduate Course on Reuse


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New Partnerships

MoA	USAID, JUST: DL , Extention, more?
NCARTT &RSS	Water management program, Extention Activity
EPIA	Possible PVs, EPIA 1 in 2004, EPIA 2 in 2007…..Ecosites
DFID	PPP in water and sanitation
GWP	Training Opportunities
IFS	Small research grants
NATO	RBF at Zarqa River


Thank you