REPUBLIC OF YEMEN

MINISTRY OF AGRICULTURE AND IRRIGATION

GROUNDWATER & SOIL CONSERVATION PROJECT
(IDA CREDIT 3860 - YEM)

PROJECT COORDINATION UNIT (SANA'A)

SALIENT FEATURES OF SPATE SCHEMES UNDER GSCP

SANA'A
MAY 2011

SUMMARY OF SPATE SCHEMES UNDER GSCP		
SCHEMES DESIGNED IN HOUSE BY GSCP		
S. NO.	**GOVERNORATE**	**NAME OF SCHEME**
1	TAIZ	Al Khair, Wadi Al Khair (Head Works)
		Al Khair Canal Rehabilitation Works
2	LAHEJ	Al Kadasia, Wadi Ma'aden
SCHEMES DESIGNED BY M/S HYDROPLAN		
S. NO.	**GOVERNORATE**	**NAME OF SCHEME**
1	TIHAMA	Al Domeyah, Wadi Jehaf, Al Maraw'ah
		Al Shalae'ah, Wadi Jehaf, Al Maraw'ah
		Al Sharifeyah, Wadi Siham
2	TAIZ	Al Khershaab, Wadi Nizal Al Rahidah
3	IBB	Wadi Al Dour Al Odein
		Jeblah, Wadi Al Seil, Jeblah
4	ABYAN	Obar Al Qureinah, Wadi Maran, Moudiah
5	SHABWA	Garadan, Wadi Beihan, Beihan
6	HAJJA	Wadi Ayan Bani Qays
		Mahal Aman, Wadi Ayan
		Al Makawa'ah, Wadi Habl, Abs
		Shat Al Barad, Wadi Hayran Mostaba
7	AL DALEH	Al Reda'ah, Wadi Al Eshari , Al Daleh
		Al Mehrar, Wadi Al Eshari, Damt, Al Daleh
8	AL BEIDA	Tiaab, Wadi Al Mas'ouq
8	HADRAMOUT	Maharet, Wadi Ein & Howrah
		Ghowrah, Wadi Al Ein & Howrah
		Nata'a & Karantoo'a, Wadi Rakhiah
		Sahwah, Wadi Rakhiah
		Al Hejei, Wadi Rakhiah

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SALIENT FEATURES		
AL KHAIR SPATE DIVERSION WORKS WADI AL KHAIR TAIZ		
GENERAL		
NAME OF SCHEME	:	AL KHAIR SPATE DIVERSION WORKS
DESIGNED BY	:	GSCP
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TAIZ
CONTRACT AMOUNT	:	US $ 159,000
LOCATION		
WADI	:	AL KHAIR
GOVERNORATE	:	TAIZ
DISTRICT	:	AL SHAMSARA
NORTH	:	13º 15' 67''
EAST	:	44º 03' 32"
ALTITUDE	:	1160 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	95 ha
NUMBER OF FAMILIES	:	45
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	75 m^3/sec
CATCHMENT AREA	:	62 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	75 m^3/sec
LENGTH	:	25 m
HEIGHT ABOVE WADI BED	:	1.50 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	1.05 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. X 1.5 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
SILT SLUICE		
DESIGN DISCHARGE	:	3 m^3/sec
NUMBER OF BAYS	:	1 NO. X 1 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 160,000
INTERNAL RATE OF RETURN	:	11 %

AL KHAIR SPATE DIVERSION WORKS WADI KHAIR TAIZ

AL KHAIR SPATE DIVERSION WORKS

DOWNSTREAM VIEW OF THE WEIR, AND SILT SLUICE

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SALIENT FEATURES		
AL KHAIR CANAL REHABILITATION WORKS TAIZ		
GENERAL		
NAME OF SCHEME	:	REHABILITATION OF CANAL SYSTEM OF AL KHAIR SPATE WORKS WADI AL KHAIR TAIZ
DESIGNED BY	:	GSCP
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TAIZ
CONTRACT AMOUNT	:	US $ 137,000
LOCATION		
WADI	:	AL KHAIR
GOVERNORATE	:	TAIZ
DISTRICT	:	AL SHAMSARA
NORTH	:	13º 15′ 67″
EAST	:	44º 03′ 32”
ALTITUDE	:	1160 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	95 ha
NUMBER OF FAMILIES	:	45
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	75 m^3/sec
CATCHMENT AREA	:	62 km2
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	1.05 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. X 1.5 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
CANAL SYSTEM		
LENGTH OF CANAL	:	ABOUT 3 KM
TYPE OF CANAL STRUCTURES IN DIFFERENT REACHES	:	BOTH SIDE MASONRY WALLS, EARTHEN CANAL, ONE SIDE MASONRY WALL AND ANOTHER SIDE AS NATURAL ROCK, CULVERTS, CHECK DAM IN WADI ADEN WHERE CANAL CROSSES THIS WADI, MASONRY AQUEDUCT, LINED CANAL

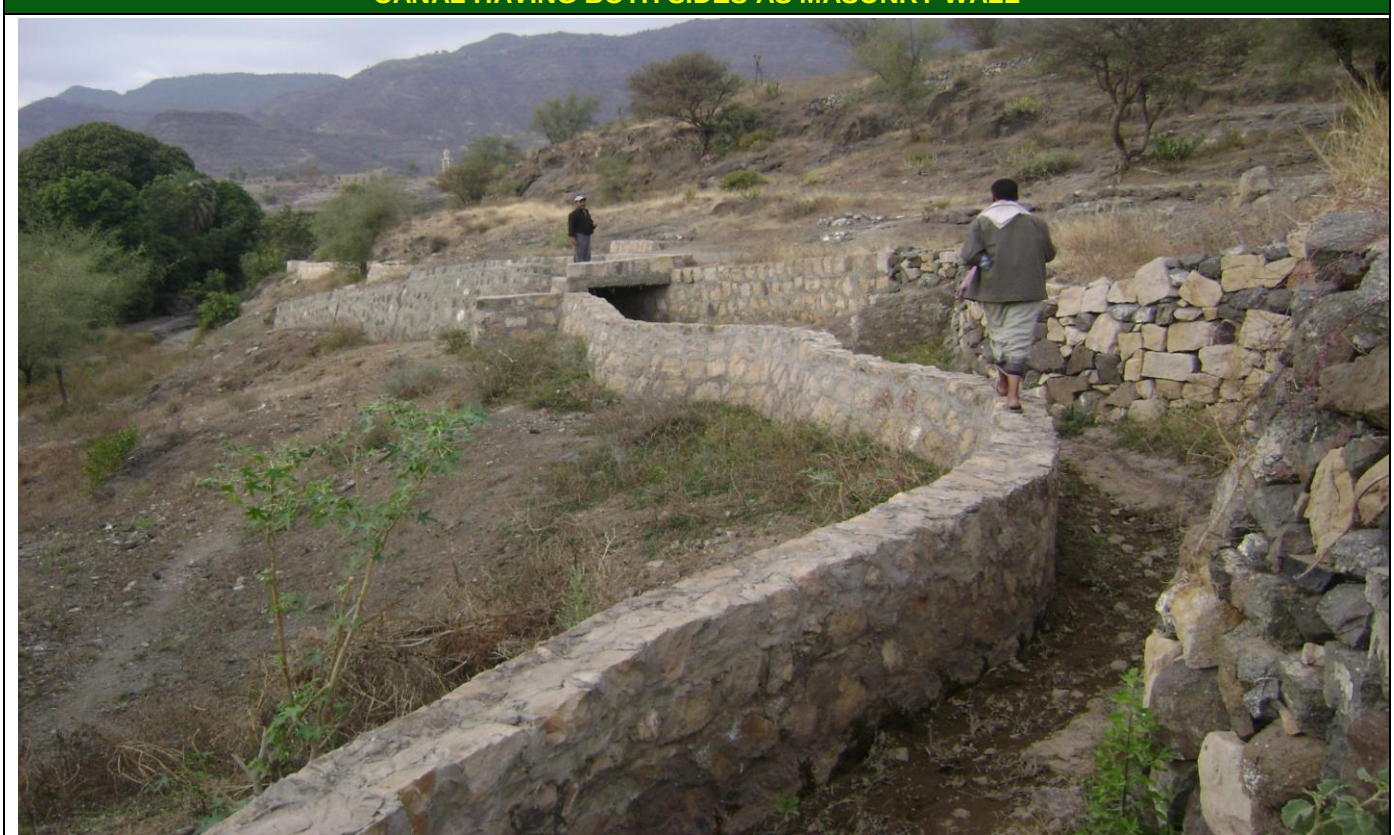
CANAL SYSTEM OF AL KHAIR SPATE DIVERSION WORKS WADI KHAIR TAIZ

LINED PORTION OF CANAL

CANAL IN MASONRY AQUEDUCT

CANAL SYSTEM OF AL KHAIR SPATE DIVERSION WORKS WADI KHAIR TAIZ

CANAL HAVING BOTH SIDES AS MASONRY WALL



CANAL HAVING ONE SIDE AS MASONRY WALL

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SALIENT FEATURES

AL-KADASHIA SPATE DIVERSION WORKS, WADI MA'ADEN LAHEJ

GENERAL

NAME OF SCHEME	:	AL-KADASHIA SPATE DIVERSION WORKS
WADI	:	MA'ADEN
DESIGNED BY	:	GSCP
SUPERVISING AGENCY FOR CONSTRUCTION	:	GSCP
CONTRACT AMOUNT	:	US DOLLARS 386,000

LOCATION

GOVERNORATE	:	LAHEJ
DISTRICT	:	TOUR AL-BAH
NORTH	:	13^{O} 08.92'
EAST	:	44^{O} 20.22'
ALTITUDE	:	8.94 m ABOVE MSL

BENEFITS

AREA BENEFITED (GROSS)	:	482 ha
NUMBER OF FAMILIES	:	102

HYDROLOGY

MAXIMUM DESIGN DISCHARGE	:	665 m^3/sec
CATCHMENT AREA	:	350 km2

OVERFLOW WEIR

TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	665 m^3/sec
LENGTH	:	74 m
HEIGHT ABOVE WADI BED	:	1.75 m

CANALS		LEFT BANK		RIGHT BANK
		AL MAKAREMA	AL-KADASHIA	YABBOA
DESIGN DISCHARGE (CUMECS)	:	4.7	10.3	3.8
GROSS COMMAND AREA (HA)	:	115	247	120
NUMBER OF BAYS/GATES	:	1	2	1
SIZE OF GATE (M)	:	2.00 X 1.25	2.50 X 1.50	2.25 X 1.25
TYPE OF GATES	:	RADIAL	RADIAL	RADIAL

SILT SLUICES		FOR AL MAKAREMA & AL-KADASHIA CANALS	FOR YABBOA CANAL
DESIGN DISCHARGE (CUMECS)	:	15	4
NUMBER OF BAYS/GATES	:	2	1
SIZE OF GATES (M)	:	3.0 X 1.25	1.0 X 1.0
TYPE OF GATES	:	RADIAL	VERTICAL

ECONOMIC FEASIBILITY

ESTIMATED COST	:	US $ 300,167
INTERNAL RATE OF RETURN	:	14 %

AL-KADASHIA SPATE DIVERSION WORKS, WADI MA'ADEN LAHEJ

SPATE DIVERSION WORKS UPSTREAM VIEW

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SALIENT FEATURES		
AL DOMEYAH, WADI JEHAF AL MARAW'AH, TIHAMA		
GENERAL		
NAME OF SCHEME	:	AL DOMEYAH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TIHAMA
CONTRACT AMOUNT	:	US $ 180,000
LOCATION		
WADI	:	JEHAF
GOVERNORATE	:	TIHAMA
DISTRICT	:	MARAW'AH
NORTH	:	14º 47.884'
EAST	:	43º 13.023'
ALTITUDE	:	71.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	312 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	671.85 m^3/sec
CATCHMENT AREA	:	591.87 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	343.00 m^3/Section (BALANCE ABSORBED IN UPSTREAM)
LENGTH	:	32 m
HEIGHT ABOVE WADI BED	:	1.25 m
CANAL INTAKE		
DESIGN DISCHARGE	:	2.14 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. X 2.0 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	6.2 m^3/sec
NUMBER OF BAYS	:	1 NO. X 2 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 2 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 183,303
IRR	:	13.86 %

AL DOMEYAH, WADI JEHAF AL MARAW'AH, TIHAMA

AL DOMEYAH, WADI JEHAF AL MARAW'AH, TIHAMA

DOWNSTREAM VIEW OF THE WEIR, AND SILT SLUICE

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SALIENT FEATURES

AL SHALAE'AH, WADI JEHAF AL MARAW'AH, TIHAMA

GENERAL

NAME OF SCHEME	:	AL SHALAE'AH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TIHAMA
CONTRACT AMOUNT	:	US $ 131,000

LOCATION

WADI	:	JEHAF
GOVERNORATE	:	TIHAMA
DISTRICT	:	MARAW'AH
NORTH	:	14º 47.573'
EAST	:	43º 12.076'
ALTITUDE	:	76.00 m ABOVE MSL

BENEFITS

AREA BENEFITED (GROSS)	:	326 ha

HYDROLOGY

MAXIMUM DESIGN DISCHARGE (Q_{50})	:	673 m^3/sec
CATCHMENT AREA	:	601.71 km2

CONCEPT OF DESIGN

THE EXISTING SCHEME COMPRISES AN EARTHEN OGMA USED BY THE BENEFICIARIES TO DIVERT ENTIRE WADI FLOW FOR IRRIGATING THE LANDS IN THE UPSTREAM. BUT THIS OGMA BREACHES AND OR IS BREACHED DURING BIG FLOWS. BENEFICIARIES FOR THIS SCHEME THEREFORE, DESIRED TO PROVIDE A PERMANENT SOLUTION AND REHABILITATE THIS SCHEME. IT HAS THEREFORE, BEEN PROPOSED IN CONSULTATION WITH THE BENEFICIARIES TO PROVIDE TWO OVERFLOW SECTIONS IN THE STRAGIC LOCATIONS TO PASS THE EXCESSIVE DISCHARGE IN TO WADI AND RETAIN/DIVERT ADEQUATE FLOW IN THE UPSTREAM. ACCORDINGLY, TWO OVERFLOW SECTIONS HAVE BEEN PROVIDED TO PASS A DISCHARGE OF 142 m^3/sec ON ECONOMICAL REASONS. THE EARTHEN OGMA BETWEEN THE TWO OVER FLOW SECTIONS SHALL ACT AS FUSE PLUG FOR THE BALANCE FLOW.

OVERFLOW WEIR

TYPE	:	STONE MASONRY
NUMBER OF OVERFLOW WEIRS	:	2
LENGTH OF EACH OF OVERFLOW WEIRS	:	26 m (TOTAL LENGTH = 52 m)
TOTAL DESIGN DISCHARGE OF TWO WEIRS	:	142.00 m^3/Section
HEIGHT ABOVE WADI BED	:	0.75 m

FUSE PLUG

TYPE	:	EARTHEN OGMA
MAXIMUM DISCHARGE THROUGH FUSE PLUG	:	431.00 m^3/Sec
LENGTH	:	236 m
MAXIMUM HEIGHT ABOVE WADI BED	:	3.2 m

ECONOMIC FEASIBILITY

ESTIMATED COST	:	US $ 147,463
IRR	:	17.43 %

AL SHALAE'AH, WADI JEHAF AL MARAW'AH, TIHAMA

AL SHALAE'AH, WADI JEHAF AL MARAW'AH, TIHAMA

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SALIENT FEATURES		
AL SHARIFEYAH, WADI SIHAM TIHAMA		
GENERAL		
NAME OF SCHEME	:	AL SHARIFEYAH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TIHAMA
CONTRACT AMOUNT	:	US $ 358,000
LOCATION		
WADI	:	SIHAM
GOVERNORATE	:	TIHAMA
DISTRICT	:	MARAW'AH
NORTH	:	14º 49.727'
EAST	:	43º 11.397'
ALTITUDE	:	85.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	3,112 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	1,021.09 m^3/sec
CATCHMENT AREA	:	3748.42 km2
DESIGN CONCEPT		
THE OBJECTIVE IS TO DESIGN DIVERSION WORKS THAT ALLOW FOR CONTROLLED SUPPLY OF WATER TO THREE AREAS NAMELY: 75 % OF MAXIMUM FLOOD FOR IRRIGATING THE AREA ON THE UPSTREAM SIDE ON THE LEFT OF THE OQMA, PART OF FLOW FOR IRRIGATING ABOUT 60 HA AREA DOWNSTREAM THROUGH AL BAHLOOLY CHANNEL AND ABOUT 25 % OF FLOOD TO OVERFLOW THROUGH WEIR FOR THE AREA DOWNSTREAM OF AL MARAWEA'A CITY.		
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE (25 % OF Q_{50})	:	257.87 m^3/Section (BALANCE ABSORBED IN UPSTREAM)
LENGTH	:	100 m
HEIGHT ABOVE WADI BED	:	2 m
CANAL INTAKE FOR 60 ha		
DESIGN DISCHARGE	:	1.85 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. X 1.0 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	5 m^3/sec
NUMBER OF BAYS	:	1 NO. X 2 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 438,305
IRR	:	37 %

AL SHARIFEYAH, WADI SIHAM TIHAMA

AL SHARIFEYAH, WADI SIHAM TIHAMA

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SALIENT FEATURES		
AL KHERSHAAB, WADI NIZAL AL RAHIDAH SHARA'AB AL SALAM, TAIZ		
GENERAL		
NAME OF SCHEME	:	AL KHERSHAAB
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TAIZ
CONTRACT AMOUNT	:	US $ 189,000
LOCATION		
WADI	:	AL NIZAL
GOVERNORATE	:	TAIZ
DISTRICT	:	SHARA'AB AL SALAM
NORTH	:	13º 51.131'
EAST	:	43º 47.721'
ALTITUDE	:	809.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	52.77 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	115.74 m^3/sec
CATCHMENT AREA	:	62.52 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	102.89 m^3/sec
LENGTH	:	26 m
HEIGHT ABOVE WADI BED	:	2.50 m
CANAL INTAKE ON LEFT BANK		
DESIGN DISCHARGE	:	1.50 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. X 1.5 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	23.00 m^3/sec
NUMBER OF BAYS	:	2 NOS. X 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 2 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 103,884
INTERNAL RATE OF RETURN	:	12 %

AL KHERSHAAB, WADI NIZAL AL RAHIDAH SHARA'AB AL SALAM, TAIZ

DOWNSTREAM VIEW OF THE SILT SLUICES AND PART CANAL INTAKE

UPSTREAM VIEW OF THE WEIR, SILT SLUICES AND THE CANAL INTAKE

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SALIENT FEATURES		
WADI AL DOUR AL ODEIN, IBB		
GENERAL		
NAME OF SCHEME	:	AL DOUR
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TAIZ
CONTRACT AMOUNT	:	US $ 79,000
LOCATION		
WADI	:	AL DOUR
GOVERNORATE	:	IBB
DISTRICT	:	AL ODEIN
NORTH	:	13º 56.909'
EAST	:	43º 59.471'
ALTITUDE	:	1175.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	100.32 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	57 m^3/sec
CATCHMENT AREA	:	221.49 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	57.00 m^3/sec
LENGTH	:	19 m
HEIGHT ABOVE WADI BED	:	1.35 m
CANAL INTAKE ON LEFT BANK		
DESIGN DISCHARGE	:	1.32 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. 1 X 0.65 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	3.5 m^3/sec
NUMBER OF BAYS	:	1 NO. 1 X 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATE 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 78,929
INTERNAL RATE OF RETURN	:	27 %

WADI AL DOUR AL ODEIN, IBB

WADI AL DOUR AL ODEIN, IBB

UPSTREAM VIEW OF THE WEIR, SILT SLUICES AND THE CANAL INTAKE

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SALIENT FEATURES		
JEBLAH SPATE DIVERSION WORKS, WADI AL SEIL JEBLAH, IBB		
GENERAL		
NAME OF SCHEME	:	JEBLAH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU TAIZ
CONTRACT AMOUNT	:	US $ 124,000
LOCATION		
WADI	:	AL SEIL
GOVERNORATE	:	IBB
DISTRICT	:	JEBLAH
NORTH	:	13º 55.518'
EAST	:	44º 09.408'
ALTITUDE	:	1955.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	100 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	98.19 m^3/sec
CATCHMENT AREA	:	31.7 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	98.19 m^3/sec
LENGTH	:	18 m
HEIGHT ABOVE WADI BED	:	1.38 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	2.31 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 NO. 1.5 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	2.03 m^3/sec
NUMBER OF BAYS	:	1 NOS. 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 100,167
INTERNAL RATE OF RETURN	:	14 %

JEBLAH SPATE DIVERSION WORKS, WADI AL SEIL JEBLAH, IBB

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SALIENT FEATURES		
OBAR AL QUREINAH, WADI MARAN MOUDIAH, ABYAN		
GENERAL		
NAME OF SCHEME	:	OBAR AL QUREINAH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU ABYAN
CONTRACT AMOUNT	:	US $ 136,000
LOCATION		
WADI	:	MARAN
GOVERNORATE	:	ABYAN
DISTRICT	:	MOUDIAH
NORTH	:	13º 57.211'
EAST	:	46º 05.188'
ALTITUDE	:	900.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	152.84 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	125.68 m^3/sec
CATCHMENT AREA	:	41.99 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	125.68 m^3/sec
LENGTH	:	42 m
HEIGHT ABOVE WADI BED	:	1.21 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	3.97 m^3/sec
NUMBER & WIDTH OF BAYS	:	3 NO. 1.5 X 0.71 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 3 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	1.86 m^3/sec
NUMBER OF BAYS	:	1 NOS. X 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 133,722
INTERNAL RATE OF RETURN	:	17 %

OBAR AL QUREINAH, WADI MARAN MOUDIAH, ABYAN

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SALIENT FEATURES		
GARADAN, WADI BEIHAN, BEIHAN, SHABWA		
GENERAL		
NAME OF SCHEME	:	GARADAN
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU SHABWA
CONTRACT AMOUNT	:	US $ 136,000
LOCATION		
WADI	:	BEIHAN
GOVERNORATE	:	SHABWA
DISTRICT	:	BEIHAN
NORTH	:	14^0 45.856'
EAST	:	45^0 43.403'
ALTITUDE	:	956.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	215 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	1049.90 m^3/sec
CATCHMENT AREA	:	2691.59 km2
DIVERSION STRUCTURE		
TYPE	:	GABION/MASONRY WALL
LENGTH	:	265 m
HEIGHT ABOVE WADI BED	:	1.45 m (VARIES)
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	3.6 m^3/sec
NUMBER & WIDTH OF BAYS	:	2 BAYS OF 2 M EACH
NUMBER & TYPE OF GATES	:	2 X 0.95
SILT SLUICE		
DESIGN DISCHARGE	:	0.92 m^3/sec
NUMBER & WIDTH OF BAYS	:	1 BAY OF 1 M
SIZE & TYPE OF GATES	:	1X 0.5 M VERTICAL SLIDE GATE
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 141,320
INTERNAL RATE OF RETURN	:	15%

GARADAN, WADI BEIHAN, BEIHAN, SHABWA

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SALIENT FEATURES		
WADI AYAN BANI QAYS, HAJJA		
GENERAL		
NAME OF SCHEME	:	WADI AYAN
WADI	:	AYAN
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	GSCP
CONTRACT AMOUNT	:	US DOLLARS 252,034.53
LOCATION		
GOVERNORATE	:	HAJJA
DISTRICT	:	BANI QAYS
NORTH	:	15^{O} 32.377'
EAST	:	43^{O} 19.109'
ALTITUDE	:	335 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	986.5 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	263 m^3/sec
CATCHMENT AREA	:	145.87 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	124.4 m^3/sec
LENGTH	:	40 m
HEIGHT ABOVE WADI BED	:	1.70 m
FUSE PLUG		
TYPE	:	EARTHEN OGMA
MAXIMUM DISCHARGE THROUGH FUSE PLUG	:	139 m^3/sec
LENGTH	:	17 m
HEIGHT ABOVE WADI BED (MAXIMUM)	:	3.9 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE (CUMECS)	:	13.70 m^3/sec
NUMBER OF BAYS/GATES	:	3 X 2.0 M EACH
SIZE OF GATE (M)	:	2 M X 1.3 M EACH
TYPE OF GATES	:	VERTICAL SLIDE GATES
SILT SLUICES		
DESIGN DISCHARGE (CUMECS)	:	6.68 m^3/sec
NUMBER OF BAYS/GATES	:	1
SIZE OF GATES (M)	:	1.0 M X 1.0 M
TYPE OF GATES	:	VERTICAL SLIDE GATES
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 209,923
INTERNAL RATE OF RETURN	:	59 %

WADI AYAN BANI QAYS, HAJJA

REPUBLIC OF YEMEN
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GROUNDWATER & SOIL CONSERVATION PROJECT
(IDA CREDIT: 3860 - YEM)

SALIENT FEATURES

MAHAL AMAN, WADI AYAN, HAJJA

GENERAL

NAME OF SCHEME	:	MAHAL AMAN
WADI	:	AYAN
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	GSCP
CONTRACT AMOUNT	:	US DOLLARS 210,915

LOCATION

GOVERNORATE	:	HAJJA
DISTRICT	:	TOUR AL-BAH
NORTH	:	15^{O} 33.126'
EAST	:	43^{O} 18.541'
ALTITUDE	:	832 m ABOVE MSL

BENEFITS

AREA BENEFITED (GROSS)	:	683.2 ha

HYDROLOGY

MAXIMUM DESIGN DISCHARGE	:	263 m^3/sec
CATCHMENT AREA	:	147.02 km2

OVERFLOW WEIR

TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	117.6 m^3/sec
LENGTH	:	60 m
HEIGHT ABOVE WADI BED	:	1.36 m

FUSE PLUG

TYPE	:	EARTHEN OGMA
MAXIMUM DISCHARGE THROUGH FUSE PLUG	:	146 m^3/sec
LENGTH	:	18 m
HEIGHT ABOVE WADI BED (MAXIMUM)	:	3.0 m

CANALS		LEFT BANK	RIGHT BANK	
		I	II	III
DESIGN DISCHARGE (CUMECS)	:	292.8	11.39	3.17
GROSS COMMAND AREA (HA)	:	4.88	683.2	190
NUMBER OF BAYS/GATES	:	3 OF 1.7 M EACH	6 OF 2 M EACH	2 OF 1.5 M EACH
SIZE OF GATE (M)	:	1.7 X 0.86	2.00 X 0.86	1.5 X 0.86
TYPE OF GATES	:	VERTICAL SLIDE GATES		

SILT SLUICES		LEFT BANK	RIGHT BANK
DESIGN DISCHARGE (CUMECS)	:	1.8	1.8
NUMBER OF BAYS/GATES	:	1	1
SIZE OF GATES (M)	:	1.0 X 0.5	1.0 X 0.5
TYPE OF GATES	:	VERTICAL SLIDE GATES	VERTICAL SLIDE GATES

ECONOMIC FEASIBILITY

ESTIMATED COST	:	US $ 211,632
INTERNAL RATE OF RETURN	:	45 %

MAHAL AMAN, WADI AYAN, HAJJA

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SALIENT FEATURES		
AL MAKAWA'AH, WADI HABL (SITE NO. 07) ABS, HAJJA		
GENERAL		
NAME OF SCHEME	:	AL MAKAWA'AH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HAJJA
CONTRACT AMOUNT	:	US $ 141,000
LOCATION		
WADI	:	HABL
GOVERNORATE	:	HAJJA
DISTRICT	:	ABS
NORTH	:	16^0 09.370'
EAST	:	43^0 10.946'
ALTITUDE	:	148.219 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	276ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	90.53 m^3/sec
CATCHMENT AREA	:	135.37 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	90.53 m^3/sec
LENGTH	:	75 m
HEIGHT ABOVE WADI BED	:	1.60 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	7.2 m^3/sec
NUMBER & WIDTH OF BAYS	:	3 NOS. X 2 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 3 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	1.89 m^3/sec
NUMBER OF BAYS	:	1 NOS. X 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 145,629
IRR	:	34 %

AL MAKAWA'AH, WADI HABL (SITE NO. 07) ABS, HAJJA

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SALIENT FEATURES		
SHAT AL BARAD, WADI HAYRAN (SITE NO. 08) MOSTABA, HAJJA		
GENERAL		
NAME OF SCHEME	:	SHAT AL BARAD
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HAJJA
CONTRACT AMOUNT	:	US $ 192,000
LOCATION		
WADI	:	HAYRAN
GOVERNORATE	:	HAJJA
DISTRICT	:	MOSTABA
NORTH	:	16^0 13.963'
EAST	:	43^0 13.503'
ALTITUDE	:	222.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	368 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	151.79 m^3/sec
CATCHMENT AREA	:	330.55 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	151.79 m^3/sec
LENGTH	:	68.5 m
HEIGHT ABOVE WADI BED	:	1.27 m
CANAL INTAKE ON LEFT BANK		
DESIGN DISCHARGE	:	5.08 m^3/sec
NUMBER & WIDTH OF BAYS	:	3 NOS. X 2 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 3 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	1.76 m^3/sec
NUMBER OF BAYS	:	1 NO. X 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 161,430
IRR	:	31 %

SHAT AL BARAD, WADI HAYRAN MOSTABA, HAJJA

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SALIENT FEATURES		
AL REDA'AH SPATE DIVERSION WORKS, WADI AL ESHARI , AL DALEH		
GENERAL		
NAME OF SCHEME	:	AL REDA'AH
DESIGNED BY	:	GSCP
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU ALDALEH
CONTRACT AMOUNT	:	US $ 165,000
LOCATION		
WADI	:	AL ESHARI
GOVERNORATE	:	AL DALEH
DISTRICT	:	DAMT
NORTH	:	14º 07.524'
EAST	:	44º 40.940'
ALTITUDE	:	1001 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	116 HA (INCLUDING THE AREA OF AL MEHRAR, WADI AL ESHARI, DAMT, AL DALEH
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	140 m^3/sec
CATCHMENT AREA	:	45km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	140 m^3/sec
LENGTH	:	34 m
HEIGHT ABOVE WADI BED	:	1.40 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	5 m^3/sec
NUMBER & WIDTH OF BAYS	:	2 NO. X 2.5 m
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 2 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	3 m^3/sec
NUMBER OF BAYS	:	1 NOS. X 0.8 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 156,530
IRR	:	12 %

THIS SCHEME ALSO COVERS THE BENEFITTING AREA COMING UNDER AL MEHRAR SPATE DIVERSION WORKS, WADI AL ESHARI, DAMT, AL DALEH

AL REDA'AH, WADI AL ESHARI , AL DALEH

SPATE DIVERSION WORKS VIEW FROM UPSTREAM

CANAL INTAKES AND SILT SLUICE VIEW FROM UPSTREAM

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SALIENT FEATURES		
TIAAB, WADI AL MAS'OUQ AL BEIDA		
GENERAL		
NAME OF SCHEME	:	TIAAB
WADI	:	AL MAS'OUQ
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	GSCP
CONTRACT AMOUNT	:	US DOLLARS 154,000
LOCATION		
GOVERNORATE	:	AL BEIDA
DISTRICT	:	ZI NA'IM
NORTH	:	14^{O} 09.249'
EAST	:	45^{O} 27.131'
ALTITUDE	:	1946 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	81 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE	:	30 m^3/sec
CATCHMENT AREA	:	8.10 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE	:	30 m^3/sec
LENGTH	:	17 m
HEIGHT ABOVE WADI BED	:	3.8 m
PERMANENT OGMA		
TYPE	:	EARTHEN OGMA
LENGTH	:	168 m
HEIGHT ABOVE WADI BED (MAXIMUM)	:	6 m (varies)
CANAL INTAKE ON LEFT BANK		
DESIGN DISCHARGE (CUMECS)	:	1.87 m^3/sec
NUMBER OF BAYS/GATES	:	2 X 1.25 M EACH
SIZE OF GATE (M)	:	1.25 M X 0.6 M EACH
TYPE OF GATES	:	VERTICAL SLIDE GATES
SILT SLUICES		
DESIGN DISCHARGE (CUMECS)	:	1.8 m^3/sec
NUMBER OF BAYS/GATES	:	1
SIZE OF GATES (M)	:	1.0 M X 0.5 M
TYPE OF GATES	:	VERTICAL SLIDE GATES
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 153,000
INTERNAL RATE OF RETURN	:	12 %

TIAAB, WADI AL MAS'OUQ AL BEIDA

TIAAB, WADI AL MAS'OUQ AL BEIDA

TIAAB, WADI AL MAS'OUQ AL BEIDA

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SALIENT FEATURES		
MAHARET, WADI EIN & HOWRAH, HADRAMOUT		
GENERAL		
NAME OF SCHEME	:	**MAHARET**
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HADRAMOUT
CONTRACT AMOUNT	:	US $ 67,000
LOCATION		
WADI	:	EIN
GOVERNORATE	:	HADRAMOUT
DISTRICT	:	HOWRAH
NORTH	:	15^0 26.713'
EAST	:	48^0 26.689'
ALTITUDE	:	845.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	307 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	194.31 m^3/sec
CATCHMENT AREA	:	896.25 km2
OVERFLOW WEIR		
TYPE	:	STONE MASONRY
DESIGN DISCHARGE (Q_{10})	:	31.77 m^3/sec (BALANCE THROUGH FUSE PLUG)
LENGTH	:	31.5 m
HEIGHT ABOVE WADI BED	:	1.27 m
FUSE PLUG		
TYPE	:	EARTHEN OGMA
MAXIMUM DISCHARGE THROUGH FUSE PLUG	:	177 m^3/sec
LENGTH	:	63.5 m
HEIGHT ABOVE WADI BED (MAXIMUM)	:	3.96 m
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	5.12 m^3/sec
NUMBER & WIDTH OF BAYS	:	2 NOS. X 2 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 2 NOS.
SILT SLUICE		
DESIGN DISCHARGE	:	1.76 m^3/sec
NUMBER OF BAYS	:	1 NO. X 1 m EACH
NUMBER & TYPE OF GATES	:	VERTICAL SLIDE GATES 1 NO.
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 67,273
INTERNAL RATE OF RETURN	:	59 %

MAHARET, WADI EIN & HOWRAH, HADRAMOUT

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SALIENT FEATURES		
GHOWRAH, WADI AL EIN & HOWRAH, HADRAMOUT		
GENERAL		
NAME OF SCHEME	:	**GHOWRAH**
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HADRAMOUT
CONTRACT AMOUNT	:	US $ 106,000
LOCATION		
WADI	:	AL EIN
GOVERNORATE	:	HADRAMOUT
DISTRICT	:	HOWRAH
NORTH	:	15^0 23.915'
EAST	:	48^0 28.852'
ALTITUDE	:	885.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	36.67 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	$177m^3$/sec
CATCHMENT AREA	:	783.65 km2
DIVERSION STRUCTURE		
TYPE	:	GABION/MASONRY WALL
LENGTH	:	465 m
HEIGHT ABOVE WADI BED	:	1.00 m (VARIES)
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	2.72 m^3/sec
NUMBER & WIDTH OF BAYS	:	ONE BAY OF 4.5 m WIDTH
NUMBER & TYPE OF GATES	:	UNGATED
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 123.275
INTERNAL RATE OF RETURN	:	10%

GHOWRAH, WADI AL EIN & HOWRAH, HADRAMOUT

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SALIENT FEATURES		
NATA'A & KARANTOO'A, WADI RAKHIAH, HADRAMOUT		
GENERAL		
NAME OF SCHEME	:	NATA'A & KARANTOO'A
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HADRAMOUT
CONTRACT AMOUNT	:	US $ 69000
LOCATION		
WADI	:	RAKHIAH
GOVERNORATE	:	HADRAMOUT
DISTRICT	:	WADI RAKHIAH
NORTH	:	15^0 20.27'
EAST	:	47^0 41.082'
ALTITUDE	:	956.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	63.5 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	210 m^3/sec
CATCHMENT AREA	:	414.19 km2
DIVERSION STRUCTURE		
TYPE	:	GABION/MASONRY WALL
LENGTH	:	230 m
HEIGHT ABOVE WADI BED	:	1.20 m (VARIES)
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	9.4 m^3/sec
NUMBER & WIDTH OF BAYS	:	ONE BAY OF 12 m WIDTH
NUMBER & TYPE OF GATES	:	UNGATED
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 65,396
INTERNAL RATE OF RETURN	:	24%

NATA'A & KARANTOO'A, WADI RAKHIAH, HADRAMOUT

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SALIENT FEATURES		
SAHWAH, WADI RAKHIAH, HADRAMOUT		
GENERAL		
NAME OF SCHEME	:	SAHWAH
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HADRAMOUT
CONTRACT AMOUNT	:	US $ 48000
LOCATION		
WADI	:	RAKHIAH
GOVERNORATE	:	HADRAMOUT
DISTRICT	:	WADI RAKHIAH
NORTH	:	15^0 15.463'
EAST	:	47^0 37.787'
ALTITUDE	:	1016.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	74.20 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	178.19 m^3/sec
CATCHMENT AREA	:	222.71 km2
DIVERSION STRUCTURE		
TYPE	:	GABION/MASONRY WALL
LENGTH	:	95 m
HEIGHT ABOVE WADI BED	:	1.20 m (VARIES)
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	4.12 m^3/sec
NUMBER & WIDTH OF BAYS	:	ONE BAY OF 2.5 m WIDTH
NUMBER & TYPE OF GATES	:	UNGATED
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 49,463
INTERNAL RATE OF RETURN	:	27%

SAHWAH, WADI RAKHIAH HADRAMOUT

REPUBLIC OF YEMEN
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SALIENT FEATURES		
AL HEJEI SPATE DIVERSION WORKS, WADI RAKHIAH, HADRAMOUT		
GENERAL		
NAME OF SCHEME	:	AL HEJEI
DESIGNED BY	:	M/S HYDROPLAN
SUPERVISING AGENCY FOR CONSTRUCTION	:	FU HADRAMOUT
CONTRACT AMOUNT	:	US $ 28,000
LOCATION		
WADI	:	RAKHIAH
GOVERNORATE	:	HADRAMOUT
DISTRICT	:	WADI RAKHIIAH
NORTH	:	15^0 23.915'
EAST	:	48^0 28.852'
ALTITUDE	:	885.00 m ABOVE MSL
BENEFITS		
AREA BENEFITED (GROSS)	:	30.50 ha
HYDROLOGY		
MAXIMUM DESIGN DISCHARGE (Q_{50})	:	$175m^3$/sec
CATCHMENT AREA	:	218 km2
DIVERSION STRUCTURE		
TYPE	:	GABION/MASONRY WALL
LENGTH	:	117 m
HEIGHT ABOVE WADI BED	:	1.00 m (VARIES)
CANAL INTAKE ON RIGHT BANK		
DESIGN DISCHARGE	:	3.39 m^3/sec
NUMBER & WIDTH OF BAYS	:	ONE BAY OF 3.0 m WIDTH
NUMBER & TYPE OF GATES	:	UNGATED
ECONOMIC FEASIBILITY		
ESTIMATED COST	:	US $ 25,100
INTERNAL RATE OF RETURN	:	30%

AL HEJEI SPATE DIVERSION WORKS, WADI RAKHIAH, HADRAMOUT