Gila River Mangas Creek Storage Analysis																
Manning's n, unitless (n)	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
Water Depth, feet (y)	5.00	5.00	5.00	5.00	5.00	5.50	5.50	5.50	5.50	5.50	6.00	6.00	6.00	6.00	6.00	6.00
Bottom Width, feet (b)	6.00	7.00	8.00	9.00	10.00	6.00	7.00	8.00	9.00	10.00	6.00	7.00	8.00	9.00	10.00	10.00
Horizontal Side Slope, unitless (m)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Top Width, feet (T)	26.00	27.00	28.00	29.00	30.00	28.00	29.00	30.00	31.00	32.00	30.00	31.00	32.00	33.00	34.00	34.00
Area, feet^2 (A)	80.00	85.00	90.00	95.00	100.00	93.50	99.00	104.50	110.00	115.50	108.00	114.00	120.00	126.00	132.00	132.00
Wetted Perimeter, feet (P)	28.36	29.36	30.36	31.36	32.36	30.60	31.60	32.60	33.60	34.60	32.83	33.83	34.83	35.83	36.83	36.83
Hydraulic Radius, feet (R)	2.82	2.90	2.96	3.03	3.09	3.06	3.13	3.21	3.27	3.34	3.29	3.37	3.45	3.52	3.58	3.58
Flow, cfs (Q)	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00	350.00
Flow times Maning's n	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1.486 times Area times Hydraulic Radius^2/3	237.33	256.57	275.98	295.55	315.26	292.59	315.00	337.62	360.42	383.38	354.97	380.75	406.75	432.96	459.36	459.36
Required Slope, feet/feet (S)	0.00063	0.00054	0.00046	0.00041	0.00036	0.00041	0.00036	0.00031	0.00021	0.00019	0.00022	0.00019	0.00017	0.00015	0.00013	0.00013
Required Elevation Drop, feet (delta E)	57.25	48.98	42.33	36.91	32.44	37.67	32.50	28.29	19.33	17.08	19.92	17.32	15.17	13.39	11.90	11.90
Design Values:																
Design Flow, Q, is 350 cfs																
Canal Length, L, is 17.25 miles																

Miller Engineering Analysis of Gravity Flow to 1987 BuRec proposal for Mangas Creek Storage Facility

12/17/03

Gila River Storage Project | 12/17/2003 | Daniel J Brown IV

Goal:

Storage of Gila River water on Mangas Creek (near Bill Evans Lake)

Diversion from Gila River (near gaging station, T14S, R16W, Section ~~29~~ 28)

Represented Contours: 1440m (4724ft)
1450m (4757ft)
1460m (4790ft)
1470m (4822ft)
1480m (4856ft)

Canal Length (approximate): ~~25.7~~ 27.8 Km (~~16~~ 17.25 miles)

POD on 1450m contour

Canal to be: Concrete lined trapezoidal section, water depth (y) of 4ft → 5ft → 6ft

Q_{design} = 350 cfs

$Storage_{design}$ = 100,000 ac-ft (@ conservation elevation = 4801ft (1463m))

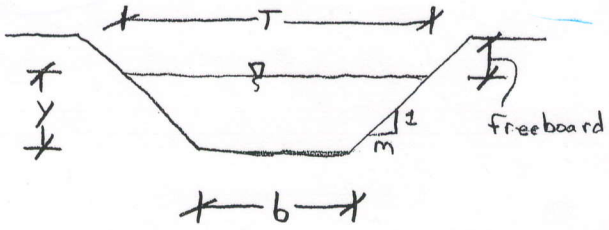
Trapezoidal Section

Area: $A = by + my^2$

Wetted Perimeter: $P = b + 2y\sqrt{m^2+1}$

Hydraulic Radius: $R = A/P$

Top Width: $T = b + 2my$



Freeboard$_{rqrd}$: $F = 0.55\sqrt{Cy}$ (Cy assumed as 1.6)

$F = 0.696$ m (2.28ft)

Water-Res. Engineering (p. 205)

$Q = \frac{1.486}{n} \cdot A \cdot R^{2/3} \cdot S_o^{1/2}$

$n = 0.015$ ~~0.016~~ (Water-Res. Engineering, p. 209)

Water-Res. Engineering (p. 205)

- Solve for S_o (assume value for A, based on y)

$$S_o = \left(\frac{Q \cdot n}{1.486 \cdot A \cdot R^{2/3}}\right)^2$$

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Table 8

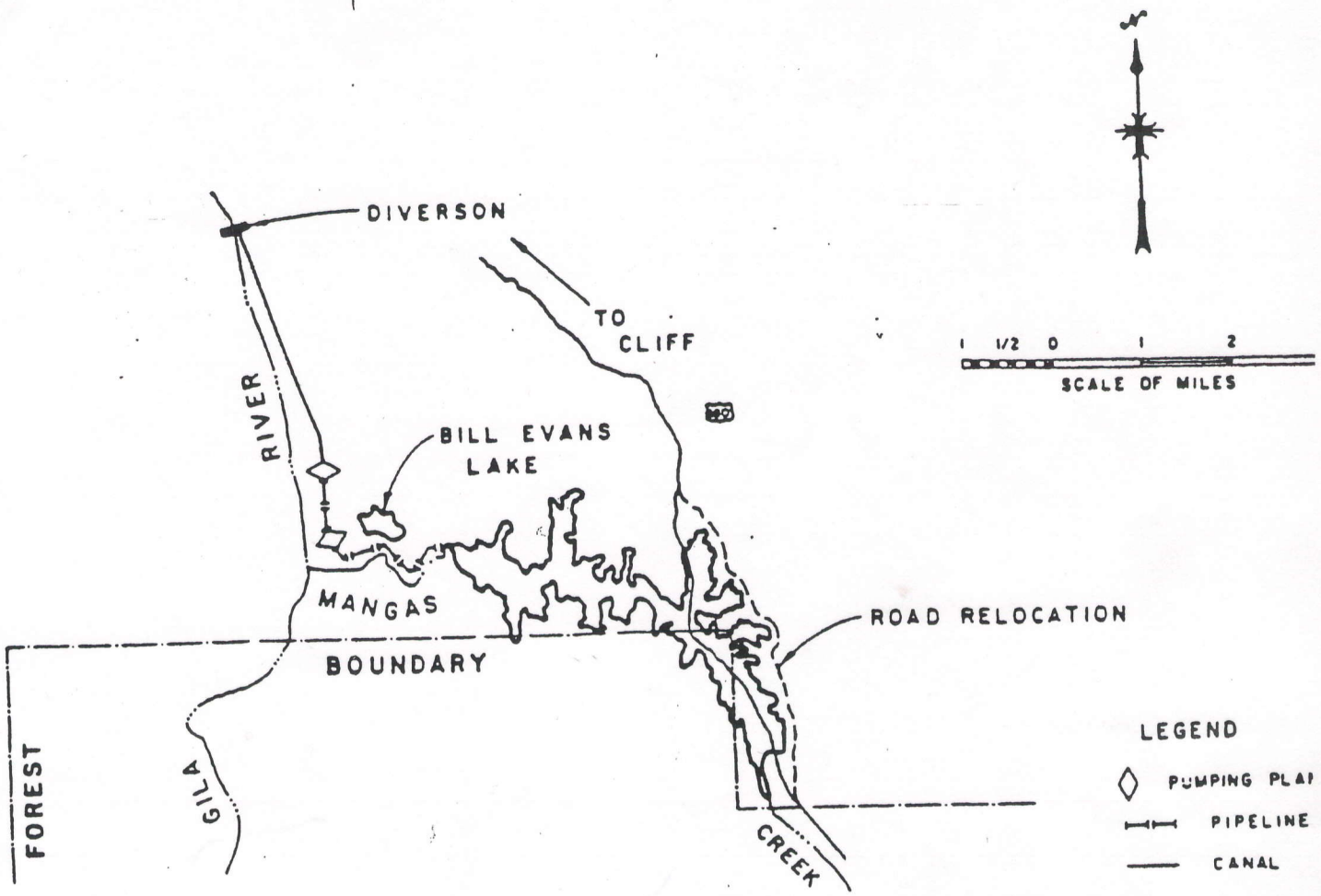
Feature-Mangas Dam

DESIGN DETAILS

DAM STRUCTURE:	Zoned Earthfill
Height	303 feet
Crest Length	1450 feet
Dam Volume	5,440,517 cubic yards
SPILLWAY:	
Crest Elevation	4801 feet
Crest Length	100 feet
Capacity	30,000 cfs
OUTLETS:	
Minimum Capacity	50 cfs
TRANSMISSION LINE:	4.5 miles
ROADS:	
Relocated	3.5 miles

STORAGE ALLOCATION:

	Incremental Storage (af)	Total Storage (af)	Surface Area (acres)	Elevation (feet)
Streambed	0	0	0	4515
Sediment and Inactive	7,000	7,000	varies	varies
Conservation	93,392	100,392	1428	4801
Surcharge	15,241	115,633	1624	4811
Dam Crest	--	--	--	4818



MANGAS CREEK DAM and RESERVOIR

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Figure 5

-330-T-254

Table # 10

Mangas Creek 2 Dam

CAPACITY

COMPUTED
10/21/81
15.50.11.

CAPACITY TABLE IN ACRE FEET

ELEVATION INCREMENT IS ONE FOOT

ELEV. FEET	0	1	2	3	4	5	6	7	8	9
4510						0	0	1	3	5
4520	8	11	15	19	24	29	35	41	48	55
4530	62	70	79	88	97	106	116	127	137	149
4540	160	173	185	198	212	226	241	256	272	288
4550	305	323	341	361	381	401	423	445	464	493
4560	519	545	573	602	632	663	696	730	765	802
4570	840	880	921	964	1008	1054	1101	1151	1201	1250
4580	1308	1369	1421	1481	1541	1600	1669	1735	1803	1872
4590	1944	2017	2092	2168	2247	2327	2408	2492	2577	2663
4600	2751	2841	2933	3025	3120	3216	3311	3412	3512	3614
4610	3718	3822	3926	4036	4145	4256	4368	4481	4596	4712
4620	4830	4950	5071	5193	5318	5444	5571	5700	5831	5964
4630	6098	6234	6373	6513	6655	6799	6945	7093	7243	7396
4640	7551	7708	7867	8029	8194	8361	8531	8703	8878	9056
4650	9237	9421	9608	9797	9990	10185	10384	10586	10791	10999
4660	11211	11425	11641	11860	12084	12311	12540	12783	13022	13263
4670	13508	13757	14009	14265	14524	14786	15052	15322	15595	15872
4680	16152	16436	16723	17014	17308	17606	17908	18213	18521	18834
4690	19150	19469	19792	20119	20450	20784	21122	21464	21810	22160
4700	22514	22873	23235	23601	23972	24347	24726	25110	25499	25892
4710	26290	26692	27100	27512	27930	28352	28780	29214	29652	30097
4720	30547	31003	31465	31933	32407	32887	33374	33867	34368	34874
4730	35388	35909	36438	36973	37517	38068	38626	39193	39768	40352
4740	40944	41544	42154	42772	43400	44037	44683	45340	46006	46682
4750	47369	48066	48774	49492	50222	50963	51716	52480	53256	54045
4760	54846	55659	56485	57324	58176	59042	59922	60815	61722	62643
4770	63579	64529	65494	66474	67468	68478	69503	70544	71600	72671
4780	73759	74862	75982	77117	78269	79437	80621	81822	83039	84273
4790	85524	86791	88075	89376	90694	92028	93380	94748	96134	97537
4800	98956	100392	101845	103325	104698	106304	107833			

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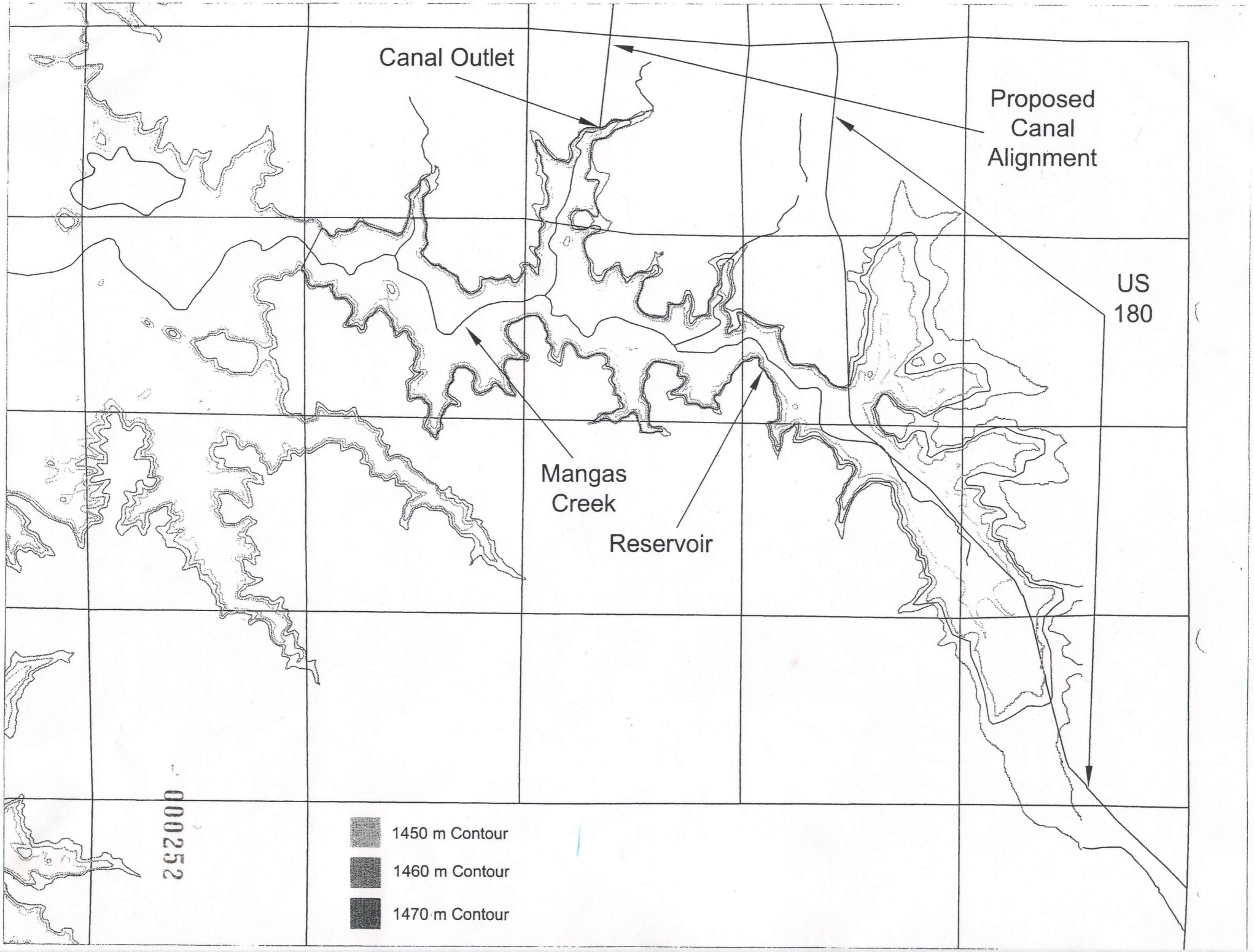
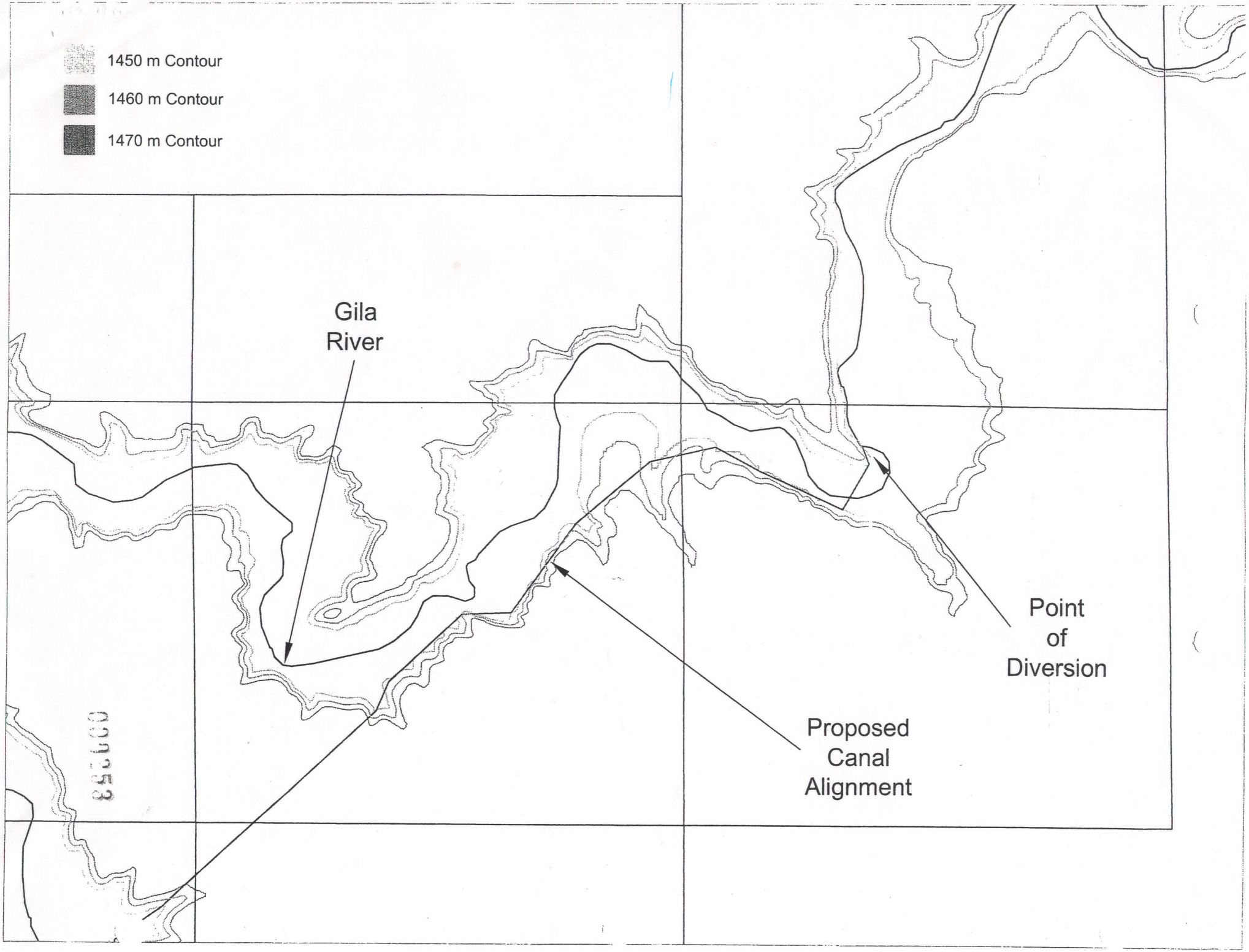
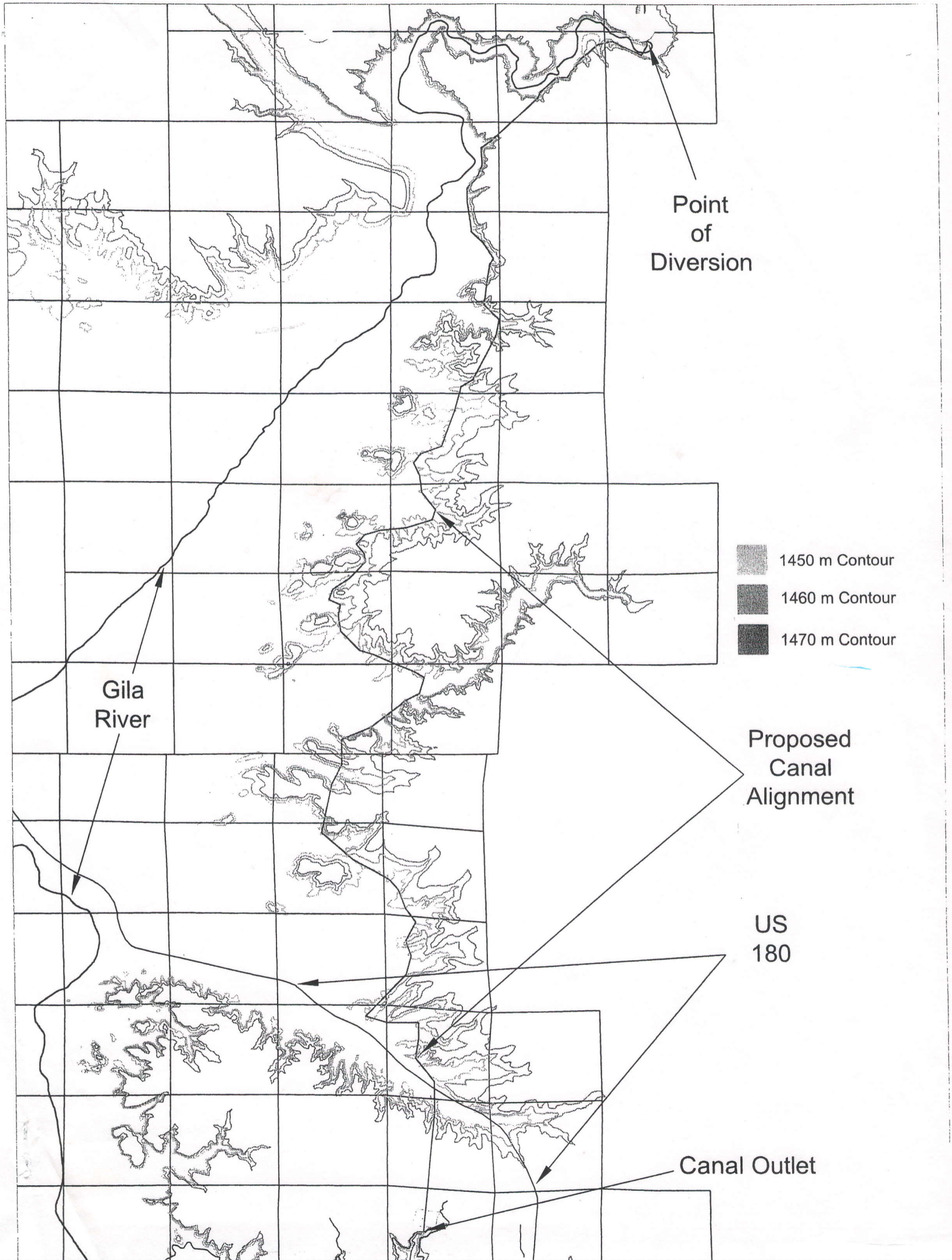

Canal Outlet
Proposed
Canal
Alignment
US
180
Mangas
Creek
Reservoir
1450 m Contour
1460 m Contour
1470 m Contour


1450 m Contour
1460 m Contour
1470 m Contour
Gila
River
Point
of
Diversion
Proposed
Canal
Alignment


Point
of
Diversion
1450 m Contour
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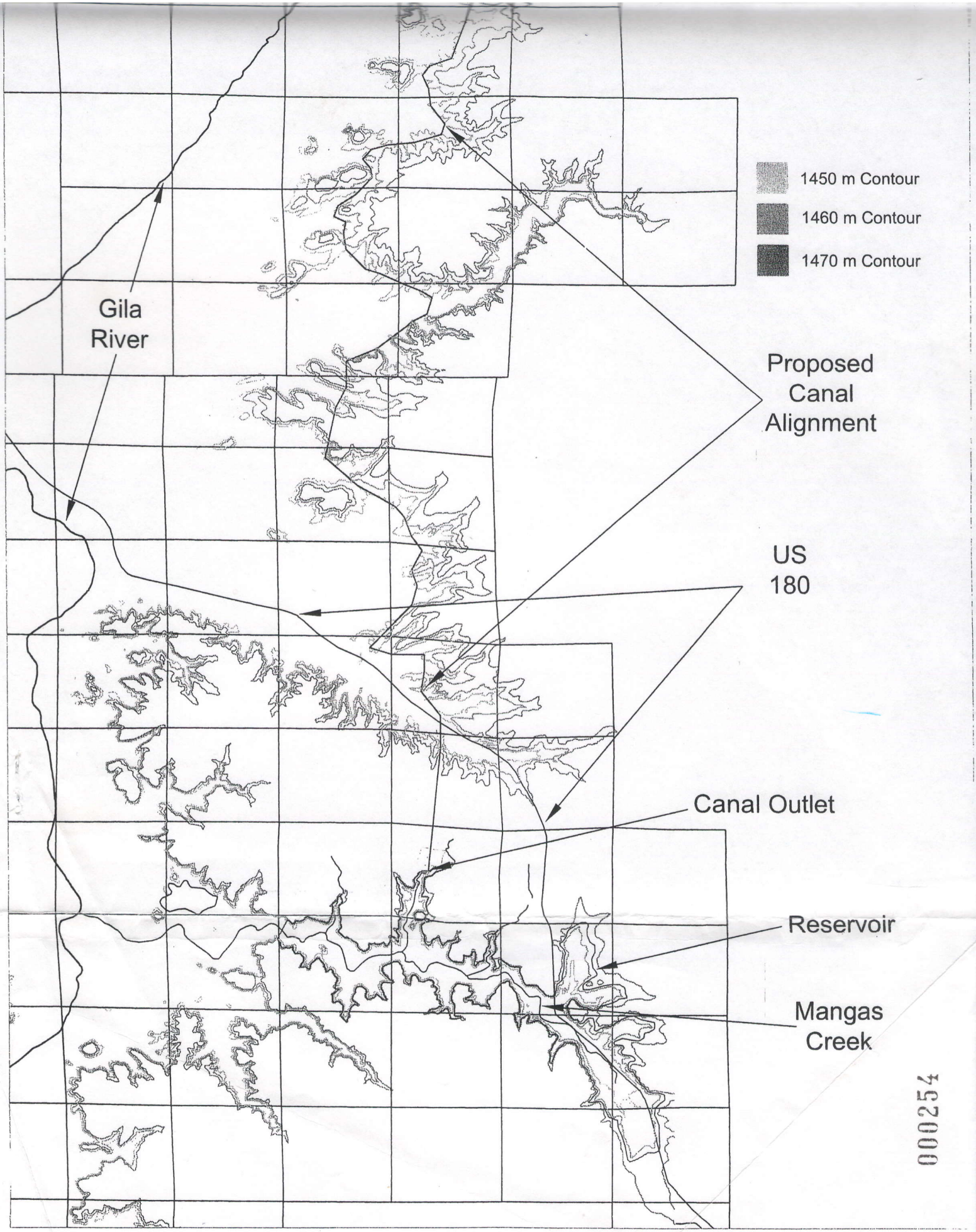
1470 m Contour
Gila
River
Proposed
Canal
Alignment
US
180
Canal Outlet


1450 m Contour
1460 m Contour
1470 m Contour
Gila River
Proposed Canal Alignment
US 180
Canal Outlet
Reservoir
Mangas Creek

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