

**REPORT ON:**

**HARNESSING HILL TORRENTS IN  
DERA GHAZI KHAN**



**DELAY ACTION DAMS ON SORI LUND  
AND SORI KHOSA HILL TORRENTS**

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**A STEP TOWARDS GREEN  
REVOLUTION IN "PACHAD"  
AREA OF DERA GHAZI KAHN  
AND RAJAN PUR DISTRICTS**

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# OBJECTIVES

- \* TO DISCOURAGE THE HORIZONTAL FLOW AND TO ENCOURAGE THE VERTICLE MOVEMENT OF THE FEROCIOUS TORRENTIAL FLOODS.
- \* TO MINIMIZE THE DISASTERS OF THE HILL TORRENT FLOODS.
- \* TO INTRODUCE BETTER UTILIZATION OF FLOOD WATER FOR IRRIGATION PURPOSE IN "PACAHD AREA".
- \* TO ENHANCE CONSERVATION OF LAND.
- \* TO ENRICH THE SUB SURFACE WATER RESERVOIR.
- \* TO DEVELOP THE FORESTRY AND VEGETATION IN THE AREA.
- \* TO BRING A PLEASANT CHANGE IN THE ENVIRONMENT AND CLIMATE OF THE SURROUNDINGS.
- \* TO UPLIFT THE SOCIO-ECONOMIC VALUES OF THE AREA.
- \* TO PROVIDE DRINKING WATER TO THE LOCAL RESIDENTS.
- \* TO REDUCE THE RATE OF MIGRATION FROM "PACHAD" AREA.
- \* TO MINIMIZE THE OPERATIONAL AND MAINTENANCE COST ON THE IRRIGATION CANAL NETWORK IN DG KHAN.

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N E C E S S I T Y .

D.G.Khan and Rajanpur Districts have an area of about six million acres. Out of this six million acre three million acre is hilly and mountainous area, where watershed management and delay action dams can be introduced.

Secondly the Pachad area comprises other two million acre of the area, which is totally at the mercy of rain and ferocious flood. Remaining one million acres is blessed with canal irrigation network. The total six million acre of both districts have a very meager water budget, but unfortunately the two million acres of fertile and virgin land of Pachad is barren due to "NILL" water resources.

This 2 million acre of land require immediate attention of all the department and functionaries, to share their responsibilities in the development of such a huge quantum of plain culturable area.

Small dam division of irrigation and Power Department is trying to tame the ferocious water of the torrents originating from Suleman range. In addition to the control in devastation of lands and infrastructure, these proposed delay action dam will enable "PACHAD" to contribute its share in food and fibre demand of the country.

BACK GROUND HISTORY.

Various investigation had been conducted to explore storage on the hill torrents at the right bank of River Indus in D.G.Khan and Rajanpur Districts before independence but no final results were taken out from these studies to construct the dams in the Suleman range mountains. MR.CLEXTON the then Executive Engineer, Indus Canal Division(inundation canal system) of District D.G.Khan did some work on hill torrents in 1930-33. He investigate and proposed three dams on the following sites.

	<u>NAME OF TORRENT.</u>	<u>DAM SITE.</u>
i)	SANGHAR	HARNBORE.
ii)	VIDORE.	PISHI.
iii)	KAHA.	NILA BUND.

MR.CLEXTON also described the poor geology of the area and no other site was considered fit for construction of storage dam in the area. In 1944-46 RAI BAHADUR LAL KANWER SAIN Superintending Engineer, Derajat Circle, D.G.Khan worked and formulate schemes for constructing storage dams at the sites given below:-

	<u>NAME OF TORRENT.</u>	<u>DAM SITE.</u>
i)	MITHAWAN.	CHOTI BALA.
ii).	KAHA.	NILA BUND.

In his report he highlighted the sedimentation and silting problem of the proposed reservior. The scheme for providing storage dams at Mithawan and Kaha was dropped due to its poor geology, poor financial return and pre-partition turmoil.

After independence the work was again started in 1954 and the bund Circle of Irrigation Department Punjab carried out the preliminary investigation for constructing dams in this area of D.G.Khan. In 1957, hill torrent Division of Derajat Circle was opened to execute the work in "PACHAD" area. Investigation for Small Dams and large dams were continued under the hill torrent Division, but no well defined project was materialized. In 1958-59 Government of Pakistan deputed F.A.O expert MR.G.E.MEADE to study and work on D.G.Khan hill torrents. MR.G.E.MEADE proposed storage dam on "KAHA" hill torrent at MURANJ, but the work did not proceed further due to geological and other technical issues. MR.G.E.MEADE said that no other site is suitable for storage dam in this area because of its,

- i) Poor Geology.
- ii) Unapproachable and inaccessible sites.
- iii) Steep slope.
- iv) Heavy silt deposition.
- v) Poor dam life.

In May 1965, hill torrent Division was closed and the task was entrusted to Small Dams Organization of Agriculture development corporation but no fruitful results could be achieved from this change. From 1975-78 MR.MOHAMMAD ISMAIL SHAHEED and MR.ABDUL HAMEED REHMANI, Superintending Engineer, Derajat Circle, D.G.Khan worked for harnessing of the hill torrents in D.G.Khan and Rajanpur Districts. These two learned Engineers applied various Techniques to handle the ferocious hill torrent floods. MR.REHMANI proposed check dams to break up the ferocity of the flow at suitable sites.

In 1995 a Project Circle under the Chief Engineer, Irrigation and Power Department was created at D.G.Khan and all the work regarding the hill torrents in D.G.Khan and Rajanpur areas were assigned to Superintending Engineer, Project Circle(Irrigation), D.G.Khan. In 1997 Flood Damages Restoration Project Division at D.G.Khan was converted into Small Dams Division under Superintending Engineer, Project Circle, (Irrigation), D.G.Khan. Small Dams Division has been working to harness the torrential floods since 1.1.1997. The basic objective of Small Dams Division is to construct Small Dams at the suitable sites in the mountainious area to facilitate the residents of the "PACHAD" area. After detail inspection and survey, few delay action dams are proposed on Sori Lund and Sori Khosa.

The objectives and design of these proposed delay action dams are discussed in this report. There structure named as delay action dam will have a great contribution to the development of the "PACHAD" area.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
DERA GHAZI KHAM.

## HILL TORRENTS IN D.G.KHAN AND RAJANPUR DISTRICTS.

The torrential area of D.G.Khan and Rajanpur District is located between the Indus River and the Suleman range bordered by province of Sindh, Baluchistan in the west and N.W.F.P in the North.

Koh Suleman range bordering the entire western side of D.G.Khan and Rajanpur Districts in a length of 205 miles, is the source of hill torrent flood. About forty five percent of the total catchment area lies in the two districts and the remaining 55% in the province of Baluchistan. The entire mountaineous range is devoid of vegetation. The mountain range alongwith its catchment area is totally dry. The formation at the lower height comprises huge deposits of sediments which are being washed down by the rain and carried away by the torrential floods. The area on the right side of the Indus River which is uncommanded and unirrigated by local canal Irrigation network is known as "PACHAD" area is rich and fertile i.e.the virgen sediments from the mountains and hill are brought down with freshet. But unfortunately the crop raising is poor, on account of uncontrolled hill torrent and flashy flows. The abnormal and ferocious torrential floods, their termendous momentum and quantum in the "PACHAD" area are dependent on the following factors.

1. Catchment area.
2. Duration and intensity of rain fall.
3. Longitudnal slope or gradient.

These three factors are highly inter-related with each other. The torrents having the less catchment area may have more discharge than the torrents in the area due to its greater intensity of rain fall or slope or vise versa.

Mostly the ferocity of the torrential flood is related to the intensity and duration of the rainfall in the catchment area. The longitudinal slope is also a major cause of ferocious velocity. PACHAD area has a steep bilateral slope i.e. from middle leading to the north and south direction both.

There are 10 major hill torrents with varying catchment areas and slopes in the "PACHAD" area. These hill torrents alongwith their respective catchment areas lying in Punjab and Baluchistan are given below:-

S.No.	Name of H/Torrents.	Gross catchment area in Sq:mile.	Catchment area in Punjab Sq:mile.	Catchment area in Baluchistan Sq:mile.	Maximum discharge in Cs: recorded with year.	
1	2	3	4	5	6	7
1.	Kaura.	197	---	197	67423	1975
2.	Vehova.	1017	117	900	90098	1977
3.	Sanghar.	1856	632	1224	125377	1976
4.	Sori Lund	202	202	---	79850	1994
5.	Vidore.	203	203	---	80431	1978
6.	Sakhi Sarwar.	65	65	---	28322	1975
7.	Mithawan.	284	284	---	131734	1978
8.	Kaha.	2050	504	1546	118500	1978
9.	Chachar.	256	177	79	85500	1984
10.	Sori (Shumami, Janubi)	749	168	581	53500	1983.
Total:-		6879 Sq:mile.	2352 Sq:mile.	4527 Sq:mile.		

In addition to the above 10 Nos major hill torrents. There are about 193 Small torrents locally known as "CHUR" have an additional catchment area of 1278 Sq:mile. A few hill torrents are running with some prennial discharge locally called as "KALA PANI".

KAHA. 30 Cs:  
SANGHAR. 45 Cs:  
VEHOVA 50 Cs:

Suleman range extending in the north and south direction rises upto 2000 meter above Sea level, usual attitude is more than 1000 meter above the sea. It comprises hard sedimentary rocks of pre-tertiary age with central anticline axis called Fort Manro. The "PACHAD" area in D.G.Khan have a vast potential for cultivation, but this drainage basin fails to utilize such a valuable irrigation water. Rainfall during monsoon month, mostly in July and August bring horrible flood with high concentration of sediments and eroded material. This complicated behaviour of the hill torrent due to uncertain and abnormal floods have left D.G.Khan hill torrent area Socia-economically behind. Most of the "PACHAD" area looks like a barren land the productivity in Pachad area is undoubtedly poor as compare to the canal irrigated area.

Flood irrigation is applied in the "PACHAD" area on the basis of "SAROPA PAINA" which means that the land owner having lands in the head reaches shall have the right to use the water first for his terraced irrigation than the lower. This process continue in the descending order up to the last land owner. Though the land owners try to apply flood irrigation, but the scheduled stable irrigation is impossible even during the rainy season.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
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SEDIMENTATION IN THE C.C.A OF C.R.B.C, D.G.KHAN AND  
DAJAL BRANCH.

The silt laden water of torrential floods spread a thick layer of silt and sediments in downstream area every year. After effecting the "PACHAD" culturable area, it raises the N.S.L of the C.C.A lying under D.G.Khan Canal, Dajal Branch and Chishma Right Bank Canal (under execution). The sediments volume per year in these areas ranges from  $800 \text{ m}^3/\text{Km}^2/\text{year}$  to  $1800 \text{ m}^3/\text{Km}^2/\text{year}$ . This sedimentation rate is a very alarming for the C.C.A of the above canal network.

This continuous silting phenomenon of these flood may convert the canal irrigated area into uncommand land in future. The delay action dams proposed will have a tendency to minimize the sedimentation downstream of the structure. By breaking the ferocity of the flood, it will restrict the deposition of silt in the "PACHAD".

DELAY ACTION DAMS ON SORI LUND AND SORI KHOSA  
HILL TORRENT.

Dams have been playing a vital role in decline and fall of the civilization since long.

There are various type of dam i.e. storage dams, Irrigation Dams, flood control dams, and hydle power dams. Dam may have single or multi purpose working behaviour. In D.G.Khan many proposals since 1930 have been made to harness the flashy flows, brusting from the catchment of Suleman Range, but no final proposal regarding the construction of Small or large dam is finalized uptill now. MR.G.E.MEADE, MR.GLEXTON, RAI BAHADUR LAL KANWAR SAIN indicated the sites for storage dam as already briefed. But the execution could not taken in hand due to the abnormal behavior of the flows. The hill torrent flood orginates from Koh Suleman Range which is about 205 mile in length on the western side of the D.G.Khan. This bionic flood hit D.G.Khan & Dajal Branch at various points with disasterious momentum and then falls into the Indus River finally.

These torrents have a specific and criticle charactiristics.

1. Abnormal flows.
2. Ferocious Velocity.
3. Steeper Longitudnal slopes.
4. Heavy silt charge.

5. Poor approach to the proposed dam sites.
6. Poor geology.
7. Termendous. momentum.

The Small Dams Division of Project Circle (Irrigation), D.G.Khan started investigation on Sori Lund and Sori Khosa hill torrents. These torrents have a catchment area of 20~~2~~ Sq: mile and 26 Sq:mile respectively. Considering the suitable catchment area and sites, survey work for Sori Lund and Sori Khosa is started in First Phase.

After observing the topography, geology, X-Section, L-Section and financial constraints, the delay action dams at suitable sites are proposed on Sori Lund and Sori Khosa hill torrents.

Eight Nos of delay action dams on "SORI LUND" and One No, on "SORI KHOSA" are proposed at the following sites.

<u>NAME OF TORRENT.</u>	<u>SITE OF THE DELAY ACTION DAM.</u>
1. Sori Lund.	Misnit.
2. Sori Lund.	Jangu.
3. Sori Lund.	Pishi.
4. Sori Lund.	Choat.
5. Sori Lund.	Shaheed.
6. Sori Lund.	U/S 3500' Zinda Pir RD.19300.
7. Sori Lund.	Ghokhar Thal.
8. Sori Lund.	1000 Ft U/S Darrah.
9. Sori Khosa.	3000 Ft U/S Darrah.

Keeping in view the steep longitudinal slope ranging from 1/1000 Ft to 19/1000 Ft, high rate of sedimentation and poor geology of the area the storage dam is not feasible at these torrents, so the delay action dams to harness the flood water are proposed at the above sites. The delay action dams are actually a type of Small Dams having a height of 30-40 Ft with spillway and dam or spillway cum dam. By considering the financial constraints and limitation, the local available material i.e. shingle and stone is only advised in the construction of delay action dams.

The main objective of the delay action dam is to discourage the horizontal flow and encourage the the verticle movement of flood water. The sub surface water level in "PACHAD" area is below more than 250 Ft. The delay action dam with spillway height of 20' will insert a pressure of 1250 lbs/Ft<sup>2</sup> by weight on the upstream bed level of the weir.

This vertical load will enable the water to penetrate into sub surface porous strata. This repid percolation and absorption proces will enrich the under ground strata. Due to heavy silt carrying capacity of the torrent, serious sedimentation occurs on the U/S of the delay action dams. The sedimentation brought by the torrential flow pertain a porous material like silt, shingle and stone/boulders. These all contents have a great capability to entre and retain water in it. This verticle and lateral absorption of water will provide a sweet water zone in the area. The seepage and percolation of water in multiple direction will introduce/natural spring culture in the barran area.

The other major objective of the delay action dam is to break the threat and continuity of the bionic floods. The construction of delay action dam will reduce the rate of flood damages by these flashy flows. These dams on tributaries and main torrents will increase the duration of the torrential flow. The extension in the duration of flows will provide better Irrigation and cultivation chances in the "PACHAD" area.

In addition to rais in sub soil water table and enriching of the undersigned water reservoir, these type of delay action dam will introduce land conservation in the hilly and semihilly catchment area. The sediments brought by the flood will fill the cavities and gaps between the hills and rocks upstream of the dam site. Sedimentation phenomenon in the spaces of the semi hilly area and mountain will creat various new patches of fertile and cultureable land.

The attain the required height more than 20 Ft, multistage delay action dam may be constructed to enhance land conservation upstream of the structure. This multistage as shown in Fig:No.5 & 6 will reduce the cost and efforts required for construction.

This process of land conservation will flatten the longitudinal slope of the area, which is major cause of the ferocity of the flows. These delay action dams have a multidimensional benifits, i.e:-

1. Conservation of land.
2. Provision of drinking water to the local abadies.
3. Recharging of under ground water acquifer.
4. Minimization of the losses due to flood destruction.

5. Flattening of the longitudinal slope.
6. Development of the forestry and vegetation.
7. Change of Climate.
8. Development of the live stock culture.
9. Uplifting of socio-economic values.
10. Reduction in the ferocity of flood.
11. Provision of better flood irrigation in "PACHAD".
12. To complete with food and fibre crises etc:

DELAY ACTION DAM ON GOKHAR THAL TRIBUTARY OF SORI LUND  
HILL TORRENT (PILOT PROJECT).

"GOKHAR THAL" is a tributary of Sori Lund hill torrent, falling just down stream of the Zinda Pir. It is a "CHUR" of Sori Lund, with 11 Sq; mile catchment area. Various villeges are lying in the surrounding of Gokhar Thal tributary.

Zinda Pir, a village famous due to tomb of pious man renowned as "ZINDA PIR" is situated about 2000' from the dam site. Thousand of peoples from all over the country gathered here every year, in the month of March-April to participate "MELA" ceremony of Zinda Pir.

The delay action dam is proposed U/S of "GHORA MUTAR" and Zinda Pir, as a Pilot Project of the other schemes in the Pachad area.. All the villeges including Zinda Pir, Ghora Mutar and other have least water resourse for irrigation as well as drinking purpose. The prennial water of Gokhar Thal usually named as "GHORA MUTAR" has a heavy contents of SULPHER, and IRON, with a very stinky and bad smell of Hydrogen Sulphide. The hot springs of Zinda Pir has also heavy sulpher contaminated water, which get dried during hot summer season.

This delay action dam proposed at Gokhar Thal will facilitate, all the villeges in the vicinity and surrounding. These structure will enable local abadies of the area to utilize water for irrigation and drinking purpose.

This Pilot Project of Gokhar Thal will prove as a gateway of development for 20 Lac acres of barani land in Pachad area.

Its results will encourage us to tame and harness other horrible torrential floods in the area."INSHALLAH".

DESIGN PERAMETER OF PROPOSED DELAY ACTION DAM ON GOKHAR THAL  
 TRIBUTARY OF SORI LUND HILL TORRENT(FOR 40' Ft HEIGHT OF DAM).

\* Catchment area of Gokhar Thal. =11 Sq:mile.

Last four high flood observed.

- 1) 1959 33690 Cs.
- 2) 1964 41093 "
- 3) 1975 50676 "
- 4) 1994 79550 "

Average Discharge  $=\frac{205009}{4}$  =51252 Cs.

Total Catchment area in Sori Lund. =202 Sq:Mile.

Flood Discharge Per Sq:mile.  $=\frac{51252}{202}$  =253 Cs.

Flood discharge of Gokhar Thal Tributary.=11x253 =2783 Cs.

Effective Water way. =W= 2.40  $\left\{ \frac{Q^{\frac{1}{2}}}{Cr} \right\}$

Q= Maximum discharge.

Cr=Co-efficient of roughness =For gravel and  
 Hard soil =2.0

W= Effective water way.

$$W= 2.40 \left\{ \frac{2783^{\frac{1}{2}}}{2.0} \right\}$$

W= 90.0 Ft

Height of the flood water over the area of spillway.

$$Q= C.B H^{\frac{3}{2}}$$

$$2783 = 3.0 \times 90 \times H^{\frac{3}{2}}$$

$$H^{\frac{3}{2}} = \frac{2783}{3 \times 90}$$

H= 4.73 Feet.

B= Water way.

H= Height of water over the crest.

By putting the value in the equation.

$$Q = 3 \times 164 \times H^{3/2}$$

$$2783 = 3 \times 90 \times H^{3/2}$$

$$H = 4.73 \text{ Ft.}$$

*	Top crest level of the spillway	=932.00
*	Top width of the spillway.	=10.00
*	U/S, D/S slope of spillway	=U/S 1.5:5, D/S 2:1
*	Height of spillway.	(-Ve)
*	Height of water over the crest	=4.73
	U/S flood water level.	=936.72
*	D/S Flood water level.	=935.00
*	Water way at spillway.	=90.00 Ft.
*	Total Discharge.	=2783 Cs.
*	Catchment area.	=11 Sq:Mile.

EXECUTIVE ENGINEER  
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(PROPOSAL No.1).

SALIENT FEATURES OF DELAY ACTION DAM AT GOKHAR THAL,  
PILOT PROJECT OF SORI LUND HILL TORRENT(Spillway  
at Right Side).

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1.	Hill Torrent.	=Sori Lund.
2.	Dam Site.	=Gokhar Thal.
3.	Discharge.	=2783 Cs:
4.	Catchment area.	=11 Sq:Mile.
5.	Water way of spillway.	=90 Ft.
6.	Water way of dam.	=350 Ft.
7.	Longitudinal slope.	=14.35/1000
8.	Depth of water over spillway.	=4.73 Ft.
9.	Height of dam.	=30 Ft.
10.	Height of spillway.	=20 Ft.
11.	Estimated Cost.	=Rs.24,51,000/-
12.	Approximate dentension capacity.	=382 Acre Ft.

ESTIMATED COST FOR CONSTRUCTING DELAY ACTION DAM AT GOKHAR THAL  
TRIBUTARY OF SORI LUND (Spillway on Right Side).

(PILOT PROJECT)

ABSTRACT OF COST(For 1st proposal with 30 Ft dam Height

<u>S.No.</u>	<u>Quantity.</u>	<u>Description of Item and Rate.</u>	<u>Amount.</u>
1.	140600 Cft	Excavation in shingle or gravel formation and rock not required balasting dressed lead upto 50' in dry soil. i)S.No.9(i)/28 =287/40 P.% Cft for 100' lead. ii)" "16(ii)/30(5.5) =22/- Extra 100' lead. iii)" "13-C/31 =25/70 Dressing & leveling to design section.	
		Total:- =Rs.335/10 %Cft.	=Rs.47115/-
2.	44750 Cft	Providing and laying stone pitching/filling dry based packed as filled behind retaining walls or pitching and aprons. S.No.27/133 @Rs.218/95 %Cft.	=Rs.97980/-
3.	15790 Cft.	Supplying and dumping stone without boat including handling of material within 3 chains(shingle or spawl). S.No.15,B/132@Rs.131/75 %Cft.	=Rs.10803/-
4.	59330 Cft.	Providing and laying stone pitching for top layers only on slope. S.No.29(a)/134 @Rs.267/55 %Cft.	=Rs.105227/-
5.	9478 KG	Small iron works such as gusset plates knees, bends, stirrups, straps, rings, etc: including cutting drilling rivetting handling assembling and fixing(but (excluding erection in position). S.No.9/223 @Rs.846/20 " " 1/224 @Rs.25/95 Errection & Fitting.	
		Total:- @Rs.872/15 P%KG.	=Rs.82662/-
6.	18396 Cft	Supplying and filling stone or boulder in iron/wire crates including sewing crates (excluding cost of crates). S.No.19(i)/132 @Rs.199/65 P%Cft.	=Rs.36728/-
7.	28734 Sft	Providing and weaving G.I.wire netting crates with G.I.wire No.8 including siding and partition to make crates 4" to 6" mesh. S.No.13(a)(iii)@Rs.206/- " " " (b)(iii)@Rs.302/30	
		page 131,32 Total:-@Rs.508/30=254/15 P%Cft.	=Rs.73027/-

8. 138266 Cft. Carriage of 100 Cft, of all materials like stone aggregate spawl kankers lime etc: by truck or by any other means owned by the contractor in hilly Kaha area lead 5 miles.

S.No.1/2 @Rs.54/35 for 5 miles, pucca.

" " 25% @Rs.13~~4~~59 hilly allowed.

Total:- @Rs.67/94 %Cft lead of 5 miles. =Rs.93938/-

Total:- =Rs.557480/-

Rs.557480/-Add:Premium @300% on item No.1-8. =Rs.1672440/-

Add:Lum sum provision for survey & Investigation and approach road etc:(detail attached). =Rs.143000/-

Add:3.5% Contingency and Workcharge. =Rs.78047/-

G:TOTAL:- =Rs.24,50,967/

SAY:- =Rs.24,51,000/-

Sub Divisional Officer,  
Small Dams Sub Division  
Dera Ghazi Khan.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
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(PROPOSAL No.2)

SALIENT FEATURES OF DELAY ACTION DAM AT GOKHAR THAL,  
PILOT PROJECT OF SORI LUND HILL TORRENT(Dam Height 50 Ft).

1.	Hill Torrent.	=Sori Lund.
2.	Dam Site.	=Gokhar Thal.
3.	Discharge.	=2783 Cs.
4.	Catchment area.	=11 Sq:Mile.
5.	Water way of spillway.	=90 Ft.
6.	Water way of dam.	=700 Ft.
7.	Longitudinal slope.	=14.35/1000
8.	Depth of water over spillway.	=4.73 Ft.
9.	Height of dam.	=50 Ft.
10.	Height of spillway.	=8.0 Ft.
11.	Estimated Cost.	=Rs.45,72,000/-
12.	Approximate dentension capacity.	=1552 Acre Ft.

ESTIMATED COST FOR DELAY ACTION DAM AT GOKHAR THAL  
TRIBUTARY, OF SORI LUND.

(PILOT PROJECT)

ABSTRACT OF COST (2nd Proposal with 50 Ft dam Height).

S.No.	Quantity.	Description of Item and Rate.	Amount.
1.	1076960 Cft	Excavation in shingle or gravel formation and rock not required balasting dressed lead upto 50' in dry soil. i) S.No.9(i)/28 @Rs.287/40 P.%Cft for 100' lead. ii) " " 16(ii)/30(5.5)@Rs.22/-Extra 100' lead. iii) " "13-C/31 @Rs.25/70 Dressing & lev: to des:section.	
		Total: 335/10 P.%OCft.	Rs.360889/-
2.	53220 Cft.	Providing and laying stone pitching/filling dry based packed as filled behind retaining walls of pitching and aprons. S.No.27/133 @Rs.218/95 P.%Sft	=Rs.116525/-
3.	61088 Cft	Supplying and dumping stone without boat including handling of material within 3 chains (shingle or spawl). S.No.15,B/132 @Rs.131/75 P.%Cft	=Rs.80483/-
4.	104180 Cft	Providing and laying stone pitching for top layers only on slope. S.No.29(a)/134 @Rs.267/55P.%Cft.	=Rs.278734/-
5.	7492 Kg	Small iron works such as gusset plates knees bends, stirrups, straps, rings, etc: i/c cutting drilling rivetting jandling assembling and fixing (but excluding erection in position). S.No.9/223 @Rs.846/20 " "1/224 @Rs.25/95 Errection & Fitting.	
		Total:- @Rs.872/15 P.%Kg	=Rs.65341/-
6.	12114 Cft	Supplying and filling stone or boulders in iron/wire crates including sewing crates (excluding cost of crates). S.No.19(i)/132 @Rs.199/65 P.%Cft	=Rs.24186/-

7. 256647 Sft. Carriage of 100 Cft, of all material like stone aggregate spawl kankers lime etc:by truck or by any other means owned by the contractor in hilly Kaha area lead 5 miles.

@Rs.56/-P.%Sft

=Rs.143722/-

Tota;:-

=Rs.1069880/-

Rs.1069880/-Add;premium @300% on item No.1-7.

=Rs.3209640/-

Add:Lum sum provision for survey & investigation and approach road etc:(detail attached).

=Rs.143000/-

Add:3.5% Contingency and Workcharge.

=Rs.149783/-

G:TOTAL:-

=Rs.4572303/-

SAY:-

=Rs.45,72,000/-

Sub Divisional Officer  
Small Dams Sub Division,  
Dera Ghazi Khan.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
DERA GHAZI KHAN.

(PROPOSAL No.3).

SALIENT FEATURES OF DELAY ACTION DAM AT GOKHAR THAL,  
PILOT PROJECT OF SORI LUND HILL TORRENT(with Dam Height 45 Ft).

1.	Hill Torrent.	=Sori Lund.
2.	Dam Site.	=Gokhar Thal.
3.	Discharge.	=2783 Cs.
4.	Catchment area.	=11 Sq:Mile.
5.	Water way of spillway.	=90 Ft.
6.	Water way of dam.	=665 Ft.
7.	Longitudinal slope.	=14.35/1000
8.	Depth of water over spillway.	=4.73 Ft.
9.	Height of Dam.	=45 Ft.
10.	Estimated Cost.	=Rs.27,84,000/-
11.	Height of spillway.	= 3 Ft.
12.	Tentative detention capacity.	=992 Acre Ft.

ESTIMATED COST FOR DELAY ACTION DAM AT GOKHAR THAL TRIBUTARY  
OF SORI LUND.

( PILOT PROJECT)

ABSTRACT OF COST( For 3rd Proposal with 45 Ft dam Height.

S.No.	Quantity.	Description of Item and Rate.	Amount.
1.	565060 Cft.	Excavation in shingle or gravel formation and rock not required balasting dressed lead upto 50' in dry soil. i) S.No.9(i)/28 @Rs.287/40 P.%Cft for 100' lead. ii) " " 16(ii)/30(5.5)=@Rs.22/-Extra 100' lead. iii) " "13-C/31 =@Rs.25/70 Dressing & Lev: Total: =@Rs.335/10 to design section. P.%Cft.	=Rs.189352/-
2.	36865 Cft	Providing and laying stone pitching/filling dry based packed as filled behind retaining walls or pitching and aprons. S.No.27/133 @Rs.218/95 P.%Cft	=Rs.80316/-
3.	42267 Cft	Supplying and dumping stone without boat i/c handling of material within 3 chains(shingle or spawl). S.No.15,B/132 @Rs.131/75 P.%Cft	=Rs.55687/-
4.	69852 Cft	Providing and laying stone pitching for top layers only on slope. S.No.29(a)/134@Rs.267/55 P.%Cft	=Rs.186889/-
5.	5172 Kg	Small iron works such as gusset plates knees bends, stirrups, straps, rings, etc:i/c cutting drilling rivetting handling assembling and fixing(but excluding erection in position). S.No.9/223 @Rs.846/20 " "1/224 @Rs.25/95 Erection & Fitting. Total:-@Rs.872/15 P.%Kg	=Rs.45108/-
6.	8364 Cft	Supplying and filling stone or boulder in iron/wire crates including sewing crates (excluding cost of crates). S.No.19(i)/132 @Rs.199/65 P.%Cft	=Rs.16699/-

7. 174831 Sft Carriage of 100 Cft, of all material like stone aggregate spawl kankers lime etc: by truck or by any other means owned by the contractor in hilly Kaha area lead 5 miles.

@Rs.56/-P.%Cft

=Rs.97905/-

Total:-

=Rs.672356/-

Rs.672356/-Add:premium @300% on item No.1-7.

=Rs.2017068/-

Add:Lum sum provision for survey & investigation and approach road etc:(detail attached).

=Rs.143000/-

Add:3.5% Contingency and Workcharge.

=Rs.94129/-

G:TOTAL:-

=Rs.2783553/-

SAY:-

=Rs.2784000/-

Sub Divisional Officer,  
Small Dams Sub Division  
Dera Ghazi Khan.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
DERA GHAZI KHAN.

(PROPOSAL No.4)

SALIENT FEATURES OF DELAY ACTION DAM AT GOKHAR THAL,  
PILOT PROJECT OF SORI LUND HILL TORRENT(with damheight 40 Ft).

1.	Hill Torrent.	=Sori Lund.
2.	Dam Site.	=Gokhar Thal.
3.	Discharge.	=2783 Cs.
4.	Catchment area.	=11 Sq:mile.
5.	Water way at spillway.	=90 Ft.
6.	Water way at Dam.	=600 Ft.
7.	Longitudinal slope.	=14.35/1000
8.	Depth of water over spillway.	=4.73 Ft.
9.	Height of Dam.	=40 Ft.
10.	Height of spillway.	= Ft
11.	Estimated Cost.	=Rs.20,54,000/-
12.	Approximate detention capacity.	= 662 Acre Ft.

ESTIMATED COST FOR CONSTRUCTING DELAY ACTION DAM AT GOKHAR THAL  
 TRIBUTARY OF SORI LUND.

( PILOT PROJECT)

ABSTRACT OF COST 4th Proposal for 40 Ft dam Height .

S.No.	Quantity.	Description of Item and Rate.	Amount.
1.	261210 Cft	Excavation in shingle or gravel formation and rock not required balasting dressed lead upto 50' in dry soil. i) S.No.9(i)/28 =287/40 P.%Cft for 100' lead. ii) " "16(ii)/30(5.5)=22/- Extra 100' lead. iii) " " 13-C/31 =25/70 Dressing & Lev: to design section.	
		Total:- =Rs.335/10 P% Cft.	=Rs.87531/-
2.	33375 Cft	Providing and laying stone pitching/filling dry based packed as filled behind retaining walls or pitching and aprons. S.No.27/133 @Rs.218/95 %Cft.	=Rs.73075/-
3.	29652 Cft	Supplying and dumping stone without boat i/c handling of material within 3 chains(shingle or spawl). S.No.15,B/132 @Rs.131/75 %Cft.	=Rs.39067/-
4.	47268 Cft	Providing and laying stone pitching for top layers only on slope. S.No.29(a)/134 @Rs.267/55 %Cft.	=Rs.124102/-
5.	5172 KG.	Small iron works such as gusset plates knees, bends, stirrups, straps, rings, etc: including cutting drilling rivetting handling assembling and fixing (but excluding erection in position). S.No.9/223 @Rs.846/20 " "1/224 @Rs.25/95 Errection & Fitting.	
		Total:- @Rs.872/15 P% Kg.	=Rs.45108/-
6.	8364 Cft	Supplying and filling stone or boulder in iron/wire crates including sewing crates (excluding cost of crates). S.No.19(i)/132 @Rs.199/65 P% Cft	=Rs.16699/-

7. 130476 Sft. Carriage of 100 Cft, of all materials like stone aggregate spawl kankers lime etc:by truck or by any other means owned by the contractor in hilly Kaha area lead 5 miles.

@Rs.56/-P.%Cft. =Rs.73065/-

Total:- =Rs.461647/-

Rs.461647/- Add premium @ 300% on item No.1-7 =Rs.1384941/-

Add:Lum sum provision for survey & Investigation and approach road etc:(detail attached0). =Rs.143000/-

Add:3.5% Contingency and Workcharge. =Rs.64630/-

G:TOTAL:- =Rs.2054218/-

SAY:- =Rs.20,54,000/-

Sub Divisional Officer,  
Small Dams Sub Division  
Dera Ghazi Khan.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
DERA GHAZI KHAN.

TENTATIVE PROVISION FOR CONSTRUCTING DELAY ACTION DAMS  
ON GOKHAR THAL OF SORI LUND.

- |    |  |             |
|----|--|-------------|
| 1) | Length of approach 3 hours per miles<br>for Dozer 1000 miles 6 hours required @1000/-<br>P/hour. | =Rs.6000/-  |
| 2) | Idle hour charges and transportation.  | =Rs.4000/-  |
|    | Total:-  | =Rs.10000/- |
| 3) | Drilling and investigation.  | =Rs.10000/- |
| 4) | Soil Investigation.  | =Rs.10000/- |
| 5) | Providing of running of Govt:Vehicle.  |             |

D E T A I L

D.G.Khan to Gokhar Thal 70-KM

- |      |                                     |          |           |
|------|-------------------------------------|----------|-----------|
| i)   | 3-trip in week for 1, S.D.O         | =12x70x2 | = 1680 KM |
| ii)  | 2-trip in week for XEN.             | =8x70x2  | = 1120 "  |
| iii) | 3-trip for field staff.             | =12x70x2 | = 1680 "  |
| iv)  | 1-trip for Superintending Engineer. | =4x70x2  | = 560 "   |
|      | Total                               |          | =4980 K.M |

Rate per K.M running Govt Vehicle 4/60 P.K.M. =Rs.22908/-

Say:-Rs.23000/-

- |    |  |             |
|----|--|-------------|
| 6) | Provision camp equipment for supervisory<br>and inspectory, staff.                   | =Rs.50000/- |
| 7) | Provision of drinking water as not available<br>at site within 10 miles of the area. | =Rs.20000/- |
| 8) | Provision of un-attractive allowance @25%<br>of the Basic pay.                       | =Rs.10000/- |
| 9) | Provision of PC-I Maps, L-Section and etc:   | =Rs.10000/- |

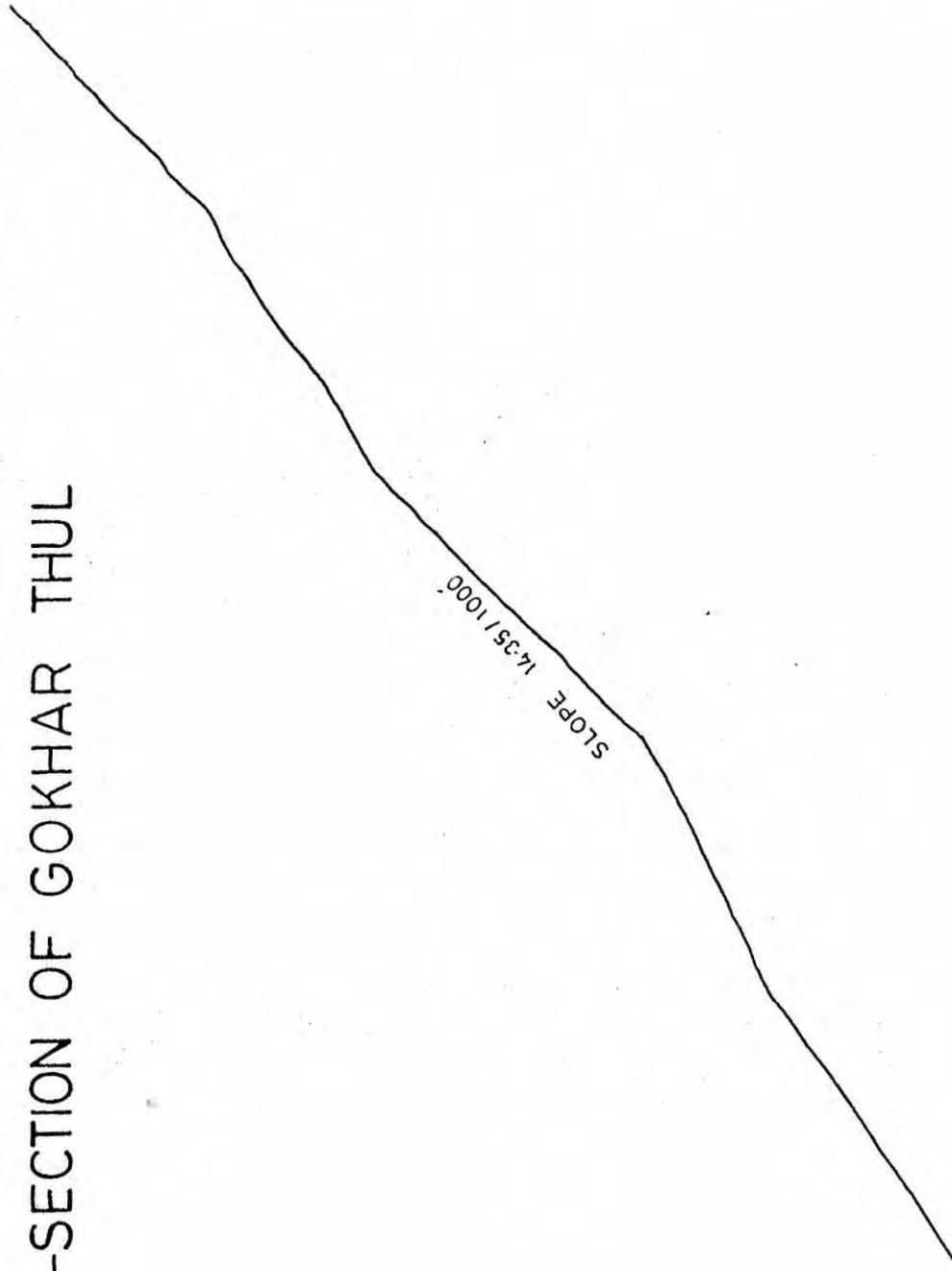
G:TOTAL:- =Rs.143000/-

Sub Divisional Officer  
Small Dams Sub Division  
Dera Ghazi Khan.

EXECUTIVE ENGINEER  
SMALL DAMS DIVISION  
DERA GHAZI KHAN.

# L-SECTION OF GOKHAR THUL

970.0  
960.0  
950.0  
940.0  
930.0  
920.0  
910.0  
900.0  
890.0  
880.0



N.S.'S

R.D.'S

0 898.88

1000 912.40

2000 922.65

3000 943.48

4000 957.48

5000 973.54

RL 99.08

# X-SECTION OF GOKHAR THUL DELAY ACTION DAM (NEAR ZINDA PEER)

980.00

970.00

SCALE = H = 1" = 50'  
V = 1" = 10'

960.0

950.0

L/S

R/S

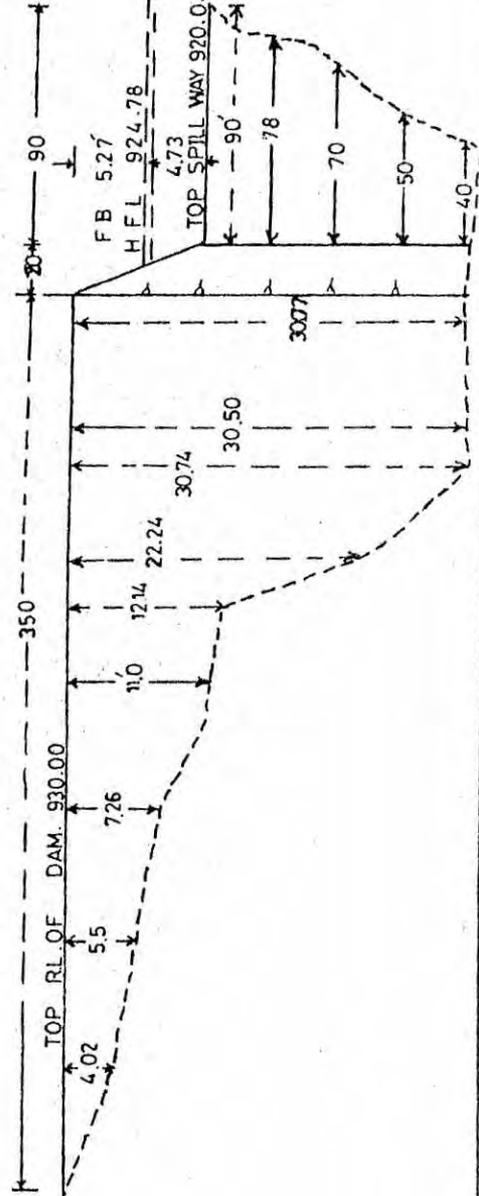
940.0

930.0

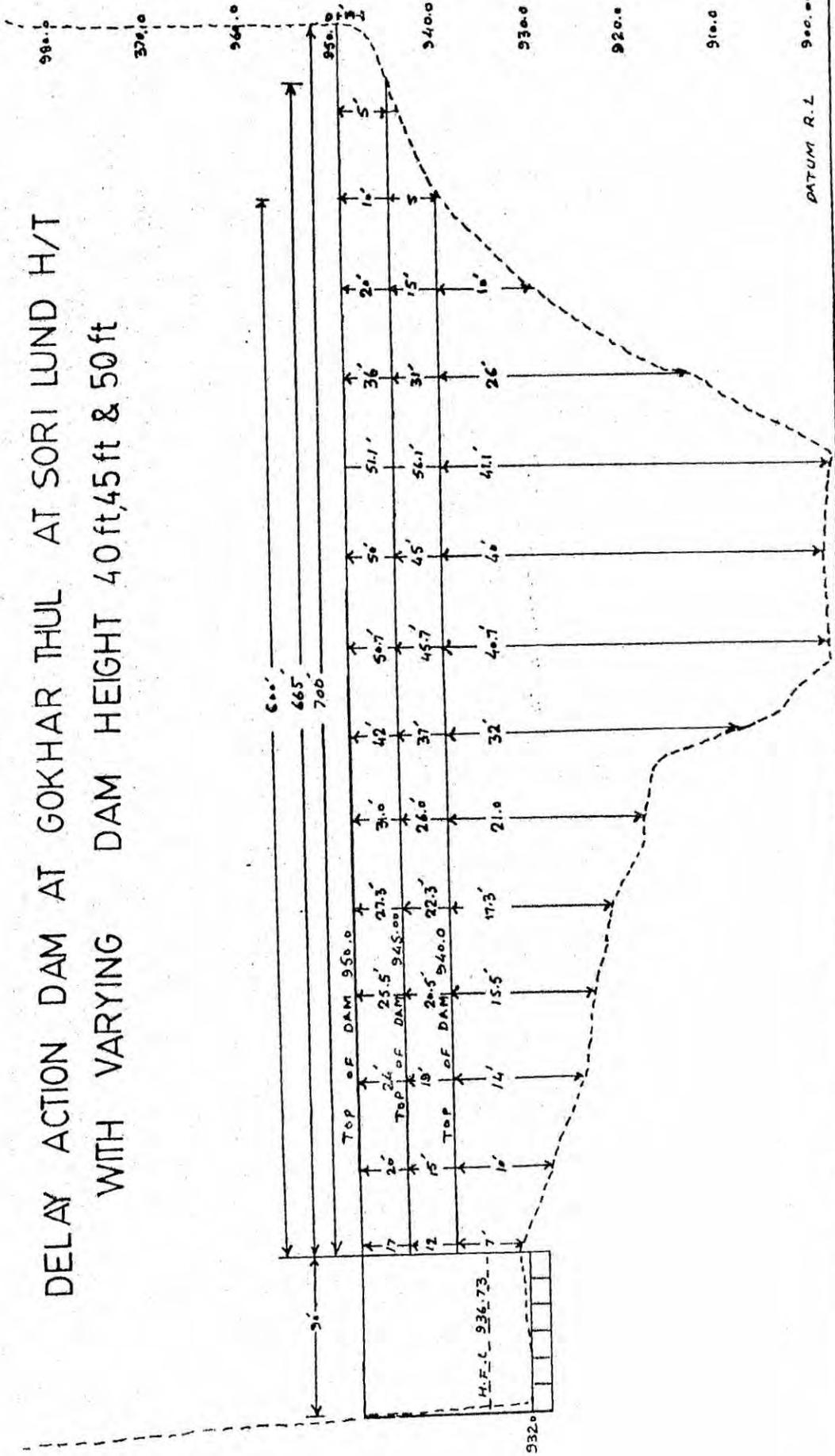
920.0

910.0

DATUM RL = 900.0

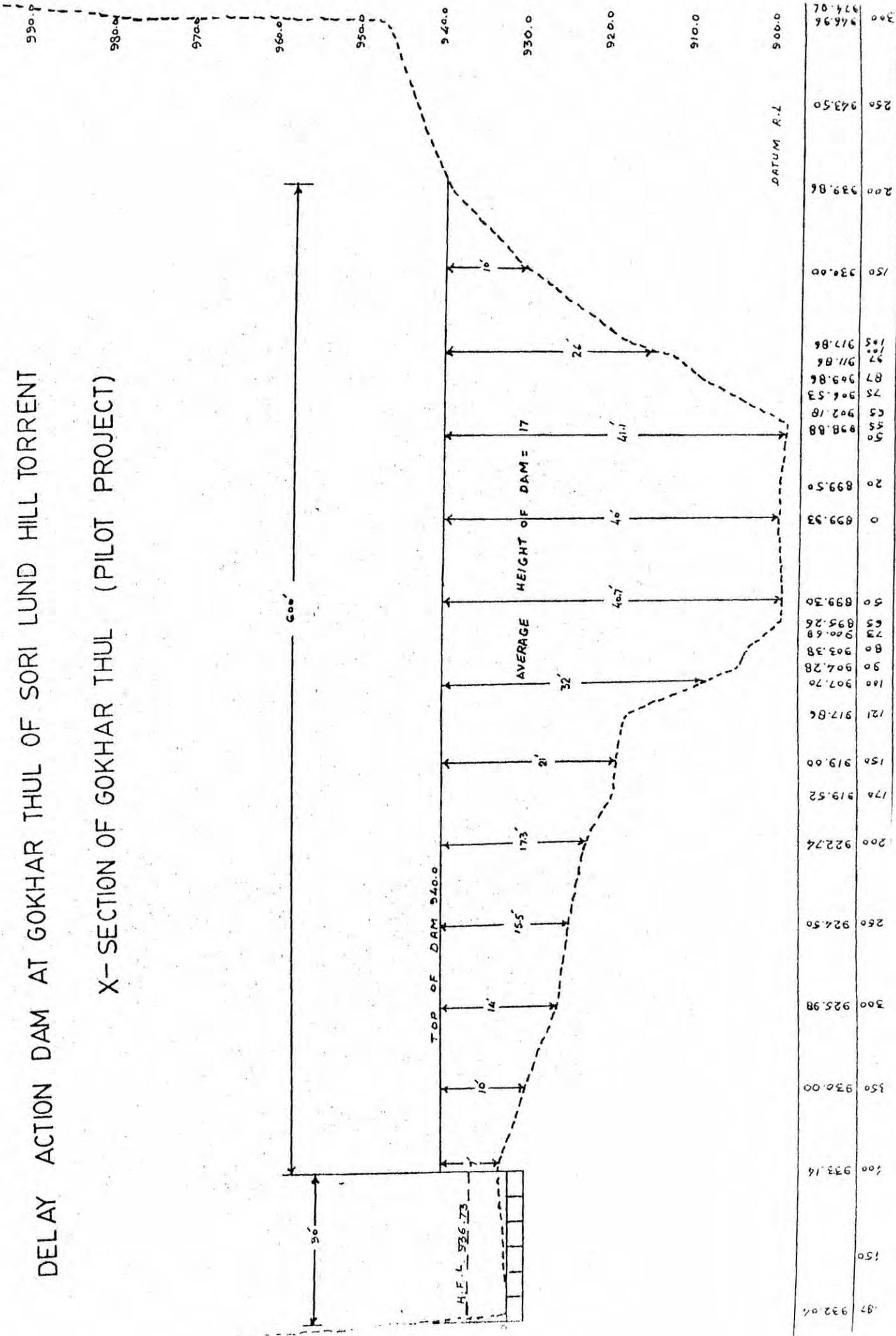


DELAY ACTION DAM AT GOKHAR THUL AT SORI LUND H/T  
 WITH VARYING DAM HEIGHT 40ft, 45ft & 50ft



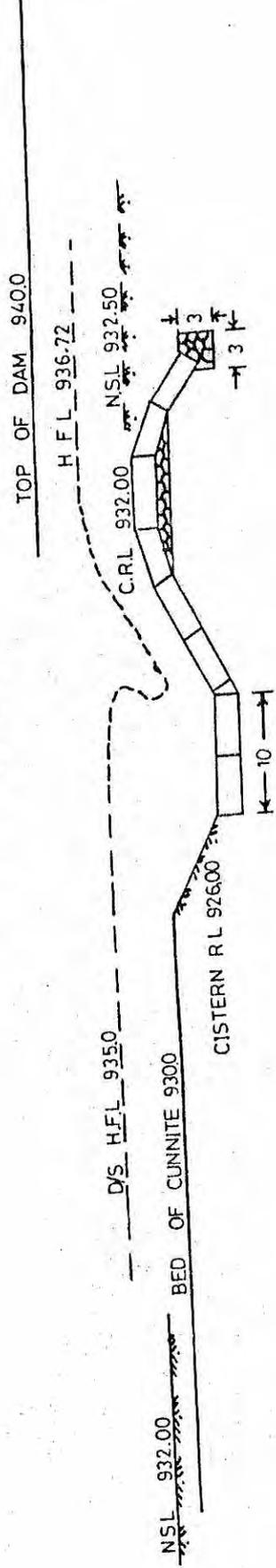
Station	DATUM R.L.	900.00	910.00	920.00	930.00	940.00	950.00
500	1087.00						
487	932.04						
451							
400	933.14						
350	930.00						
300	925.98						
250	924.50						
200	922.74						
170	919.52						
150	919.00						
121	917.84						
100	917.06						
90	916.28						
80	915.50						
73	914.72						
65	913.94						
50	913.16						
0	890.93						
20	899.50						
50	898.88						
55	898.88						
65	902.18						
75	906.53						
87	909.86						
97	911.86						
105	917.86						
150	930.00						
200	939.86						
250	943.50						
300	946.96						
	947.00						

DELAY ACTION DAM AT GOKHAR THUL OF SORI LUND HILL TORRENT  
 X-SECTION OF GOKHAR THUL (PILOT PROJECT)

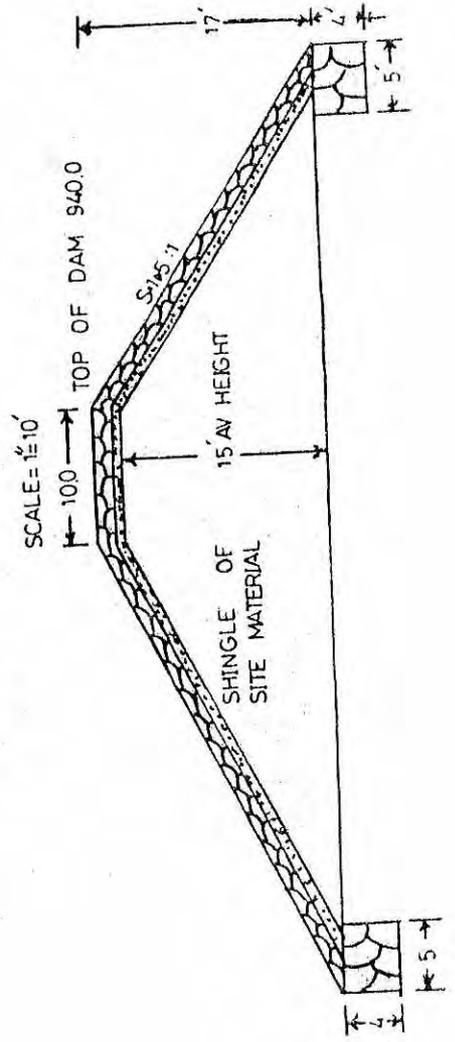


# DELAY ACTION DAM AT GOKHAR THUL OF SORI LUND H/T

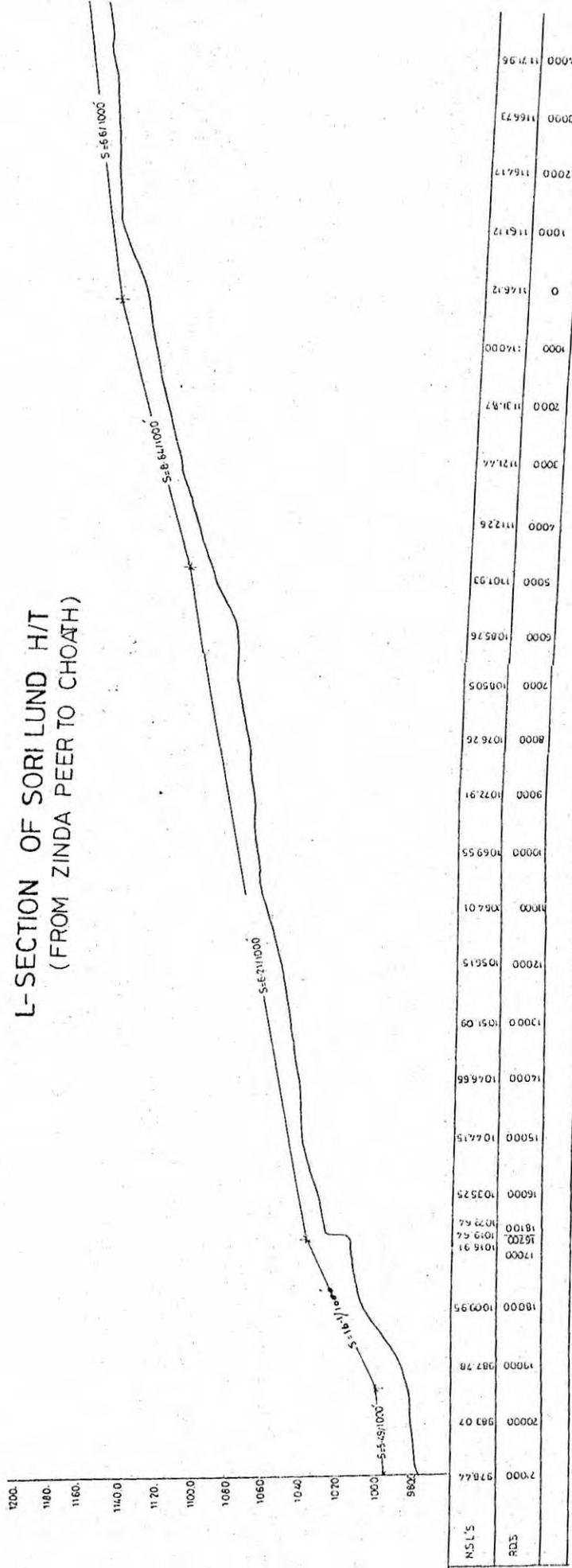
## X-SECTION OF SPILL WAY SCALE = 1" = 10'



## X-SECTION OF DELAY ACTION DAM

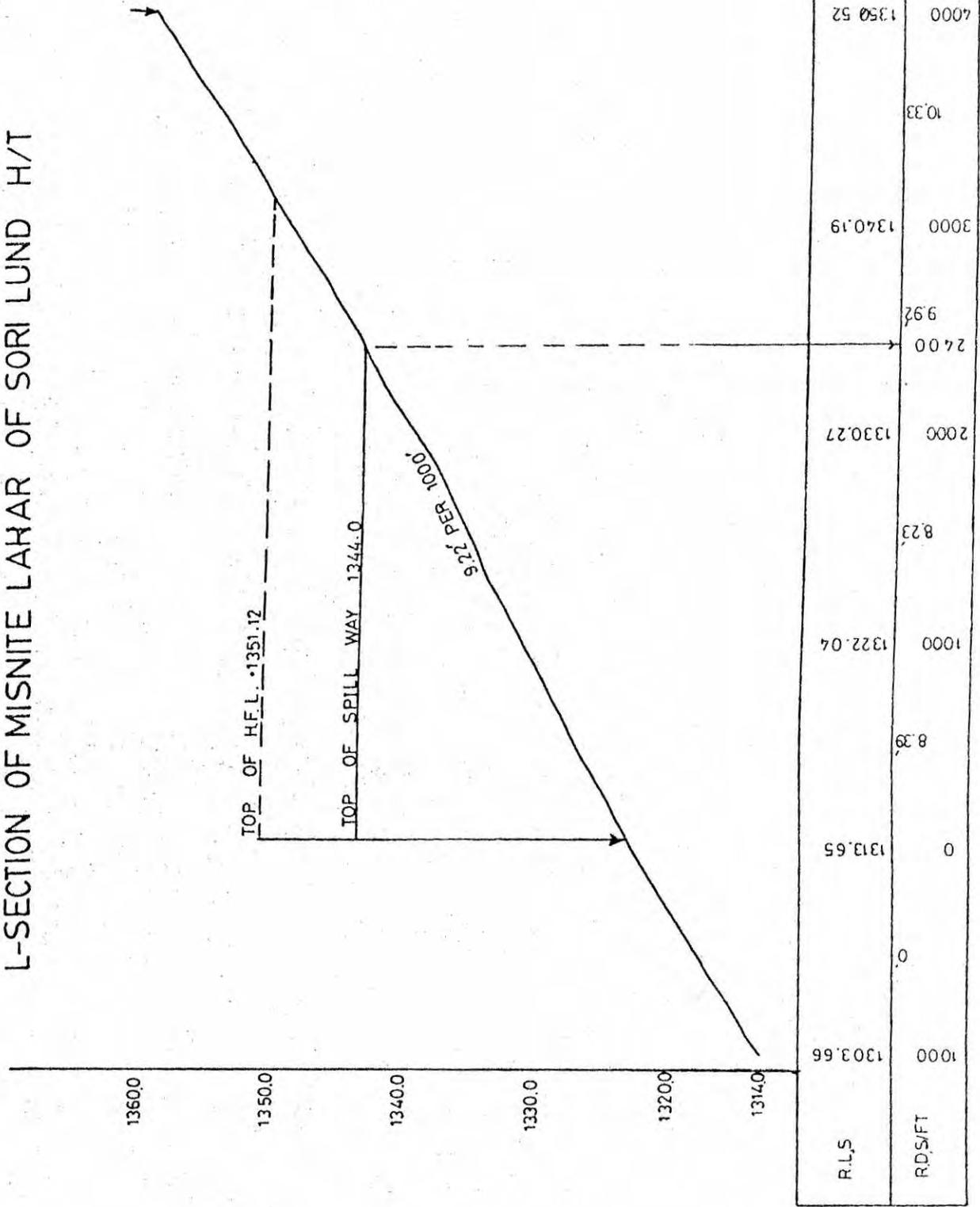


L-SECTION OF SORI LUND H/T  
 (FROM ZINDA PEER TO CHOATH)



N.S.L.	978.44	20000	983.07	19000	987.78	18000	1000.95	17000	1015.91	16100	1029.64	15100	1043.54	14000	1056.66	13000	1071.09	12000	1086.15	11000	1102.01	10000	1118.55	9000	1135.26	8000	1152.66	7000	1168.12	6000	1184.17	5000	1200.00	4000	1216.73	3000	1230.96	2000	1246.17	1000	1262.36	0	1278.56
--------	--------	-------	--------	-------	--------	-------	---------	-------	---------	-------	---------	-------	---------	-------	---------	-------	---------	-------	---------	-------	---------	-------	---------	------	---------	------	---------	------	---------	------	---------	------	---------	------	---------	------	---------	------	---------	------	---------	---	---------

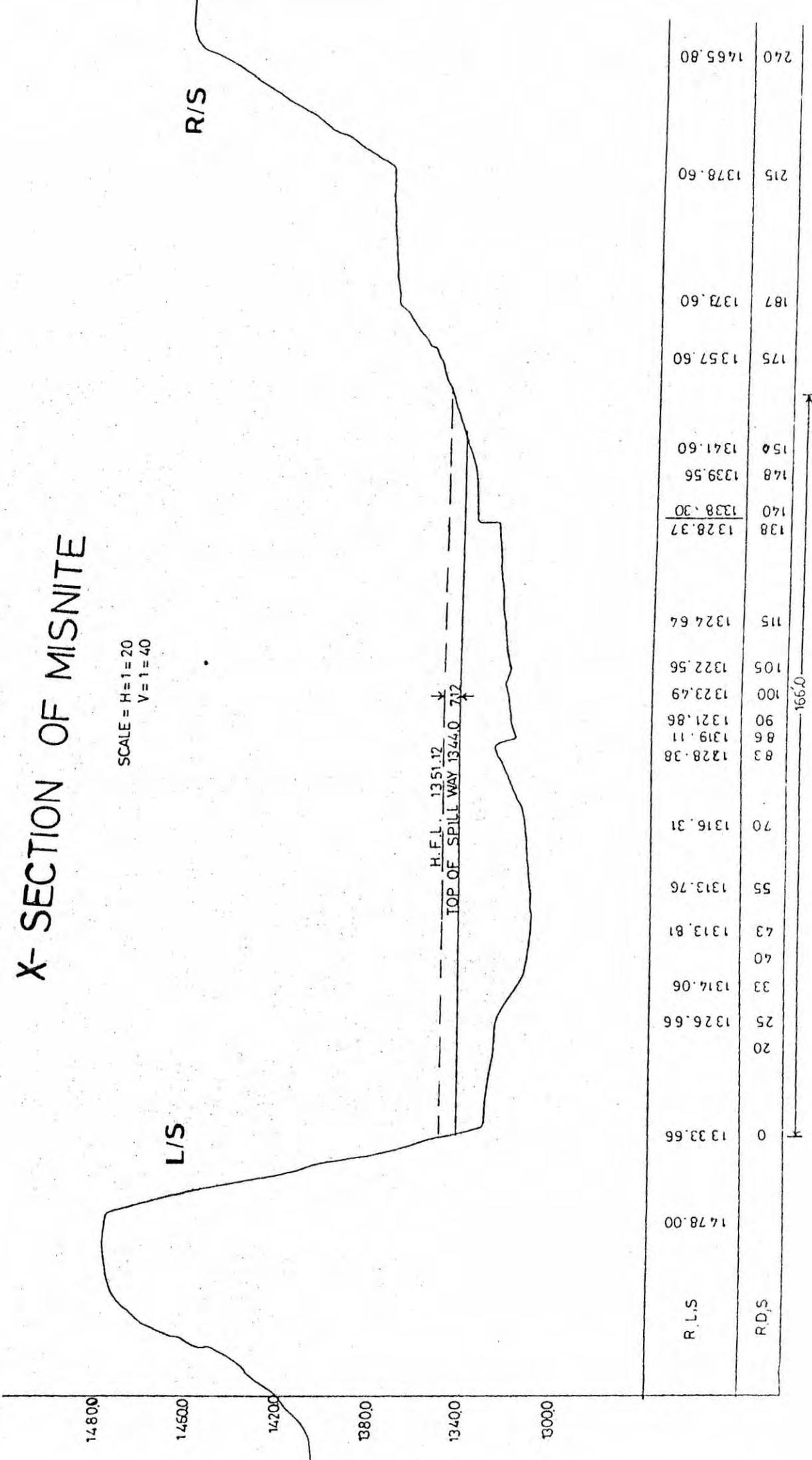
L-SECTION OF MISNITE LAHAR OF SORI LUND H/T



R.L.S	RD./SFT
1303.66	1000
1313.65	0
1322.04	1000
8.23	
1330.27	2000
24.00	
9.92	
1340.19	3000
10.33	
1350.52	4000

# X-SECTION OF MISNITE

SCALE = H=1=20  
V=1=40

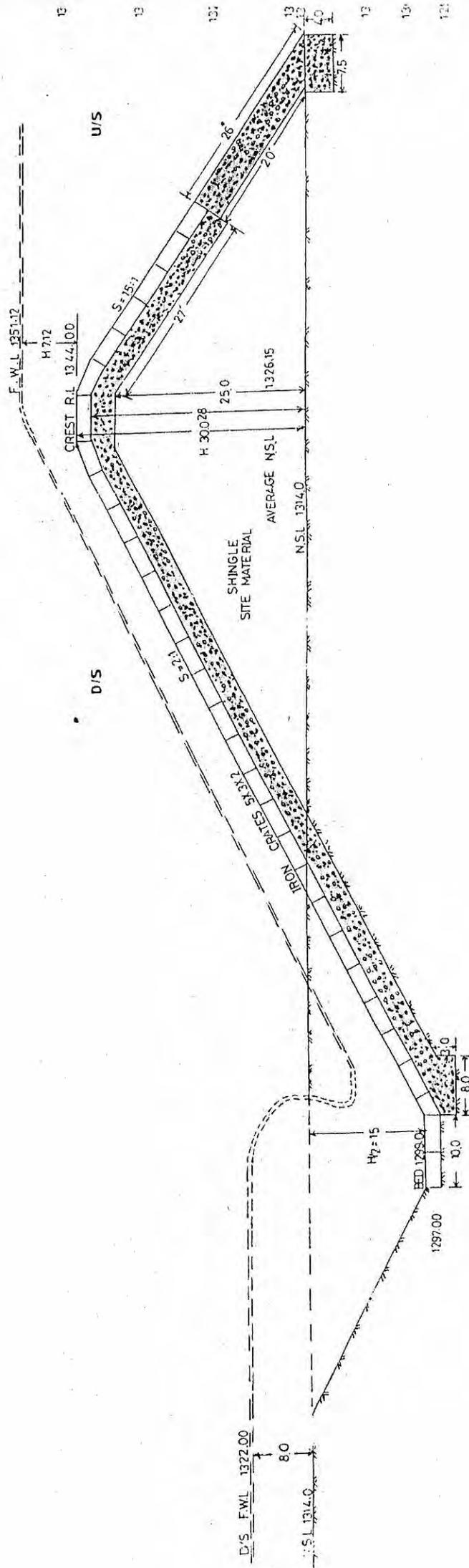


R.L.S	1478.00	0	1333.66	20	1326.66	25	1314.06	33	1313.81	40	1313.81	55	1313.76	70	1316.31	83	1228.38	86	1319.11	90	1321.86	100	1323.49	105	1322.56	115	1324.64	138	1328.37	140	1338.30	148	1339.56	150	1341.60	175	1357.60	187	1373.60	215	1378.60	240	1465.80				
R.D.S																																															

166.0

# X-SECTION OF PROPOSED MISNITE DELAY ACTION SPILL WAY

SCALE = 1" = 10'



# X-SECTION OF DELAY ACTION DAM

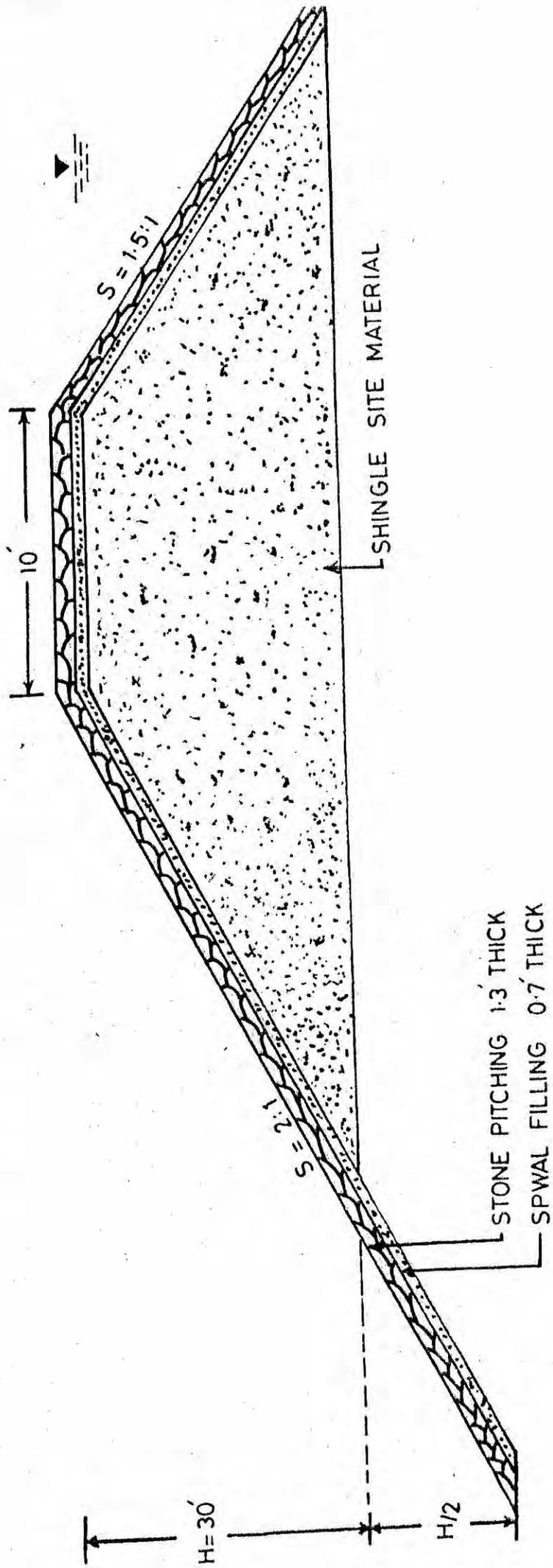


FIG-1



# DETAIL OF CREST

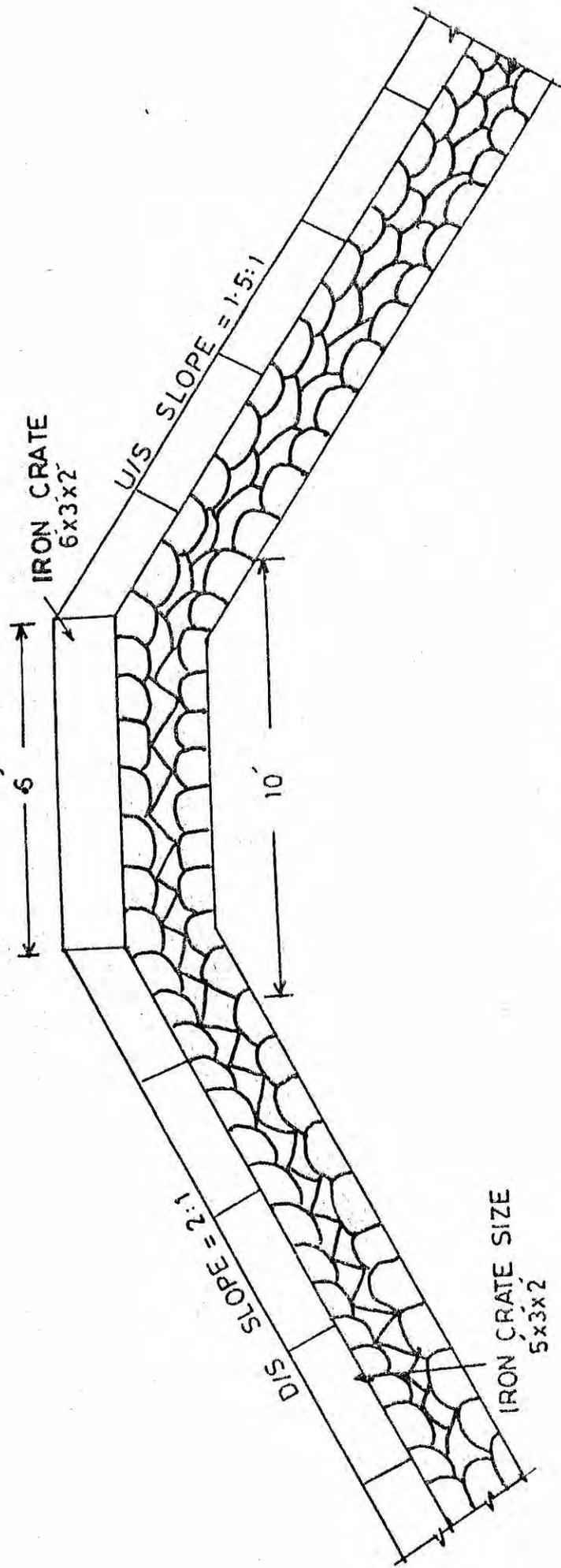


FIG - 3

X-SECTION AT JUNCTION POINT FOR  
SPILLWAY AND DELAY ACTION DAM

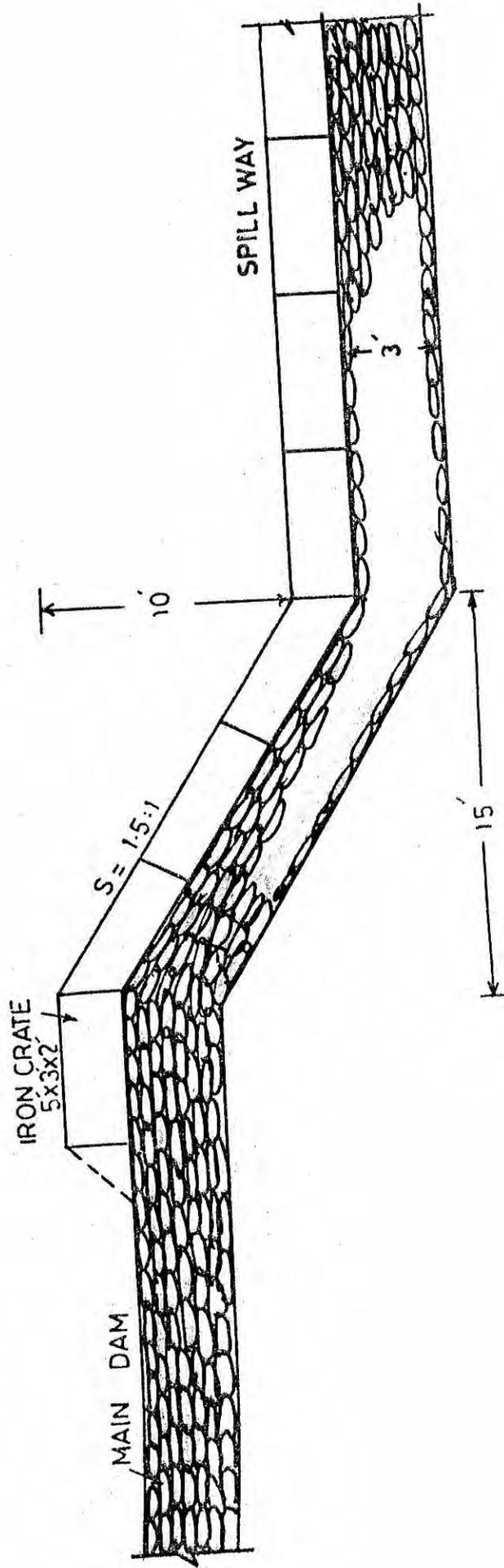


FIG-4

COMPOSITE SECTION FOR SINGLE 60' HIGH DAM  
 (X-SECTION OF THREE STAGE DELAY ACTION DAM AT ADJACENT SITE)

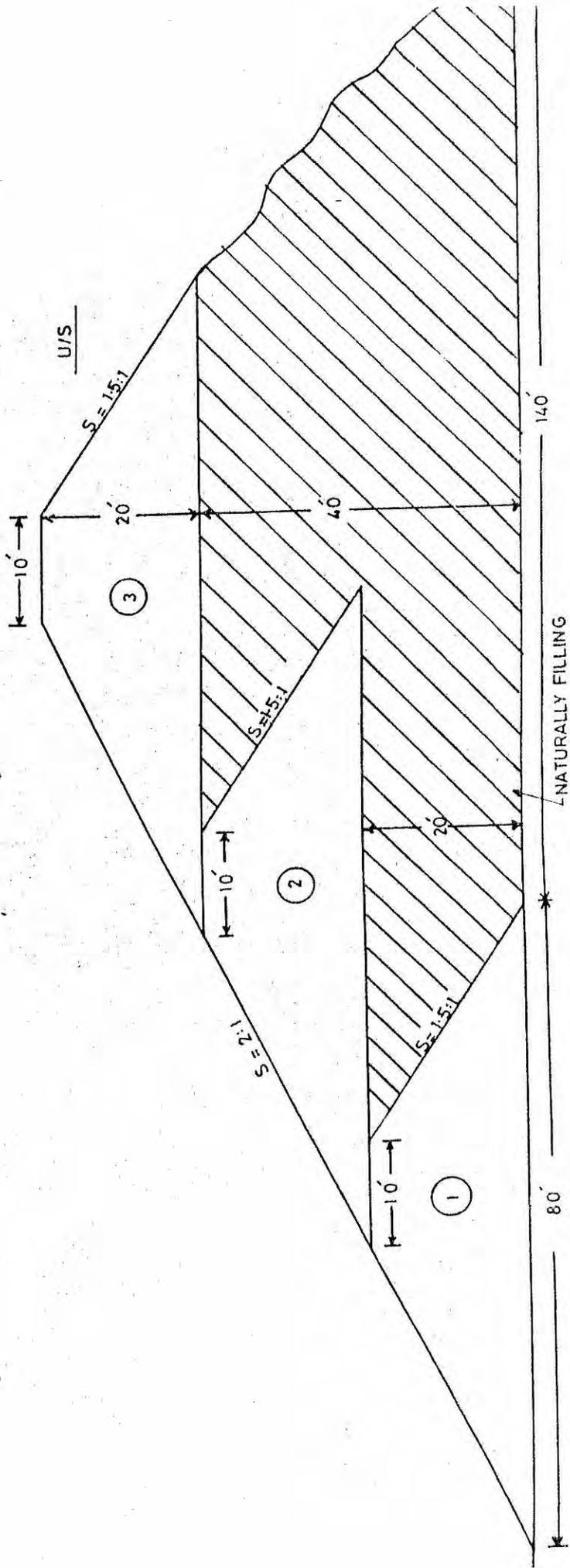


FIG-5





A view for tomb of pious man "Zinda Pir" at Sori Lund Hill Torrent.



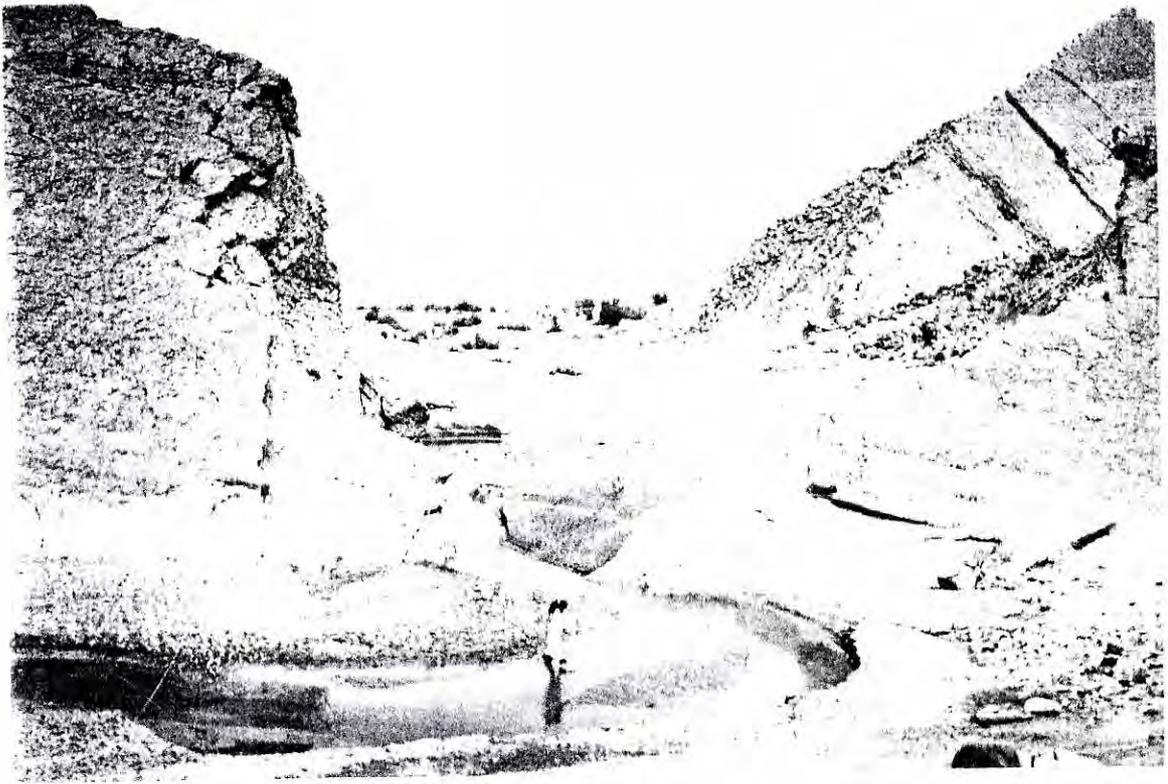
A Place for "MELA" ceremony at Zinda Pir about 2000' D/S of Gokhar Thal.



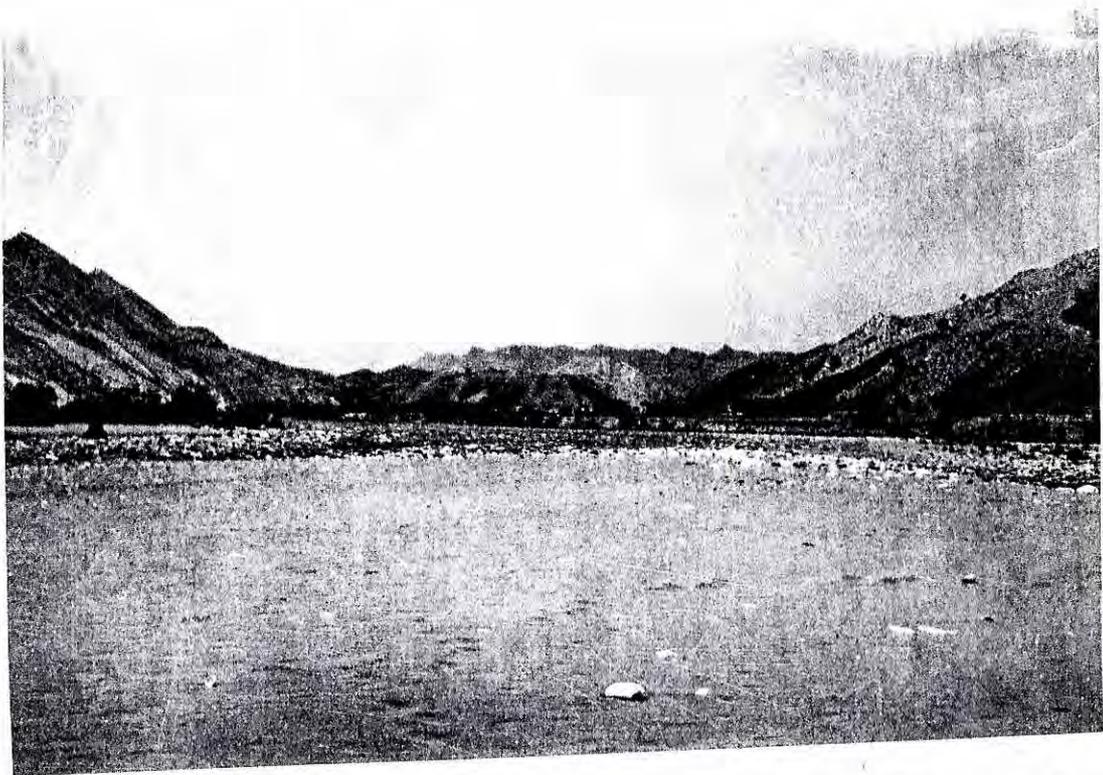
A Dam site of Gokhar Thal Tributary of Sori Lund Hill Torrent.



A Stinky and dirty water of Ghora Mutar with heavy contents of Sulpher and iron having a bad smell of rotten eggs i.e. Hydrogen Sulphide (KALA PANI).



A Dam Site at Shaheed of Sori Lund Hill Torrent.



Valley of Mauza Choath U/S Dam site of Sori Lund Hill Torrent.



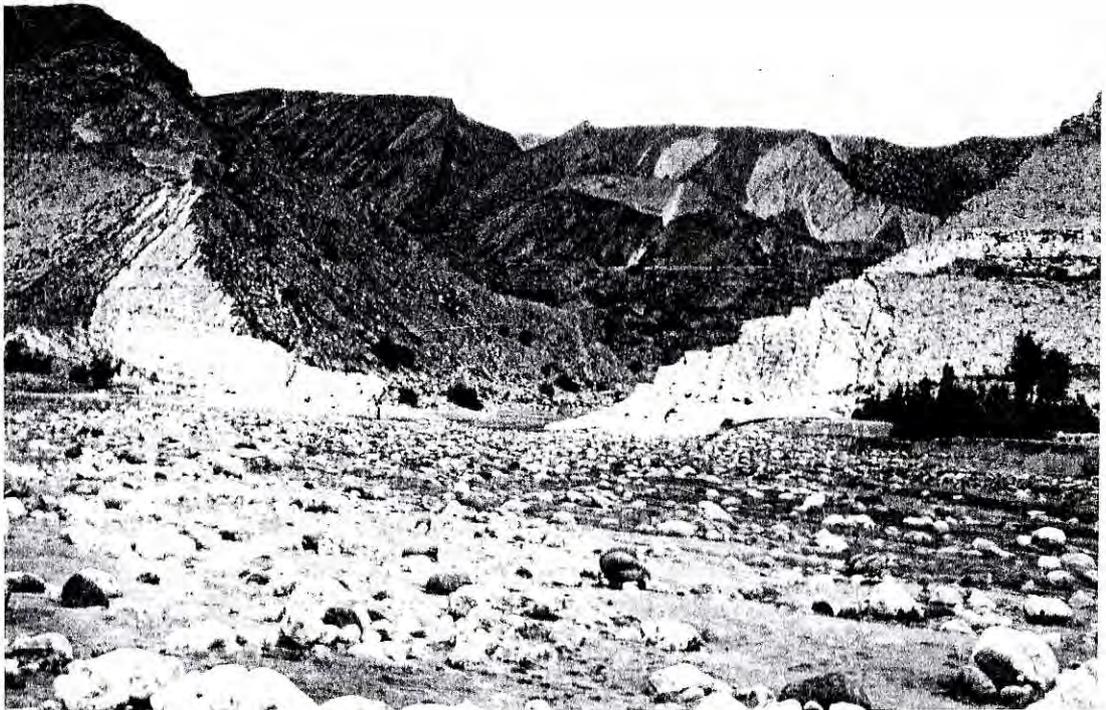
D/S of Jangu Dam site on Sori Lund Hill Torrent.



Discussion with the Local Baloachs.



Searching for Dams on Sori Lund Hill Torrent.



Dam site of Choath on Sori Lund Hill Torrent.



Dam site on Sori Khosa.



A Beautiful dam site of Phishi at Sori Lund Hill Torrent.