2.2.2 Existing Drainage Facilities

(1) Drainage Channels

All the channels are unlined and have a trapezoidal section. The side slope of the channel varies from 1:1.0 to 1:2.5, depending on the channel design capacity. As for the major collectors, in the side slope is divided into two sections; 1:2.5 for the wet perimeter portion, and 1:1.5 for the dry portion. All drainage channels are deteriorated by sedimentation and erosion. Sediment deposits in the drainage channels cause poor drainage, especially along the middle reaches of the North Main Collector in the upstream area. Sediment deposits not only in the major collectors but also in the field drains bring about inundation in the local farmland.

(2) Structures

The related structures on the major collectors are only road bridges. The number of these bridges is as follows:

Description	Bridge (no.)
South Main Collector	12
North Main Collector	14
Chokes Collector	1
East Karmachinsky Collector	6

2.2.3 Drainage Method

The surface drainage system is not so developed at present. Excess rainwater penetrates into the soils, flows down to the depressed areas and into field drains in farmlands. Most of this water is finally collected by the channels as percolation water. The excess water in farmlands may be very little because of small rainfall and sufficient capacity of the field drains, field collectors, etc. to collect it.

Sub-surface drainage is mainly in the Kzyl Orda Left Bank Area, since rainfall is very limited during the cropping season. Sub-surface drainage is commonly practiced by using open drain. However, drainage in the field is not adequately controlled. Some fields are inundated due to the silting up of field drains. Most drainage water flows down to low-lying lands. This drainage system comes poor drainage and accumulation of salt on the ground surface. Besides open channel drainage, underground drainage is also applied in a very small area of the III International Farm and others.

2.3 Master Plan for Development

2.3.1 Irrigation Plan

(1) Irrigation Method

The basic concept of irrigation is to supply the farmlands timely with an adequate quantity of water required for the crops. The current oversupply of irrigation water and water seepage from the irrigation canals, which bring about salt injury to the upland crops due to the rise of groundwater table and accumulation of salt on the ground surface shall be controlled. To come up with this objective, a strategy shall be formulated to provide the Kzyl-Orda Left Bank Area with water adequately and effectively for agricultural production and to secure water distribution with less conveyance and operation water losses through improvement of the irrigation water supply system, and ultimately to restore the natural environment of the Aral Sea in the future by applying such water saving irrigation method to other irrigation areas in the Syr Darya and Amu Darya river basins.

The surface irrigation method will be applied in the land plot, as follows flooding irrigation for paddy, and flooding/contour ditch (corrugation) irrigation for upland crops, as referred to in Table F.7. The depth of flooding water for paddy shall be 5 to 10 cm, depending on the rotation interval and crop growing stage, while irrigation application interval for upland crops will be determined by crop water requirements and Total Readily Available Moisture (TRAM). Flexibility in time and depth of water shall be maintained to accommodate distinct difference in crop water requirement during the crop growing cycle. The water saving irrigation method is better than the application of fixed water supply schedule. Deep flooding depth of water and/or oversupply of water shall not be allowed. If the proposed water depth is difficult to apply to one plot due to the configuration of farmland, provision of farm levees and/or ditches parallel to contour lines is recommended.

The run-of-river system will be employed for water diversion. Irrigation water will be diverted from the Syr Darya river at the existing headworks for the Kzyl-Orda Massive Irrigation Area and conveyed through the canals by gravity. The major irrigation canal network will be the same as it is. Minor modifications will be made for the distributors. Some distributors will be demolished and/or integrated with other distributors, taking into account the water distribution, location of farms, etc.

The total irrigation area will remain at 87,000 ha commanded by each distributor will be rearranged based on the proposed land use. The proposed irrigation canal systems are schematically illustrated in Figure F.6 for the Left Main Canal, Figures F.7 to F.9 for the Right and Left Branch Canals, and Figure F.10 for the major inter-farm/on-farm canals. Furthermore, the command area and length for each distributor are tabulated in Table F.6. The areas to be irrigated by the major canals are summarized below:

Irrigation Area at Headworks		87,000 ha
in which :	Area irrigated directly from LMC	33,390 ha
	Area through. Right Branch	34,960 ha
	Area through. Left Branch	15,890 ha
	Area for Kos-Uzyak	2,760 ha

(2) Irrigation Water Requirement

(a) Crop Water Requirement

The crop water requirements for paddy and upland crops are different in terms of irrigation. The crop water requirement for paddy is the water quantity required for evapo-transpiration of paddy and deep percolation to saturate the root zone of paddy, while the crop water quantity requirement for upland crops is the water necessary to be retained in soils for the growing of crops.

The water requirement for crops must be estimated based on the field measurement data. However, since experimental data were scarcely available, the Modified Penman method, which is commonly applied for other projects in Kazakstan, has been introduced to estimate the irrigation water requirement for the Kzyl-Orda Massive Irrigation System.

The reference crop evapo-transpiration (ETo) on a monthly basis for the crop growing period has been computed by applying the Modified Penman method, as shown in Table F.9. Since climate data were collected from the meteorological station located in the dry surroundings, the Oasis' effect has been employed in calculation of ETo, applying a correction factor of 0.85 and 0.9 for the summer season and the winter season cropping, respectively.

Crop coefficient (Kc) has been selected by referring to FAO Irrigation and Drainage Paper No. 24, as presented for each crop growing stage in Table F.10. For paddy, the percolation rate applied is 3 mm/day, taking into account field observation data (Table F.8), soils, lowering of groundwater table in the future, etc.

In addition, non-irrigation periods before harvesting have been determined to be 30 days for paddy, 20 days for maize and wheat, and 15 days for vegetables. Based on the proposed cropping calendar, the water requirement for crops has been computed by multiplying ETo by Kc, as detailed in Table F.11.

(b) Net Irrigation Requirement

(i) Pre-irrigation Water

For paddy, a water depth of 120 mm will be provided immediately after sowing, to saturate the tillage depth of about 20 cm for seed soaking and protection from birds, etc. After soaking for one week, the standing water in the farmland shall be drained. Irrigation water for crop management will be supplied after one week for dry. The land preparation will not be requested, because direct sowing of dry seeds. The water requirement for saturation is calculated by the following equation.

Sn (Saturation Water Requirement) = (Sc-Mc) x As x Ds/1000

Where : Sc (Saturation capacity) = 36%
Mc (Moisture content) = 18%
As (Apparent Specific gravity) = 1.7
Ds (Depth of plough layer) = 20 cm

For the upland crops, a water depth of 25 to 35 mm, which is equivalent to TRAM for a tillage depth of 20 cm plus soil surface evaporation for 5 days, will be secured as a pre-irrigation operation for ploughing, harrowing, and seed germination. Water for crop management will be supplied after germinating. Such pre-irrigation water requirement has been calculated referring to the available soil water and fraction of available soil water in silty loam presented in FAO Irrigation and Drainage Paper No. 24, as follows:

Crops/items	Paddy	Maize	Wheat	Melon	Lucerne
ETo at sowing time (mm/day)	6.20	6.20	5.82	6.20	6.20
Depth of water application (m)	0.2	0.2	0.2	0.2	0.2
Available soil water (mm/m)	-	160.0	160.0	160.0	160.0
Fraction of available soil water	-	0.6	0.55	0.35	0.55
Readily available soil water (mm/m)	-	96.0	88.0	56.0	88.0
Readily available soil water (mm)	61.2	19.2	17.6	11.2	17.6
Surface evaporation (mm)	-	12.4	11.6	12.4	12.4
Flooding (mm)	50.0	-	-	-	-
Pre-irrigation (mm)	111.2	31.6	29.2	23.6	30.0
Say	120	35	30	25	30

(ii) Leaching Water

For desalinization of the soil, leaching water may be required. However, according to the proposed cropping pattern, the planting of upland crops is scheduled to be carried out after paddy cultivation. Salinity level in the soils will be decreased by deep seepage water (percolation) and lowering of groundwater table by drainage improvement. In other words, paddy irrigation water will leach salt accumulation in the soils and play the same function as leaching water. Leaching water, therefore, will not be introduced in the plan.

(iii) Effective Rainfall

Effective rainfall is defined as the quantity of rainwater provided to crops effectively at the field level. The precipitation in the non-irrigation period from October through March is estimated to be about 74 mm in 4 out of 5 years but negligibly small for the

period from April to September. Effective rainfall, therefore, will be ignored for the summer season crops but expected for the winter season crops, such as winter wheat and Lucerne.

(iv) Groundwater Contribution

The contribution of groundwater is concerned with the depth of water table below the roof zone, depending on capillary properties of the soils. Irrigation water is practically not supplied at present to the crops other than paddy, except vegetable crops. As the lowering of groundwater table is not so much expected in the future condition with the project, groundwater would inevitably be used for cropping. On the other hand, the salinity of groundwater in the upper portion is expected to be more or less 1,000 ppm, as observed by the water quality survey in the drainage channels.

In order to avoid oversupply of irrigation water to the crops, groundwater contribution has been calculated by referring to FAO Irrigation and Drainage Paper No. 24. The results are presented in Table F.12.

(v) Stored Soil Water

Rainfall during the period of October through March is estimated to be about 74 mm in 4 out of 5 years. This percolates into the root zone of crops in Spring after thawing of frozen rainwater. The groundwater table is as relatively high as 2 to 3 meters. Taking this condition into account, the stored soil water is expected to be at field capacity in the initial stage of irrigation period, specially in April. The effectiveness of stored soil water has been assumed to be about 60 % of readily available soil water for crops.

(vi) Net Irrigation Requirement

The net water requirement for irrigation has been calculated for each crop by subtracting effective rainfall, groundwater contribution and stored soil water from the sum of crop water requirement and pre-irrigation water on a monthly basis. The net irrigation requirement for the irrigation period has been computed as shown in Table F.13. The averaged net water requirement weighted with the proposed cropping pattern for the whole irrigation area is presented in Table F.14.

(c) Irrigation Efficiency

The water diverted from the headworks and conveyed to farm plots is subject to water losses due to evaporation from the water surface, seepage from the wetted perimeter of canals, and leakage through cracks/holes in canals, etc. (conveyance losses); due to water distribution, such as time lag between the headworks and the farm plot, water necessary for raising of the water surface by regulators/check structures, etc. (operation losses); and due to the water application method to the crops at the farm plot (application losses).

The conveyance losses for the Left Main Canal and Right and Left Branch Canals will be greatly decreased by providing side slope protection works with cut-off sheet piles, and by rehabilitation and improving inter-farm and on-farm canals, field canals, and field ditches. The operation losses will be improved significantly by introducing proper water management. The application losses are expected to be slightly improved by applying appropriate farm management.

The irrigation efficiency is expressed by the percentage of net irrigation requirement to the diversion water requirement including the above losses. The proposed irrigation efficiency compared to the present efficiency, assumed based on water supply and practices and planted area is shown below:

Item	Present		With Project	
	Paddy	Upland	Paddy	Upland
Application Efficiency.	0.85	0.60	0.95	0.70
Conveyance Efficiency	0.42	0.42	0.73	0.73
Main Canal	(0.85)	(0.85)	(0.95)	(0.95)
Distributors	(0.70)	(0.70)	(0.90)	(0.90)
Field Canals/Ditches	(0.70)	(0.70)	(0.85)	(0.85)
Operation Efficiency	0.45	0.45	0.80	0.80
Overall Efficiency	0.16	0.11	0.55	0.41
Ratio of Discharges	0.91	0.09	0.81	0.19
Weighted Efficiency	0.16		0.52	

(d) Diversion Water Requirement

The diversion water requirement for the irrigation period from April to September, based on the average water requirement weighted with the cropped area and the proposed cropping pattern, has been calculated by applying the net water requirement and irrigation efficiency mentioned above, as shown in Table F.15 and summarized below:

DWR	April	May	June	July	Aug.	Sept.	Total
in MCM	26.4	327.3	275.6	347.5	181.3	46.8	1205.9
in m^3/sec	10.2	122.3	106.3	129.7	67.7	181.1	454.3

DWR: Diversion Water Requirement

The total irrigation water quantity supplied from the Syr Darya river will be enough, except in September, considering the estimated monthly discharge for the Left Bank Area (refer to the following table). About 680 MCM or 36 % of the average quantity of water discharged to the Left Main Canal can be saved per annum. However, the peak demand in July corresponds to about 82 % and 86 % of the available discharge with a return period of 5 and 10 years, respectively. In addition, some reserves for water distribution in September will be required.

(Unit : m^3/s)

Item/ Month	April	May	June	July	Aug.	Sept.	Total	(MCM)
Avg.	53.3	185.6	194.6	177.6	107.5	0.7	719.3	1889.7
Max.	68.5	238.5	250.0	228.2	138.1	0.9	924.2	2428.1
Min.	43.4	151.1	158.5	144.6	87.5	0.3	585.4	1530.2
10 yr.	45.1	157.0	164.6	150.2	90.9	0.68	608.4	1598.4
5 yr.	47.2	164.5	172.5	157.4	95.3	0.71	637.6	1675.1

The design diversion water requirement at the headworks has been calculated at 137.1 m^3/sec. The unit design discharges applied to the canals have been estimated taking into account the maximum water requirement based on the proposed cropping pattern; that is, only paddy irrigation by field canals and pre-irrigation for paddy by field ditches. The results are shown below:

Canals	Unit Design Discharges (lit/s/ha)
Main, Branch Canals and Distributors	1.576
Field Canals	1.772
Field Ditches	4.170

(3) Improvement of Irrigation Facilities

(a) Canals

All canals will be rehabilitated and improved under the Project, since the canals are severely deteriorated due to absence of maintenance works. Among others, the Left Main Canal and both Right and Left Branch Canals will be provided with side-slope protection works. Some inter-farm/on-farm canals, where large water seepage is anticipated, will be lined. Other canals will be unlined. The total length of canals to be rehabilitated is shown below:

(Unit : km)

	Main Canal	Branch C.	Inter/On-farm C.	Field Canals	Field Ditches
Total Length	89.9	118.8	445.0	974.4	2697.0

(b) Structures

(i) Headworks

The Kzyl-Orda headworks, including the flood gates, right and left intake gates and scouring sluice gates as well as related structures will be rehabilitated. All gates will be operated by remote control.

(ii) Canal Structures

The canal structures, such as regulators, head gates, turnouts, bridges, road crossings and aqueducts, will be rehabilitated to restore their function. All gates of regulators, head gates and turnouts will be replaced with new ones. The heavily deteriorated structures will be reconstructed.

2.3.2 Drainage Improvement Plan

(1) Drainage Method

The direct objective of drainage is to improve the crop growing condition and working condition for farming by draining excess water on the ground surface and in the soil. Drainage control is as important as irrigation for the function of farmlands. Sub-surface drainage shall be applied instead of surface drainage to control soil moisture in the Study Area, because rainfall is very small with mean monthly rainfall ranging from 19.3 mm in May to 3.5 mm in August and total rainfall being 59 mm only during the irrigation period, April to September.

From the above standpoints, drainage control will be adopted to remove excess soil moisture in a depth of about 0.5 meter below the ground surface and it is expected that the presently high groundwater table will be lowered by 0.5 meter or 1.0 m below the ground surface. This drainage control is expected to improve farming operations and accelerate leaching of salt in the topsoil. Deeper groundwater table control, for instance at 1.5 to 2.0 m below the ground surface, will be required for deep excavation of field drains and/or the vertical under-drainage system. Such works will be costly and unfeasible economically (see Table F.28).

Drainage water from farms will be discharged into the inter-farm/on-farm collectors through field drains and field collectors. Water collected in inter-farm/on-farm collectors will be basically discharged into main collectors. Nevertheless, some water will be drained to depressed land, if it could not be discharged into the main collectors due to the lower elevation of the depressed land than the bottom elevation of the collectors concerned. The drainage system in the village homesteads, however, shall be improved to drain water into field collectors or on-farm collectors by providing village drainage channels. A schematic diagram of the drainage system is shown in Figure F.10.

At on-farm level, excess water will be drained through the field outlet provided for each farm plot. The field outlet shall be located lowest ground elevation in the farm plot. As mentioned previously, provision of farm levees, in the case of configured farmland, will be effective to keep the flooding water depth evenly in the farm plot, in the event of heavy rain or over-supply of irrigation water by miss-operation. Field drains will collect not only such excess water from field outlet but also the excess soil moisture as seepage water along the drain.

Natural drainage by open channel will be applied. The open channels will have an adequate water level to collect the percolation water along the channels. By keeping the water level in the open channels at 1.5 meters in minimum below the field ground surface, the drainage objectives stated previously will be achieved. However, proper drainage control to maintain the minimum water level in the channels is strictly required for sub-surface drainage. Surface drainage water will be drained into those open channels, because of small rainfall during the irrigation period.

(2) Drainage Module

Rainfall during the irrigation period, April to September, is about 59 mm in total and 82 mm in maximum in May, as shown in the following table.

(Unit : mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Avg.	16.7	14.1	18.9	19.2	19.3	8.6	4.7	3.5	3.6	11.9	17.2	18.7	156
Max.	41.0	30.0	60.7	64.4	82.4	69.4	27.9	20.1	18.2	42.9	53.9	48.0	310.6
Min.	0.0	0.3	3.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	80.7
STD.	9.7	9.0	13.9	18.2	21.5	13.2	6.5	4.7	5.1	11.5	12.9	12.6	50.3

Precipitation falls in the form of snow from October to February but melts in a few days. Rainfall with high intensity comes out mostly in March, April, and May. With regard to surface drainage, daily and 3-day successive rainfalls have been estimated as follows:

Probability of Exceedance	Max. Daily Rainfall (mm)	Max. 3-day Successive Rainfall (mm)
1/5 year	21.2	29.1
1/10 year	25.2	36.2
1/20 year	28.9	43.6

The small quantity of rainfall shown in the table could be absorbed by the farmland without any damage to the crops. In addition, the present drainage system has been developed for the practical purpose of sub-surface drainage. Surface drainage water flows down to low-lying land disconnected with any channels and evaporates and/or percolates into the soils.

Drainage improvement, therefore, will be taken up through groundwater control. The drainage water collected by the field drains in farm land will consist of the percolation water and a part of operation losses during irrigation water distribution. Drainage water from the lands other than farmlands is expected to be collected by other channels, such as main collectors, inter-farm/on-farm collectors, etc., as percolation water.

The sub-surface drainage discharge (q) to be collected into the open drainage channels can be computed by the following equation:

$$q = k(Ho^2 - ho^2)/R$$

where : k = Coefficient of water permeability
Ho = Depth of groundwater table in the farm land above the impermeable layer
ho = Depth of groundwater table in the field drain above the impermeable layer
R = Circle of influence

To estimate the percolation water quantity in the field, the depth of groundwater table in the farmland is assumed to be 9.5 m above the first impermeable layer in the upper aquifer. The circle of influence is the interval between field drains. By substituting $k = 4x10^{-5}$ m/s, Ho = 9.5 m, ho = 8.5 m, and R = 110 m in the above equation, the discharge collected by the field drains is computed to be $6.55x10^{-3}$ (lit/s/m). As the density of field drains is 39.1 m/ha (Table F.28), the discharge is converted to $Q_1 = 6.55x10^{-3}$ lit/s/m x 9.1 m/ ha = 0.256 lit/s/ha.

The quantity of additional incoming water into the field drains, which is composed of water unused for irrigation, is estimated at about 50 % of the total field operation losses or 10 % of 1.417 lit/s/ha which is the irrigation water requirement at the head gate in July (Table F.15). That is Q_2 = 1.417 lit/s/ha x 0.1 = 0.142 lit/s/ha. Finally, the drainage module for farmlands can be computed as follows:

Q1 +Q2 = 0.256 + 0.142 = 0.398 lit/s/ha

The drainage module for the lands other than farmlands has been computed by applying the same equation for estimate of percolation in the farmland. The figures adopted for computation have been examined, taking into account the interval between inter-farm/on-farm collectors, deeper depth of channels than field drains, topography, soils, etc. The drainage module, then, has been calculated at 0.174 lit/sec/ha, by substituting $k=3x10^{-4}$, Ho = 9.5 m, ho = 8.4 m, R =4 20 m and canal density of 12.4 m/ha for the main and major collectors (see Table F.26). The computed drainage modules per ha are presented below:

Land Category	Drainage Module (lit/s/ha)
Farmland	0.398
Other land than farm land	0.174

(3) Drainage Discharge

The drainage discharges of major collectors have been calculated by applying the drainage modules to each land category. The results are shown in Table F.16 for main collectors and Table F.17 for major inter-farm/on-farm collectors.

(4) Improvement of Drainage Facilities

All drainage canals will be rehabilitated by removal of sediments, reshaping the canal section, and providing O&M roads along the major canals.

3 FEASIBILITY STUDY ON THE PRIORITY PROJECT

3.1 The Project Components

The Priority Project, selected under the Master Plan Study would include the following components:

(i) Rehabilitation and improvement of the intake structure of the Kzyl-Orda Headworks;

(ii) Rehabilitation and improvement of the Left Main Canal;

(iii) Rehabilitation and improvement of the North and South Main Collectors; and

(iv) Rehabilitation and improvement of the Ilyasov and Shagan Areas (13,690 ha in total) including the inter/on-farm canals.

3.2 Priority Project Area

3.2.1 Present Irrigation Condition

(1) Irrigation Area

The Area, consisting of the Ilyasov and Shagan Areas which have been singled out as the Priority Project Area, is located in Terenozek Raion, extending on both the right and left banks of the Left Main Canal between the Regulators PK 272 and PK 744 within the Kzyl-Orda Left Bank Massive Irrigation System. The total irrigation area is some 13,690 ha, including some 6,480 ha of the Ilyasov Area and 7,210 ha of the Shagan Area.

(2) Irrigation System

(a) Canal Networks

Irrigation water is supplied to the farms by the inter-farm/on-farm canal systems through the head gates built on both the left and right banks of the Left Main Canal. Five on-farm canals (LMK-6, LMK-8, LMK-12, LMK-14, and LMK-16) are provided in the right bank area and 3 inter-farm/on-farm canals (LMK-9, LMK-11v-3, and LMK-11G) in the left bank area for the Priority Project Area. Among them, LMK-9 for the Shagan Farm is an inter-farm canal which also serves a part of the Shrikeli and Akzharma farm areas located outside the Project Area. A schematic diagram of the irrigation system is illustrated in Figure F.11 for the Ilyasov area and Figure F.12 for the Shagan area.

The head gates of LMK-6 had originally been built on the right bank of the Left Main Canal between the Regulators PK-272 and PK-402, but were relocated upstream of the Regulator PK-272 in 1982, by constructing an about 8.8 km long leading canal for the LMK-6 on-farm canal from its head gate to the first turnout in its service area.

The LMK-8 divides into three on-farm canals, LMK-8A, 8B, and 8G, at a point 120 m downstream of the Left Main Canal. Head gates and hydro-posts are equipped for each on-farm canal but not for the leading canal, LMK-8. The total service area of LMK-8 is 5,809 ha. The LMK-8A serves the area located immediately below the head gates and to the north of the North Main Collector in the Project area. The LMK-8B and 8G serve the area situated to the west and east of LMK 8A respectively to the south of the North Main Collector.

The LMK-9 is the inter-farm canal to divert water to the Shirkeli farm area through the main field canal LMK-9B and deliver water to the LMK-9-4 for the Akzharma farm at the last turnout for the Shagan farm irrigation area. The service area of LMK-9 is 2,653 ha including 230 ha of the Shrikeli farm and 462 ha of the Akzharma farm.

The LMK-12, which is located on the right side of the Left Main Canal, has a service area of 2,583 ha and the longest canal length, about 27.6 km, among the inter-farm/on-farm canals in the Project area. This on-farm canal is operated for 3 brigade areas of the Shagan farm and some areas of Raison's reserved land which are located in the north through northeast of the Shagan Area. Water seepage from on-farm canals and elevated farmlands which can not be irrigated by gravity constitutes a serious problem for this canal system.

The LMK-14 was modified from the original plan by integrating the downstream area of the original LMK-16 into the present service area. The total irrigation area is 824 ha, of which 42 ha was the original area of LMK-14. The leading canal is long, about 6.4 km from its head gate to the point of contact with the original canal LMK-16.

The LMK-11V-3 is the on-farm canal system which was separated from the original plan of LMK-11V by constructing a head gate and a leading canal to supply water to the original LMK-11V-3 service area. This modified canal system has been operated since 1967 and

covers the area of one brigade of the Shagan farm. In the downstream area of this system, a land area of 93 ha is presently irrigated by the LMK-11-7-2.

The LMK-11G is the on-farm canal system, which diverts the water from the left bank of the Left Main Canal, and is located on the west of the Shagan area. This system is small with a service area of 178 ha only.

As for the canal network, the Project Area has been equipped with an inter-farm/on-farm canal irrigation system. In general, the inter/on-farm canals branch off from the Left Main Canal, while the field canals are those to convey irrigation water from the inter-farm/on-farm canals to the field ditches. Nonetheless, it is considered that such generally defined field canals shall be further classified into main field canals (MFC), secondary field canals (2FC), and supplementary field canals which serve as a part of the on-farm facilities (Figure F.13).

The Left Bank Main Canal with a length of about 90 km is unlined but provided partly with side-slope protection works. The Canal has presently an irregular shape due to side-slope failure, erosion, and scouring. Most side-slope protections have failed. Eroded materials are carried into the inter-farm/on-farm canals. In addition, the seepage water loss from the canal, which is about 15 % of its discharge, is a major cause of rise of the groundwater table in the Project Area.

All irrigation canals in the farmlands are also shaped irregularly, due to deposits of silty material, erosion and/or canal side-slope failures, passage of farm machinery, and so on. The canals with small flow capacity in the downstream area are covered with thick vegetation, due to absence of routine maintenance works. Maintenance roads with a width of about 6 m are provided along the major canals. These roads are passable but very rough.

(b) Irrigation Structures

The diversion structure is the Kzyl-Orda headworks, which are equipped with flood sluices and two-side intakes, of which the left side intake with six gates having a design discharge capacity of 228 m^3/sec is supplying irrigation water to an area of 87,000 ha through the Left Main Canal at present. The headworks have been used for 40 years since their completion in 1957, therefore concrete has been worn out and gates have been rusted and dislocated. In addition, the inoperative scouring sluice gates keep a bulk of sediment loads in the Left Main Canal.

For water distribution, the Left Main Canal is equipped with 39 head gates for the inter-farm/on-farm canals and 6 regulators including the hydro-knot for the Right and Left Branch Canals at the terminal (Table F.4). Those structures, which were constructed mostly in the 1960s, are currently operated but can hardly control the water level and discharge. Concrete are worn out and most gates are not operational.

The canals in the farms are equipped with structures such as check structures, turnouts for field canals, offtakes for field ditches, aqueducts over collectors, bridges, and road-crossings, to control and supply water (Table F.19). All structures are deteriorated and do not function properly, except the water measurement structures.

(3) Major Constraint on Irrigation

Major concerns about the canals are deposit of silty materials which are brought in mostly from the Left Main Canal, seepage from the canals, erosion/side slope failure of canals, insufficient water head of the canals, vegetation in the field canals and ditches, and so on. Particularly, the seepage losses along the canal have been observed to be about 0.168 m^3/s/km or about 30 % of the water discharge at the head gate of the canal for a distance of about 16.7 km (Table F.25) and result in the abandoned land along the canal.

On the other hand, the incoming silty materials from the Syr Darya river may be mostly the bed loads rather than suspended loads, due to absence of scouring sluice operation. The removal of such canal deposits as well as the remedy of canal structures are intensely required but have not been executed recurrently. According to the farms, a quantity of about 35,000 m^3 of deposits have been excavated and/or planned in 1997 for the Ilyasov Farm and 58,000 m^3 for the Shagan Farm.

The pumping irrigation system from the Syr Darya river and the drainage canals within the Project Area is employed for the farmlands with high ground elevation and water shortage, because gravity irrigation from the canals is not possible. Those lands with a area of reportedly about 480 ha are mostly abandoned and this area will increase more in the future due to insufficient fund for pump operation.

At on-farm level, constraints on irrigation are configuration of farm plots, big difference in the ground elevation between the farm plots within one irrigation unit, big size of farm plots, inadequate discharge capacity of inlet and outlet for each farm plot, etc. With regards to the configuration of farm plots, the cause may be not only original land development but also cultivation by farm machinery. The big difference of farm plots in ground elevation may be due to the land development in the construction stage. To remedy such difference in ground elevation, a huge amount of investment will be required.

3.2.2 Present Drainage Condition

(1) Drainage Area

The drainage area is situated within the drainage area of the North Main Collector and South Main Collector in the Kuvan Darya drainage area. It covers a gross area of some 40, 230 ha compare to an irrigation area of some 13,690 ha in a total.

(2) Drainage System

The North Main Collector canal network extends in the north of the Project Area bounded by the Left Bank Main Canal. The stationing of the North Main Collector begin at the culvert under the on-farm canal LMK-6. The North Main Collector traverses nearly the center of the Ilyasov irrigation area, turns toward the northwest in the west of the Ilyasov Area, then changes its direction to the west in the north of the Shagan Area, and finally joins the South Main Collector after running about 80 km. A number of inter-farm/on-farm collectors join the North Main Collector, which are provided for the rice rotation areas but not for any other areas. The drainage canals for each drainage system are tabulated in Table F.21.

The South Main Collector, which has a drainage area of some 2,060 km^2, originates in the KZ MIS farm area in the Kzyl-Orda Left Bank Area and runs toward the southwest. At Kzul Tu, the Collector changes its direction, runs on the south boundary of the Kzyl-Orda Left Bank Area toward the west and joins the Kuvan Darya river at PK-1496. The inter-farm/on-farm collectors Yuk-8 and Yuk-12 are tributary of the South Main Collector. Besides the field collector, drainage canals with a total length of about 3,400 m provided for the settlement area join to the inter-farm collector Yuk-12.

The drainage canal networks are classified into main collectors, inter-farm/on-farm collectors, field collectors, in general terms, and field drains in their function and nomination. The field collectors, nonetheless, are further classified into main field collectors (MFC), secondary field collectors (2FC), and supplementary field collectors which serve as a part of the on-farm facilities (Figure F.20).

Earth drainage canals are prevailing but a few canals are equipped with side slope protection works. Most collectors were designed for sub-surface drainage but had enough flow capacity for surface drainage, because the volume excess water from surface drainage is

expected to be small. However, due to absence of maintenance works, all collectors become shallow.

The structures for the drainage canals involve bridges, culverts, pipe road crossings, canal outlet and drain outlet, as shown in Table F.22.

(3) Major Problems on Drainage

All collectors, including two Main Collectors and field collectors become shallow due to sediment deposits in the collectors. No recurrent excavation works have been done for remedying the canal shape since the early 1970s. As a result, such shallow collectors cause water logging, high groundwater table, salt injury to the crops, and so on, resulting in lower production yield of the crops and abandonment of cultivation land.

Besides land and sub-surface drainage problems, the area in the northeast of the Ilyasov Area has often suffered from damage by flood water overtopping the dike of the Syr Darya river since 1970. This condition was caused by the Syr Darya river flood control project which aimed to divert the flood water to the Karaozek river. Therefore this flood problem shall be dealt with the said project.

3.3 The Project

3.3.1 Proposed Irrigation System

(1) Irrigation Method

The gravity irrigation system by open canals will be employed under the Project. The water quantity will be controlled by head gates, check structures, and turnouts. Field ditches receive water from supplementary field canals through offtakes, principally.

The surface irrigation method will be applied at the field, namely flooding irrigation for paddy, furrow irrigation for vegetables including water melon, and flooding/corrugation irrigation for the upland crops other than vegetables, taking into account the basic intake rate observed in the course of the Study (Table F.23).

(2) Diversion Water Requirement

(a) Crop Water Requirement

To estimate the crop water requirement, the reference crop evapo-transpiration (ETo) on a 10-day basis during the crop growing period has been computed by the Modified Penman method, applying a correction factor of 0.85 and 0.9 for the summer and winter cropping seasons, respectively (refer to Table F.23). Crop coefficient (Kc) has also been modified on a 10-day basis by referring to FAO Irrigation and Drainage Paper No. 24 (refer to Table F.24).

The crop water requirement on a 10-day basis has been computed based on the proposed cropping calendar (Table F.25). The non-irrigation period before harvesting has been assumed to be as that determined in Sub-section 2.3.1.

(b) Net Irrigation Water Requirement

To estimate the net irrigation requirement, the water quantity needed for pre-irrigation, groundwater contribution and stored soil water as well as a deep percolation rate of 3 mm/day for paddy have been assumed by applying the same figures and/or conditions as those presented in Sub-section 2.3.1.

The net irrigation water requirement for irrigation, then, has been calculated by subtracting groundwater contribution and stored soil water from the sum of crop water requirement and pre-irrigation water on a 10-day basis (Table F.26).

(c) Diversion Water Requirement

The diversion water requirement for the irrigation period from April 10th to September has been calculated by using the same irrigation efficiencies presented in Sub-section 2.3.1, as the average water requirement weighted with the cropped area based on the proposed cropping pattern for the Ilyasov and Shagan Areas (Table F.27).

The design water discharges for each canal have been calculated by using the maximum diversion water requirement for the service area of each canal, taking into account the crop rotational pattern. The unit design water discharges applied to the canals, which are different from the ones in the Master Plan due to the modified cropping pattern, are as follows:

Unit Design Water Discharge (lit/s)	Application to Canals
1.556	On-farm canals up to the last brigade
1.642	On-farm canal w/in one brigade & main field canals
1.700	Secondary & supplementary field canals
3.520	Field ditches

(3) Rehabilitation and Improvement of Irrigation Facilities

(a) Proposed Irrigation System

The existing eight inter/on-farm canal systems will be rehabilitated and improved under the Priority Project. However, the project area and on-farm canals were modified from the Master Plan based on further studies. Namely, the area of LMK-16A will be excluded because the land is not currently irrigated. The LMK-11V-3' will be used for kitchen garden and ecological purposes. A part of the service area up to the LMK-11V-7-2 will be served by the LMK-11V-3.

On the other hand, the area of LMK-8A-6 will be served through the LMK-8A, as it is, though the # 4 brigade is requested to irrigate its land through the LMK-6. The requested plan will not be economical, because the on-farm canal is required to be heightened by 0.8 m over its entire length of 16 km.

(b) Improvement of Left Main Canal and Structures

(i) Headworks

The intake structure of the Kzyl-Orda headworks will be improved, in order to control the intake water discharge to the Left Bank Main Canal properly, and protect the canal from the deposition of incoming river bed materials of the Syr Darya river. Besides the intake, the lifting devices of five flood sluice gates might be replaced for proper operation and control the water level of the intake and the water discharge to areas downstream of the headworks. Those gates will be controlled from the remote operation room.

(ii) Left Main Canal

The Left Main Canal with a length of 85.35 km will be improved by providing side-slope protection works on both banks of the canal over its entire length, in addition to the reshaping of the canal section by excavation and embankment.

(iii) Canal Structures

The structures on the Left Main Canal will need remedy and/or reconstruction depending on the respective conditions. In either case, all gates of the regulators and head gates shall be replaced with new ones to control the water discharge properly. Other unused and unauthorized inlets will be disregarded or demolished under the Project. The inlet of the spillway at PK-827+50 will be improved from the sluice way type to the over-flow type.

(c) Improvement of Irrigation Facilities in the Farms

(i) Canals

All inter-farm/on-farm canals with a total length of 108,030 m will be lined, among which the inter-farm canal LMK-9 will be improved up to the turnout for the LMK-9I which is the last turnout along the LMK-9 to divert water to the Shagan Area. The main and secondary field canals will be unlined in principle, except some sections of the canals where serious water seepage due to highly embanked canal is anticipated.

(ii) Canal Structures

The canal structures, such as turnouts for field canals, check structures, bridges, pipe road crossing and aqueducts, will be rehabilitated and improved, depending on the respective conditions. All gates of the turnouts and check structures will be replaced with new ones for proper water operation and management. The turnouts, which divert water directly from the inter-farm/on-farm canals and main and secondary field canals to the field ditches, will be integrated adequately into the new ones, taking into account efficient field water management.

(iii) O&M Roads

The Project will include the rehabilitation of the existing roads for operation and maintenance of irrigation canals. The O&M roads for the Left Bank Main Canal will be provided on both sides of the canal. The roads will have a with of 6 m and gravel pavement. If there are no existing roads, the top of the embankment will be used as O&M road. The inter-farm/on-farm canals and the field canals will be equipped with O&M roads on one side of the canals. All O&M roads for inter-farm/on-farm canals will be paved with gravel, and have width of 6 m for the inter/on-farm canals and 5.0 m for other field canals. If farm roads are provided along the canals, the roads will be improved as farm roads.

3.3.2 Proposed Drainage System

(1) Drainage Method

For sub-surface drainage, the open drainage method will be applied for the following reasons; lowering cost (Table F.29), presence of clay loam in most soils, expected lowering of groundwater table by 50 cm below the ground surface, and no constraint for the right-of-way acquisition. The field ditches will be excavated to a depth of 1.5 m from the ground surface, taking into account the permeability of soils, spacing of field drains, and depth of the groundwater table.

For natural drainage, open channels will be used. The channels will have an adequate water level to collect the percolated water along the channels. The drainage water from the farms will be discharged into the inter-farm/on-farm collectors through the field drains and field collectors. The water collected by the inter-farm/on-farm collectors will be basically discharged into the main collectors. Nevertheless, some water will be drained to depressed area, if it could

not be discharged into the main collectors due to the absence of drainage outlets specially in the lands other than farmlands.

(2) Design Drainage Discharge

(a) Design Drainage Module

The drainage discharges have been estimated by category of farmland and other lands, as stated in Sub-section 2.3.2. The drainage modules for each land category are as follows:

Land Category	Drainage Module (lit/s/ha)
Farmland	0.398
Land other than farmland	0.174

(b) Design Discharge

The design drainage discharges have been computed by applying the land area and drainage module for each land category. The calculated design drainage discharges of the canals at the selected stations are presented in Table F.21.

(3) Rehabilitation and Improvement of Drainage Facilities

(a) Proposed Drainage System

The Project includes the rehabilitation and improvement of the existing North and South Main Collectors as well as the collectors in the Priority Project Area. However, the drainage water from the area upstream of the North Main Collector will be directly conveyed to the existing North Main Collector in the downstream area by providing a drainage culvert across the Right Branch Canal. The existing diversion drainage channel will be abandoned.

(b) Rehabilitation of Drainage Canals

The North and South Main Collectors (269.3 km in total length) will be rehabilitated. The collectors will be unlined and have a trapezoidal section. The Project also include the rehabilitation and improvement of the existing inter-farm/on-farm collectors and field collectors in the Project Area. In addition to those collectors, the YUK-12 collector will also be rehabilitated for the section of about 20 km from the project boundary in the Shagan Area up to the confluence with the South Main Collector (Table F.19). The collectors will be of trapezoidal earth canal type and have an enough depth to drain water effectively.

(c) Rehabilitation of Drainage Canal Structures

The structures on the main collectors, inter-farm/on-farm collectors and the main and secondary field collectors, which mainly consist of sluice ways, culverts, bridges and road crossings, will be rehabilitated and/or improved under the Priority Project (Table F.22).

(d) O&M Roads

For proper maintenance of the collectors, O&M roads will be constructed on the top of the dikes of the North and South Main Collectors and the on-farm collectors. The roads will have a width of 6 m on one side of the dike of the Main Collectors and 4.5 m on the other side, and 3.0 m on one side of the dike of the inter-farm/on-farm collectors.

3.3.3 Proposed On-farm Facilities

(1) Irrigation Rotation Area

The on-farm facilities, as referred to in this Sub-section, are those to be provided for the farmland blocks, each of which is irrigated from a turnout. The facilities include irrigation canals, drainage canals, farm roads, and related structures. The on-farm development plan for the Priority Project consists mainly of the improvement of these facilities.

Each farmland block with an average area of 61.4 ha, which can also be called irrigation rotation area, consists of 2 to 8 unit land blocks, i.e. about 5 unit land blocks on an average. The unit land blocks are rectangular and their area varies from 6 ha to 24 ha, i.e. 13.55 ha on an average. Each unit land block is composed of several farm plots divided by levees of 2.5 m to 3.6 m wide and 0.5 m high. The area of one farm plot varies from 0.2 ha to 6 ha, i.e. about 2. 2 ha on an average.

Configuration of farm plots and big difference in elevation among the farm plots are observed, as mentioned previously. To solve the configuration problem, leveling work is suggested to be conducted by the farms themselves after harrowing every year. As the problem of difference in elevation, land grading is proposed to be implemented by the farms themselves in the future.

(2) Improvement of Irrigation System

The rehabilitation and improvement of existing supplementary field canals, field ditches and related structures such as offtakes and field inlets for farm plots are also contemplated in the Project. In addition, new supplementary field canals will be required for the integration of turnouts provided for the field ditches in order to divert the water directly from the on-farm canals and main field canals, as mentioned previously (Table F.29).

(3) Improvement of Drainage System

As on-farm drainage facilities, field drains, supplementary field collectors and drainage outlets for main field collectors, on-farm collectors and/or main collectors will be provided in the farmland blocks. Most outlets will be of natural flow type but some will be of sluice way type with road crossing structures. Besides, since some canals, called Karta Check, are still functioning for the dual purposes of irrigation and drainage in the some farmlands, new field drains are proposed to be constructed to take over the drainage function from these canals (Table F.29).

4 DESIGN OF IRRIGATION AND DRAINAGE FACILITIES

4.1 Design Criteria

4.1.1 Hydraulic Calculation

(1) Flow Formula

The following criteria are applied for the design of the irrigation and drainage facilities:

The "Manning formula" expressed below is adopted for the uniform flow calculation and "non-uniform flow" calculation by applying Bernoulli's theorem is made where it is required.

$$Q = A \times V$$
$$V = 1/n \times R^{2/3} \times I^{1/2}$$

where, Q : Design discharge (m^3/sec)
A : Flow area (m^2)
V : Mean velocity (m/sec)
n : Roughness coefficient
R : Hydraulic radius
I : hydraulic gradient

(2) Roughness Coefficient

Roughness coefficients are determined considering canal construction material and the canal inside condition with proper maintenance referring the design standard of the Kazakstan and shown as follows:.

Canals	Roughness Coefficient
Earth Canal (Irrigation Canal) less than 10m^3/s	0.0250
Earth Canal (Irrigation Canal) more than 10m^3/s	0.0225
Earth Canal (Drainage Canal) less than 10m^3/s	0.0300
Earth Canal (Drainage Canal) more than 10m^3/s	0.0275
Concrete Lining Canal (Flume)	0.0150

(3) Permissible Velocity

The maximum permissible velocity in irrigation canals is determined so as not to cause scouring. While the minimum permissible velocity is determined so as not to induce the growth of aquatic plant and moss, and not to cause sedimentation in the canal.

The maximum permissible velocity of drainage canals is set a little higher than that of irrigation canals considering the frequency and duration of design drainage water flow.

The permissible velocities for both irrigation and drainage canals are shown below.

Irrigation Canal	Minimum (m/sec)	Maximum (m/sec)
Flume and Concrete Lining	-	1.50
Left Main Canal with Slope Lining	-	1.00
Earth Canal (Irrigation)	0.20	0.50
Earth Canal (Drainage)	0.20	0.90

4.1.2 Physical Coefficient

(1) Unit Weight of Materials

	Material	Unit Weight (ton/m^3)
1.	Reinforcement Concrete	2.40
2.	Plain Concrete	2.30
3.	Structural Steel and Reinforcement Bar	7.85

(2) Soil Characteristic

Material	Wet Density (ton/m^3)	Dry Density (ton/m^3)
Natural Condition	1.69	1.52
Compacted Condition	1.78	1.48
Saturated	1.89	-

source: soil and constriction material test, October 1996, by JICA Study Team

(3) Internal Friction Angle and Cohesion

Material	Internal Friction angle (degree)	Cohesion (ton/m^2)
Sandy Loam	30 - 31	0.4 - 0.5
Loam	18	0.45

source: Kzyl-orda Left Bank Group Pipe Water in Kzyl-Orda Oblast, 1990

4.2 Irrigation and Drainage Canal

4.2.1 Design Discharge

(1) Irrigation Canal

According to the diversion water requirement calculation, the design discharge at the intake is estimated at 137.1 m^3/sec for the after completion of the rehabilitation for all the systems. While more than 200 m^3/sec of water is diverted to the Left Main Canal at present. Since the irrigation efficiency will be increased parallel to the progress of the canal rehabilitation works and these implementation will be required for many years, it is needed to give a certain allowance of water volume for the canal design than the estimated diversion water requirement of 137.1 m^3/sec so as to supply the irrigation water to all the area under the present canal condition.

Meanwhile, the Kzyl-Orda Left Bank Massive Irrigation System was originally planned to irrigate a farm land of 142,000 ha, expecting the land development in future and some 87,000 ha has been opened up until now. Therefore, the design discharge of the Left Main Canal is determined to be 224. 39 m^3/sec, considering the present diversion water discharge and the potential development area.

As for the other irrigation canals to be rehabilitated under the Project, the unit design discharges for respective canals are determined based on the maximum diversion water requirement as follows:

Unit Design Discharge (lit/sec/ha)	Application to Canals
1.556	On-farm canals down to the last brigade
1.642	On-farm canal within one brigade & main field canals
1.700	Secondary and supplementary field canals
3.520	Field Ditches

(2) Collector

The drainage module is estimated for two categories by their characteristics. One is the water from the farm land and the other is the land other than the farm land. The former consists of the percolation water collected by the field drains and a part of the application losses of irrigation water, and the latter is the percolation water collected by the other collectors. The drainage module thus estimated is shown as follows:

Land Category	Drainage Module (lit/sec/ha)
Farm land	0.398
Other lands than farm land	0.174

4.2.2 Design of Irrigation Canals

Canal section is designed taking into account the effective water flow and the canal slope stability and from economic viewpoint for rehabilitation. A side slope protection work by

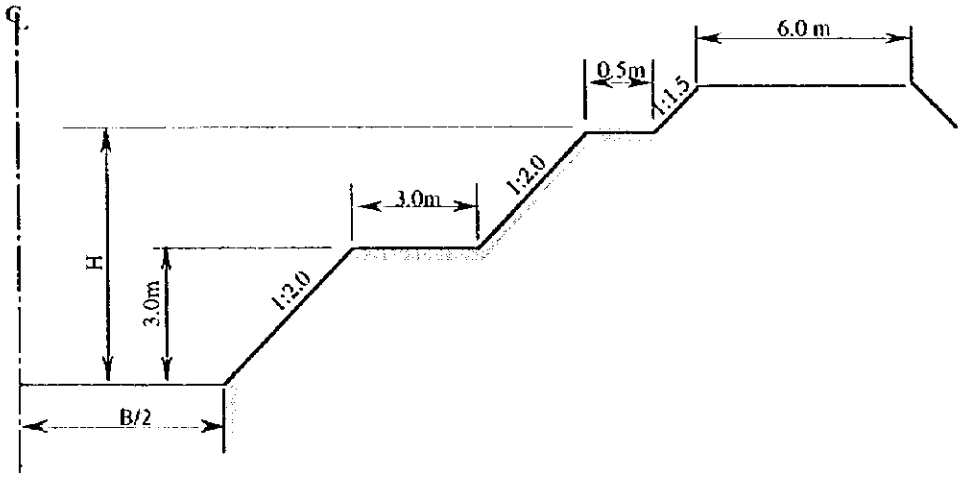
concrete panels is applied for entire sections of the Left Main Canal except 300 m at the beginning point which is considered as transition section from the left bank intake and will be provided with a concrete lining. A concrete flume is provided for the full length of inter-farm/on-farm canals. Other irrigation canals, such as field canals and field ditches, are designed in principle as earth canal with a trapezoidal section.

(1) Cross sectional design of irrigation canal

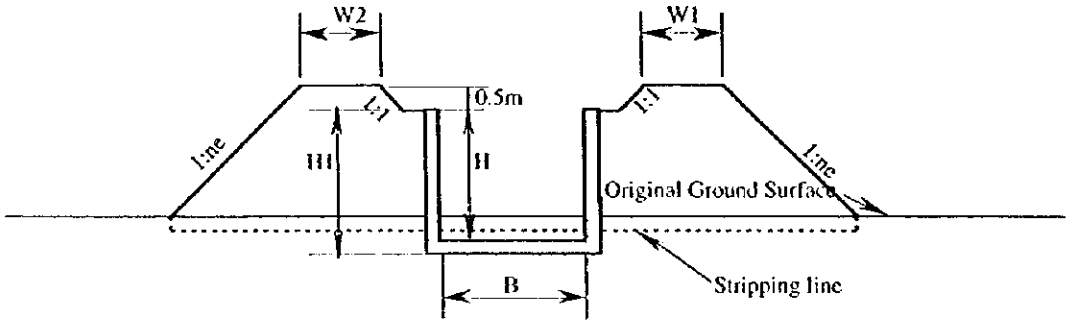
A design of canal cross section is so made as to have a simple trapezoidal section or rectangular section referring to the design standard of Kazakstan except the Left Main Canal. Taking into account the canal height of Left Main Canal exceeding 5 m and soil conditions, the combined trapezoidal section is employed in the cross sectional design.

The inside and outside slope of canals and other dimensions employed in the design are shown below/

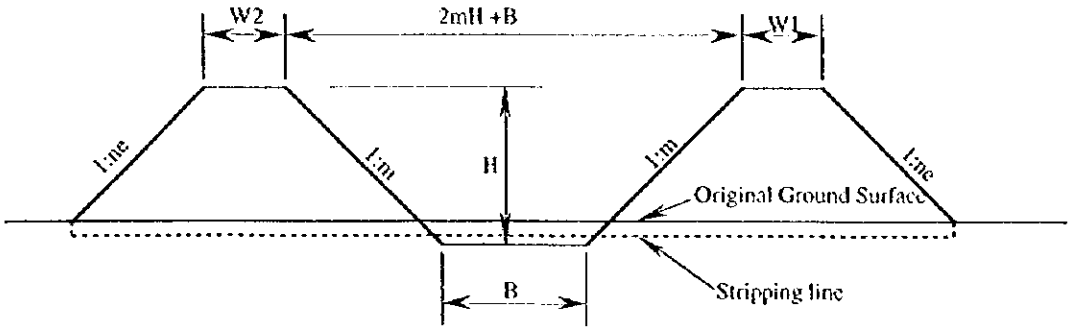
(a) Left Main Canal



(b) Flume Channel



(c) Unlined Open Channel



(d) Inside Slope

Canal Type	Slope (1: m)
Left Main Canal	2.0
Concrete Flume	vertical
Unlined Earth Canal	1.5

(e) Freeboard and Berm Width

Discharge (m^3/sec)	Freeboard (m)	Berm Width W1 (m)	Berm Width W2 (m)
less than 0.5	0.2	1.0 (3.0)	1.0 (3.0)
0.5 - 2.0	0.3	1.0 (3.0)	1.0 (3.0)
2.0 - 5.0	0.4	3.0	3.0
5.0 - 10.0	0.5	4.5	3.0
Over 100.0	1.0	6.0	6.0

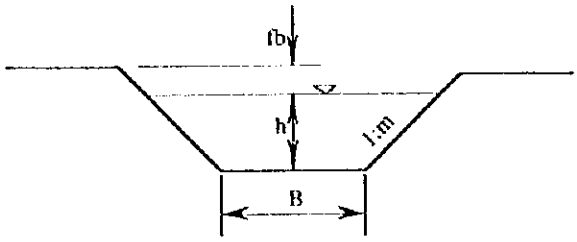
The dimensions and hydraulic properties of the Left Main Canal are shown in Table F.30, and salient features of inter-farm/on-farm canals and field canals are summarized in Table F.31 respectively.

(2) Permissible Curvature

The permissible curvature for canal depends on the size and capacity, flow velocity, lining materials and canal section. When a radius of curvature is more than 10 times of water surface width in the canal, the head loss caused by canal bend can be neglected in the calculation of the hydraulic gradient of the canal. In consideration of these factors, and for the convenience of canal construction, the minimum radius of curvature is given more than 10 times of the canal water surface width for the new canal route. As for the Left Main Canal, the radius of curvature is decided to be 600 m.

4.2.3 Design of Collectors

All the collectors are designed as unlined earth canals with a trapezoidal section. The cross sectional design of the collectors is made taking into account the effective water flow and the canal slope stability.



(a) Inside Slope

Collectors	Inside Slope (1:m)
Field Drain	1.5
Field Collector	2.0
Inter-farm/on-farm Collectors	2.0
North & South Main Collectors	
Less than 50.0 m^3/sec	2.25
More than 50.0 m^3/sec	3.0

(b) Freeboard

The minimum freeboard of the collector is 0.0 m from the surface. In case of embankment portion, the freeboard should not be less than the following minimum requirement:

Design Discharge (m^3/sec)	Freeboard (embankment) (m)
Less than 1.0	0.2
1.0 to 5.0	0.4
More than 5.0	0.5

The hydraulic property of North and South Main Collectors are shown in Table F.32, and salient features of other collectors are shown in Table F.33.

4.3 Structures

4.3.1 Kzyl-Orda Headworks

(1) Left Bank Intake Structure

Design condition and dimension of the intake structure are summarized as follows:

Dimension of intake structure

Description		
Design intake discharge	:	Q = 224.4 m^3/sec
Width	:	5.0 m x 6
Gate type	:	Roller gate
Gate width	:	5.00 m
Gate height	:	4.00 m
Gate number	:	6 nos.
Intake water level	:	EL 129.00 m
Intake floor level	:	EL 125.20 m
Intake water depth	:	3.80 m

Dimension of under sluice

Description		
Width	:	5.0 m
Gate type	:	Roller gate
Gate width	:	5.00 m
Gate height	:	1.50 m
Gate number	:	6 nos.
Floor level	:	EL. 123.00 m

(2) Settling Basin

A function of settling basin is to catch the wash loads of intake water and flush these out. A particle size to be considered for the design varies from the purpose of water use. Under this Project, a size of particle to be considered for the design is determined to be more than 0.25 mm as a practical way.

For the judgment of necessity and required dimension of settling basin, the estimation of sediment load flowing to the Left Main Canal is made at monthly basis during the irrigation period from April to September employing the "Rubey's formula" for the sedimentation velocity calculation and the "Rouse's formula" for the concentration calculation to determine the required size of settling basin. The result of calculation is summarized as follows and its details are shown in Table F.34.

(unit : m^3)

Month	Total	Particle Size in mm		
		2.0 - 0.25	0.25 - 0.1	less than 0.1
April	12,278	7	95	12,176
May	55,751	53	568	55,130
June	31,789	20	258	31,511
July	20,594	8	127	20,459
August	5,745	0	10	5,735
September	1	0	0	1
Total	126,158	88	1,058	125,012

As seen in the above table, the sediment load to be caught at the settling basin is only 88 m^3 per year. Therefore, it is judged that no settling basin is required for the intake structure.

(3) Temporary River Diversion Works

A temporary river diversion works will be provided for the rehabilitation work of the left bank intake structure for about one year. The diversion discharge is determined at 200 m^3/sec taking into account the recent peak intake discharge record from the left bank intake structure.

The structure consists of (i) inlet channel, (ii) Inlet, and (iii) outlet channel. The design results of the temporary river diversion work is shown in "Drawings", and the required dimensions of each part are summarized as follows:

(a) Inlet Channel

- Length of channel 400 m
- Channel type Trapezoidal earth channel
- Base width 45 m
- Inside slope 1: 2.0

(b) Inlet Section

- Type of inlet	Concrete flume provided with steel gate
- Gate dimension	width: 5.0 m, height : 4.0 m
- Gate type and nos.	4 nos of roller gates

(c) Outlet Channel

- Length of channel	220 m
- Channel type	Trapezoidal earth channel, (the upstream portion of 85 m are provided with gabion mattress)
- Base width	60 m
- Inside slope	1: 2.0

4.3.2 Road Bridge

Two new bridges across the proposed short-cut section of the Left Main Canal will be required, since the new canal alignment will cross the existing road connecting the resident area or kitchen gardens to the national road M32 . The width of both roads where new bridges will be considered are almost same. Therefore, the same size of bridge is planned to be constructed at these crossing points. Considering the present traffic conditions and road width, and referring to the standard of Kazakstan, and salient features of these bridge are determined as follows:

(1) Superstructure

- Type of bridge	Composite H-shape steel simple girder bridge
- Length of bridge	77.25 m
- Span length	73.50 m (Clear span: 18.00 m x 4 nos)
- Total width	7.98 m
- Effective width	6.000 m
- Kind of slab	Pre stressed concrete slab
- Kind of pavement	Asphalt concrete pavement
- Skew angle	90 degree
- Design live load	8 ton axial load

(2) Substructure

- Type of structure	Hollow precast concrete piles
- Type of foundation	Direct contact
- Kind of foundation	Loam soils

4.3.3 Canal Related Structures

As shown in "Drawings", various types of canal structures will be provided in conjunction with irrigation and drainage canals to convey water across roads, to divert and control canal flows, to regulate canal water levels and to protect canal slopes. The design of these structures is made referring to the design standard of Kazakstan in principle.

(1) Turnout/Offtake

Turnouts are provided to divert irrigation water to field canal from the parent canal. A pipe flow type of turnout is proposed so as to cross the O&M road, which is the same type as the existing structure. The pipe length varies depending on the parent canal dimension, and a diameter of pipe is also different: 1,400 mm, 1,000 mm, 800 mm, and 600 mm ,depending on the discharge.

Offtakes are provided on the field canal to divert irrigation water to field ditch. A pipe flow type, which is the same type as that of turnout is also proposed considering the existing conditions of structures in the Project Area.

Seven types of turnouts and one type of offtake are proposed for the Project as shown below taking into account the its diversion discharge and type of parent canal:

Type	Discharge (m^3/sec)		Pipe	Pipe
	from	to	Diameter (mm)	Length (m)
Turnouts				
on Inter-farm/On-farm Canal				
TO1	1.0	<	1,400	10.0
TO2	0.5	1.0	1,000	10.0
TO3	<	0.5	800	8.0
on Field Canal				
TO4	0.5	<	1,400	15.0
TO5	0.3	0.5	1,000	13.5
TO6	0.2	0.3	800	13.5
TO7	<	0.2	600	12.5
Offtake				
			400	12.5

(2) Check Structure

Check structures are provided to keep the required water level in the parent canal so as to divert the design discharge to the subordinate canal when water flow discharge in the parent canal is less than design discharge. The following seven types of check structures are proposed depending on the canal discharge and canal type.

Type	Discharge (m^3/sec)		Check Gate	
	from	to	Width (m)	Nos
on Inter-farm/On-farm Canal				
CK1	5.0	<	1,500	3
CK2	2.5	5.0	1,500	2
CK3	2.0	2.5	1,000	1
CK4	0.8	2.0	1,000	1
CK5	<	0.8	600	1
on Field Canal				
CK6	1.0	2.0	1,000	1
CK7	<	1.0	600	1

(3) Culvert

Culverts are provided on irrigation canals and collectors for passing water under the roads. A cross drain is provided where a collector or irrigation canal crosses a road. The culverts are categorized into two (2) types by the conduit type. One is a cast-in-place box type conduit, and the other is precast concrete pipe type. The adaptation of these conduit is determined depending on flow discharge as follows:

Type	Deign Discharge (m^3/sec)	
	Irrigation Culvert	Drainage Culvert
Box conduit	more than 1.00	more than 1.50
Pre-cast pipe conduit	less than 1.00	less than 1.50

The box width of 1.5 m for both irrigation canal and collector and pipe diameter of 1.0 m for irrigation canal and 0.8 m for collector are considered as a standard dimension. The numbers of conduits and those length vary depending on the design discharge and crossing length.

(4) Spillway

An overflow type of side spillway is applied for the Project. These are provided on the Left Main Canals at in front of all regulaters and at certain places where spill-out facilities are required. The spillway comprises a overflow crest, spillway basin, pit of waste way, and waste way conduit. For the design of spillway , the followings are considered:

(i) Length of crest is calculated employing the following equations:

$$Qs = 1.84\ Ls\ h^{3/2}$$

$$Q = Qf - Qd$$

where, Qs : Spill-out discharge (m^3/sec)
Qf : Discharge, WEL = bank top(m^3/sec)
Qd : Design discharge(m^3/sec)
Ls : Length of crest (m)
h : Water depth of overflow at crest (m).

(ii) Overflow water level is more than 5 cm below the canal bank elevation.
(iii) Flow velocity in the waste way is not more than 2.0 m/sec.

(5) Canal Outlet (Drain Inlet)

Canal outlets are provided on a parent drainage canal where the subordinate collector flow in. The canal outlet consists of inlet protection, pipe conduit for crossing road, and outlet protection (canal protection for a parent canal). Three types of canal outlets are proposed for the Project depending on the design discharge as follows:

Type	Discharge (m3/sec)		Pipe	Pipe
	from	to	Diameter (mm)	Length (m)
DI 1	1.0	<	800	17.5
DI 2	0.5	1.0	800	15.0
DI 3	<	0.5	600	15.0

(6) Other Related Structures

(a) Field Inlet

Field inlets are provided on the field ditch to divert the irrigation water to the field plot. Two types of field inlets will be provided depending on diverting number: single or double outlet.

(b) Field Outlets

Field outlets are provided every field plot so as to drain excess water to the field drain. The structure consists of inlet, 200 mm diameter pipe conduit, and outlet protection. The length of pipe conduit will vary depending on the location.

4.4 O&M ROADS

O&M roads will be provided along the canal for the canal maintenance and farm activity either right or left side of the canal except for the Left Main Canal. As for the Left Main canal,

the roads will be provided along both side of the canal. Referring to the standard canal design criteria of Kazakstan, some parts of canal berm will be used as O&M roads. Since no O&M roads for the field ditches and field drains are provided at present, any farm roads will not be provided along these canals.

Considering the present O&M road design and future O&M activity as well as rainfall condition in the Project Area, a gravel pavement will be provided on the roads along the inter-farm/on-farm canals, and no pavement will be provided for the other canals. The following table shows the salient features of O&M roads:

(unit: m)

Description	Road width	Pavement thickness	Road height
Left Main Canal	6.0 x 2 side	-	0.5
Inter-/On-farm Canal	6.0	0.2	0.5
North & South Collector	6.0	-	0.5
Inter-/On-farm Collector	6.0	-	0.5
Field Canal	5.0	-	0.5
Field Collector	5.0	-	0.5

Tables

Table F.1 Planted Area in Left Bank Irrigation System for 1992-1996

Nama of Distributors	1992 (ha)	1993 (ha)	1994 (ha)	1995 (ha)	1996 (ha)	Average (ha)
LMK-1	65	50	200	-	-	105
LMK-3	685	-	940	735	605	741
LMK-3A	280	280	250	280	337	285
LMK-4A	130	210	190	300	350	236
LMK-5	474	470	460	377	550	466
LMK-5'	510	450	480	480	-	480
LMK-5A	705	1,480	610	605	605	801
For Syrdarya	2,849	2,940	3,130	2,777	2,447	2,829
LMK-5A	220	220	135	135	250	192
LMK-5B	969	960	874	874	790	893
LMK-6(4)	745	565	597	799	750	691
LMK-7A	1,123	1,086	1,234	1,234	837	1,103
LMK-7B"	133	120	120	120	120	123
LMK-7B'	215	225	233	233	240	229
LMK-7B	1,453	1,498	1,453	1,453	1,385	1,448
LMK-8A	3,484	3,365	2,996	3,802	2,670	3,263
LMK-8B	1,566	1,580	1,590	1,299	1,140	1,435
LMC-8G	300	110	147	100	100	151
LMC-9	2,752	2,321	2,002	1,892	1,684	2,130
LMC-9A	205	185	190	190	185	191
LMC-11V	1,800	1,536	1,445	1,520	1,115	1,483
LMC-11V-3	873	734	896	-	725	807
LMC-11V-3'	129	129	-	640	-	299
LMC-11G	155	150	150	122	200	155
LMC-12	2,071	2,120	2,220	2,070	2,125	2,121
LMC-14	744	754	690	650	685	705
LMK-15B	690	661	695	695	558	660
LMK-16	610	663	680	575	565	619
LMK-16A	95	120	95	40	-	88
LMK-17B	810	757	776	776	640	752
LMK-18V	693	654	688	688	577	660
LMK-19	164	120	110	110	-	126
LMK-24A	675	657	624	624	629	642
P-1-1	21	28	10	10	10	16
Baydaulet	120	100	100	100	-	105
Daulet Aryk	20	20	75	75	40	46
Koncheboi Sbros	84	38	6	6	50	37
For Terenozek	22,919	21,476	20,831	20,832	18,070	20,826
LMK-15V	2,634	2,278	2,630	1,752	2,144	2,288
LMK-17A	4,483	3,610	3,697	3,820	3,487	3,819
Kos-Uzyak	2,506	2,393	2,415	2,482	1,994	2,358
Right Branch Canal	9,421	8,498	8,487	7,850	7,259	8,303
Left Branch Canal	15,155	14,293	13,058	12,282	12,070	13,372
For Zhalagash	34,199	31,072	30,287	28,186	26,954	30,140
RB-9	1,002	1,120	950	950	903	985
PK 420	24,209	24,330	23,490	22,330	19,319	22,736
For Karmakshy	25,211	25,450	24,440	23,280	20,222	23,721
Total	85,178	80,938	78,688	75,075	67,693	77,514
% to R/Rotation Area	97.9%	93.0%	90.5%	86.3%	77.8%	89.1%

Data Source : Kzyl-Orda Oblast Water Resources Committee

Table F.2 List of Existing Distributors (Inter-farm/On-farm Canals)

Regulator Name	Distributor Sta.No.	Distributor Name	R/L	Area (ha)	Discharge (m3/s)	Length of Distributors Inter-farm	On-farm	Total
Left Main Canal								
PK-00	Sta. 0			86,995	228.0			
	Sta.166	LMK-1*	L	264	0.84	-	2.7	2.7
	Sta.220	LMK-3A	L	255	0.81	-	1.4	1.4
	Sta.222	LMK-3	L	700	2.22	-	20.1	20.1
	Sta.256	LMK-5'	L	550	1.74	-	10.2	10.2
	Sta.256	LMK-5A	L	250	0.79	-	1.0	1.0
	Sta.271	LMK-5	L	212	0.67	-	5.5	5.5
	Sta.267	LMK-4A	R	352	1.12	-	3.5	3.5
	Sta.268	LMK-4*	R	750	2.38	-	1.8	1.8
PK-272	Sta.272			83,662	217.43	-	-	-
	Sta.372	LMK-5V	L	740	2.35	-	5.5	5.5
	Sta.327	LMK-5B	L	860	2.73	-	8.8	8.8
	Sta.384	LMK-8A	R	2,670	8.46	-	14.0	14.0
	Sta.384	LMK-8B	R	1,140	3.61	-	9.3	9.3
	Sta.384	LMK-8G	R	100	0.32	-	0.3	0.3
PK-402	Sta.402			78,152	199.96	-	-	-
	Sta.433	LMK-10*	R	100	0.32	-	1.6	1.6
	Sta.450	LMK-7A	L	837	2.65	-	10.3	10.3
	Sta.475	LMK-7B'	L	240	0.76	-	1.1	1.1
	Sta.495	LMK-7B	L	1,385	4.39	-	2.6	2.6
	Sta.495	LMK-7'	L	120	0.38	-	0.1	0.1
PK-514	Sta.514			75,470	191.46	-	-	-
	Sta.536	LMK-9	L	1,684	5.34	12.8	5.2	18.0
	Sta.537	LMK-9A	L	185	0.59	-	0.1	0.1
	Sta.562	LMK-12	R	2,125	6.74	-	4.5	4.5
	Sta.596	LMK-14	R	685	2.17	-	-	-
PK-634	Sta.634			70,791	176.62	-	-	-
	Sta.618	LMK-11V-3'	L	50	0.16	-	1.2	1.2
	Sta.645	LMK-11V-3	L	725	2.30	-	3.6	3.6
	Sta.658	LMK-11V	L	1,615	5.12	11.2	2.30	13.5
	Sta.658	LMK-16	R	565	1.79	-	4.1	4.1
	Sta.699	LMK-11G	L	50	0.16	-	0.7	0.7
	Sta.706	LMK-16A	R	100	0.32	-	1.7	1.7
	Sta.708	LMK-18	R	150	0.48	-	1.4	1.4
PK-744	Sta.744			67,536	166.29	-	-	-
	Sta.753	LMK-18V	R	580	1.84	-	3.4	3.4
	Sta.752	Baydaulet*	L	100	0.32	-	0.4	0.4
	Sta.807	LMK-17A	L	3,427	10.86	-	4.4	4.4
	Sta.809	LMK-17B	L	640	2.03	-	0.1	0.1
	Sta.823	LMK-19*	L	720	2.28	-	-	-
	Sta.819	LMK-15A	L	200	0.63	-	0.8	0.8
	Sta.834	LMK-15B*	L	558	1.77	-	0.1	0.1
	Sta.842	LMK-15V	L	2,044	6.48	-	11.9	11.9
	Sta.845	LMK-24	R	629	1.99	-	3.0	3.0
Hydro-Knot	Sta.899			58,638	138.1	-	-	-
	Sta.899	Kos-Yeazk	C	1,994	4.1	-	6.1	6.1
	Sta.899	Right Branch Canal	R	33,627	93.0	-	-	-
	Sta.899	Left Branch Canal	L	23,017	41.0	-		
		Total Length				24.0	154.8	178.8
Right Branch Canal								
Pk-00				33,627	93.00	-	-	-
	Sta.104	RB-1A	L	830	2.30	-	5.8	5.8
	Sta.107	Shoaek	L	3,509	9.70	-	20.1	20.1
PK-111	Sta.111	Regulator		29,288	81.00	-	-	-
PK-211	Sta.211			29,288	81.00	-	-	-
	Sta.316	RB-7A	L	1,060	2.93	-	4.7	4.7
	Sta.316	RB-7A-1	L	70	0.19	-	0.8	0.8
	Sta.316	RB-7A-2	L	200	0.55	-	3.2	3.2
	Sta.316	RB-7A-3	L	310	0.86	-	1.9	1.9
PK-317	Sta.317			27,648	76.47	-	-	-
	Sta.325	RB-7B	L	328	0.91	-	2.3	2.3

(to be continued)

Table F.2 List of Existing Distributors (Inter-farm/On-farm Canals)

Regulator	Distributor			Area	Discharge	Length of Distributors		
Name	Sta.No.	Name	R/L	(ha)	(m3/s)	Inter-farm	On-farm	Total
	Sta.387	RB-7V	L	140	0.39	-	13.5	13.5
	Sta.393	Zhambas	L	200	0.55	-	6.4	6.4
	Sta.401	RB-9	L	900	2.49	-	9.0	9.0
	Sta.410	RB-11	L	405	1.12	-	3.5	3.5
PK-420	Sta.420			25,675	71.01	-	-	-
	Sta.518	RB-13	L	13,058	36.11	30.9	24.1	55.0
PK-518	Sta.518			12,617	34.90	-	-	-
		RB-11 etc.	L	2,567	7.10	-	-	-
	Sta.606	RB-15	L	6,449	17.84	7.2	19.6	26.8
PK-606	Sta.606			3,601	9.96	-	-	-
		Direct Supply		2,881	7.97	-	-	-
	Sta.702	RB-17	L	720	1.99	-	14.1	14.1
PK-702	Sta.702			0	0			
		Total Length				38.1	129.0	167.1
Left Branch Canal								
PK-00				23,017	41.0			
	Sta.046	LB-1A	L	418	0.74	-	5.8	5.8
	Sta.110	LB-1B	L	731	1.30	-	4.5	4.5
	Sta.070	LB-2A*	R	726	1.29	-	-	-
	Sta.103	LB-2B*	R	968	1.72	-	-	-
	Sta.135	LB-3A	L	1,704	3.04	-	16.0	16.0
	Sta.141	LB-4A	R	444	0.79	-	3.0	3.0
PK-142				18,026	32.12	-	-	-
	Sta.172	LB-4A-1	R	301	0.54	-	1.5	1.5
	Sta.180	LB-4B**	R	1,655	2.95	-	13.8	13.8
	Sta.190	LB-4V	L	332	0.59	-	1.4	1.4
	Sta.210	LB-3B	L	763	1.36	-	-	-
PK-210				14,975	26.68	-	-	-
	Sta.258	LB-5A	L	4,670	8.32	-	4.4	4.4
	Sta.258	LB-5B	L	865	1.54	-	3.6	3.6
	Sta.257	LB-6B	R	637	1.13	-	4.5	4.5
	Sta.311	LB-6G	L	1,793	3.19	-	5.0	5.0
PK-312				7,010	12.50	-	-	-
	Sta.380	LB-8A**	R	664	1.18	-	4.1	4.1
	Sta.380	LB-9A**	L	2,522	4.49	-	12.0	12.0
	Sta.379	LB-9B	L	471	0.84	-	2.7	2.7
PK-381				3,353	5.99	-	-	-
	Sta.436	LB-10B**	R	824	1.47	-	9.2	9.2
	Sta.400	LB-11	L	1,470	2.62	-	7.6	7.6
KP-483				1,059	1.90	-	-	-
	Sta.483	Akkyr		1,059	1.90	-	-	-
		Total Length					99.1	99.1
		Grand Total for Distributors				62.1	382.9	445.0

source: Kzyl-Orda Oblast Water Resources Committee

Note: 1.* marked canals are not used currently

2.** marked canals are combined with other canals

3.Length of Distributors are estimated based on 1/100,000 map

Table F.3 Existing Side Slope Protection Works

No.	Location				Total Length (m)	In Which Left S. (m)	In Which Right S. (m)
For Left Main Canal							
1	Sta. 150		-	Sta. 153	300	300	-
2	Sta. 153		-	Sta. 155	200	200	-
3	Sta. 214		-	Sta. 216	+50	250	-	250
4	Sta. 215		-	Sta. 217		200	200	-
5	Sta. 235		-	Sta. 237		200	200	-
6	Sta. 237		-	Sta. 239		200	200	-
7	Sta. 236		-	Sta. 240	+50	450	-	450
8	Sta. 241		-	Sta. 244		300	-	300
9	Sta. 267		-	Sta. 270		300	300	-
10	Sta. 267		-	Sta. 269		200	-	200
11	Sta. 270		-	Sta. 273		300	300	-
12	Sta. 277		-	Sta. 278	+50	150	150	-
13	Sta. 277		-	Sta. 282		500	-	500
14	Sta. 279	+50	-	Sta. 281		150	-	150
15	Sta. 282		-	Sta. 283		100	-	100
16	Sta. 296		-	Sta. 299		300	-	300
17	Sta. 303		-	Sta. 305		200	200	-
18	Sta. 306		-	Sta. 309		300	300	-
19	Sta. 323		-	Sta. 327		400	-	400
20	Sta. 327		-	Sta. 329		200	200	-
21	Sta. 331		-	Sta. 332	+50	150	150	-
22	Sta. 343		-	Sta. 348		500	500	-
23	Sta. 357		-	Sta. 363		600	600	-
24	Sta. 357		-	Sta. 360		300	-	300
25	Sta. 363		-	Sta. 365	+50	250	-	250
26	Sta. 364		-	Sta. 367	+50	350	350	-
27	Sta. 365	+20	-	Sta. 369		380	-	380
28	Sta. 369		-	Sta. 372		300	300	-
29	Sta. 372		-	Sta. 373	+50	150	150	-
30	Sta. 385		-	Sta. 390		500	-	500
31	Sta. 392		-	Sta. 400		800	-	800
32	Sta. 405		-	Sta. 407		200	-	200
33	Sta. 414		-	Sta. 416	+50	250	250	-
34	Sta. 419		-	Sta. 423	+50	450	-	450
35	Sta. 425		-	Sta. 428		300	300	-
36	Sta. 426		-	Sta. 431		500	500	-
37	Sta. 428	+50	-	Sta. 430	+50	200	-	200
38	Sta. 431		-	Sta. 434		300	300	-
39	Sta. 434	+80	-	Sta. 441		620	620	-
40	Sta. 436	+80	-	Sta. 443		620	-	620
41	Sta. 441		-	Sta. 449		800	800	-
42	Sta. 443		-	Sta. 451		800	-	800
43	Sta. 449		-	Sta. 456		700	700	-
44	Sta. 452		-	Sta. 455		300	-	300
45	Sta. 455		-	Sta. 457		200	200	-
46	Sta. 455		-	Sta. 459		400	-	400
47	Sta. 459		-	Sta. 464		500	500	-
48	Sta. 462		-	Sta. 465		300	-	300
49	Sta. 463	+50	-	Sta. 466	+50	300	300	-
50	Sta. 479		-	Sta. 484		500	-	500
51	Sta. 486		-	Sta. 489		300	300	-
52	Sta. 490	+50	-	Sta. 492	+50	200	200	-
53	Sta. 492	+50	-	Sta. 496		350	350	-
54	Sta. 500		-	Sta. 501	+50	150	-	150
55	Sta. 501		-	Sta. 503		200	200	-
56	Sta. 504		-	Sta. 506		200	200	-
56	Sta. 510		-	Sta. 512		200	-	200
58	Sta. 512		-	Sta. 514		200	200	-
59	Sta. 513		-	Sta. 515	+65	265	-	265
60	Sta. 517		-	Sta. 519		200	-	200
61	Sta. 523		-	Sta. 526		200	-	200
62	Sta. 532		-	Sta. 535		200	200	-
63	Sta. 537		-	Sta. 541		400	-	400
64	Sta. 543		-	Sta. 546		300	-	300
65	Sta. 545		-	Sta. 547	+50	250	250	-
66	Sta. 549		-	Sta. 554		500	500	-
67	Sta. 557		-	Sta. 558	+50	150	-	150
68	Sta. 558	+50	-	Sta. 560	+50	200	200	-
69	Sta. 564		-	Sta. 566		200	200	-
70	Sta. 566		-	Sta. 569		300	300	-

(Continued)

No.	Location				Total L. (m)	In Which Left S. (m)	In Which Right S. (m)
For Left Main Canal							
71	Sta. 567	+50	-	Sta. 572	450	-	450
72	Sta. 569		-	Sta. 572	300	300	-
73	Sta. 588		-	Sta. 592	400	400	-
74	Sta. 595		-	Sta. 601	600	600	-
75	Sta. 602		-	Sta. 605	300	300	-
76	Sta. 605		-	Sta. 608	300	-	300
77	Sta. 607	+50	-	Sta. 611	+50	400	400	-
78	Sta. 618	+50	-	Sta. 620		150	-	150
79	Sta. 625		-	Sta. 626		100	-	100
80	Sta. 628		-	Sta. 630		200	-	200
81	Sta. 627		-	Sta. 629		200	200	-
82	Sta. 630		-	Sta. 633		300	300	-
83	Sta. 631	+50	-	Sta. 633	+50	200	-	200
84	Sta. 633	+50	-	Sta. 635	+50	200	-	200
85	Sta. 639		-	Sta. 641	+50	250	-	250
86	Sta. 641		-	Sta. 645	+30	430	430	-
87	Sta. 645		-	Sta. 647		200	-	200
88	Sta. 60251		-	Sta. 653		200	200	-
89	Sta. 669		-	Sta. 672	+50	350	-	350
90	Sta. 683		-	Sta. 685	+40	240	240	-
91	Sta. 687		-	Sta. 687	+30	30	-	30
92	Sta. 687		-	Sta. 688	+70	170	170	-
93	Sta. 690		-	Sta. 692		200	200	-
94	Sta. 692		-	Sta. 694		200	200	-
95	Sta. 696		-	Sta. 700		400	400	-
96	Sta. 712		-	Sta. 714		200	200	-
97	Sta. 783		-	Sta. 784	+73	173	173	-
98	Sta. 783		-	Sta. 784	+50	150	-	150
99	Sta. 802		-	Sta. 804		200	-	200
100	Sta. 809		-	Sta. 814		500	-	500
101	Sta. 815		-	Sta. 817		200	-	200
102	Sta. 825		-	Sta. 829		400	-	400
103	Sta. 827		-	Sta. 832		500	500	-
104	Sta. 830		-	Sta. 831		100	-	100
105	Sta. 833		-	Sta. 835		200	200	-
106	Sta. 834		-	Sta. 836		200	-	200
107	Sta. 835		-	Sta. 837		200	200	-
108	Sta. 840		-	Sta. 845		500	500	-
109	Sta. 842		-	Sta. 845		300	-	300
110	Sta. 847		-	Sta. 849		200	200	-
111	Sta. 862		-	Sta. 864		200	200	-
	Sub-total					33,678	18,683	14,995
For Right Branch								
112	Sta.0+20		-	Sta. 2+50		230	-	230
	Total					33,908	18,683	15,225

Data Source : Kzyl-Orda Oblast Committee on Water Resources

Table F.4 Existing Regulators and Head Gates on the Main and Right Branch Canals

Structures		Locaton	Irrigation Area (ha)	Design Discharge (m³/s)	Gate Width (m)	Gate Height (m)	Gate Nos.	Structure Width (m)	Structure Height (m)	Structure Length (m)	Structure Head (m)	Structure Sill El. (m)	Constructed Year
Headworks		PK-0	86,995	228.0	5.0		6					125.30	1957
Head Gate	LMC-1	-166	264	10.0	1.5	1.5	2	4.00	3.42	12.10	1.14	124.80	1967
-ditto-	LMC-3A	-220	255	3.1	1.5	1.5	2	4.50	3.00	14.00	0.80	123.81	1982
-ditto-	LMC-3	-222	700	10.0	1.5	1.5	3	7.00	4.73	16.00	1.90	123.10	1963
-ditto-	LMC-5"	-256	550	2.2	1.5	1.5	1	2.00	3.00	14.10	0.80	123.45	1963
-ditto-	LMC-5A	-256	250	9.3	1.5	1.5	2	4.00	3.42	12.10	1.14	123.41	1966
-ditto-	LMC-5	-271	212	2.1	1.5	1.5	1	2.00	3.00	14.10	0.80	124.21	1963
-ditto-	LMC-4A	-267	352	4.2	1.5	1.5	2	4.50	3.00	14.00	0.80	123.90	1982
-ditto-	LMC-4	-268	750	3.6	1.5	1.5	2	4.50	3.00	14.00	0.80	124.30	1968
Regulator		Pk-272		220.0	2.5	3.0	10	29.00	5.90	24.75	1.00	121.73	1966
Head Gate	LMC-5V	-272	740	3.0	1.5	1.5	2	4.50	3.00	14.00	0.80	122.00	1969
-ditto-	LMC-5B	-327	840	4.1	1.5	1.5	2	4.50	4.26	20.20	1.47	122.22	1969
-ditto-	LMC-8A	-384	2,670	10.0	1.5	1.5	3	6.85	5.82	20.00	1.83	121.18	1969
-ditto-	LMC-8B	-384	1,140	4.1	1.5	1.5	1	2.00	4.30	10.10	0.80	122.78	1966
-ditto-	LMC-8G	-384	100	2.3	1.5	1.5	1	2.00	4.30	10.10	0.80	122.98	1967
Regulator		Pk-402	-	220.0	2.5	3.0	10	29.00	5.90	24.75	0.87	120.07	1968
Head Gate	LMC-10	-433	100	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	122.50	1972
-ditto-	LMC-7A	-450	837	3.5	1.5	1.5	1	2.00	4.50	18.50	1.47	120.00	1962
-ditto-	LMC-7B'	-475	240	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	124.40	1973
-ditto-	LMC-7B	-495	1,385	3.4	1.5	1.5	2	4.90	5.17	15.10	0.70	119.13	1962
-ditto-	LMC-7"	-495	120	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	123.35	1976
Regulator		Pk-514	-	195.0	2.5	3.0	10	29.00	5.90	24.75	0.78	119.08	1965
Head Gate	LMC-9	-536	1,684	6.4	1.5	1.5	2	4.50	5.00	18.38	2.28	118.35	1962
-ditto-	LMC-9A	-537	185	1.0	1.5	1.5	1	2.00	3.00	14.10	0.80	119.10	1968
-ditto-	LMC-12	-562	2,125	10.0	1.5	1.5	3	6.30	4.80	18.40	1.51	118.43	1966
-ditto-	LMC-14	-596	120	10.0	1.5	1.5	2	4.00	3.42	12.10	1.14	118.78	1963
Regulator		Pk-634	-	185	2.5	3.0	10	29.00	5.90	24.75	1.00	116.43	1964
Head Gate	LMC-11V-1	-618	50	0.6	1.5	1.5	1	2.00	3.40	12.10	0.80	117.00	1965
-ditto-	LMC-11V-2	-645	725	4.2	1.5	1.5	2	4.00	4.27	16.10	1.86	117.77	1962
-ditto-	LMC-11V	-658	1,615	14	1.5	1.5	5	14.00	4.90	15.10	0.86	116.20	1960
-ditto-	LMC-16	-658	565	4.1	1.5	1.5	2	4.50	3.42	12.10	1.14	116.80	1966
-ditto-	LMC-11G	-699	50	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	116.20	1976
-ditto-	LMC-16A	-706	100	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	118.97	1975
-ditto-	LMC-18	-708	150	4.6	1.5	1.5	2	4.50	5.00	18.38	2.28	117.79	1979
Regulator		Pk-744	-	160.0	2.5	3.0	10	29.00	5.94	24.75	0.40	115.76	1966
Head Gate	LMC-18V	-753	580	3.0	1.5	1.5	1	2.00	3.00	14.10	0.80	117.64	1971
-ditto-	Baydaulet	-752	100	2.1	1.5	1.5	1	2.00	3.00	24.10	0.80	118.52	1960
-ditto-	LMC-17A	-807	3,427	9.3	1.5	1.5	3	7.00	4.75	18.10	1.52	115.94	1969
-ditto-	LMC-17B	-809	640	4.6	1.5	1.5	2	2.00	3.00	14.00	0.80	116.29	1970
-ditto-	LMC-19	-823	720	1.0	1.5	1.5	1	2.00	3.00	14.10	0.80	117.00	1983
-ditto-	LMC-15A	-819	200	9.3	1.5	1.5	2	4.50	3.00	14.00	1.50	115.28	1987
-ditto-	LMC-15B	-834	558	10.0	1.5	1.5	3	7.00	4.73	16.00	0.90	115.97	1962
-ditto-	LMC-15V	-842	2,044	10.2	1.5	1.5	3	7.00	5.94	18.10	0.30	115.50	1981
-ditto-	LMC-24A	-845	629	4.2	1.5	1.5	2	4.50	3.00	14.00	0.80	116.99	1969
Spill Way		-791	-	55.0			5	13.40	4.65	12.30	1.01	115.46	1960
Hydro-Knot													
Head Gate	Kos-Uyak	PK-899	1,994	4.1	1.50	2.20	3	6.00	4.10	20.60	2.00	116.42	1960
-ditto-	Left B.	PK-899	23,017	41.0	1.50	2.20	5	10.00	5.28	25.80	4.44	114.88	1960
-ditto-	Right B.	PK-899	-	93.0	1.50	2.20	10	24.00	1.28	25.80	4.44	114.88	1960
ght Branch Canal													
Head Gate	RB-1A	PK-104	830	3.0	1.5	1.5	2	4.50	3.00	14.00	0.80	114.16	1968
-ditto-	Shonek	-107	3,509	12.2	1.5	1.5	3	7.00	4.73	16.00	0.80	112.99	1960
Regulator		PK-111	-	75.0	1.50	2.20	10	19.80	5.98	27.94	1.92	112.72	1959
Regulator		PK-211	-	75.0	1.50	2.20	10	24.00	5.91	24.73	0.26	109.85	1959
Head Gate	RB-7A	-316	1,060	3.4	1.5	1.5	2	4.00	3.00	14.00	0.80	108.85	1960
-ditto-	RB-7A-1	-316	70	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	109.82	1978
-ditto-	RB-7A-2	-316	200	3.2	1.5	1.5	2	4.00	3.00	14.00	0.80	109.34	1971
-ditto-	RB-7A-3	-316	313	1.5	1.5	1.5	1	2.00	3.00	14.10	0.80	109.40	1973
Regulator		PK-317	-	69.0	1.5	2.2	6	13.50	4.15	15.20	0.80	108.87	1959
	RB-7B	-325	328	1.6	1.5	1.5	1	2.00	4.60	12.00	0.54	108.45	1960
	RB-7V	-387	140	7.2	1.5	1.5	3	7.00	4.73	16.00	0.90	108.60	1960
	Zhambas	-393	200	2.7	1.5	1.5	1	2.00	3.00	14.10	0.80	107.95	1970
	RB-9	-401	900	8.0	1.5	1.5	3	7.00	4.73	16.00	0.80	108.10	1960
	RB-11	-410	405	2.8	1.5	1.5	2	4.00	3.00	14.00	0.80	108.15	1974
Regulator		PK-420	25,675	64.0	1.5	2.2	5	14.00	4.90	15.10	0.86	107.06	1960

Data Source : Kzyl-Orda Oblast Water Resources Committee

Table F.5 Existing Main and Inter-farm Collectors

	Name of Canals		Location	Length (km)	Irrigation Area (ha)	Discharge (m³/s)	Discharging Channels
A	Main Collectors						
	1.North Main Collector		U/S	44.3	10,782	15	Diversion C.
			Diversion C.	(26.3)		15	Right Branch C.
	2.North Main Collector		D/S	75.6	18,712	18	South MC
			Sub-total	119.9	29,494		Excl. Div.C.
	3.South Main Collector			149.6	26,366	30	Kubandarya
	Total			269.5	45,078		
B	Inter-farm Collectors						
	1. Tributaries of North Main Collector (U/S)						
	Terenozek Raion						
	Ilyasov	CK-5B	PK-213	4.5	5,390	3.0	North MC
	Shagan	CK-8B	PK-254	2.0	2,570	1.5	North MC
		CK-8A	PK-280	1.0	770	1.0	North MC
		CK-9B	PK-290	1.0	630	1.5	North MC
		CK-9V	PK-295	1.0	105	1.0	North MC
		Sub-total		5.0	4,075		
	Akzharma	CK-11V	PK-392	4	1,317	2.5	North MC
	Total for Terenozek			13.5	10,782		
	Total for North Drainage Canal(U/S)			13.5	10,782		
	2. Tributaries of North Drainage Canal (D/S)						
	Zhakagash Raion						
	Akkumski	CK-13V	PK-544	9.2	2,447	4.6	North MC
		CK-13D	PK-580	1.9	1,306	0.6	North MC
		Sub-total		11.1	3,753		
	Bukarbaibatir	CK-12B-3	PK-733+45	15.4	1,220	0.8	North MC
		CK-15D	PK-544+45	5.9	1,296	1.2	North MC
		CK-10D	PK-633	5.9	916	0.9	North MC
		CK-15G-4	PK-711	8.4	879	0.5	North MC
		CK-12B	PK-716	1.6	647	0.4	North MC
		CK-14A	PK-761+40	5.9	850	0.9	North MC
		Sub-total		43.1	5,808		
	Madeniet	CK-15D	PK-732+74	5.3	1,866	1.6	North MC
		CK-15G-2	PK-734+75	6.3	915	0.5	North MC
		CK-15B	PK-744+50	5.0	991	0.4	North MC
		Sub-total		16.6	3,772		
	Zhanatalan	CK-15	PK-841+50	8.4	676	0.8	North MC
		CK-17	PK-908+50	11.0	986	1.4	North MC
		Sub-total		19.4	1,662		
	Enbek	CK-13G-4	Pk688	4.0	768	0.4	North MC
	Tan	CK-14D-1		12.0	2,034	1.3	North MC
		CK-14D-2		7.1	915	0.6	North MC
		Sub-total		19.1	2,949		
	Total for Zhalagash Raion			113.3	18,712		
	Total for North Main Collector(D/S)			113.3	18,712		
	3. Tributaries of South Main Collector						
	Syrdarya Raion						
	MIS	YuK-4	PK-136	2.6	1,710	1.0	South MC
	Zhambul	YuK-4	PK-112	3.2	2,495	1.4	South MC
	Total for Syrdarya			5.8	4,205		
	Ternozek Raion						
	Shirkeli	YuK-6A	PK-230	4.0	1,039	2.0	South MC
		YuK-6B	PK-363	4.5	2,940	2.5	South MC
		YuK-12-1	PK-038	1.5	200	1.5	South MC
		Sub-total		10.0	4,179		
	Shagan	YuK-12-12	PK-080	1.6	881	1.0	South MC
		YuK-12-20	PK-140	1.1	120	1.0	South MC
		YuK-12-22	PK-210	1.0	170	1.0	South MC
		YuK-8	PK-368	2.0	1,830	2.5	South MC
		Sub-total		5.7	3,001		
	Akzharma	YuK-12-7	PK-041	1.8	537	2.0	South MC
		YuK-12-9	PK-047	2	1,370	2.5	South MC
		YuK-12-20	PK-140	1.0	122	1.5	South MC
		YuK-16-1G	PK-051	3.5	1,484	2.0	South MC
		Sub-total		8.3	3,513		
	Total for Terenozek			24.0	10,693		
	Zhalagash Raion						
	Akkumski	YuK-16	PK-75+80	7.5	876	0.3	South MC
	Karaketken	YuK-22	PK-165	17.0	2,156	1.7	South MC
	Zhanatalan	YuK-22-8	PK-165	1.0	2,034	0.9	South MC
		YuK-26	PK-168	2.2	278	0.2	South MC
		Sub-total		3.2	2,312		
	Ak-Anik	YuK-16	PK-277	20.2	3,700	3.2	South MC
	Enbek	YuK-16	PK-185	12.5	2,424	1.8	South MC
	Total for Zhalagash			60.4	11,468		
	Total for South Main Collector			90.2	26,366		
	Grand Total			217.0	55,860		

Data Source : Kzyl-Orda Oblast Water Resources Committee

Table F.6 Inter-farm/On-farm Canals Proposed under the Master Plan

Raion	No.	Name of Farm	Distributors (km)				Area	Discharge
			Name	Inter-Farm	On-farm	Total	(ha)	(m³/sec)
Syrdarya	3	KZ MIS	LMC-3A	-	1.4	1.4	280	0.44
			LMC-5'	-	10.2	10.2	550	0.87
			LMC-5	-	2.3	2.3	210	0.33
			LMC-4A	-	3.5	3.5	360	0.57
			LMC-4	-	-	-	-	
		Sub-total		-	17.4	17.4	1,400	
	7	Mahambeotov	LMC-1	-	2.7	2.7	750	1.18
	8	Kogalykol	LMC-3	-	16.8	16.8	700	1.10
			LMC-5A	-	12.9	12.9	480	0.76
		Sub-total		-	29.7	29.7	1,180	
		Total		-	49.8	49.8	3,330	
Terenozek	3	Akzharma	LMC-9	-	5.2	5.2	460	0.72
			LMC-11V	-	2.3	2.3	1,540	2.43
			LMC-15A	-	-	-	-	
			LMC-15B	-	0.1	0.1	690	1.09
			LMC-17B	-	0.1	0.1	710	1.12
			LMC-18	-	-	-	-	-
			LMC-18V	-	3.4	3.4	730	1.15
			Baydaulet	-	0.4	0.4	660	1.04
			LMC-19	-	0.2	0.2	160	0.25
			LMC-24A	-	3.0	3.0	670	1.06
		Sub-total		-	14.7	14.7	5,620	
	6	Ilyasov	LMC-6(4)	-	-	0	670	1.06
			LMC-8A	-	14.0	14.0	4,170	6.57
			LMC-8B	-	9.3	9.3	1,490	2.35
			LMC-8G	-	0.3	0.3	150	0.24
			LMC-10	-	-	-	-	-
		Sub-total		-	23.6	23.6	6,480	
	8	Shagan	LMC-9	12.5	-	12.5	1,960	3.09
			LMC-11V	11.2	-	11.2	90	0.14
			LMC-11V-3'	-	1.2	1.2	730	1.15
			LMC-11V-3	-	3.6	3.6	100	0.16
			LMC-11G	-	0.7	0.7	180	0.28
			LMC-12	-	4.5	4.5	2,580	4.07
			LMC-14	-	0.1	0.1	820	1.29
			LMC-16	-	4.1	4.1	650	1.02
			LMC-16A	-	1.7	1.7	100	0.16
		Sub-total		23.7	15.9	39.6	7,210	
	9	Shirkeli	LMC-5B	-	8.8	8.8	860	1.36
			LMC-5V	-	5.5	5.5	740	1.17
			LMC-7A	-	10.3	10.3	840	1.32
			LMC-7B"	-	0.1	0.1	120	0.19
			LMC-7B'	-	1.1	1.1	240	0.38
			LMC-7B	-	2.6	2.6	1,380	2.17
			LMC-9A	-	0.1	0.1	180	0.28
		Sub-total		-	28.5	28.5	4,360	
		Total		23.7	82.7	106.4	23,670	
Zhalagash	1	Ak-Arik	LMC-17A	8.9	1.8	10.7	3,880	6.11
	3	Akkumski	Kos-Uzyak	-	9.9	9.9	2,760	4.35
			LMC-15B	9.9	-	9.9	1,400	2.21
			RB-1A	-	5.8	5.8	830	1.31
			LB-1A	-	-	-	-	-
			LB-1B	-	-	-	-	-
			LB-2A	-	-	-	-	-
			LB-2B	-	-	-	-	-
		Sub-total		9.9	15.7	25.6	4,990	
	7	Zhanatalan	LB-1I	-	7.6	7.6	1,370	2.16
	8	Bukarbaibatir	LB-4B	-	13.8	13.8	2,130	3.36
			Shonek	4.8	15.3	20.1	4,520	7.12
		Sub-total		4.8	29.1	33.9	6,650	
	10	Enbek	LMC-15V	-	2.3	2.3	1,110	1.75
			LB-4A	-	3.0	3.0	350	0.55
			LB-3A	-	16.0	16.0	1,330	2.10
			LB-3B	-	1.4	1.4	590	0.93
			LB-4A-1	-	1.5	1.5	230	0.36
		Sub-total		-	24.2	24.2	3,610	

(to be continued)

Table F.6 Inter-farm/On-farm Canals Proposed under the Master Plan

Raion	No.	Name of Farm	Distributors (km)				Area	Discharge
			Name	Inter-Farm	On-farm	Total	(ha)	(m^3/sec)
	11	Madeniet	LB-4V	-	13.8	13.8	180	0.28
			LB-5A	-	4.4	4.4	1,830	2.88
			LB-5B	-	3.6	3.6	460	0.72
			LB-6B	-	4.5	4.5	330	0.52
			LB-6G	-	5.0	5.0	940	1.48
		Sub-total		-	31.3	31.3	3,740	
	12	Tan	RB-7A	-	4.7	4.7	1,240	1.95
			RB-7A-1	-	0.8	0.8	200	0.32
			RB-7A-2	-	3.2	3.2	300	0.47
			RB-7A-3	-	1.9	1.9	460	0.72
			RB-7B	-	2.3	2.3	700	1.10
			RB-7B	-	13.5	13.5	210	0.33
			Zhambas	-	6.4	6.4	300	0.47
			RB-11	-	3.5	3.5	600	0.95
		Sub-total		-	36.3	36.3	4,010	
	14	Karaketken	LB-5A	-	4.4	4.4	2,400	3.78
	15	Zhursnov	LB-8A	-	4.1	4.1	450	0.71
			LB-9A	-	12.0	12.0	1,700	2.68
			LB-9B	-	2.7	2.7	320	0.50
			LB-10B	-	9.2	9.2	560	0.88
			Akkyr	-	1.0	1.0	720	1.13
		Sub-total		-	29.0	29.0	3,750	
		Total		23.6	179.4	203.0	34,400	
Karmakshy	1	III-International	RB-15	-	19.6	19.6	4,920	7.75
	2	Aktobe	RB-13	16.6	-	16.6	4,000	6.30
	3	Zhanazhol	RB-15	7.2	-	7.2	1,560	2.46
			RB-11G	-	0.2	0.2	3,070	4.84
		Subtotal		7.2	0.2	7.4	4,630	
	4	Akzharski	RB-9	-	9.0	9.0	880	1.39
			RB-13	14.3	-	14.3	4,020	6.33
		Subtotal		14.3	9.0	23.3	4,900	
	9	Turmaubet	RB-13	14.2	-	14.2	4,330	6.82
	11	Oktobyabr	Others	-	-	0.0	760	1.20
			RB-17	-	14.1	14.1	720	1.13
		Subtotal		-	14.1	14.1	1,480	
	12	Maiiozek	RB-13	-	11.3	11.3	1,340	2.11
		Total		52.3	54.2	106.5	25,600	
Grand Total				99.6	366.1	465.7	87,000	

Table F.7 Basic Intake Rate Observed in the Study

Test No.	Location	Soil Class	Soil Type	Land Category	n	c	Ib
1	L-31-118 Syrdarya	Marshy-Meadow	clay	Paddy Field	0.383	25.413	15.20
2	L-41-117 (suare-70-54)	Marshy-Meadow	Heavy clay	Paddy Field	0.333	6.847	2.50
3	L-41-118 (suare-70-34)	Marshy-Meadow	clay	Paddy Field	0.784	10.793	178.11
4	L-41-118 (suare-70-34)	Marshy-Meadow	Heavy clay	Paddy Field	0.812	5.274	105.91
5	L-41-119 (suare-80-66)	Marshy-Meadow	clay	Lucerne Field	0.737	3.285	38.31
6	L-41-119 (suare-68-82)	Marshy-Meadow	Heavy clay	Paddy Field	0.655	19.928	124.22
7	L-41-119 (suare-68-82)	Marshy-Meadow	Heavy clay	Paddy Field	0.985	1.995	114.14
8	L-41-119 (suare-88-26)	Marshy-Meadow	clay	Paddy Field	0.819	2.970	62.65
9	L-41-105 (suare-08-44)	Marshy-Meadow	Heavy clay	Arable Land	0.570	21.342	66.95
10	L-41-105 (suare-08-44)	Alluvial-Meadow	Sand	Fallow Land	0.680	3.230	24.55
				Average			68.99

Note : n, c; Intake Rate factors, Ib; Basic Intake rate

Table F.8 Percolation Rate Observed in the Study

Test No.	Location		Soils	Observation	Observed mm/5-day		E+P	E	P
	Irrigation A.	Farm		Period	E+P	E	(mm/day)	(mm/day)	(mm/day)
1	LMK-122	Shagan	Heavy Loam	20-25/6 '97	66	54	13.1	10.7	2.4
2	LMK-12-17-1	-ditto-	Light Loam	26-30/6 '97	70	61	15.8	13.8	2
3	LMK-16-52	-ditto-	Heavy Loam	02-07/7 '97	83	68	15.3	12.5	2.8
4	LMK-11V-3-3	-ditto-	-ditto-	09-14/7 '97	83	66	16.4	13	3.4
5	LMK-9-2B-3	-ditto-	-ditto-	14-19/7 '97	91	65	18.4	13.1	5.3
6	LMK-8A-9-5B'	Ilyasov	-ditto-	20-25/6 '97	80	63	15.9	12.5	3.4
7	LMK-8B-2	-ditto-	-ditto-	26/6-1/7 '97	91	65	18.1	13	5.1
8	LMK-8A-5-4	-ditto-	-ditto-	03-08/7 '97	79	67	15.5	13.2	2.3
9	LMK-8A-11-1	-ditto-	-ditto-	08-13/7 '97	74	66	14	12.5	1.5
10	LMK-6-6	-ditto-	-ditto-	14-19/7 '97	77	66	15.9	13.6	2.3
	Average						15.8	12.8	3.1

Note: E; Evaporation, P; Percolation
Observed in collaboration with the Polytechnics Institute in Kzyl-Orda

Table F.9 Estimated Reference Crop Evapo-transpiration (ETo)

Month	ETo (mm/no.)	ETo (mm/day)
January	15.28	0.49
February	24.77	0.88
March	63.47	2.05
April	156.09	5.20
May	226.07	7.29
June	256.43	8.55
July	269.22	8.68
August	240.17	7.75
September	161.51	5.38
October	99.01	3.19
November	30.31	1.01
December	14.39	0.46
Total/Avg.	1,556.72	4.26

Table F.10 KC Values for Crops

Crops	Sowing	Harv'ng	Items	Crop Growing Stage				Total/
				Initial	C.Deve.	Mid-S	Late	Average
Paddy	May	Sept.	Crop Day=	25-day	35-day	30-day	30-day	120-day
			Kc =	0.70	0.95	1.20	0.95	0.96
Maize	May	Mid-Sept.	Crop Day=	25-day	40-day	40-day	30-day	135-day
			Kc =	0.25	0.70	1.15	0.60	0.73
S. Wheat	Late-Apr.	Early-Aug.	Crop Day=	15-day	25-day	45-day	25-day	110-day
			Kc =	0.30	0.70	1.10	0.2	0.70
W. Wheat	Late-Sept.	Early July	Crop Day=	165-day	25-day	60-day	30-day	280-day
			Kc =	0.30	0.70	1.10	0.20	0.50
Vegetables	May	Sept.	Crop Day=	25-day	35-day	40-day	20-day	120-day
			Kc =	0.40	0.70	1.00	0.75	0.75
Safflower	May	Sept.	Crop Day=	20-day	30-day	45-day	25-day	120-day
			Kc =	0.25	0.70	1.15	0.2	0.69
Lucerne	May/July/Sept.		Crop Day=	peak	low	Avg.		360-day
			Kc =	1.10	0.55	0.90		0.90

Note 1: Vegetables are presented by melon
Note 2: Period of sowing & harvesting are 30-day

Table F.11 Estimates of Crop Water Requirement on Monthly Basis

	Apr.	May	June	July	Aug.	Sept.	Total
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
Evapo-transpiration							
ETo-Month	156.09	226.07	256.43	269.22	240.17	161.51	1,309.49
with Oasis-Effect	132.68	192.16	217.97	228.84	204.14	137.28	1,113.07
ETo/Day	4.42	6.20	7.27	7.38	6.59	4.58	
For Paddy							
Cropping Schedule							
Weighted KC	-	0.36	0.89	1.08	0.60	-	
Water Requirement (mm)	-	69.9	195.1	245.9	122.6	-	633.5
Q='000 m³/ha	-	0.70	1.95	2.46	1.23	-	6.34
For Maize							
Cropping Schedule							
Weighted KC	-	0.13	0.54	0.86	1.10	0.28	
Water Requirement (mm)	-	25.2	118.6	195.9	224.4	38.1	602.2
Q='000 m³/ha	-	0.25	1.19	1.96	2.24	0.38	6.02
For Spring Wheat							
Cropping Schedule							
Weighted KC	0.02	0.37	0.54	0.98	0.16	-	
Water Requirement (mm)	2.2	71.5	118.7	223.4	31.0	-	446.8
Q='000 m³/s/ha	0.02	0.72	1.19	2.23	0.31	-	4.47
For Winter Wheat							
Cropping Schedule							
Weighted KC	0.89	1.10	0.61	0.01		0.02	
Water Requirement (mm)	118.1	204.6	132.1	2.5		2.3	459.6
Q='000 m³/s/ha	1.18	2.05	1.32	0.03		0.02	4.6
For Vegetables							
Cropping Schedule							
Weighted KC		0.20	0.25	0.85	0.85	0.01	
Water Requirement (mm)		39.2	53.6	194.5	173.8	1.4	462.5
Q='000 m³/s/ha		0.39	0.54	1.95	1.74	0.01	4.63
For Safflower							
Cropping Schedule							
Weighted KC	-	0.15	0.63	1.05	0.78	0.02	
Water Requirement (mm)	-	28.8	136.3	240.2	158.5	3.3	567.1
Q='000 m³/s/ha	-	0.29	1.36	2.4	1.59	0.03	5.67
For Lucerne							
Cropping Schedule							
Weighted KC	0.9	0.9	0.9	0.9	0.9	0.9	
Water Requirement (mm)	119.3	173.0	196.3	205.9	183.9	123.7	1,002.1
Q='000 m³/s/ha	1.19	1.73	1.96	2.06	1.84	1.24	10.02

Item	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
ETo-Mons	99.01	30.31	14.39	15.28	24.77	63.47	247.23
with Oasis-Eff	89.11	27.28	12.95	13.75	22.29	57.12	222.51
ETo/Day	2.87	0.91	0.42	0.44	0.80	1.84	
For Winter Wheat							
Cropping Schedule							
Weighted KC	0.26	0.30	0.30	0.30	0.30	0.44	
Water Requirement (mm)	23.4	8.2	3.9	4.1	6.7	25.0	71.3
Q='000 m³/s/ha	0.23	0.08	0.04	0.04	0.07	0.25	0.71
				Total Water Req'mnt (mm)=			530.9
For Lucerne							
Cropping Schedule							
Weighted KC	0.55	0.55	0.55	0.55	0.55	0.90	
Water Requirement (mm)	48.9	15.0	7.2	7.5	12.3	51.3	142.2
Q='000 m³/s/ha	0.49	0.15	0.07	0.08	0.12	0.51	1.42
				Total Water Req'mnt (mm)=			1,144.3

Table F.12 Groundwater Contribution with Project

Items		April	May	June	July	Aug.	Sept.
Groundwater Table (m)		2.50	2.00	1.50	1.50	1.50	2.00
Maize	(root m)	-	0.50	1.20	1.30	1.30	1.30
	(mm/d)	-	0.00	3.70	4.47	4.47	1.33
Spring Wheat	(root m)	0.50	0.80	1.20	1.20	1.20	-
	(mm/d)	0.00	0.04	3.70	3.70	3.70	-
Winter Wheat	(root m)	1.20	1.20	1.20	1.20	1.20	0.50
	(mm/d)	0.00	0.92	3.70	3.70	3.70	0.00
Vegetable	(root m)	-	0.50	0.60	0.60	0.60	0.60
	(mm/d)		0.00	0.59	0.59	0.59	0.00
Safflower	(root m)	-	0.50	0.80	1.10	1.10	1.10
	(mm/d)	-	0.00	1.33	3.00	3.00	0.59
Lucerne	(m)	1.30	1.30	1.30	1.30	1.30	1.30
	(mm/d)	0.04	1.33	4.47	4.47	4.47	1.33

Note : Groundwater Contribution q=((1.3-(Dw - Ds))/0.52)2
Where ; Dw = Depth of groundwater table (m)
Ds = Depth of root zone (m)

Table F.13 Net Water Requirement for Crops on Monthly Basis

(unit:mm)

Item	April	May	June	July	August	Sept.	Total
For Paddy							
Crop Water Requirement	-	69.9	195.1	245.9	122.6	-	633.5
Percolation	-	45.0	90.0	93.0	45.0	-	273.0
Pre-irrigation	-	120.0	-	-	-	-	120.0
Groundwater Contribution	-	-	-	-	-	-	0.0
Soil Stored	-	-	-	-	-	-	0.0
Total	0	234.9	285.1	338.9	167.6	0	1026.5
For Maize							
Crop Water Requirement	-	25.2	118.6	195.9	224.4	38.1	602.2
Pre-irrigation	-	35	-	-	-	-	35.0
Groundwater Contribution	-	0.0	-111.0	-138.6	-136.6	-13.9	-400.1
Stored Soil Water	-	-	-	-	-	-	0.0
Total	0.0	60.2	7.6	57.3	87.8	24.2	237.1
For Spring Wheat							
Crop Water Requirement	2.2	71.5	118.7	223.4	31.0	-	446.8
Pre-irrigation	15	15	-	-	-	-	30.0
Groundwater Contribution	0	-1.0	-111.0	-108.3	-25.5	-	-245.8
Soil Stored	-	-	-	-	-	-	0.0
Total	17.2	85.5	7.7	115.1	5.5	0	231.0
For Winter Wheat							
Crop Water Requirement	118.1	204.6	132.1	2.5	-	-	711.2
Groundwater Contribution	0	-28.5	-86.3	-2.5	-	-	408.9
Soil Stored	-79.2	0	-	-	-	-	85.8
Total	38.9	176.1	45.8	0.0	0.0	0.0	216.5
For Vegetables							
Crop Water Requirement	-	39.2	53.6	194.5	173.8	1.4	544.5
Pre-irrigation	-	30.0	-	-	-	-	30
Groundwater Contribution	-	0	-18.3	-18.3	-16.0	0	99.9
Soil Stored	-	-	-	-	-	-	0
Total	0.0	69.2	35.3	176.2	157.8	1.4	474.6
For Safflower							
Crop Water Requirement	-	28.8	136.3	240.2	158.5	3.3	567.1
Pre-irrigation	-	30.0	-	-	-	-	30.0
Groundwater Contribution	-	0	-39.9	-93	-72.3	-1.0	-206.2
Soil Stored	-	-	-	-	-	-	0.0
Total	0.0	58.8	96.4	147.2	86.2	2.3	390.9
For Lucerne							
Crop Water Requirement	119.3	173.0	196.3	205.9	183.9	123.7	1002.1
Pre-irrigation	-	30.0	-	-	-	-	30.0
Groundwater Contribution	-1.2	-41.2	-134.1	-138.6	-138.6	-39.9	-493.6
Soil Stored	-85.8	-	-	-	-	-	-85.8
Total	32.3	161.8	62.2	67.3	45.3	83.8	452.7

Table F.14 Irrigation Water Requirement on Monthly Basis (unit : mm)

Item	Area Ratio	April	May	June	July	August	Sept.	Total
Paddy	0.50	0.0	117.0	142.0	168.7	83.5	0.0	511.2
Maize	0.03	0.0	1.9	0.2	1.8	2.7	0.7	7.3
Spring Wheat	0.07	1.2	6.1	0.5	8.2	0.4	0.0	16.4
Winter Wheat	0.08	3.1	14.2	3.7	0.0	0.0	0.0	21.0
Vegetables	0.04	0.0	2.7	1.4	7.0	6.3	0.1	17.5
Sunflower	0.03	0.0	1.7	2.9	4.4	2.6	0.1	11.7
Lucerne	0.25	8.1	40.5	15.6	16.8	11.3	21.0	113.3
I.W.R Total	1.00	12.4	184.1	166.3	206.9	106.8	21.9	698.4
at On-farm*		17.7	219.0	184.2	232.2	121.2	31.3	805.6
at Head Gate		28.9	357.8	301.0	379.4	198.0	51.1	1,316.2
at Headworks		30.4	376.6	316.8	399.4	208.4	53.8	1,385.4
Project D.W.R.(MCM)		26.4	327.6	275.6	347.5	181.3	46.8	1,205.2
-ditto-	(m^3/sec)	10.2	122.3	106.3	129.7	67.7	18.1	454.3

Note : * Applied application efficiency for paddy and upland crops

Table F.15 Unit Diversion Water Requirement on monthly basis (lit/sec/ha)

Canal	April	May	June	July	August	Sept.	Design q
For Field Ditches	-	4.170	-	-	-	-	4.170
For Field canal	-	1.086	1.318	1.567	0.775	0	1.772
For Distributors	0.111	1.336	1.161	1.417	0.739	0.197	1.574
For Main Canal	0.117	1.406	1.222	1.491	0.778	0.208	1.576

Note: Adjustment factor of 5-10% to the max. monthly diversion water requirement are applied for the design water discharge (q)

Table F.16 Major Elements of Main Collectors under the Master Plan

Name of Canals		Location	Length (km)	Drainage Area(km^2)	Irrigation Area(km^2)	Discharge (m^3/s)	Design Q (m^3/s)
1. North Main Collector							
	U/S -1	Pk-52	5.2	75.5	14.6	1.6	1.6
	U/S -2	PK-269	21.7	166.8	82.5	4.8	6.4
	U/S -3	PK-443	17.4	145.4	22.0	3.0	9.4
	Sub-total		44.3	387.7	119.1	9.4	-
	D/S -1	PK-631	18.8	126.1	35.9	3.0	12.4
	D/S -2	PK-733	10.2	83.6	28.9	2.1	14.5
	CK-14	PK-859	12.6	269.7	76.3	6.4	-
	D/S-3	PK-999	14.0	119.2	22.8	2.6	-
	CK-18	PK-1033	3.4	154.0	17.8	3.1	-
	D/S -4	PK-1116	8.3	198.1	0.0	3.4	-
	Confluence	PK-1199	8.3	-	-	-	
	Sub-total		46.6	741.0	116.9	15.5	30.0
Total		Total	119.9	1,338.4	300.8	30.0	
2. South Main Collector							
	U/S -1	PK-187	18.7	141.1	38.2	3.3	3.3
	U/S -2	PK-338	15.1	144.5	25.8	3.1	6.4
	YuK-L1	PK-408	7.0	66.0	0.0	1.1	-
	YuK-8	PK-486	7.8	16.4	7.7	0.5	-
	YuK-L2	PK-520	3.4	58.0	0.0	1.0	-
	YuK-12	PK-534	1.4	189.1	57.7	4.6	-
	Sub-total	PK.408 - 534	19.6	329.5	65.4	7.2	13.6
	YuK-L3	PK-680	14.6	82.0	0.0	1.4	-
	YuK-14	PK-756	7.6	32.9	7.8	0.7	-
	YuK-16	PK-831	7.5	316.9	117.4	8.1	-
	Sub-total	PK.680 - 831	29.7	431.8	125.2	10.2	23.8
	YuK-22	PK-894	6.3	123.4	42.9	3.1	-
	YuK-L4	PK-1007	11.3	234.0	0.0	4.1	-
	YuK-26	PK-1058	5.1	152.8	17.0	3.0	-
	Confluence	PK-1304	24.6	-	-	-	-
	Sub-total	PK.894- 1304	47.3	510.2	59.9	10.2	34.0
	Joint w/ CK	PK-1304	-	-	-	30.0	-
	Bkk	PK-1348	4.4	254.8	24.3	5.0	-
	YuK-32	PK-1408	6.0	229.4	49.3	5.1	-
	YuK-L5	PK-1440	3.2	20.0	0.0	0.3	-
	Confluence	PK-1496	5.9	-	-	-	-
	Sub-total	PK.1304-1488	19.5	504.2	73.6	40.4	74.4
Total		Total	149.9	2,061.3	388.1	74.4	
3. Zhana Darya Drainage Area							
		Kirov	1.8	102.5	7.5	2.0	2.0
4. Karmakshy Drainage Area							
		ZKK'	5.0	125.0	12.4	2.5	2.5
		ZKK	28.7	357.9	89.7	8.2	8.2
		KK-1	18.8	223.9	56.7	5.2	5.2
		KK-2	4.0	372.0	14.8	6.8	6.8
		Total	56.5	1,078.8	173.6	22.7	
Grand Total			328.1	4,581.0	870.0	129.1	

Table F.17 Major Inter-farm/On-farm Collectors Proposed under the Master Plan

No	Name of Raion/Farms	Collectors Name	Collectors Location	Channel Length (km) Inter-farm	On-farm	Total	Drainage Area(km²)	Irrigat'n Area(km²)	Discharge (cu.m/s)	Drainage Basin
Syrdarya										
3	KZ MIS	YuK-4	PK-136	4.4	-	4.4	14.6	10.4	0.5	SMC-U/S1
7	Mahambetov			-	7.5	7.5	102.5	7.5	2.0	Zhana Darya
8	Kogalykol	YuK-4	PK-112	3.2	-	3.2	31.0	22.2	1.0	SMC-U/S1
	Total			7.6	7.5	15.1				
Terenozek										
3	Akzharma	CK-11V	PK-392	4.0	-	4.0	4.2	14.0	0.4	NMC-U/S3
		YuK-8	PK-368	-	2.0	2.0	16.4	7.7	0.5	SMC-JK12
		YuK-12	PK-282	10.8	-	10.8	189.1	57.7	4.6	Do.
		YuK-12-7	PK-041	-	1.8	1.8	13.7	4.6	0.3	Do.
		YuK-12-9	PK-047	-	2	2.0	22.6	7.6	0.6	Do.
		YuK-12-20	PK-140	1.0	-	1.0	3.0	1.0	0.1	Do.
		YuK-16-1G	PK-051	-	3.5	3.5	36.8	1.4	0.7	SMC-JK16
		Sub-total		15.8	9.3	25.1				
6	Ilyasov	CK-5B	PK-213	4.5	-	4.5	56.1	15.8	1.3	NMC-U/S2
		CK-6A	Pk-112	-	2.5	2.5	17.8	12.7	0.6	NMC-U/S2
		Sub-total		4.5	2.5	7.0				
8	Shagan	CK-8B	PK-254	2.0	-	2.0	4.0	3.8	0.2	NMC-U/S2
		CK-8A	PK-280	1.0	-	1.0	23.4	7.0	0.6	NMC-U/S3
		CK-9B	PK-290	-	1.0	1.0	5.0	3.2	0.2	Do.
		CK-9V	PK-295	-	1.0	1.0	8.0	1.0	0.2	Do.
		YuK-12	PK-108	3.2	-	3.2	138.4	46.6	3.5	SMK-JK12
		YuK-12-12	PK-080	-	1.6	1.6	22.3	7.5	0.6	Do.
		YuK-12-20	PK-140	-	1.1	1.1	3.0	1.0	0.1	Do.
		YuK-12-22	PK-210	-	1.0	1.0	4.5	1.5	0.1	Do.
		Sub-total		6.2	5.7	11.9				
9	Shirkeli	YuK-6A	PK-230	4.0	-	4.0	20.8	8.4	0.6	SMC-U/S-1
		YuK-6V	PK-363	-	4.5	4.5	129.2	25.8	2.8	SMC-U/S-2
		YuK-12-1	PK-038	-	1.5	1.5	9.7	1.8	0.2	SMK-JK12
		Sub-total		4.0	6.0	10.0				
	Total			30.5	23.5	54.0				
Zhalagash										
1	Ak-Arik	YuK-16	PK-277	20.2	-	20.2	93.1	26.3	2.2	SMC-JK16
3	Akkumiski	CK-13B	PK-544	-	9.2	9.2	30.1	15	0.9	NMC-D/S1
		CK-13D	Pk-580	1.9	-	1.9	25.8	13	0.7	Do.
		YuK-16	PK-75+80	7.5	-	7.5	15.2	6.9	0.4	SMC-JK16
		Sub-total		9.4	9.2	18.6				
7	Zhanatalan	CK-15	PK-841+50	8.4	-	8.4	34.6	5.6	0.7	NMC-D/S3
		CK-17	PK-908+50	11.0	-	11.0	33.0	10.1	0.8	Do.
		YuK-22-8	PK-165	-	1.0	1.0	13.2	4.6	0.3	SMC-JK22
		YuK-26	PK-168	-	2.2	2.2	16.1	5.6	0.4	SMC-JK26
		Sub-total		19.4	3.2	22.6				
8	Bukarbaibatir	CK-12B-3	PK-733+45	-	15.4	15.4	49.7	22.6	1.4	NMC-D/S1
		CK-10D	PK-544+45	-	5.9	5.9	13.4	9.1	0.4	Do.
		CK-15A	PK-633	-	5.9	5.9	9.2	6.1	0.3	NMC-D/S3
		CK-15G-4	PK-711	-	8.4	8.4	19.3	11.6	0.6	Do.
		CK-12B	PK-716	-	1.6	1.6	15.2	6.4	0.4	NMC-D/S1
		CK-14A	PK-761+40	-	5.9	5.9	36.4	12.4	0.9	NMC-CK14
		Sub-total		-	43.1	43.1				
10	Enbek	CK-13G-4	Pk-688	-	4.0	4.0	5.6	1.8	0.1	NMC-D/S1
		YuK-16	PK-185	12.5	-	12.5	61.3	17.3	1.5	SMC-JK16
		Sub-total		12.5	4.0	16.5				
11	Madeniet	CK-15D	PK-732+74	-	5.3	5.3	8.8	3.3	0.2	NMC-D/S2
		CK-15G-2	PK-734+75	-	6.3	6.3	7.5	4.5	0.2	Do.
		CK-15B	PK-744+50	-	5.0	5.0	8.7	5.4	0.3	NMC-D/S3
		Sub-total		-	16.6	16.6				
12	Tan	CK-14D-1		-	12.0	12.0	89.9	25.4	2.1	NMC-CK14
		CK-14D-2		-	7.1	7.1	50.5	11.4	1.1	Do.
		Sub-total		-	19.1	19.1				
14	Karakedken	YuK-22	PK-165	17.0	-	17.0	123.4	42.9	3.1	SMC-JK22
15	Zhursnov	CK-18	PK-1033	-	19.8	19.8	154.0	17.8	3.1	NMC-CK18
	Total			78.5	115.0	193.5				
Karmakshy										
9	Tumaubet	YuK-30	PK-1382	9.6	-	9.6	91.7	8.0	1.8	SMC-JK32
		YuK-32	PK-1408	-	11.9	11.9	87.2	29.7	2.2	Do.
		Sub-total		9.6	11.9	21.5				
12	Mailiozek	YuK-34	PK-1460	5.2	-	5.2	50.5	13.4	1.2	SMC-JK32
	Total			14.8	11.9	26.7				
	Grand Total			131.4	157.9	289.3				

Table F.18 List of Canals for Each Irrigation System in the Priority Project Area

Sta. km	On-farm Canal/ Field Canal	Area for Canal (ha)			Discharge (m³/s)			Canal Length (m)			Proposed W.L. (El.m)		
		On-farm	MFIC	2-FIC	On-farm	MFIC	2-FIC	On-farm	MFIC	2-FIC	Field	D (m)	W.L.
LMK-6													
8.8	LMK-6-1	671	32	-	1.04	0.05	-	8,800	160	-	124.7	400	125.1
9.1	LMK-6-2	639	111	-	0.99	0.19	-	300	430	-	123.9	1,800	125.0
10.3	LMK-6-3	528	130	-	0.82	-	-	1,200	-	-	123.6	1,000	124.3
10.8	LMK-6-5	398	178	-	0.62	-	-	500	-	-	123.1	2,700	124.7
13.0	LMK-6-6	220	91	-	0.36	-	-	2,200	-	-	123.7	100	124.0
14.6	LMK-6-6'	-	129	99	-	0.22	0.17	-	1,600	-	124.1	100	124.4
	1.6 LMK-6-6"	-	-	30	-	-	0.05	-	-	1,400	123.5	1,600	124.5
	Total for LMK-6							13,000	2,190	1,400			
LMK-8A													
0.8	LMK-8A-4	4,174	111	-	6.49	-	-	800	-	-	122.4	800	123.0
1.0	LMK-8A-3	4,063	234	-	6.32	-	-	200	-	-	123.1	2,000	124.3
2.7	LMK-8A-5	3,829			5.96			1,700					
	0.1 LMK-8A-5-1	-	1,160	121	-	1.90	-	-	100	-	123.2	700	123.8
	0.1 LMK-8A-5-2	-	-	138	-	-	-	-	0	-	123.2	500	123.7
	2.7 LMK-8A-5-3	-	901	51	-	1.48	-	-	2,600	-	121.2	900	121.9
	2.7 LMK-8A-5-4	-	-	89	-	-	-	-	0	-	121.9	800	122.5
	4.2 LMK-8A-5-6	-	761	81	-	1.25	-	-	1,500	-	122.6	100	122.9
	4.5 LMK-8A-5-5	-	680	-	-	1.12	-	-	300	-			
	LMK-8A-5-5'	-	-	71	-	-	0.12	-	-	-	123.1	600	123.6
	4.5 LMK-8A-5-5"	-	-	145	-	-	0.25	-	300	600	121.8	1,500	122.8
	5.1 LMK-8A-5-7	-	464	236	-	0.79	-	-	600	-	-	-	-
	LMK-8A-5-7-1	-	-	135	-	-	0.23	-	-	50	122.0	700	122.6
	LMK-8A-5-7-2	-	-	31	-	-	0.05	-	-	850	111.7	700	112.3
	LMK-8A-5-7-3	-	-	70	-	-	0.12	-	-	450	120.9	400	121.3
	5.4 LMK-8A-5-8	-	228	79	-	0.39	-	-	250	-	122.4	1,400	123.3
	6.3 LMK-8A-5-9	-	149	-	-	0.25	-	-	-	-	-	-	
	LMK-8A-5-9-2	-	-	68	-	-	0.12	-	900	-	122.0	600	122.5
	LMK-8A-5-9-4	-	-	81	-	-	0.13	-	-	900	120.7	1,900	121.9
3.9	LMK-8A-6	2,669	134	-	4.15	-	-	1,200	1,200	-	123.1	2,900	124.8
5.7	LMK-8A-7'	2,535	70	-	3.94	-	-	1,800	-	-	122.7	500	123.2
6.0	LMK-8A-7	2,465	138	-	3.84	-	-	300	-	-	123.2	1,200	124.0
8.0	LMK-8A-9'	2,327	95	-	3.62	-	-	2,000	-	-	122.5	1,500	123.5
8.8	LMK-8A-9	2,232			3.47			800					
	0 LMK-8A-9-2	-	1,049	49	-	1.72	-	-	-	-	122.3	800	122.9
	0.9 LMK-8A-9-1	-	1,000	102	-	1.64	-	-	900	-	121.9	1,300	122.8
	2.3 LMK-8A-9-3	-	898	69	-	1.47	-	-	1,400	-	122.9	40	123.1
	2.3 LMK-8A-9-4	-	-	91	-	-	-	-	0	-	122.5	1,400	123.4
	4.1 LMK-8A-9-6	-	738	156	-	1.21	-	-	1,800	-	122.4	200	122.7
	4.9 LMK-8A-9-5	-	582	-	-	0.96	-	-	800	-	-	-	-
	LMK-8A-9-5-2	-	-	311	-	-	0.53	-	-	650	121.5	500	122.0
	LMK-8A-9-5-1	-	-	207	-	-	0.35	-	-	200	121.8	800	122.4
	LMK-8A-9-5-3	-	-	157	-	-	0.27	-	-	400	120.8	2,000	122.0
	LMK-8A-9-5-4	-	-	78	-	-	0.13	-	-	570	119.5	1,300	120.4
	5.7 LMK-8A-9-7	-	271	110	-	0.46	0.19	-	800	600	121.7	300	122.1
	5.7 LMK-8A-9-8	-	-	126	-	-	-	-	-	-	121.3	400	121.7
	5.7 LMK-8A-9-9	-	-	35	-	-	0.06	-	-	1400	119.8	600	120.3
10.1	LMK-8A-9"	1,183	79	-	1.84	-	-	1,300	-	-	121.4	200	121.7
11.9	LMK-8A-11	1,104		-	1.72		-	1800	-	-			
	0 LMK-8A-11-2	-	191	108	-	-	-	-	-	-	121.3	300	121.7
	0 LMK-8A-11-4	-	-	83	-	-	-	-	-	-	121.7	800	122.3
13.9	LMK-8A-13	913	86	-	1.50	0.15	-	2,000	-	-	119.5	2000	120.7
14.7	LMK-8A-15	827	14	-	1.36	0.02	-	800	-	-	120.3	100	120.6
16.7	LMK-8A-17	813			1.33			2,000					
	0.0 LMK-8A-17-2	-	519	41	-	0.88	-	-	-	-	120.2	800	120.8
	0.4 LMK-8A-17-1	-	478	89	-	0.81	-	-	400	-	120.6	200	120.9
	0.9 LMK-8A-17-3	-	389	73	-	0.66	-	-	500	-	120.1	1300	121.0
	LMK-8A-17-3'	-	-	75	-	-	0.13	-	-	1,350	119.8	2000	121.0
	0.9 LMK-8A-17-4	-	241	108	-	-	-	-	0	-	122.2	100	122.5
	2.2 LMK-8A-17-5	-	133	50	-	0.23	-	-	1,300	-	112.8	1000	113.5
	2.2 LMK-8A-17-6	-	-	83	-	-	-	-	-	-	119.4	200	119.7
18.7	LMK-8A-19	294			0.50			2,000					
	0.0 LMK-8A-19-1	-	115	76	-	0.20	-	-	-	-	119.9	1,000	120.6
	0.6 LMK-8A-19-3	-	39	-	-	0.07	-	-	550	-	119.3	400	119.7
19.1	LMK-8A-21	179			0.30			400					
	0 LMK-8A-21-2	-	179	102	-	0.30	-		-		119.9	1,000	120.6
	1.2 LMK-8A-21-1	-	77	-	-	0.13	-	-	1,200	-	119.4	850	120.0
	Total for LMK-8A							19,100	17,400	8,020			
LMK-8B													
0.0	LMK-8B-2'	1,489	56	-	2.44	-	-	50	-	-	123.7	300	124.1
1.9	LMK-8B-2"	1,433	122	-	2.35	-	-	1,850	-	-	122.4	100	122.7
2.6	LMK-8B-2	1,311	112	-	2.15	-	-	700	-	-	122.5	600	123.0
3.6	LMK-8B-4'	1,199	98	-	1.97	-	-	1,000	-	-	122.0	1,600	123.0
4.7	LMK-8B-4"	1,101	98	-	1.81	-	-	1,100	-	-	121.0	1,500	122.0
5.7	LMK-8B-6'	1,003	52	-	1.65	0.09	-	1,000	-	-	120.6	1,400	121.5
6.0	LMK-8B-3	951	65	-	1.56	0.11	-	300	-	-	120.8	700	121.4
6.0	LMK-8B-6"	886	52	-	1.45	0.09	-	0	-	-	120.4	900	121.1
7.2	LMK-8B-8	834	70	-	1.37	0.12	-	1,200	-	-	119.8	1,200	120.6
7.3	LMK-8B-5	764	50	-	1.25	0.09	-	100	-	-	121.3	700	121.9
7.9	LMK-8B-10	714	38	-	1.21	0.06	-	600	-	-	119.9	1,100	120.7
8.9	LMK-8B-12	676			1.15			1,000					
	0.4 LMK-8B-12-1	-	320	80	-	0.54	0.14	-	400	-	119.7	1,200	120.5
	1.1 LMK-8B-12-2	-	240	43	-	0.41	0.07	-	700	-	119.8	1,400	120.7
	2.4 LMK-8B-12-3	-	197	-	-	0.33	-	-	1,300	-	119.2	600	119.7
8.9	LMK-8B-12'	356	45	-	0.58	0.08	-	-	-	-	119.0	100	119.3
11.7	LMK-8B-14	311			0.51			2800					
	0.0 LMK-8B-14-1	-	311	38	-	0.53	-	-	-	-	119.2	500	119.7
	1.4 LMK-8B-14-2	-	273	106	-	0.46	-	-	1,350	-	119.2	1,600	120.2
	1.4 LMK-8B-14-3	-	-	86	-	-	-	-	-	-	118.5	1,200	119.3
	2.3 LMK-8B-14-4	-	81	-	-	-	-	-	950	-	118.9	900	119.6
	Total for LMK-8B							11,700	4,700	0			

(to be continued)

Table F.18 List of Canals for Each Irrigation System in the Priority Project Area

Sta km	On-farm Canal/ Field Canal	Area for Canal (ha)			Discharge (m³/s)			Canal Length (m)			Proposed W.L. (El.m)		
		On-farm	MHC	2-HC	On farm	MHC	2-HC	On-farm	MHC	2-HC	Field	D (m)	W.L.
LMK-8G													
0.2	LMK-8G-1	146	-	62	0.24	-	-	200	-	-	123.1	-	123.3
2.7	LMK-8G-2	-	84	69	-	0.14	-	-	2,500	-	123.2	200	123.5
3.8	LMK-8G-2'	-	-	15	-	-	0.03	-	-	1,080	122.3	200	122.6
	Total for LMK-8G							200	2,500	1,080			
LMK-9													
0.5	LMK-9A	2,653	230	-	4.13	-	-	480	-	-	-	-	-
1.7	LMK-9A'	2,423			3.77			1,220					
1.5	LMK-9-A'-1	-	302	100	-	0.51	-	-	1,500	-	120.1	900	120.8
2.9	LMK-9-A'-2,3	-	202	94	-	-	-	-	1,400	-	119.6	400	120.0
3.5	LMK-9-A'-4,5			108									
2.7	LMK-9-2A	2,121			3.30			1,000					
0.1	LMK-9-2A-1	-	161	117	-	0.27	-	-	100	-	119.9	200	120.2
1.8	LMK-9-2A-3	-	44	19	-	0.07	-	-	1,700	-	119.2	400	119.6
2.0	LMK-9-2A-2	-	25	-	-	0.04	-	-	200	-	119.2	1,100	120.0
2.8	LMK-9-2B	1,960			3.05			100					
1.1	LMK-9-2B-1	-	366	89	-	0.62	-	-	1,100	-	119.0	300	119.4
5.5	2.6 LMK-9-2B-3	-	277	44	-	0.47	-	-	1,500	-	118.9	1,200	119.7
6.1	3.2 LMK-9-2B-2	-	233	21	-	0.40	0.04	-	600	1,100	118.5	500	119.0
6.9	4.0 LMK-9-2B-5	-	212	60	-	0.36	-	-	800	-	118.5	100	118.8
7.9	5.0 LMK-9-2B-7	-	152	57	-	0.26	-	-	1,000	-	117.3	500	117.8
7.9	5.0 LMK-9-2B-4	-	-	95	-	0.16	0.16	-	1,730	-	117.4	600	117.9
7.9	5.0 LMK-9-2B-6	-	-	49	-	-	0.08	-	-	380	116.5	1,500	117.5
4.6	LMK-9-2V	1,594	68	68	2.48	0.12	0.12	1750	-	-	118.5	200	118.8
5.2	LMK-9-2G	1,526			2.37		-	600	-	-			
0.0	LMK-9-2G-2	-	102	61	-	-	0.10	-	0	-	118.2	100	118.5
0.0	LMK-9-2G-2'	-	-	41	-	-	0.07	-	0	1100	117.5	100	117.8
0.8	LMK-9-2G-4	-	80	37	-	0.14	0.06	-	750	450	116.4	1,900	
1.8	LMK-9-2G-1	-	43	-	-	0.07	-	-	1,000	-	117.2	300	117.6
7.55	LMK-9-2B'	1,344	-	-	2.21	-	-	2,400	-	-			
2.6	LMK-9-2B'-1	-	540	69	-	0.89	-	-	2,550	-	115.6	1,200	116.4
2.6	LMK-9-2B'-2	-	471	72	-	0.77	-	-	0	-	115.4	1,700	116.5
2.6	LMK-9-2B'-2'	-	399	20	-	0.66	0.03	-	0	1,700	116.9	1,900	118.1
3.4	LMK-9-2B'-3	-	329	72	-	0.62	-	-	850	-	116.8	1,000	117.5
4.4	LMK-9-2B'-5	-	239	98	-	0.41	-	-	950	-	115.7	1,500	116.7
4.5	LMK-9-2B'-4	-	307	68	-	0.52	0.12	-	100	750	117.2	900	117.9
7.2	LMK-9-2B'-4'	-	141	12	-	0.24	0.02	-	2,750	400	116.4	700	117.0
8.5	LMK-9-2B'-6	-	129	-	-	0.22	-	-	1,300	-	115.7	1,000	116.4
8.6	LMK-9D	804			1.25			1,050					
0.3	LMK-9D-2	-	109	23	-	0.19	0.04	-	250	450	117.1	600	117.6
0.5	LMK-9D-4	-	86	-	-	0.15	-	-	250	-	116.3	100	116.6
10.2	LMK-9E	695	-	128	1.08	-	0.22	1,600	-	450	116.3	1,400	117.2
11.9	LMK-9I	567	-	105	0.88	-	0.18	1,700	-	400	116.4	800	117.0
11.9	LMK-9-4	462			0.72			0					
	Total for LMK-9							11,900	22,380	7,180			
LMK-11V-3													
3.9	LMK-11V-3-1	917	32	-	1.51	-	-	3,900	-	-	114.8	700	115.4
3.9	LMK-11V-3-4	885	-	-	1.45	-	-	0	-	-			
0.0	LMK-11V-3-4'	-	484	60	-	0.79	-	-	0	-	117.2	400	117.6
1.8	LMK-11V-3-4-1	-	424	17	-	0.70	-	-	1,750	-	117.2	600	117.7
2.0	LMK-11V-3-4-2	-	407	17	-	0.67	0.03	-	200	950	116.2	200	116.5
2.0	LMK-11V-3-4-3	-	390	72	-	0.64	-	-	0	-	117.3	200	117.6
2.5	LMK-11V-3-4-4	-	165	72	-	0.28	-	-	550	-	115.8	1,100	116.6
3.7	LMK-11V-3-4-5	-	318	153	-	0.54	-	-	1,150	-	114.6	1,000	115.3
4.5	LMK-11V-3-4-7	-	93	-	-	0.16	-	-	850	-	115.2	2,000	116.4
4.6	LMK-11V-3-3	401	205	159	0.66	0.35	-	700	-	-	115.8	1,700	116.9
1.7	LMK-11V-3-3'	-	46	46	-	0.08	-	-	1,700	-	116.0	1,900	117.2
4.6	LMK-11V-3-6	196	64	-	0.32	-	-	0	-	-	116.2	700	116.8
5.4	LMK-11V-3-8	132	-	-	0.22	-	-	800	-	-	114.9	1,200	115.7
	Total for LMK-11V-3							5,400	6,200	950			
LMK-11G													
0.6	LMK-11G-1	178	54	-	0.29	0.09	-	550	560	-	117.4	900	118.1
1.4	LMK-11G-2	124	66	-	0.21	0.11	-	800	-	-	117.7	1100	118.5
2.2	LMK-11G-3	-	58	-	-	0.10	-	-	850	-	116.6	1000	117.3
	Total for LMK-11G	-						1,350	1,410	0			
LMK-12													
0.3	LMK-12-2'	2,583	41	-	4.02	0.07	-	340	1,350	-	120.0	2,250	121.3
3.2	LMK-12-2"	2,542	136	-	3.96	0.23	-	2,810	-	-	119.8	700	120.4
3.7	LMK-12-2	2,406	-	-	3.74	-	-	550	-	-			
0.0	LMK-12-2-1	-	325	99	-	0.55	-	-	0	-	118.8	1,500	119.8
1.0	LMK-12-2-2	-	226	116	-	0.38	-	-	1,000	-	120.3	1,500	121.3
1.0	LMK-12-2-3	-	-	110	-	-	-	-	-	-	119.3	1,400	120.2
4.6	LMK-12-4	2,081	37	-	3.24	-	-	870	-	-	119.5	300	119.9
4.9	LMK-12-7	2,044	147	-	3.18	-	-	330	-	-	118.8	1,500	119.8
7.1	LMK-12-9	1,897	-	-	2.95	-	-	2,200	-				
0	LMK-12-9-1	-	391	113	-	-	-	-	-	-	119.5	950	120.2
0	LMK-12-9-2	-	278	60	-	-	-	-	-	-	119.6	1,400	120.5
0.9	LMK-12-9-3,4	-	218	57	-	0.37	-	-	900	-	119.9	500	120.4
1.4	LMK-12-9-5	-	161	92	-	0.27	0.16	-	450	650	118.7	900	119.4
	LMK-12-9-6	-	-	69	-	-	-	-	-	-	117.8	800	118.4
7.9	LMK-12-11	1,506	65	-	2.34	-	-	800	-	-	119.1	800	119.7
10.6	LMK-12-13	1,441	120	-	2.24	-	-	2,700	-	-	118.7	1,400	119.6
11.1	LMK-12-15	-	-	-	-	-	-	500	-				
1.6	LMK-12-15-1	1,321	41	-	2.06	0.07	-	-	1,600	-	118.1	1,000	118.8
1.6	LMK-12-15-4	1,280	66	-	1.99	-	-	-	0	-	118.3	800	118.9
3.5	LMK-12-15-3	1,214	84	-	1.89	0.14	-	-	1,900	-	118.5	1,000	119.2
13.8	LMK-12-17	1,130	-	-	1.76	-	-	2,300					
2.3	LMK-12-17-1	-	134	49	-	0.23	-	-	2,250	-	118.4	450	118.8
2.7	LMK-12-17-2	-	85	-	-	0.14	-	-	450	-	118.8	400	119.2
17.1	LMK-12-17'	996	58	-	1.55	-	-	3,300	-	-	118.2	100	118.5
20.8	LMK-12-17"	938	206	-	1.54	-	-	3,700	-	-	117.9	500	118.4
23.1	LMK-12-19	732	106	-	1.20	-	-	2,300	-	-	117.4	1,550	118.4

Table F.18 List of Canals for Each Irrigation System in the Priority Project Area

Sta km.	On-farm Canal/ Field Canal	Area for Canal (ha)			Discharge (m³/s)			Canal Length (m)			Proposed W.L (El m)		
		On-farm	MFIC	2-FIC	On-farm	MFIC	2-FIC	On-farm	MFIC	2-FIC	Field	D (m)	W.L.
													(to be continued)
24.6	LMK-12-21	626	-	-	1.03	-	-	1,500					
	1.1 LMK-12-21-1	-	375	39	-	0.64	-	-	1,100	-	116.7	800	117.3
	1.1 LMK-12-21-2	-	336	133	-	0.57	0.23	-	0	400	116.9	2,000	118.1
	2.1 LMK-12-21-4	-	203	66	-	0.35	-	-	1,000	-	118.7	1,600	119.7
	2.7 LMK-12-21-6	-	137	-	-	0.23	-	-	600	-	117.2	1,900	118.4
26.0	LMK-12-23'	251	187	-	0.41	-	-	1,400	-	-	116.9	700	117.5
27.6	LMK-12-23	64	-	-	0.11	-	-	1,600	-	-	116.1	500	116.6
	Total for LMK-12							27,600	12,600	1,050			
LMK-14													
4.7	LMK-14-2	824	42	-	1.36	0.07	-	4,700	200	-	118.4	600	118.9
6.4	LMK-16-6	782			1.28			1,680					
	0.7 LMK-16-6-1	-	39	-	-	0.07	-	-	700	-	118.7	1,100	119.5
7.0	LMK-16-6'	743	45	-	1.22	-	-	590	-	-	119.5	100	119.8
7.7	LMK-16-11	698			1.15			730					
	0.0 LMK-16-11-1	-	78	21	-	0.13	-	-	0	-	118.1	500	118.6
	0.9 LMK-16-11-2	-	57	-	-	0.10	-	-	900	-	118.4	1,000	119.1
8.5	LMK-16-8'	620	43	-	1.02	-	-	800		-	18.3	300	18.7
8.7	LMK-16-8	577			0.95			200					
	1.0 LMK-16-8-1	-	371	84	-	0.63	-	-	1,000	-	118.5	750	119.1
	1.0 LMK-16-8-2	-	287	76	-	0.49	-	-	0	-	118.6	1,200	119.4
	1.0 LMK-16-8-4	-	211	58	-	0.36	-	-	0	-	118.9	1,200	119.7
	2.5 LMK-16-8-3	-	153	39	-	0.26	-	-	1,460	-	117.1	800	117.7
	2.7 LMK-16-8-5	-	114	58	-	0.19	-	-	1,660	-	117.7	700	118.3
	3.4 LMK-16-8-7	-	56	-	-	0.10	-	-	690	-	117.7	900	118.4
9.8	LMK-16-10	206	53	-	0.35	-	-	1,140	-	-	117.8	500	118.3
10.2	LMK-16-13	153	27	-	0.26	-	-	400	-	-	117.6	1,050	118.3
10.6	LMK-16-12	126	78	-	0.21	-	-	400	-	-	117.8	1,550	118.8
10.8	LMK-16-15	48	-	-	0.08	-	-	200	-	-	117.7	900	118.4
	Total for LMK-14	-	-	-	-	-	-	10,840	6,610	0			
LMK-16													
1.82	LMK-16-5	747			1.23			1,820					
	0.6 LMK-16-5-2	-	408	-	-	0.67		-	600	-			
	LMK-16-5-2'	-	-	174	-	-	0.29	-	-	-	118.8	700	119.4
	LMK-16-5-2"			107	-	-	0.18	-	-	1,250	117.5	600	118.0
	LMK-16-5-2'	-	-	43	-	-	0.07	-	-	-	117.2	100	117.5
	1.7 LMK-16-5'	-	234	20	-	0.40	-	-	1,100	-	119.1	100	119.4
	2.5 LMK-16-5"	-	214	121	-	0.35	-	-	750	-	119.0	200	119.3
	2.7 LMK-16-5-1	-	93	24	-	0.16	-	-	280	-	117.8	400	118.2
	3.1 LMK-16-5-3	-	69	-	-	0.12	-	-	320	-	117.3	550	117.8
4.7	LMK-16-7	339			0.56			2,830					
	1.6 LMK-16-7-1-1	-	110	32	-	0.19	-	-	1,570	-	116.7	1,350	117.6
	1.6 LMK-16-7-1-2	-	-	78	-	-	-	-	0	-	116.1	1,000	116.8
5.6	LMK-16-7-3	229			0.39			950					
	0.0 LMK-16-7-3'	-	90	61	-	0.15	-	-	0	-	118.1	400	118.5
	1.0 LMK-16-7-3"	-	29	-	-	0.05	-	-	1,000	-	116.9	900	117.6
6.4	LMK-16-7-2	139	18	-	0.24	0.03	-	820	-	-	117.9	850	118.5
6.9	LMK-16-7-4	121	41	-	0.21	0.07	-	520	-	-	118.8	750	119.4
6.9	LMK-16-7-5	-	80	-	-	0.14	-	-	-	-	117.8	700	118.4
	Total for LMK-16							6,940	5,620	1,250			

Remarks :

Farm Area	Item / Canal	Area (ha)	Canal Length (m)				Density (m/ha)			
			On-farm	MFIC	2-FIC	Total	On-farm	MFIC	2-FIC	Total L
Ilyasov	LMK-6	671	13,000	2,190	1,400	16,590	19.37	3.26	2.09	24.72
	LMK-8A	4,174	19,100	17,400	8,020	44,520	4.58	4.17	1.92	10.67
	LMK-8B	1,489	11,700	4,700	0	16,400	7.86	3.16	0.00	11.01
	LMK-8G	146	200	2,500	1,080	3,780	1.37	17.12	7.40	25.89
	Sub-total	6,480	44,000	26,790	10,500	81,290	6.79	4.13	1.62	12.54
Shagan	LMK-9	1,961	11,900	22,380	7,180	41,460	6.07	11.41	3.66	21.14
	LMK-11V-3	917	5,400	6,200	950	12,550	5.89	6.76	1.04	13.69
	LMK-11G	178	1,350	1,410	0	2,760	7.58	7.92	0.00	15.51
	LMK-12	2,583	27,600	12,600	1,050	41,250	10.69	4.88	0.41	15.97
	LMK-14	824	10,840	6,610	0	17,450	13.16	8.02	0.00	21.18
	LMK-16	747	6,940	5,620	1,250	13,810	9.29	7.52	1.67	18.49
	Sub-total	7,210	64,030	54,820	10,430	129,280	8.88	7.60	1.45	17.93
	Total	13,690	108,030	81,610	20,930	210,570	7.89	5.96	1.53	15.38

Table F.19 List of Irrigation Canal and on-farm Structures in the Priority Project Area

Sta. km	On-farm Canal/ Field Canal	Turnout O-FIC	Turnout FIC	Check S. O-FIC	Check S. FIC	Bridg. O-FIC	P.Crossing O-FIC	P.Crossing FIC	Aqueduct O-FIC	Aqueduct FIC	Offtake O-FIC	Offtake FIC	Drain Outlet MDC	Drain Outlet O-FDC	Drain Outlet FDC	Collectors
LMK-6		-	-	-	-	-	2	-	-	-	-	-	-	-	-	
8.8	LMK-6-1	1	-	-	-	-	-	-	-	-	-	2	-	2	-	CK-1
9.1	LMK-6-2	1	-	-	-	-	-	-	-	-	-	9	-	3	5	CK-2', CK-2'-1
10.3	LMK-6-3	1	-	-	-	-	-	-	-	-	6	-	-	6	-	CK-1
10.8	LMK-6-5	1	-	1	-	-	-	-	-	-	1	4	6	-	-	CK
13.0	LMK-6-6	-	-	-	-	-	-	-	-	-	2	-	-	2	-	CK-2
14.6	LMK-6-6'	-	-	1	-	-	-	-	-	-	2	-	-	2	-	CK-2
	2 LMK-6-6"	-	-	-	-	-	-	-	-	-	-	1	-	1	-	CK-2
Total for LMK-6		4	0	2	0	0	2	0	0	0	11	16	6	16	5	
LMK-8A		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.8	LMK-8A-4	1	-	-	-	-	-	-	-	-	2	3	-	2	2	CK-3A
1.0	LMK-8A-3	1	-	-	1	-	-	-	-	-	4	10	1	8	3	CK, CK-3B, 3B-a
2.7	LMK-8A-5	1	-	1	-	-	-	-	-	-	-	-	-	-	-	
	0.1 LMK-8A-5-1	-	-	-	-	-	-	-	-	-	-	6	2	3	-	CK, CK-4A
	0.1 LMK-8A-5-2	-	-	-	-	-	-	1	-	-	-	6	-	5	-	CK-6A
	2.7 LMK-8A-5-3	-	-	-	-	-	-	1	-	-	-	5	-	1	5	CK-4B, 4B-1
	2.7 LMK-8A-5-4	-	-	-	1	-	-	-	-	-	-	3	-	3	-	CK-6A
	4.2 LMK-8A-5-6	-	-	-	-	-	-	-	-	-	-	3	-	4	-	CK-6A
	4.5 LMK-8A-5-5'	-	-	-	-	-	-	-	-	-	-	6	-	4	2	CK-4B, 4V, 4V-1
	LMK-8A-5-5"	-	1	-	2	-	-	-	-	-	-	10	-	9	-	CK4B, 4V
	5.1 LMK-8A-5-7	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
	LMK-8A-5-7-1	-	-	-	1	-	-	-	-	-	-	6	-	2	4	CK-6A-D, 6A-D-1
	LMK-8A-5-7-2	-	-	-	1	-	-	-	-	-	-	4	-	3	-	CK-4V
	LMK-8A-5-7-3	-	2	-	-	-	-	-	-	-	-	6	1	-	4	CK, CK-6A-D-1
	5 LMK-8A-5-8	-	1	-	-	-	-	-	-	-	-	2	-	-	2	CK-6A-1
	6 LMK-8A-5-9-2	-	-	-	-	-	-	-	-	-	-	3	-	-	3	CK-6A-3
	LMK-8A-5-9-4	-	-	-	-	-	-	-	-	-	-	3	-	3	-	CK-6A
3.9	LMK-8A-6	1	-	-	-	-	-	-	-	-	4	-	-	5	-	CK-4
5.7	LMK-8A-7'	-	-	-	-	-	-	-	-	-	-	4	-	4	-	CK-6A
6.0	LMK-8A-7	1	-	-	-	-	-	1	-	-	5	-	-	-	6	CK-6A-2
8.0	LMK-8A-9'	-	-	-	-	-	-	-	-	-	6	-	-	-	6	CK-6A-2, 6A-2-1
8.8	LMK-8A-9	1	-	1	-	-	-	-	-	-	-	-	-	-	-	
	0 LMK-8A-9-2	-	1	-	-	-	-	-	-	-	-	3	-	-	4	CK-6V-3-2
	1 LMK-8A-9-1	-	-	-	-	-	-	-	-	-	-	3	-	3	-	CK-6A
	2 LMK-8A-9-3	-	-	-	-	-	-	-	-	-	-	4	-	4	-	CK-6A
	2 LMK-8A-9-4	-	-	-	1	-	-	-	-	-	-	5	-	-	4	CK-6V-3
	4 LMK-8A-9-6	-	1	-	1	-	-	-	-	-	-	5	-	-	6	CK-6V-3
	5 LMK-8A-9-5	-	1	-	-	-	-	1	-	-	-	-	-	-	-	
	LMK-8A-9-5-2	-	1	-	-	-	-	-	-	-	-	4	-	-	4	CK-6V-5
	LMK-8A-9-5-1	-	1	-	1	-	-	-	-	-	-	3	-	-	2	CK-6A-4
	LMK-8A-9-5-3	-	1	-	1	-	-	-	-	-	-	2	-	1	1	CK-6B-5'
	LMK-8A-9-5-4	-	-	-	-	-	-	-	-	-	-	6	-	-	4	CK-6V-5'
	6 LMK-8A-9-7	-	1	-	-	-	-	-	-	-	-	4	-	-	4	CK-6V-2, 6V-5
	6 LMK-8A-9-8	-	1	-	-	-	-	-	-	-	-	4	-	-	5	CK-6V, 6V-3-1
	6 LMK-8A-9-9	-	1	-	-	-	-	-	-	-	-	2	-	-	2	CK-6V-5
10.1	LMK-8A-9"	-	-	-	-	-	-	-	-	-	4	-	-	-	3	CK-6V-3
11.9	LMK-8A-11	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0 LMK-8A-11-2	-	-	-	-	-	-	-	-	-	-	4	-	-	4	CK-6V-3-4
	0 LMK-8A-11-4	-	-	-	-	-	-	-	-	-	4	-	-	-	5	CK-6V-3-1
13.9	LMK-8A-13	1	-	-	-	-	-	-	-	-	-	7	-	2	4	CK-6V, 6V-1
14.7	LMK-8A-15	-	-	-	-	-	-	-	-	-	1	-	-	-	1	CK-6V-1
16.7	LMK-8A-17	1	-	1	1	-	-	-	-	-	-	-	-	-	-	
	0.0 LMK-8A-17-2	-	-	-	-	-	-	-	-	-	3	-	-	-	2	CK-6G-1
	0 LMK-8A-17-1	-	-	-	-	-	-	-	-	-	-	3	-	-	3	CK-6V
	1 LMK-8A-17-3	-	1	-	1	-	-	-	-	-	-	4	-	-	4	CK-6V-4-1
	LMK-8A-17-3'	-	-	-	-	-	-	-	-	-	-	4	-	5	-	CK-6V
	1 LMK-8A-17-4	-	-	-	-	-	-	-	-	-	-	5	-	5	-	CK-6G'
	2 LMK-8A-17-5	-	1	-	-	-	-	-	-	-	-	3	-	-	4	CK-6G-3
	2 LMK-8A-17-6	-	-	-	1	-	-	-	-	-	-	4	-	3	-	CK-6G
18.7	LMK-8A-19	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
	0.0 LMK-8A-19-1	-	1	-	-	-	-	-	-	-	3	3	-	-	4	CK-6G-2
	1 LMK-8A-19-3	-	-	-	-	-	-	-	-	-	-	3	-	2	-	CK-6G
19.1	LMK-8A-21	1	-	1	-	-	-	-	-	-	-	-	-	-	-	
	0 LMK-8A-21-2	-	-	-	-	-	-	1	-	-	4	-	-	-	3	CK-6G-4'
	1 LMK-8A-21-1	-	-	-	1	-	-	-	-	-	-	5	-	3	-	CK-6G
Total for LMK-8A		10	17	5	14	0	0	5	0	0	40	170	4	84	110	
LMK-8B		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.0	LMK-8B-2'	-	-	-	-	-	-	-	-	-	4	-	-	3	-	CK-3B
1.9	LMK-8B-2"	-	-	-	-	-	-	-	-	-	4	-	-	4	-	CK-3B
2.6	LMK-8B-2	1	-	1	1	-	-	-	-	-	6	-	-	6	-	CK-3V
3.6	LMK-8B-4'	-	-	-	-	-	-	-	-	-	3	-	-	-	2	CK-3G-2
4.7	LMK-8B-4"	-	-	1	-	-	-	-	-	-	3	-	-	-	3	CK-3E
5.7	LMK-8B-6'	-	-	-	-	-	-	-	-	-	2	-	-	2	1	CK-3E
6.0	LMK-8B-3	-	-	-	-	-	-	-	-	-	4	-	-	4	-	CK-3Z
6.0	LMK-8B-6"	-	-	1	-	-	-	-	-	-	3	-	-	1	2	CK-3Zh
7.2	LMK-8B-8	-	-	-	-	-	-	-	-	-	4	-	-	1	2	CK-3I
7.3	LMK-8B-5	-	-	-	-	-	-	-	-	-	1	1	-	-	2	CK-3Z-2
7.9	LMK-8B-10	-	-	1	-	-	-	-	-	-	3	-	-	1	-	CK-F
8.9	LMK-8B-12	1	-	1	-	-	1	-	-	-	-	-	-	-	-	
	0.4 LMK-8B-12-1	-	-	-	-	-	-	1	-	-	-	3	-	2	4	CK-5A-2
	1.1 LMK-8B-12-2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	CK
	2.4 LMK-8B-12-3	-	-	-	-	-	-	-	-	-	-	7	-	7	-	CK-5A
	8.9 LMK-8B-12'	-	-	-	-	-	-	-	-	-	-	3	-	-	2	CK-5A-2
11.7	LMK-8B-14	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0.0 LMK-8B-14-1	-	1	-	-	-	1	-	-	-	-	2	-	-	2	CK-5B-2
	1.4 LMK-8B-14-2	-	-	1	-	-	-	-	-	-	-	5	-	4	-	CK-5A
	1.4 LMK-8B-14-3	-	-	-	-	-	1	-	-	-	-	5	-	6	-	CK-5B
	2.3 LMK-8B-14-4	-	1	-	-	-	1	-	-	-	-	5	3	-	-	CK
Total for LMK-8B		3	2	6	1	0	4	1	0	0	37	33	5	41	20	

Table F.19 List of Irrigation Canal and on-farm Structures in the Priority Project Area

Sta. Km.	On-farm Canal/ Field Canal	Turnout O-FIC	Turnout FIC	Check S O-FIC	Check S FIC	Brdg. O-FIC	P.Cros'ng O-FIC	P.Cros'ng FIC	Aqueduct O-FIC	Aqueduct FIC	Offtake O-FIC	Offtake FIC	Drain Outlet MDC	Drain Outlet O-FDC	Drain Outlet FDC	Collectors
LMK-8G		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0 2	LMK-8G-1	-	-	1	-	-	-	-	-	-	5	-	-	2	4	CK-3A, 3A-2
2.7	LMK-8G-2	-	-	-	-	-	-	-	-	-	4	-	-	4	-	CK-3A
3.8	LMK-8G-2'	-	-	-	-	-	-	-	-	-	1	-	-	-	-	
	Total for LMK-8G	0	0	1	0	0	0	0	0	0	10	0	0	6	4	
LMK-9		-	-	-	-	1	4	-	-	-	-	-	-	-	-	
0.5	LMK-9A	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.7	LMK-9A'	-	-	-	-	-	-	1	-	-	-	-	-	-	-	
2	LMK-9-A'-1	1	1	-	-	-	-	-	-	-	-	3	-	-	2	Y_1K-12-3-2
3	LMK-9-A'-2,3	-	2	-	-	-	-	-	-	-	-	4	-	-	4	Y_1K-12-3-2-2
4	LMK-9-A'-4,5	-	2	-	-	-	-	-	-	-	-	4	-	3	-	Y_1K-12
2.7	LMK-9-2A	-	-	-	1	-	-	1	-	-	-	-	-	-	-	
0.1	LMK-9-2A-1	1	-	1	-	-	-	-	-	-	-	5	-	-	3	Y_1K-8-2-1
1.8	LMK-9-2A-3	-	-	-	-	-	-	-	-	-	2	5	-	-	1	Y_1K-12-3
2.0	LMK-9-2A-2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	Y_1K-12-3
2.8	LMK-9-2B	-	-	-	-	-	-	1	-	1	-	-	-	-	-	
1	LMK-9-2B-1	1	-	-	-	-	-	-	-	-	-	3	-	-	3	Y_1K-8-1
5.5	3 LMK-9-2B-3	-	-	-	1	-	-	-	-	-	-	3	-	-	2	Y_1K-8-2
6.1	3 LMK-9-2B-2	-	1	-	-	-	-	-	-	-	-	2	-	1	-	Y_1K-12
6.9	4.0 LMK-9-2B-5	-	1	-	-	-	-	-	-	-	-	3	-	-	3	Y_1K-8-4
7.9	5.0 LMK-9-2B-7	-	-	-	-	-	-	-	-	-	-	4	-	-	3	Y_1K-8-6
7.9	5.0 LMK-9-2B-4	-	-	-	1	-	-	-	-	-	-	3	-	-	2	Y_1K-12-3A-1
7.9	5.0 LMK-9-2B-6	-	-	-	-	-	-	-	-	-	-	5	-	-	2	Y_1K-12-3A
4.6	LMK-9-2V	1	-	-	-	-	-	1	-	-	-	4	-	-	1	Y_1K-8-3
5.2	LMK-9-2G	1	-	1	-	-	-	-	-	-	-	-	-	-	-	
0.0	LMK-9-2G-2	-	1	-	-	-	-	1	-	-	-	4	-	-	4	Y_1K-8-5
0.0	LMK-9-2G-2'	-	1	-	-	-	-	-	-	-	-	2	-	-	1	Y_1K-8-5
0.8	LMK-9-2G-4	-	-	-	-	-	-	-	-	-	-	3	-	3	-	Y_1K-8
1.8	LMK-9-2G-1	-	1	-	-	-	-	1	-	-	-	3	-	-	3	Y_1K-8-7
7.55	LMK-9-2B'	1	-	-	-	-	-	1	-	-	-	-	-	-	-	
2.6	LMK-9-2B'-1	-	1	-	-	-	-	-	-	-	-	5	-	-	-	Y_1K-8
2.6	LMK-9-2B'-2	-	1	-	-	-	-	-	-	-	1	6	-	-	-	Y_1K-8-8
2.6	LMK-9-2B'-2'	-	1	-	-	-	-	-	-	-	-	1	-	-	-	Y_1K-12-3-7
3.4	LMK-9-2B'-3	-	-	-	-	-	-	-	-	-	-	4	-	2	-	Y_1K-8
4.4	LMK-9-2B'-5	-	1	-	-	-	-	-	-	-	-	5	-	1	-	Y_1K-8
4.5	LMK-9-2B'-4	-	1	-	-	-	-	-	-	-	-	4	-	-	-	Y_1K-12-5
7.2	LMK-9-2B'-4'	-	-	-	-	-	-	-	-	-	-	1	-	-	-	Y_1K-12-5
8.5	LMK-9-2B'-6	-	-	-	-	-	-	-	-	-	-	6	-	-	-	Y_1K-12-7
8.6	LMK-9D	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
0	LMK-9D-2	-	1	-	-	-	-	-	-	-	-	2	-	-	-	Y_1K-8
1	LMK-9D-4	-	-	-	-	-	-	-	-	-	-	4	-	-	-	Y_1K-8
10.2	LMK-9E	1	-	-	1	-	-	-	-	-	-	7	-	-	-	Y_1K-8
11.9	LMK-9I	1	-	-	-	-	-	-	-	-	-	6	-	-	-	Y_1K-8
11.9	LMK-9-4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	Y_1K-12
	Total for LMK-9	11	16	2	4	1	4	7	0	1	3	112	0	10	35	
LMK-11V-3		1	-	1	-	-	-	1	-	-	1	-	-	-	-	
3.9	LMK-11V-3-1	-	-	1	-	-	-	-	-	-	2	-	-	-	2	Y_1K-12-10
3.9	LMK-11V-3-4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.0	LMK-11V-3-4'	-	-	-	-	-	-	-	-	-	-	4	-	-	2	Y_1K-12-14-2
1.8	LMK-11V-3-4-1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	Y_1K-12-14
2.0	LMK-11V-3-4-2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	Y_1K-12-16-3
2.0	LMK-11V-3-4-3	-	1	-	1	-	-	-	-	-	-	4	-	-	4	Y_1K-12-16-3
3	LMK-11V-3-4-4	-	-	-	-	-	-	-	-	-	-	7	-	-	-	Y_1K-12-16
4	LMK-11V-3-4-5	-	1	-	1	-	-	-	-	-	-	7	-	6	-	Y_1K-12
5	LMK-11V-3-4-7	-	-	-	-	-	-	-	-	-	-	6	-	5	-	Y_1K-12
4.6	LMK-11V-3-3-2	1	-	-	1	-	-	-	-	-	1	7	-	-	-	Y_1K-12-12
2	LMK-11V-3-3-1	-	1	-	-	-	-	-	-	-	-	1	-	-	1	Y_1K-12-3-7
4.6	LMK-11V-3-6	1	-	-	-	-	-	-	-	-	1	3	-	-	4	Y_1K-12-14
5.4	LMK-11V-3-8	1	-	1	-	-	-	-	-	-	-	6	-	6	-	Y_1K-12
	Total for LMK-11V-3	5	3	3	3	0	0	1	0	0	5	47	0	17	14	
LMK-11G		-	-	1	-	1	-	-	-	-	-	-	-	-	-	
0.6	LMK-11G-1	1	1	-	-	-	-	-	-	-	-	4	-	-	3	Y_1K-12-20-16
1.4	LMK-11G-2	-	2	-	-	-	-	-	-	-	3	-	-	-	5	Y_1K-12-20-14, 20-16
2.2	LMK-11G-3	-	-	-	-	-	-	-	-	-	3	-	-	-	3	Y_1K-12-20
	Total for LMK-11G	1	3	1	0	1	0	0	0	0	6	4	0	0	11	
LMK-12		-	-	-	-	-	1	-	-	-	-	-	-	-	-	
0.3	LMK-12-2'	-	-	-	-	-	-	1	-	-	-	3	-	-	3	CK-5B-1
3.2	LMK-12-2"	-	-	-	-	-	-	-	-	-	7	-	-	-	6	CK-5B
3.7	LMK-12-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.0	LMK-12-2-1	1	-	-	1	-	-	-	-	-	-	5	1	3	-	CK, CK-5B
1.0	LMK-12-2-2	-	1	-	-	-	-	-	-	-	-	5	-	6	1	CK-5B
1.0	LMK-12-2-3	-	-	-	1	-	-	-	-	-	-	5	-	7	-	CK-5B
4.6	LMK-12-4	1	-	-	-	-	-	-	1	-	-	3	-	-	2	CK-8A
4.9	LMK-12-7	-	-	-	-	-	-	-	-	-	5	-	4	-	-	CK
7.1	LMK-12-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0	LMK-12-9-1	1	-	1	-	-	-	-	-	-	-	6	-	6	-	CK-8B
0	LMK-12-9-2	-	-	-	-	-	-	-	-	-	-	4	-	4	-	CK-8D
1	LMK-12-9-3,4	-	2	-	1	-	-	-	-	-	-	5	-	-	-	CK, CK-8D
1	LMK-12-9-5	-	-	-	-	-	-	-	-	-	-	6	3	3	-	CK-8D
	LMK-12-9-6	-	-	-	1	-	-	-	-	-	-	6	2	2	-	CK, CK-8D
7.9	LMK-12-11	1	-	-	1	-	-	1	-	-	1	6	-	-	1	CK-8D-2-1
10.6	LMK-12-13	1	-	-	-	-	-	-	-	-	7	4	-	-	3	CK-8D-2-1
11.1	LMK-12-15	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	LMK-12-15-1	-	-	-	1	-	-	-	-	-	-	4	-	4	-	CK-8D
2	LMK-12-15-4	-	-	-	-	-	-	-	-	-	-	7	-	-	7	CK-8E-3
4	LMK-12-15-3	-	-	-	-	-	-	-	-	-	-	6	-	5	-	CK-8D
13.8	LMK-12-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	LMK-12-17-1	1	-	-	2	-	-	1	-	-	-	6	-	-	-	CK-8-A-1
3	LMK-12-17-2	-	-	1	1	-	-	-	-	-	-	7	-	6	-	CK-8-A
17.1	LMK-12-17'	-	-	-	-	-	-	-	-	-	8	-	-	6	-	CK-8-A
20.8	LMK-12-17"	-	-	-	-	-	-	-	-	-	12	-	3	10	-	CK, CK-8-V
23.1	LMK-12-19	1	-	-	-	-	-	-	-	-	4	2	-	3	3	CK-8-G, 8-G-2

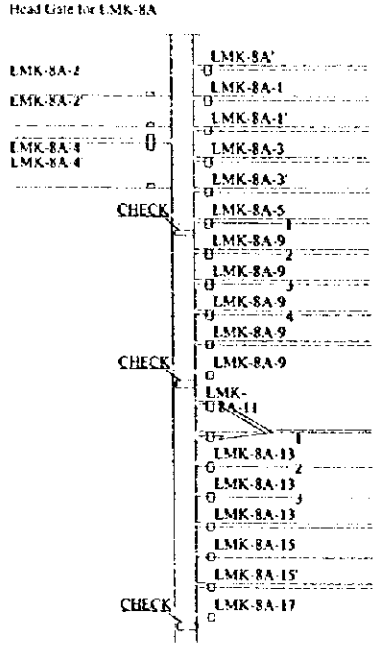
Table F.19 List of Irrigation Canal and on-farm Structures in the Priority Project Area

Sta. km.	On-farm Canal/ Field Canal	Turnout		Check S.		Bridg.	P.Cros'ng		Aqueduct		Offtake		Drain Outlet			Collectors
		O-FIC	FIC	O-FIC	FIC	O-FIC	O-FIC	FIC	O-FIC	FIC	O-FIC	FIC	MDC	O-FDC	FDC	
																(to be continued)
24.6	LMK-12-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1 LMK-12-21-1	1	-	-	-	-	-	-	-	-	-	2	-	1	-	CK-8-G
	1 LMK-12-21-2	-	-	-	-	-	-	-	-	-	-	6	-	6	-	CK-8-E
	2 LMK-12-21-4	-	1	-	1	-	-	-	-	-	-	2	-	2	-	CK-8-D
	3 LMK-12-21-6	-	1	-	1	-	-	1	-	-	-	6	-	-	-	CK
26.0	LMK-12-23'	1	-	-	-	-	-	-	-	-	-	6	-	7	-	CK-8-E
27.6	LMK-12-23	-	-	-	-	-	-	-	-	-	-	8	-	7	-	CK-8-E
	Total for LMK-12	10	5	2	11	0	1	4	1	0	44	120	13	88	26	
LMK-14		-	-	-	-	-	2	-	-	-	-	-	-	-	-	
4.7	LMK-14-2	-	-	-	1	-	-	-	-	-	-	3	-	3	-	CK-7A
6.4	LMK-16-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1 LMK-16-6-1	1	-	-	1	-	-	-	-	-	-	2	-	-	1	CK-7A-1
7.0	LMK-16-6'	-	-	-	-	-	-	-	-	-	3	-	-	-	3	CK-7A-1
7.7	LMK-16-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0.0 LMK-16-11-1	1	-	-	-	-	-	-	-	-	-	2	-	-	2	CK-7V
	1 LMK-16-11-2	-	-	-	-	-	-	1	-	-	-	4	3	-	-	CK
8.5	LMK-16-8'	-	-	-	-	-	1	-	-	-	4	-	-	4	-	CK-7A, 7B
8.7	LMK-16-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1.0 LMK-16-8-1	-	1	-	1	-	-	-	-	-	-	4	-	-	3	CK-7A-2
	1.0 LMK-16-8-2	1	-	-	-	-	-	-	-	-	-	3	-	3	-	CK-7A
	1.0 LMK-16-8-4	-	-	-	-	-	-	-	-	-	-	2	-	1	-	CK-7A
	2.5 LMK-16-8-3	-	1	-	-	-	-	1	-	-	-	2	-	1	-	CK-7A
	2.7 LMK-16-8-5	-	1	-	-	-	-	-	-	-	-	3	-	-	3	CK-7A-4
	3.4 LMK-16-8-7	-	-	-	-	-	-	-	-	-	-	2	-	-	2	CK, CK-7A
9.8	LMK-16-10	-	-	1	-	-	-	-	-	-	6	-	-	7	-	CK-7A, 7V
10.2	LMK-16-13	1	-	-	-	-	-	-	-	-	-	3	-	-	-	CK
10.6	LMK-16-12	-	-	-	-	-	1	-	-	-	-	5	-	3	-	CK-7A
10.8	LMK-16-15	1	-	-	-	-	-	-	-	-	-	3	1	-	-	CK
	Total for LMK-14	5	3	1	3	0	4	2	0	0	13	38	4	22	14	
LMK-16		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.8	LMK-16-5	-	1	-	-	-	1	-	-	-	-	-	-	-	-	
	LMK-16-5-2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
	1 LMK-16-5-2'	-	-	-	-	-	-	-	-	-	-	6	-	-	4	CK-11-6-2, 6-2-2
	LMK-16-5-2"	-	-	-	-	-	-	-	-	-	-	5	-	-	2	CK-11-6-2, 6-2-2
	LMK-16-5-2'	-	-	-	-	-	-	-	-	-	-	3	-	-	1	CK-11-6-2, 6-2-2
	2 LMK-16-5'	-	-	-	-	-	-	-	-	-	-	3	-	-	3	CK-11-6-2
	2 LMK-16-5"	-	-	-	-	-	-	1	-	-	-	5	-	-	4	CK-11-6-2
	3 LMK-16-5-1	-	-	-	-	-	-	-	-	-	-	2	-	-	1	CK-11-6
	3 LMK-16-5-3	-	1	-	1	-	-	-	-	-	-	4	-	-	6	CK-11-6-2
4.7	LMK-16-7	1	-	1	-	-	-	-	-	-	-	-	-	-	-	
	2 LMK-16-7-1	-	1	-	-	-	-	-	-	-	-	5	-	-	4	CK-116-2-2-2, 6-4
	2 LMK-16-7-2	-	1	-	-	-	-	-	-	-	-	5	-	-	4	CK-11-6-2-4
5.6	LMK-16-7-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0.0 LMK-16-7-3'	1	-	-	-	-	-	-	-	-	-	7	-	5	-	CK-9B, 9V
	1.0 LMK-16-7-3"	-	-	-	-	-	-	-	-	-	-	3	-	3	-	CK-9V
6.4	LMK-16-7-2	-	-	-	-	-	-	-	-	-	-	2	-	1	-	CK-9A
6.9	LMK-16-7-4	-	-	-	-	-	-	-	-	-	-	3	-	4	-	CK-9A
6.9	LMK-16-7-5	1	-	-	-	-	-	-	-	-	1	5	-	6	-	CK-9B
	Total for LMK-16	3	5	1	1	0	1	1	0	0	1	58	0	19	29	
Total for Ilyasov (m)																
	LLMK-6	4	0	2	0	0	2	0	0	0	11	16	6	16	5	
	LMK-8A	10	17	5	14	0	0	5	0	0	40	170	4	84	110	
	LMK-8B	3	2	6	1	0	4	1	0	0	37	33	5	41	20	
	LMK-8G	0	0	1	0	0	0	0	0	0	10	0	0	6	4	
	Total	17	19	14	15	0	6	6	0	0	98	219	15	147	139	
Total for Shagan (m)																
	LMK-9	11	16	2	4	1	4	7	0	1	3	112	0	10	35	
	LMK-11V-3	5	3	3	3	0	0	1	0	0	5	47	0	17	14	
	LMK-11G	1	3	1	0	1	0	0	0	0	6	4	0	0	11	
	LMK-12	10	5	2	11	0	1	4	1	0	44	120	13	88	26	
	LMK-14	5	3	1	3	0	4	2	0	0	13	38	4	22	14	
	LMK-16	3	5	1	1	0	1	1	0	0	1	58	0	19	29	
	Total	35	35	10	22	2	10	15	1	1	72	379	17	156	129	
Grand Total (m)		52	54	24	37	2	16	21	1	1	170	598	32	303	268	

Note : O-FIC; on Inter/On-farm Canal
FIC; on Field Canal
MDC; to Main Collector
O-FDC; to Inter/On-farm Collector
FDC; to Field Collector

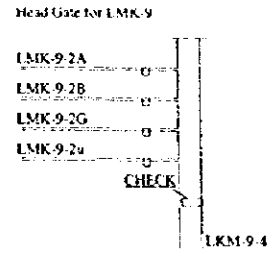
Table F.20 Canal Water Losses Observed by Water Discharge Survey

For MLK-8A



Survey Points	Survey Date			
	21/06	02/07	05/07	07/07
LMK-8A	9.82	9.35	8.68	8.16
LMK-8A'	0.07	0.07	0.07	0.07
LMK-8A-1	0.18	0.18	0.18	0.18
LMK-8A-1'	0.08	0.06	0.06	0.06
LMK-8A-2	0.06	0.06	0.06	0.06
LMK-8A-2'	0.04	0.04	0.04	0.01
LMK-8A-3	0.02	0.02	0.02	0.02
LMK-8A-3'	0.06	0.06	0.06	0.06
LMK-8A-4	0.06	0.06	0.06	0.06
LMK-8A-4'	0.06	0.06	0.06	0.06
LMK-8A-5	2.89	2.69	2.39	2.10
LMK-8A-9'	0.06	0.06	0.06	0.06
LMK-8A-9^2	0.04	0.04	0.04	0.04
LMK-8A-9^3	0.06	0.06	0.06	0.06
LMK-8A-9^4	0.05	0.05	0.06	0.05
LMK-8A-9	1.18	1.08	0.90	0.80
LMK-8A-11	0.19	0.16	0.19	0.19
LMK-8A-13	0.03	0.03	0.03	0.03
LMK-8A-13'	0.06	0.06	0.06	0.06
LMK-8A-13^2	0.10	0.10	0.10	0.10
LMK-8A-13^3	0.08	0.08	0.08	0.08
LMK-8A-15	0.20	0.20	0.20	0.02
LMK-8A-15'	0.08	0.08	0.08	0.08
LMK-8A-17	1.32	1.22	1.06	0.91
T-Delivered	6.97	6.52	5.92	5.16
Losses	29.0%	30.3%	31.8%	36.8%

For MLK-9



Survey Points	Survey Date			
	03/07	13/07	23/07	27/07
LMK-9	5.97	5.93	6.08	5.45
LMK-9-2A	0.35	0.34	0.26	0.32
LMK-9-2B	1.85	1.61	1.51	1.53
LMK-9-2G	1.20	1.10	1.34	1.04
LMK-9-2u	0.24	0.28	0.16	0.15
LMK-9-4	1.84	1.91	2.06	1.74
T-Delivered	5.48	5.24	5.33	4.78
Losses	8.2%	11.6%	12.3%	12.3%

Table F.21 List of Collectors for Each Drainage System under the Priority Project

Sta. (km)	On-farm Collector O-FDC	MFDC	SFDC	Drainage Area (ha) MDC	O-FDC	MFDC	2FDC	Irr. A. (ha)	Discharge (m³/s) MDC	O-FDC	MFDC	2FDC	Canal Length (m) MDC	O-FDC	MFDC	2FDC
North Main Collector																
	CK-U/S			3,347	-	-	-	398	0.67	-	-	-	0	-	-	-
0	CK-2'			4,780	1,433	-	-	111	0.94	0.27	0.27	-	0	-	2,400	-
1.3	CK-1			-	-	299		162	-	-	0.09	-	-	-	2,100	-
1.2	CK-3			5,337	557	258	-	178	1.11	0.17	0.08	-	1,180	1,300	-	-
1.3	CK-2			5,737	400	-	-	220	1.23	0.12	-	-	70	-	2,100	-
3.6	CK-3'			6,961	1,224	-	-	0	1.44	0.21	-	-	2,350	-	-	-
3.7	CK-3A			7,284	323	-	-	257	1.55	0.11	0.11	-	50	-	2,000	-
3.8	CK-4			7,550	266	-	-	134	1.63	0.08	0.08	-	150	-	1,100	-
4.8	Culvert			7,550	-	-	-	-	-	-	-	-	1,000	-	-	-
5.3	CK-3B-1			7,693	143	-	-	119	1.68	0.05	-	-	540	-	-	-
6.9	CK-3B			8,099	406	-	-	293	1.82	0.14	0.14	-	1,520	-	1,150	-
7.2	CK-3B'			8,359	260	-	-	121	1.89	0.07	-	-	340	-	-	-
7.9	CK-3V			8,490	131	-	-	112	1.94	0.05	-	-	730	-	-	-
8.7	CK-4B-3			8,734	244	-	-	173	2.02	0.08	0.08	-	800	-	1,450	-
8.9	CK-3G			8,854	120	-	-	98	2.06	0.04	0.04	-	130	-	100	-
9.8	CK-4B			9,014	160	-	-	125	2.12	0.06	0.06	-	920	-	1,550	-
10.0	CK-3E			9,134	120	-	-	98	2.16	0.04	0.04	-	170	-	40	-
11.4	CK-3Zh			9,258	124	-	-	104	2.20	0.04	-	-	1,400	-	40	-
	0	CK-6A-1		-	-	466	-	297	-	-	0.15	-	-	-	1,450	-
	0	CK-6A-2		-	761	295	-	233	-	0.25	0.10	-	-	0	1,130	-
	2.7	CK-6A-3		-	1,137	376	-	331	-	0.39	0.14	-	-	2,700	-	-
	4.6	CK-6A-6		-	1,366	229	-	118	-	0.46	0.07	-	-	1,930	-	-
	5.6	CK-6A-8		-	1,458	92	-	79	-	0.49	0.03	-	-	1,000	-	-
		0.5	CK-6A-D'	-	-	-	141	135	-	-	-	0.05	-	-	-	500
		1.5	CK-6A-D-1	-	-	220	79	70	-	-	0.08	0.03	-	-	-	-
	5.6	CK-6A-D		-	1,774	316	96	81		0.60	0.11	0.03	-	-	1,000	-
12.2	CK-6A			11,032					2.80				800			
12.6	CK-3I			11,125	93	-	-	70	2.83	0.03	-	-	450	-	-	-
13.1	CK-3I'			11,190	65	-	-	38	2.85	0.02	-	-	450	-	-	-
14.6	CK-6'			11,311	121	-	-	94	2.89	0.04	-	-	1,530	-	-	-
15.0	CK-5'			11,432	121	-	-	43	2.92	0.03	-	-	420	-	-	-
16.7	CK-6V-5			11,738	306	-	-	233	3.03	0.11	-	-	1,700	-	-	-
		0.0	CK-6V-3'	-	-	238	-	156	-	-	0.08	-	-	-	-	-
		3.7	CK-6V-3²	-	554	316	-	219	-	0.18	0.10	-	-	-	3,670	-
	1.4	CK-6V-3		-	793	239	-	191	-	0.26	0.08	-	-	1,420	2,230	-
	2.9	CK-6V-1		-	1,160	367	-	189	-	0.37	0.11	-	-	1,500	1,580	-
	4.3	CK-6V-2		-	1,499	339	-	274	-	0.49	0.12	-	-	1,400	700	-
16.8	CK-6V			13,237					3.52				100			
	0.0	CK-5A-1		-	-	90	-	0	-	-	0.02	-	-	0	150	-
	0.0	CK-5A-2		-	-	146	-	125	-	-	0.05	-	-	0	850	-
	2.0	CK-5A-3		-	586	350	-	303	-	0.20	0.13	-	-	2,000	-	-
17.1	CK-5A			13,823					3.72				300			
	0.0	CK-6G-1		-	-	50	-	41	-	-	0.02	-	-	-	-	-
	1.0	CK-6G-4		-	196	146	-	115	-	0.07	0.05	-	-	1,000	-	-
	1.0	CK-6G-4'		-	313	117	-	102	-	0.11	0.04	-	-	-	1,800	-
	2.5	CK-6G-5		-	-	213	-	191	-	-	0.08	-	-	1,530	-	-
	2.5	CK-6G-2		-	664	138	-	77	-	0.23	0.04	-	-	0	-	-
	2.5	CK-6G-3		-	720	56	-	50	-	0.25	0.02	-	-	0	1,150	-
17.6	CK-6G			14,543					3.97				500			
18.1	CK-5B-6			14,636	93	-	-	81	4.00	0.03	-	-	500	-	-	-
	0.0	CK-3Z-1		-	-	171	-	0	-	-	0.03	-	-	0	-	-
	0.0	CK-3Z-2		-	575	404	-	0	-	0.10	0.07	-	-	0	-	-
	0.4	CK-3Z-3		-	1,766	1,191	-	0	-	0.31	0.21	-	-	400	-	-
	1.8	CK-3Z		-	1,928	162	-	115	-	0.36	0.05	-	-	1,400	-	-
	3.0	CK-3u"		-	2,119	191	-	0	-	0.39	0.03	-	-	1,200	-	-
	6.0	CK-5B		-	3,433	1,314	-	0	-	0.62	0.23	-	-	3,030	-	-
		0.7	CK-5B'	-	-	-	432		-	-	-	0.08	-	-	-	740
	6.0	CK-5B-1		-	4,161	728	296	177	-	0.79	0.17	0.09	-	0	800	-
	8.9	CK-5B-2		-	4,581	420	-	350	-	0.94	0.15	-	-	2,870	-	-
18.65	CK-5B			19,217					4.94				550			
	0.0	CK-8A-1		-	-	65	-	37	-	-	0.02	-	-	-	500	-
	0.3	CK-8A-2		-	422	356	-	0	-	0.08	0.06	-	-	1,800	-	-
20.3	CK-8A			19,639					5.02				1,650			
20.4	CK-5V			19,784	145	-	-	99	5.07	0.05	-	-	100	-	-	-
23.9	CK-8B'			19,996	212	-	-	147	5.14	0.07	-	-	3,500	-	-	-
24.4	CK-8B			20,192	196	-	-	137	5.20	0.06	-	-	450	-	-	-
25.0	CK-8G'			20,269	77	-	-	98	5.24	0.04	-	-	650	-	-	-
	0	CK-8D-2		-	-	280	-	185	-	-	0.09	-	-	-	1,580	-
	0.5	CK-8D-1		-	418	138	-	93	-	0.13	0.04	-	-	500	1,580	-
	1.6	CK-8D-4		-	464	46	-	41	-	-	0.02	-	-	1,100	-	-
	1.6	CK-8D-3		-	586	122	-	63	-	0.19	0.04	-	-	1,100	-	-
	2.9	CK-8D-6		-	749	163	-	84	-	0.24	0.05	-	-	1,300	-	-
25.85	CK-8D			21,018					5.48				850			
	0	CK-5E-3		-	-	703	-	0	-	-	0.12	-	-	-	-	-
	3.6	CK-5E-2		-	2,076	1,373	-	0	-	0.36	0.24	-	-	-	-	-
	3.6	CK-5E-1		-	3,014	938	-	0	-	0.52	0.16	-	-	-	-	-
	6.5	CK-5E'		-	3,304	290	-	0	-	-	-	-				
26.9	CK-5E			24,322				0	6.00				1,000	-	-	-
	0	CK-8E-1		-	-	188	-	0	-	-	0.03	-	-	-	-	-
	2.1	CK-8E-3		-	394	206	-	66	-	0.08	0.05	-	-	2,100	-	-

(to be continued)

Table F.21 List of Collectors for Each Drainage System under the Priority Project

Sta. (km)	On-farm Collector O-FDC	M-FDC	S-FDC	Drainage Area (ha) MDC	O-FDC	M-FDC	2-FDC	Irr. A (ha)	Discharge (m³/s) MDC	O-FDC	M-FDC	2-FDC	Canal Length (m) MDC	O-FDC	M-FDC	2-FDC
26.9	CK-8E			24,716					6.08				50			
	1.0 CK-7A-1			-	-	252	-	158	-	-	0.08	-	-	950	-	-
	1.4 CK-7A-2			-	584	332	-	229	-	0.19	0.11	-	-	400	-	-
	2.9 CK-7A-3			-	1,045	461	-	242	-	0.32	0.13	-	-	1,500	1,000	-
28.2	CK-7A			25,761					6.40				1,300			
29.1	CK-8'			26,047	286	-	-	0	6.45	0.05	-	-	900	-	-	-
	0.0 CK-8-A-3			-	-	125	-	49	-	-	0.03	-	-	-	900	-
	0.0 CK-8-A-2			-	-	222	-	0	-	-	0.04	-	-	-	-	-
	3.2 CK-8-A-1			-	661	318	-	199	-	0.17	0.10	-	-	3,200	-	-
29.1	CK-8-A			26,708	-	-	-	0	6.62	-	-	-	0	-	-	-
31.0	CK-8-V			26,927	219	-	-	150	6.69	0.07	-	-	1,900	-	-	-
32.1	CK-7V			27,287	360	-	-	151	6.79	0.10	-	-	1,100	-	1,400	-
	5.2 CK-7"			-	-	1,279	-	0	-	-	0.22	-	-	-	-	-
32.4	CK-7'			29,068	1,781	502	-	0	7.10	0.31	0.09	-	250	-	-	-
33.0	CK-9A			29,206	138	-	-	59	7.14	0.04	-	-	600	200	-	-
33.9	CK-8G			29,720	514	-	-	145	7.26	0.12	-	-	950	1,420	-	-
35.5	CK-9B			29,896	176	-	-	116	7.32	0.06	-	-	1,550	1,400	-	-
	0.0 CK-11-6-2A			-	563	-	-	194	-	0.14	-	-	-	0	-	-
	1.5 CK-11-6-2B			-	-	-	193	79	-	-	-	0.05	-	-	1,450	-
	0.6 CK-11-6-2V			-	1,007	444	251	134	-	0.26	0.12	0.07	-	620	-	-
	1.5 CK-11-6-3			-	1,282	275	-	0	-	0.31	0.05	-	-	880	-	-
	1.5 CK-11-6-2G			-	1,454	172	-	93	-	0.36	0.05	-	-	0	610	-
	2.8 CK-11-6-4			-	1,614	160	-	20	-	0.39	0.03	-	-	1,250	-	-
	3.6 CK-9V-1			-	1,749	135	-	0	-	0.41	0.02	-	-	850	-	-
	3.8 CK-9V-2			-	1,999	250	-	95	-	0.47	0.06	-	-	200	-	-
36.4	CK-9V			31,895				0	7.79	-	-	-	950	-	-	-
37.7	CK-8-D			32,175	280	-	-	203	7.88	0.09	-	-	1,330	1,030	-	-
	CK-8-E-2			-	-	234	-	187	-	-	0.08	-	-	-	-	-
	CK-8-E-1			32,674	499	265	-	198		0.17	0.09	-		1,800	-	-
39.1	CK-8-E								8.05				1,370			
	CK-11-4			-	-	308	-	0	-	-	0.05	-	-	-	-	-
	CK-11-6-1			-	441	133	-	0	-	0.07	0.02	-	-	-	-	-
	CK-11-8			-	1,223	782	-	0	-	0.21	0.14	-	-	-	-	-
39.8	CK-11			33,897					8.26				700			
43.4	PK-434	U/S-3		38,770	4,873	-	-	878	9.30	1.04	-	-	3,600	-	-	-
63.1	PK-631	D/S-1		51,380	12,610	-	-	3,590	12.30	3.00	-	-	19,700	-	-	-
73.3	PK-733	D/S-2		59,740	8,360	-	-	2,890	14.40	2.10	-	-	10,200	-	-	-
85.9	PK-859	CK-14		86,710	26,970	-	-	7,630	20.80	6.40	-	-	12,600	-	-	-
99.9	PK-999	D/S-3		98,630	11,920	-	-	2,280	23.38	2.58	-	-	14,000	-	-	-
103.3	PK-1033	CK-18		114,030	15,400	-	-	1,780	26.46	3.08	-	-	3,400	-	-	-
111.6	PK-1116	D/S-4		133,840	19,810	-	-	0	29.91	3.45	-	-	8,300	-	-	-
111.9	PK-1119	Confluence		133,840	0	-	-	-	29.91	-	-	-	300	-	-	-
												Total Canal Length=	111,900	48,280	39,560	1,240

Table F.21 List of Collectors for Each Drainage System under the Priority Project

Sta. (km)	On-farm Collector O-FDC	M-FDC	S-FDC	Drainage Area (ha) MDC	O-FDC	M-FDC	2-FDC	Irr A (ha)	Discharge (m³/s) MDC	O-FDC	M-FDC	2-FDC	Canal Length (m) MDC	O-FDC	M-FDC	2-FDC
South Main Collector																
6.9	PK-69		U/S-1	14,110	-	-	-	3,820	3.31	-	-	-	6,900	-	-	-
22.0	PK-220		U/S-2	28,560	14,450	-	-	2,580	6.40	3.09	-	-	15,100	-	-	-
29.8	PK-298		Left-1	35,160	6,600	-	-	0	7.55	1.15	-	-	7,800	-	-	-
0.0	YuK-8-2-1			-	158	-	-	117	-	-	0.05	-	-	-	-	-
0.9	YuK-8-2			-	332	174	-	133	-	-	0.11	0.06	-	900	-	-
1.5	YuK-8-3,4			-	519	187	-	128	-	-	0.17	0.06	-	610	-	-
2.5	YuK-8-5,6			-	714	195	-	159	-	-	0.24	0.07	-	1,030	-	-
4.8	YuK-8-8			-	949	230	-	72	-	-	0.30	0.06	-	2,210	-	-
4.8	YuK-8-7			-	1,186	242	-	80	-	-	0.36	0.06	-	0	700	-
6.2	YuK-8-9			-	1,500	314	-	152	-	-	0.45	0.09	-	1,400	-	-
7.7	YuK-8-11			-	1,819	319	-	226	-	-	0.56	0.11	-	1,520	-	-
10.25	YuK-8-13			-	2,145	326	-	203	-	-	0.66	0.10	-	2,580	-	-
11.7	YuK-8				2,145			1270		0.66				1,450		
36.8	PK-368(Yuk-8)			37,305					8.21				7,000			
40.2	PK-402		Left-2	43,105	5,800	-	-	0	9.22	1.01	-	-	3,400	-	-	-
0.0	YuK-12-4			-	1126	-	-	230	-	0.25	-	-	-	-	-	-
0.0	YuK-12-1			-	1243	117	-	213	-	0.32	0.07	-	-	0	300	-
1.8	YuK-12-6			-	1406	163	-	0	-	0.40	0.03	-	-	1,800	-	-
1.9	YuK-12-1'			-	1533	127	-	0	-	0.42	0.02	-	-	-	-	-
			YuK-12-3-2	-	-	-	504	0	-	-	-	-	-	-	-	-
1.9	YuK-12-3				2128	595	91	133	-	0.37	0.05	-	-	100	420	-
8.2	YuK-12-6'			-	2488	360	-	21	-	0.47	0.07	-	-	6,250	-	-
9.7	YuK-12-8'			-	2783	295	-	0	-	0.52	0.05	-	-	1,550	-	-
	0.6	YuK-12-8-4		-	-	262	-	0	-	-	0.05	-	-	-	-	-
	0.6	YuK-12-8-2'		-	-	-	191	0	-	-	-	0.03	-	-	-	-
		YuK-12-8-2		-	-	662	400	0	-	-	0.12	0.07	-	-	-	-
	3.6	YuK-12-8-1		-	-	889	227	0	-	-	0.16	0.04	-	-	-	-
9.7	YuK-12-8				3672			0		0.68						
10.6	YuK-12-10'			-	3,795	123	-	0	-	0.70	0.02	-	-	-	-	-
10.6	YuK-12-10			-	3,938	143	-	32	-	0.73	0.03	-	-	-	-	-
	1.0	YuK-12-3A'		-	-	-	117	0	-	-	-	0.02	-	-	-	-
12.5	YuK-12-3A			-	4,580	642	525	161	-	0.88	0.15	0.13	-	1,900	-	-
13.7	YuK-12-12			-	4,792	212	-	159	-	0.95	0.07	-	-	1,200	-	-
13.7	YuK-12-5			-	4,983	191	-	80	-	1.00	0.05	-	-	0	-	-
			YuK-12-7-1	-	-	1,197		0								
			YuK-12-7-2	-	-	173	-	129	-	1.06	0.06	-	-		-	-
14.8	YuK-12-7				1,370									1,100		
			YuK-12-14	-	-	-	265	213	-	-	-	0.09	-	-	-	-
15.1	YuK-12-14'			-	1,803	433	168	132	-	1.21	0.15	0.06	-	15100	-	-
	0.0	YuK-12-16-1		-	-	143	-	0	-	-	0.02	-	-	-	-	-
	0.0	YuK-12-16-2		-	-	215	72	0	-	-	0.03	0.01	-	-	-	-
	1.0	YuK-12-16-4		-	-	342	127	0	-	-	0.05	0.02	-	-	-	-
	2.1	YuK-12-16-6		-	-	470	128	0	-	-	0.07	0.02	-	-	-	-
	2.4	YuK-12-16-8		-	-	575	105	0	-	-	0.09	0.02	-	-	-	-
	3.1	YuK-12-16-10		-	-	644	69	33	-	-	0.11	0.02	-	-	650	-
	4.3	YuK-12-16-3		-	-	769	125	56	-	-	0.14	0.03	-	-	1,250	-
	4.3	YuK-12-16-12		-	-	845	76	0	-	-	0.15	0.01	-	-	-	-
17.0	YuK-12-16			-	2,842	1,039	194	153	-	1.43	0.22	0.07	-	1,900	-	-
18.1	YuK-12-18'			-	2,959	117	-	93	-	1.47	0.04	-	-	1,100	-	-
20.7	YuK-12-18			-	3,188	229	-	0	-	1.51	0.04	-	-	2,600	-	-
	0.0	YuK-12-20-1		-	-	365	-	0	-	-	0.06	-	-	-	-	-
	1.5	YuK-12-20-2		-	-	665	300	0	-	-	0.11	0.05	-	-	-	-
	2.2	YuK-12-20-4		-	-	1,103	438	178	-	-	0.26	0.12	-	-	700	-
	2.9	YuK-12-20-3		-	-	1,299	196	0	-	-	0.14	0.03	-	-	700	-
	4.8	YuK-12-20-6		-	-	1,368	69	0	-	-	0.30	0.01	-	-	1,900	-
	6.0	YuK-12-20-8		-	-	1,687	133	0	-	-	0.32	0.02	-	-	1,200	-
	6.2	YuK-12-20-5		-	-	1,554	186	0	-	-	0.29	0.03	-	-	200	-
21.8	YuK-12-20			-	4,875				-	1.83				1,100		
41.8	YuK-12-18 to 1			-	18,405	13,530	-	1,984	-	4.63	2.8	-	-	20,000	-	-
53.4	YuK-12			61,510					13.85				13,200			
68.0	PK-680		Left-3	69,710	8,200	-	-	0	15.28	1.43	-	-	14,600	-	-	-
75.6	PK-756		YuK-14	73,000	3,290	-	-	780	16.03	0.75	-	-	7,600	-	-	-
83.1	PK-831		YuK-16	104,690	31,690	-	-	11,740	24.17	8.14	-	-	7,500	-	-	-
89.4	PK-894		YuK-22	117,030	12,340	-	-	4,290	27.28	3.11	-	-	6,300	-	-	-
100.7	PK-1007		Left-4	140,430	23,400	-	-	0	31.35	4.07	-	-	11,300	-	-	-
105.8	PK-1058		Yuk-26	155,710	15,280	-	-	1,700	34.39	3.04	-	-	5,100	-	-	-
130.4	PK-1304		Join w/ CK	289,550	133,840				64.30	29.91	-	-	24,600	-	-	-
134.8	PK-1348		BKK	315,030	25,480	-	-	2,430	69.28	4.98	-	-	4,400	-	-	-
140.8	PK-1408		YuK-32	337,970	22,940	-	-	4,930	74.38	5.10	-	-	6,000	-	-	-
144.0	PK-1440		Left-5	339,970	2,000	-	-	0	74.73	0.35	-	-	3,200	-	-	-
149.6	PK-1496		Kuvan Darya	339,970	0	-	-		74.73	0	-	-	5,600	-	-	-
												Total Canal Length=	149,600	67,400	8,020	0

Remarks : Length of Collectors in the Project Area

Drainage System	Area	MDC	I/O-FDC	M-FDC	2-FDC	Total	Density
North Main Collector	Ilyasov	20,300	24,680	29,740	1,240	75,960	11.72
	Shagan	19,500	23,600	9,820	0	52,920	12.74
	Sub-total	39,800	48,280	39,560	1,240	128,880	12.12
South Main Collector	Shagan	0	47,400	8,020	0	55,420	18.13
Total		39,800	95,680	47,580	1,240	184,300	13.46

Note:
MDC: Main Collector
I/O-FDC: Inter/On-farm Collector
M-FDC: Main Field Collector
2-FDC: Secondary Field Collector
Density = Length/Irrigation area (m/ha)

Table F.22 List of Existing Drainage Canal Structures under the Priority Project

Sta. (km)	On-farm Collector O-FDC	MFDC	SFDC	Bridge MDC	Bridge O-FDC	Cul't MDC	P.Crossing MDC	P.Crossing O-FDC	P.Crossing FDC	Canal Outlet MDC	Canal Outlet O-FDC	Drain Outlet MDC	Drain Outlet O-FDC	Drain Outlet FDC
North Main Collector														
	CK-U/S			-	-	-	-	-	-	-	-	-	-	-
0	CK-2'			-	-	1	-	-	-	-	-	-	3	5
1.3	CK-1			-	-	-	-	1	-	-	-	-	8	-
1.2	CK-3			-	-	-	-	-	-	1	-	6	-	-
1.3	CK-2			-	-	-	-	-	-	1	-	-	5	-
3.6	CK-3'			-	-	-	-	-	-	-	-	-	-	-
3.7	CK-3A			-	-	-	-	-	-	2	1	-	4	6
3.8	CK-4			-	-	-	-	-	-	1	-	-	5	-
4.8	Culvert			-	-	1	-	-	-	-	-	-	-	-
5.3	CK-3B-1			-	-	-	-	-	-	1	-	-	3	-
6.9	CK-3B			-	-	-	-	1	-	1	1	1	12	3
7.2	CK-4A			-	-	-	-	-	-	1	-	2	3	-
7.9	CK-3V			-	-	-	-	-	-	1	-	-	6	-
8.7	CK-4B			-	-	-	-	-	-	1	-	-	7	5
8.9	CK-3G			-	-	-	-	-	-	1	-	-	-	2
9.8	CK-4V			-	-	-	-	-	-	1	-	-	10	2
10.0	CK-3E			-	-	-	-	-	-	1	-	-	2	4
11.2	CK-4'			-	-	-	-	-	-	-	-	1	-	4
11.2	CK-6A-D			-	-	-	-	-	-	1	-	-	2	4
11.4	CK-3Zh			-	-	-	-	-	-	1	-	-	1	-
0	CK-6A-1			-	-	-	-	1	-	-	-	-	12	2
0	CK-6A-2			-	-	-	-	-	-	-	2	-	-	12
2.7	CK-6A-3			-	-	-	-	-	-	-	-	-	4	2
0.86	CK-6A-2'			-	-	-	-	-	-	-	-	-	7	8
4.6	CK-6A-6			-	-	-	-	-	-	-	3	-	-	5
5.6	CK-6A-8			-	-	-	-	-	-	1	-	-	4	5
12.2	CK-6A			-	-	-	-	1	-	-	-	-	-	-
12.6	CK-3I			-	-	-	-	-	-	1	-	-	1	2
13.1	CK-3I'			-	-	-	-	-	-	1	-	-	1	4
14.6	CK-6'			-	-	-	-	-	-	-	-	-	-	-
15.0	CK-5'			1	-	-	-	-	-	-	-	2	-	-
16.7	CK-6V-5			-	-	-	-	-	1	1	1	-	-	10
0.0	CK-6V-3'			-	-	-	-	-	-	-	-	-	-	6
1.4	CK-6V-3			-	-	-	-	-	-	-	1	-	-	12
2.9	CK-6V-1			-	-	-	-	-	-	-	-	-	2	5
4.3	CK-6V-2			-	-	-	-	-	1	-	1	-	5	12
16.8	CK-6V			-	-	-	-	-	-	1	-	-	-	-
0.0	CK-5A-1			-	-	-	-	-	-	-	-	-	-	-
0.9	CK-5A-2			-	-	-	-	-	-	-	1	-	4	6
2.0	CK-5A			-	-	-	-	-	-	1	-	-	11	-
17.1	CK-5A			-	-	-	-	-	-	1	-	-	-	-
0.0	CK-6G-1			-	-	-	-	-	-	-	-	-	-	2
1.0	CK-6G-4			-	-	-	-	-	-	-	1	-	2	4
1.0	CK-6G-4'			-	-	-	-	1	-	-	-	-	-	3
2.5	CK-6G-5			-	-	-	-	-	-	-	-	-	5	-
2.5	CK-6G-2			-	-	-	-	-	-	-	1	-	6	-
2.5	CK-6G-3			-	-	-	-	-	-	-	-	-	-	4
17.6	CK-6G			-	-	-	-	-	-	-	-	-	-	-
18.1	CK-5B-6			-	-	-	-	-	-	-	-	3	-	-
0.0	CK-3Z-1			-	-	-	-	-	-	-	-	-	-	-
0.0	CK-3Z-2			-	-	-	-	-	-	-	-	-	-	-
0.4	CK-3Z-3			-	-	-	-	-	-	-	-	-	-	-
1.8	CK-3Z			-	-	-	-	-	-	-	-	-	4	2
3.0	CK-3u"			-	-	-	-	-	-	-	-	-	-	-
6.0	CK-5B			-	-	-	-	-	-	-	-	-	-	-
0.7	CK-5B'			-	-	-	-	-	-	-	-	-	-	-
6.0	CK-5B-1			-	-	-	-	-	-	-	-	-	-	9
8.9	CK-5B-2			-	-	-	-	-	-	-	1	-	19	3
18.65	CK-5B			-	-	-	-	-	-	1	-	-	-	-
0.0	CK-8A-1			-	-	-	-	-	-	-	-	-	-	-
0.3	CK-8A-2			-	-	-	-	-	-	-	-	-	-	2
20.3	CK-8A			-	-	-	-	-	-	1	-	-	-	-
20.4	CK-5V			-	-	-	-	-	-	2	-	1	3	-
23.9	CK-8B'			1	-	-	-	-	-	1	-	4	-	-
24.4	CK-8B			-	-	-	-	-	-	1	-	-	6	-
25.0	CK-8G'			-	-	-	-	-	1	1	-	-	5	-
0	CK-8D-2			-	-	-	-	-	-	-	-	-	-	4
0.5	CK-8D-1			-	-	-	-	-	-	-	4	-	-	-
1.6	CK-8D-4			-	-	-	-	-	-	-	-	-	4	-
1.6	CK-8D-3			-	-	-	-	-	-	-	-	5	5	-
2.9	CK-8D-6			-	-	-	-	-	-	-	-	-	5	-
25.85	CK-8D			-	-	-	-	-	-	1	-	-	-	-
0	CK-5E-3			-	-	-	-	-	-	-	-	-	-	-
3.6	CK-5E-2			-	-	-	-	-	-	-	1	-	-	-
3.6	CK-5E-1			-	-	-	-	1	-	-	1	-	-	-
6.5	CK-5E'			-	-	-	-	-	-	-	-	-	-	-
26.9	CK-5E			-	-	-	-	-	-	-	-	-	-	-
0	CK-8E-4			-	-	-	-	-	1	-	-	-	-	-
2.1	CK-8E-2			-	-	-	-	-	-	-	-	-	-	7

(to be continued)

Table F.22 List of Existing Drainage Canal Structures under the Priority Project

Sta. (km)	On-farm Collector O-FDC	MFDC	SFDC	Bridge MDC	Bridge O-FDC	Culvert MDC	P.Crossing MDC	P.Crossing O-FDC	P.Crossing FDC	Canal Outlet MDC	Canal Outlet O-FDC	Drain Outlet MDC	Drain Outlet O-FDC	Drain Outlet FDC
26.9	CK-8E			1	-	-	-	-	-	1	-	-	-	-
	1.0	CK-7A-3		-	-	-	-	1	1	-	-	-	9	4
	1.4	CK-7A-2		-	-	-	-	-	-	-	-	-	8	6
	2.9	CK-7A-1		-	-	-	-	1	-	-	2	1	-	2
28.2	CK-7A			-	-	-	-	-	-	1	-	-	-	-
29.1	CK-8'			-	-	-	-	-	-	-	-	-	-	-
	0.0	CK-8-A-3		-	-	-	-	-	-	-	-	-	-	-
	0.0	CK-8-A-2		-	-	-	-	-	-	-	-	-	-	-
	3.2	CK-8-A-1		-	-	-	-	-	1	-	-	-	6	-
29.1	CK-8-A			-	-	-	-	-	-	-	-	-	6	-
31.0	CK-8-V			-	-	-	-	-	-	-	1	3	10	-
32.1	CK-7V			-	-	-	-	-	-	1	1	3	5	2
	5.2	CK-7'		-	-	-	-	-	-	-	-	-	-	-
32.4	CK-7'			-	-	-	-	-	-	-	-	-	-	-
33.0	CK-9A			-	1	-	-	-	-	1	-	-	5	-
33.9	CK-8G			1	-	-	-	1	-	-	-	-	4	3
35.5	CK-9B			-	-	-	-	-	-	1	-	-	9	-
	0.0	CK-11-6-2A		-	-	-	-	-	-	-	-	-	-	14
		1.5	CK-11-6-2B	-	-	-	-	-	-	-	-	-	-	-
	0.6	CK-11-6-2V		-	-	-	-	-	-	-	-	-	-	7
	1.5	CK-11-6-3		-	-	-	-	-	-	-	-	-	-	-
	1.5	CK-11-6-2G		-	-	-	-	-	-	-	-	-	-	7
	2.8	CK-11-6-4		-	-	-	-	-	-	-	-	-	-	1
	3.6	CK-9V-1		-	-	-	-	-	-	-	-	-	-	-
	3.8	CK-9V-2		-	-	-	-	-	-	-	-	-	5	-
36.4	CK-9V			-	-	-	-	-	-	-	-	-	-	-
37.7	CK-8-D			-	-	-	-	-	-	1	-	-	2	-
		CK-8-E-2		-	-	-	-	-	-	-	-	-	7	-
		CK-8-E-1		-	-	-	-	-	-	-	-	-	13	-
39.1	CK-8-E			-	-	-	-	-	-	1	-	-	-	-
		CK-11-4		-	-	-	-	-	-	-	-	-	-	-
		CK-11-6-1		-	-	-	-	-	-	-	-	-	-	-
		CK-11-8		-	-	-	-	-	-	-	-	-	-	-
39.8	CK-11			-	-	-	-	-	-	-	-	-	-	-
43.4	PK-434			-	-	-	-	-	-	-	-	-	-	-
63.1	PK-631	D/S-1		3	-	-	-	-	-	-	-	-	-	-
73.3	PK-733	D/S-2		2	-	-	-	-	-	-	-	-	-	-
85.9	PK-859	CK-14		2	-	-	-	-	-	-	-	-	-	-
99.9	PK-999	D/S-3		1	-	-	-	-	-	-	-	-	-	-
103.3	PK-1033	CK-18		-	-	-	-	-	-	-	-	-	-	-
111.6	PK-1116	D/S-4		2	-	-	-	-	-	-	-	-	-	-
111.9	PK-1119	Confluence		-	-	-	-	-	-	-	-	-	-	-
Total				14	1	2	0	8	7	37	24	32	275	212

Table F.22 List of Existing Drainage Canal Structures under the Priority Project

Sta. (km)	On-farm Collector O-FDC	M-FDC	S-FDC	Bridge MDC	Bridge O-FDC	Culvt MDC	P.Crossing MDC	P.Crossing O-FDC	P.Crossing FDC	Canal Outlet MDC	Canal Outlet O-FDC	Drain Outlet MDC	Drain Outlet O-FDC	Drain Outlet FDC
South Main Collector														
6.9 PK-69			U/S-1	2	-	-	2	-	-	-	-	-	-	-
22 PK-220			U/S-2	2	-	-	-	-	-	-	-	-	-	-
29.8 PK-298			Left-1	-	-	-	-	-	-	-	-	-	-	-
	0.0 YuK-8a			-	-	-	-	-	1	-	-	-	-	3
	0.9 YuK-8-1			-	-	-	-	2	-	-	1	-	-	5
	1.5 YuK-8-3			-	-	-	-	1	-	-	2	-	-	4
	2.5 YuK-8-5			-	-	-	-	1	-	-	2	-	-	8
	4.8 YuK-8-6			-	-	-	-	-	-	-	1	-	-	-
	4.8 YuK-8-7			-	1	-	-	1	-	-	-	-	3	3
	6.2 YuK-8-9			-	-	-	-	-	-	-	-	-	-	-
	7.7 YuK-8-11			-	1	-	-	-	-	-	-	-	2	-
	10.3 YuK-8-13			-	-	-	-	-	-	-	-	-	1	-
	11.7 YuK-8			-	-	-	-	1	-	-	-	-	-	-
36.8 PK-368(Yuk-8)				-	-	-	-	-	-	-	-	-	-	-
40.2 PK-402			Left-2	-	-	-	-	-	-	-	-	-	-	-
	0.0 YuK-12-4			-	-	-	-	-	-	-	-	-	-	-
	0.0 YuK-12-1			-	-	-	-	-	1	-	-	-	1	2
	1.8 YuK-12-6			-	-	-	-	-	-	-	-	-	-	-
	1.9 YuK-12-1'			-	1	-	-	-	-	-	1	-	3	-
		YuK-12-3-2		-	-	-	-	-	-	-	-	-	-	5
	1.9 YuK-12-3			-	-	-	-	-	-	-	1	-	-	1
	8.2 YuK-12-6'			-	-	-	-	-	-	-	-	-	-	-
	9.7 YuK-12-8'			-	-	-	-	-	-	-	-	-	-	-
		0.6 YuK-12-8-4		-	-	-	-	-	-	-	-	-	-	-
		0.6 YuK-12-8-2'		-	-	-	-	-	-	-	-	-	-	-
		YuK-12-8-2		-	-	-	-	-	-	-	-	-	-	-
		3.6 YuK-12-8-1		-	-	-	-	-	-	-	-	-	-	-
	9.7 YuK-12-8			-	-	-	-	-	-	-	-	-	-	-
	10.6 YuK-12-10'			-	-	-	-	-	-	-	-	-	-	-
	10.6 YuK-12-10			-	-	-	-	-	-	-	1	-	-	2
		1.0 YuK-12-3A'		-	-	-	-	-	-	-	-	-	-	4
	12.5 YuK-12-3A			-	-	-	-	-	-	-	-	-	-	1
	13.7 YuK-12-12			-	1	-	-	1	-	-	1	-	-	-
	13.7 YuK-12-5			-	-	-	-	1	-	-	-	-	-	-
		YuK-12-7-1		-	-	-	-	-	-	-	-	-	-	-
		YuK-12-7-2		-	-	-	-	-	-	-	-	-	-	-
	14.8 YuK-12-7			-	-	-	-	-	-	-	1	-	-	-
		YuK-12-14		-	-	-	-	-	-	-	-	-	6	6
	15.1 YuK-12-14'			-	-	-	-	-	-	-	1	-	-	-
		0.0 YuK-12-16-1		-	-	-	-	-	-	-	-	-	-	-
		0.0 YuK-12-16-2		-	-	-	-	-	-	-	-	-	-	-
		1.0 YuK-12-16-4		-	-	-	-	-	-	-	-	-	-	-
		2.1 YuK-12-16-6		-	-	-	-	-	-	-	-	-	-	-
		2.4 YuK-12-16-8		-	-	-	-	-	-	-	-	-	-	-
		3.1 YuK-12-16-10		-	-	-	-	-	-	-	-	-	-	1
		4.3 YuK-12-16-3		-	-	-	-	1	-	-	-	-	-	-
		4.3 YuK-12-16-12		-	-	-	-	-	-	-	-	-	-	-
	17.0 YuK-12-16			-	-	-	-	-	-	-	1	-	6	-
	18.1 YuK-12-18'			-	-	-	-	-	-	-	-	-	5	-
	20.7 YuK-12-18			-	-	-	-	-	-	-	-	-	-	-
		0.0 YuK-12-20-1		-	-	-	-	-	-	-	-	-	-	-
		1.5 YuK-12-20-2		-	-	-	-	-	-	-	-	-	-	-
		2.2 YuK-12-20-4		-	-	-	-	-	-	-	1	-	-	11
		2.9 YuK-12-20-3		-	-	-	-	-	-	-	-	-	-	-
		4.8 YuK-12-20-6		-	-	-	-	-	-	-	-	-	-	-
		6.0 YuK-12-20-8		-	-	-	-	-	-	-	-	-	-	-
		6.2 YuK-12-20-5		-	-	-	-	-	-	-	-	-	-	-
	21.8 YuK-12-20			-	-	-	-	-	-	-	-	-	-	-
	41.8 YuK-12-18 to 1			1	-	-	-	-	-	-	-	-	-	-
53.4 YuK-12				-	-	-	-	-	-	-	-	-	-	-
68.0 PK-680			Left-3	-	-	-	-	-	-	-	-	-	-	-
75.6 PK-756			YuK-14	1	-	-	-	-	-	-	-	-	-	-
83.1 PK-831			YuK-16	2	-	-	-	-	-	-	-	-	-	-
89.4 PK-894			YuK-22	1	-	-	-	-	-	-	-	-	-	-
100.7 PK-1007			Left-4	-	-	-	-	-	-	-	-	-	-	-
105.8 PK-1058			Yuk-26	2	-	-	-	-	-	-	-	-	-	-
134.8 PK-1348			BKK	1										
149.6 PK-1496			Confluence	-	-	-	-	-	-	-	-	-	-	-
Total				12	4	0	2	9	2	0	14	0	27	56

Summary													
North Main Collector	Ilyasov	1	0	2	0	4	3	23	14	15	142	143
	Shagan	3	1	0	0	4	4	14	10	17	133	69
	Sub-total	4	1	2	0	8	7	37	24	32	275	212
South Main Collector	Shagan	0	4	0	0	9	2	0	14	0	27	56
Total		4	5	2	0	17	9	37	38	32	302	268
Outside Area	N.M.C	10	0	0	0	0	0	0	0	0	0	0
	S.M.C.	12	0	0	2	0	0	0	0	0	0	0
Grand Total		26	5	2	2	17	9	37	38	32	302	268

Table F.23 Reference Crop Evapo-transpiration (ETo) on 10-day Basis

Month	Apr.		May			June			July			Aug.			Sept.			Total
10-day / Item	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	(mm)
Evapo-transpiration																		
ETo-10-day (mm/10-day)	53.2	60.6	67.3	73.1	85.5	82.3	86.1	87.2	87.8	86.8	94.1	82.5	79.8	77.2	62.3	53.5	45.8	1,265.0
Oasis-Eff (mm/10-day)	45.2	51.5	57.2	62.1	72.6	70.0	73.2	74.1	74.6	73.8	79.9	70.1	67.8	65.6	53.0	45.5	38.9	1,075.3
ETcrop (mm/day)	4.52	5.15	5.72	6.21	6.60	7.00	7.32	7.41	7.46	7.38	7.27	7.01	6.78	5.97	5.30	4.55	3.89	6.22

Table F.24 KC Values for Crops on 10-day Basis

Month	Apr.		May			June			July			Aug.			Sept.			Avg.
10-day / Item	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	(mm)
Paddy	-	-	0.70	0.85	1.00	1.15	1.15	1.15	1.20	1.25	1.20	1.15	0.95	0.80	-	-	-	1.05
Spring Wheat	-	0.25	0.35	0.60	0.95	1.15	1.20	1.20	1.15	1.00	0.75	0.20	-	-	-	-	-	0.80
Winter Wheat	1.05	1.15	1.15	1.10	1.10	0.80	0.50	0.20	-	-	-	-	-	-	-	-	0.30	0.82
Vegetables		-	0.35	0.45	0.45	0.55	0.75	0.90	1.00	1.05	1.05	0.95	0.80	0.60	-	-	-	0.74
Safflower		-	0.25	0.40	0.65	0.70	0.80	1.10	1.20	1.20	1.15	0.95	0.50	0.20	-	-	-	0.76
Lucerne	0.75	0.80	0.90	0.90	0.55	1.20	0.75	1.10	0.55	1.20	0.75	1.10	1.20	0.75	1.10	0.55	0.55	0.86

Table F.25 Crop Water Requirement on 10-day Basis

(Continued)

Month	Apr.		May			June			July			Aug.			Sept.			Total
10-day / Description	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	(mm)
For Paddy Cropping Schedule												Non-Irrigation						
Weighted KC w/ area	-	-	0.12	0.38	0.68	1.00	1.10	1.15	1.17	1.20	1.22	1.02	0.62	0.2	-	-	-	-
Water Requirement (mm)	-	-	6.7	23.3	49.6	70.0	80.5	85.2	87.0	88.6	97.3	71.3	41.8	13.1	-	-	-	714.4
Q='000 m3/ha	-	-	0.07	0.23	0.50	0.70	0.81	0.85	0.87	0.89	0.97	0.71	0.42	0.13	-	-	-	7.15
For Spring Wheat Cropping Schedule													Non-Irrigation					
Weighted KC w/ area	-	0.04	0.14	0.30	0.63	0.90	1.10	1.18	1.18	1.12	0.95	0.55	0.17	-	-	-	-	
Water Requirement (mm)	-	2.1	8.1	18.6	41.8	63.0	80.5	87.7	88.3	82.4	69.1	38.6	11.3	-	-	-	-	591.5
Q='000 m3/s/ha	-	0.02	0.08	0.19	0.42	0.63	0.81	0.88	0.88	0.82	0.69	0.39	0.11	-	-	-	-	5.92
For Winter Wheat Cropping Schedule							Non-Irrigation											
Weighted KC w/ area	0.95	1.09	1.12	1.13	1.12	1.00	0.87	0.50	0.13	-	-	-	-	-	-	-	(0.05)	
Water Requirement (mm)	42.9	56.0	63.9	70.4	73.7	70.0	63.4	37.1	9.9	-	-	-	-	-	-	-	(1.9)	487.3
Q='000 m3/s/ha	0.43	0.56	0.64	0.70	0.74	0.70	0.63	0.37	0.10	-	-	-	-	-	-	-	(0.02)	4.87
For Vegetable Cropping Schedule													Non-Irrigation					
Weighted KC w/ area	-	-	0.06	0.19	0.34	0.48	0.58	0.73	0.88	0.98	1.03	0.98	0.90	0.66	0.31	0.03	-	
Water Requirement (mm)	-	-	3.3	11.9	22.6	33.8	42.7	54.3	65.9	72.6	75.1	68.5	61.0	39.4	16.5	1.5	-	569.1
Q='000 m3/s/ha	-	-	0.03	0.12	0.23	0.34	0.43	0.54	0.66	0.73	0.75	0.69	0.61	0.39	0.17	0.02	-	5.71
For Safflower Cropping Schedule													Non-Irrigation					
Weighted KC	-	-	0.04	0.15	0.33	0.58	0.72	0.87	1.03	1.17	1.18	0.99	0.59	0.19	-	-	-	
Water Requirement (mm)	-	-	2.4	9.3	21.5	40.8	52.5	64.2	77.1	86.1	86.0	69.5	40.1	11.4	-	-	-	560.9
Q='000 m3/s/ha	-	-	0.02	0.09	0.22	0.41	0.53	0.64	0.77	0.86	0.86	0.70	0.40	0.11	-	-	-	5.61
For Lucerne Cropping Schedule						Harvesting			Harvesting			Harvesting						
Weighted KC	0.75	0.80	0.82	0.87	0.78	0.88	0.83	1.02	0.80	0.95	0.83	1.02	1.02	1.02	1.02	0.80	0.73	
Water Requirement (mm)	33.9	41.2	46.7	53.8	51.7	61.8	61.0	75.3	59.7	70.1	60.6	71.3	68.9	60.7	53.9	36.4	28.5	935.5
Q='000 m3/s/ha	0.34	0.41	0.47	0.54	0.52	0.62	0.61	0.75	0.60	0.70	0.61	0.71	0.69	0.61	0.54	0.36	0.29	9.37

Table F.26 Net Irrigation Water Requirement on 10-day Basis

Month	Apr.		May			June			July			Aug.			Sept.			Total
10-day / Description	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	1st (mm)	2nd (mm)	3rd (mm)	
For Paddy																		
Crop Water Requirement	-	-	6.7	23.3	49.6	70.0	80.5	85.2	87.0	88.6	97.3	71.3	41.8	13.1	-	-	-	714.4
Percolation	-	-	10.0	20.0	27.5	30.0	30.0	30.0	30.0	30.0	33.0	25.0	20.0	5.5	-	-	-	291.0
Initial Irrigation	-	-	40.0	40.0	40.0	-	-	-	-	-	-	-	-	-	-	-	-	120.0
Total	0	0	56.7	83.3	117.1	100.0	110.5	115.2	117.0	118.6	130.3	96.3	61.8	18.6	0.0	0.0	0.0	1125.4
For Spring Wheat																		
Crop Water Requirement	-	2.1	8.1	18.6	41.8	63.0	80.5	87.7	88.3	82.4	69.1	38.6	11.3	-	-	-	-	591.5
Pre-irrigation	-	10.0	10.0	10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	30.0
Groundwater Contribution	0	0.5	4.1	0.3	12.5	24.8	37.0	60.0	60.0	37.0	50.0	40.0	10.0	-	-	-	-	336.2
Soil Stored	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total	0	11.6	14.0	28.3	29.3	38.2	43.5	27.7	28.3	45.4	19.1	0.0	1.3	0.0	0.0	0.0	0.0	286.7
For Winter Wheat																		
Crop Water Requirement	42.9	56.0	63.9	70.4	73.7	70.0	63.4	37.1	9.9	-	-	-	-	-	-	-	-	487.3
Groundwater Contribution	0.0	3.1	6.2	9.2	66.0	60.0	50.0	40.0	10.0	-	-	-	-	-	-	-	-	244.5
Soil Stored	42.9	15.6	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	58.5
Total	0.0	37.3	57.7	61.2	7.7	10.0	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	187.3
For Vegetables																		
Crop Water Requirement	-	-	3.3	11.9	22.6	33.8	42.7	54.3	65.9	72.6	75.1	68.5	61.0	39.4	16.5	1.5	-	569.1
Pre-irrigation	-	-	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	30.0
Groundwater Contribution	-	-	0.0	0.0	4.9	8.9	5.9	13.3	13.3	5.9	14.6	13.3	5.9	9.8	4.4	0.0	-	100.3
Soil Stored	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total	0	0	13.3	21.9	27.7	24.9	36.8	41.0	52.6	66.7	60.5	55.2	55.1	29.6	12.1	1.5	0.0	498.8
For Safflower																		
Crop Water Requirement	-	-	2.4	9.3	21.5	40.8	52.5	64.2	77.1	86.1	86.0	69.5	40.1	11.4	-	-	-	560.9
Pre-irrigation	-	-	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	30.0
Groundwater Contribution	-	-	0.0	0.0	4.9	8.9	13.3	18.9	24.4	30.0	33.0	30.0	30.0	11.4	-	-	-	204.6
Soil Stored	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total	0	0	12.4	19.3	27	31.9	39.2	45.3	52.7	56.1	53.0	39.5	10.1	0.0	0.0	0.0	0.0	386.3
For Lucerne																		
Crop Water Requirement	33.9	41.2	46.7	53.8	51.7	61.8	61.0	75.3	59.7	70.1	60.6	71.3	68.9	60.7	53.9	36.4	28.5	935.5
Pre-irrigation	3.3	3.3	3.3															
Groundwater Contribution	0.4	4.7	9.0	13.3	23.8	34.3	44.7	44.7	44.7	44.7	44.7	44.7	44.7	37.7	26.2	13.3	13.3	489.2
Soil Stored	33.5	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33.5
Total	3.3	39.8	41.0	40.5	27.9	27.5	16.3	30.6	15.0	25.4	15.9	26.6	24.2	23.0	27.7	23.1	15.2	422.8

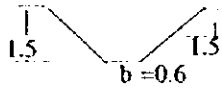
Table F.27 Diversion Water Requirement on 10-day Basis

(unit : '000 m3)

Month		Apr.		May			June			July			Aug.			Sept.			Total
10-day		2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	
Crop	Area (ha)	('000 m3)			('000 m3)			('000 m3)			('000 m3)			('000 m3)			('000 m3)		
For Ilyasov																			
Paddy	3,240	0	0	1,837	2,699	3,794	3,240	3,580	3,732	3,791	3,843	4,222	3,120	2,002	603	0	0	0	36,463
S. Wheat	330	0	38	46	93	97	126	144	91	93	150	63	0	4	0	0	0	0	945
W. Wheat	520	0	194	300	318	40	52	70	0	0	0	0	0	0	0	0	0	0	974
Vegetable	320	0	0	43	70	89	80	118	131	168	213	193	177	176	95	39	5	0	1,597
Safflower	130	0	0	16	25	35	42	51	59	68	73	69	51	13	0	0	0	0	502
Lucerne	1,940	65	773	796	785	541	534	315	593	290	492	308	515	469	446	538	448	295	8,203
Total	6,480	65	1,005	3,038	3,990	4,596	4,074	4,278	4,606	4,410	4,771	4,855	3,863	2,664	1,144	577	453	295	48,684
Field W.R. at On-farm		93	1,436	3,649	4,685	5,139	4,602	4,766	5,177	4,875	5,371	5,348	4,346	3,053	1,408	824	647	421	55,840
D.W.R. at Head Gates		152	2,346	5,962	7,655	8,397	7,520	7,788	8,459	7,966	8,776	8,739	7,101	4,989	2,301	1,346	1,057	688	91,242
D.W.R. at Head Works		160	2,470	6,276	8,058	8,839	7,915	8,197	8,904	8,385	9,238	9,198	7,475	5,251	2,422	1,417	1,113	724	96,042
For Shagan																			
Paddy	3,610	0	0	2,047	3,007	4,227	3,610	3,989	4,159	4,224	4,281	4,704	3,476	2,231	671	0	0	0	40,626
S. Wheat	360	0	42	50	102	105	138	157	100	102	164	69	0	5	0	0	0	0	1,034
W. Wheat	580	0	216	335	355	45	58	78	0	0	0	0	0	0	0	0	0	0	1,087
Vegetable	360	0	0	48	79	100	90	132	148	189	240	218	199	198	107	43	5	0	1,796
Safflower	140	0	0	17	27	37	45	55	63	74	79	74	55	14	0	0	0	0	540
Lucerne	2,160	72	861	886	875	603	595	351	660	323	548	342	574	522	497	599	499	328	9,135
Total	7,210	72	1,119	3,383	4,445	5,117	4,536	4,762	5,130	4,912	5,312	5,407	4,304	2,970	1,275	642	504	328	54,218
Field W.R. at On-farm		103	1,599	4,063	5,220	5,721	5,123	5,303	5,765	5,429	5,979	5,956	4,842	3,404	1,569	917	720	469	62,182
N.W.R. at Head Gates		168	2,613	6,639	8,529	9,348	8,371	8,665	9,420	8,871	9,770	9,732	7,912	5,562	2,564	1,498	1,176	766	101,604
N.W.R. at Headworks		177	2,750	6,988	8,978	9,840	8,811	9,121	9,916	9,338	10,284	10,244	8,328	5,855	2,699	1,577	1,238	807	106,951

Table F.28 Alternative Study on Sub-surface Drainage System

1. Open Ditch System (12 ha)

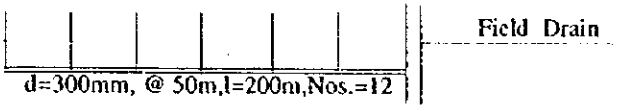


1.0 Excavation 4.275 m³/m
For Reh. 2.565 m³/m

Description	unit	Quantity	Unit Price ($)	Amount ($)	Remarks
Earth Work	cu.m	1,539	0.68	1,047	
Misc.Works				157	15% of the above
Total				1,204	100 $/ha

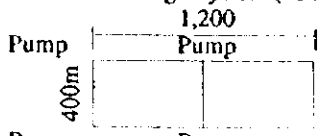
2. Lateral Drainage System (12 ha)

d=50mm, @ 33m,l=50m,Nos.=60



Description	unit	Quantity	Unit Price ($)	Amount ($)	Remarks
PVC Pipe (50mm)	m	36,000	4.2	151,200	
PVC Pipe (300mm)	m	2,400	18.2	43,680	
Drain Outlet	Nos.	12	500	6,000	
Field Drain	L.S.			1,204	Refer Open Ditch System
Total				202,084	16,840 $/ha

3. Vertical Drainage System (48 ha)



H=10m, h=9.5m,k=4*10⁻⁵m/s
r= 391 R=1,000

Q= 3.0 lit/sec/6-pump
q= 3 cu.m/min per pump

Pump: 150mm,10m,3cu.m/min,11kw

Description	unit	Quantity	Unit Price ($)	Amount ($)	Remarks
Well Construction	Nos.	90	370	33,300	
Pump & housing	Nos.	6	4,770	28,620	
Electric Works	L.S.			576,000	1,200*2 km wiring & others
Discharge Pipe	m	60	77	4,620	
Misc.Works	L.S.			64,254	10% of the above
Total				706,794	14,725 $/ha
O&M Cost per annum					
Electric Charge	kwh	142,560	0.05	7,128	
Operator's Wage	man-day	240	10.64	2,554	Electrician & Others
Misc. Costs	L.S.			713	20% of electric charge
Total				10,395	217 $/ha

4. Alternative Costs

Depriation Cost :	For Open Ditch System	0 $/ha
	For Lateral Drainage System	0 $/ha
	For Vertical Drainage System	217 $/ha

Table F.29 Development Plan of On-farm Facilities in the Priority Project Area

Sta. km	On-farm Canal/ Field Canal	LU. Nos.	Irr. R. Area A. (ha)	Irr. R. Area Q (m3/s)	Nos. of OT. Reh.	Nos. of OT. New	S Field Canal Reh (m)	S Field Canal New (m)	Field Ditch Nos.	Field Ditch L (m)	SFDC Nos.	SFDC L (m)	Field Drain Nos.	Field Drain Reh (m)	Field Drain Nos.	Field Drain New (m)
LMK-6																
8.8	LMK-6-1	3	32	0.05	1	-	400	-	2	1,000	1	620	2	1,180	-	-
9.1	LMK-6-2	13	111	0.19	-	2	1,000	-	9	3,060	2	1,700	8	3,840	-	-
10.3	LMK-6-3	10	130	0.22	-	2	1,400	-	6	3,850	1	2,170	6	4,200	-	-
10.8	LMK-6-5	9	178	0.30	-	2	1,800	770	5	5,220	-	-	6	6,180	-	-
13.0	LMK-6-6	4	91	0.15	-	1	-	500	2	2,560	-	-	2	2,480	-	-
14.6	LMK-6-6'	4	99	0.17	-	1	-	700	2	1,960	1	880	3	3,000	-	-
	1.6 LMK-6-6"	2	30	0.05	1	-	-	-	1	810	-	-	2	1,720	-	-
	Total for LMK-6	45	671		2	8	4,600	1,970	27	18,460	5	5,370	29	22,600	0	0
LMK-8A																
0.8	LMK-8A-4	7	111	0.19	-	2	470	500	5	3,660	1	270	4	2,960	-	-
1.0	LMK-8A-3	20	234	0.40	-	2	1,700	800	14	8,200	1	630	14	5,870	-	-
2.7	LMK-8A-5															
	0.1 LMK-8A-5-1	9	121	0.21	-	2	-	900	6	4,150	1	730	5	4,240	-	-
	0.1 LMK-8A-5-2	8	138	0.23	-	2	-	1,300	6	4,380	-	-	5	3,830	-	-
	2.7 LMK-8A-5-3	7	51	0.09	-	1	500	-	7	3,760	2	1,160	6	3,285	-	-
	2.7 LMK-8A-5-4	5	89	0.15	-	1	800	-	3	2,880	-	-	3	2,970	-	-
	4.0 LMK-8A-5-5A	7	71	0.12	-	2	1,200	-	6	3,530	1	1,500	6	3,720	-	-
	4.2 LMK-8A-5-6	6	81	0.14	-	1	1,300	-	3	1,650	-	-	4	2,540	-	-
	4.5 LMK-8A-5-5B	14	145	0.25	1	-	1,400	-	10	4,220	-	-	11	5,430	-	-
	5.1 LMK-8A-5-7							-								
	LMK-8A-5-7A	7	135	0.23	-	2	-	1500	6	4,630	1	1,320	6	4,770	-	-
	LMK-8A-5-7B	4	31	0.05	-	1	200	450	4	1,170	-	-	3	1,050	-	-
	LMK-8A-5-7V	7	70	0.12	1	-	1,200	-	6	2,790	1	1,200	4	2,450	-	-
	5.4 LMK-8A-5-8	3	79	0.13	2	-	500	-	2	2,270	1	630	3	3,690	-	-
	6.3 LMK-8A-5-9A	4	68	0.12	1	-	900	-	3	2,470	1	850	4	2,980	-	-
	LMK-8A-5-9B	4	81	0.14	1	-	900	-	3	3,040	-	-	3	3,790	-	-
3.9	LMK-8A-6	9	134	0.23	-	2	1,400	750	5	3,480	1	1,950	5	3,340	-	-
5.7	LMK-8A-7A	5	70	0.12	-	1	-	1,000	4	2,630	1	1,330	4	2,440	-	-
6.0	LMK-8A-7	6	138	0.23	-	2	900	400	5	6,220	-	-	6	7,610	-	-
8.0	LMK-8A-9A	8	95	0.16	-	1	-	1,700	6	3,140	1	2,020	6	3,480	-	-
8.8	LMK-8A-9															
	0 LMK-8A-9-2	4	49	0.08	-	1	-	600	3	1,810	1	1,230	4	7,490	-	-
	0.9 LMK-8A-9-1	5	102	0.17	-	1	850	-	3	3,010	-	-	3	3,270	-	-
	2.3 LMK-8A-9-3	7	69	0.12	-	1	1,000	-	4	1,820	1	1,230	4	1,950	-	-
	2.3 LMK-8A-9-4	5	91	0.15	-	2	1,200	-	5	2,770	-	-	5	2,330	-	-
	4.1 LMK-8A-9-6	10	156	0.27	-	2	-	1,600	5	3,730	-	-	6	5,390	-	-
	4.9 LMK-8A-9-5															
	LMK-8A-9-5B	4	104	0.18	-	2	1,100	550	4	5,780	1	920	4	5,500	-	-
	LMK-8A-9-5A	4	50	0.09	-	1	540	-	3	1,610	1	510	3	1,800	-	-
	LMK-8A-9-5V	3	79	0.13	1	-	380	-	2	2,490	1	480	2	2,730	-	-
	LMK-8A-9-5B'	7	78	0.13	1	-	1,060	-	6	3,130	1	1,750	4	2,220		
	5.7 LMK-8A-9-7	5	110	0.19	1	-	760	-	4	4,640	1	470	4	4,450	-	-
	5.7 LMK-8A-9-8	6	126	0.21	1	-	1,080	-	4	4,030	1	600	5	4,690	-	-
	5.7 LMK-8A-9-9	3	35	0.06	1	-	520		3	1,520	-	-	2	1,220	-	-
10.1	LMK-8A-9B	5	79	0.13	-	1	1,000		4	2,770	-	-	3	2,510	-	-
11.9	LMK-8A-11															
	0 LMK-8A-11-2	5	108	0.18	1	-	1,050	-	4	2,980	-	-	4	3,530	-	-
	0 LMK-8A-11-4	6	83	0.14	-	1	-	1,000	4	3,530	1	1,630	5	4,930	-	-
13.9	LMK-8A-13	8	86	0.15	1	-	1,700	-	7	3,280	-	-	6	3,580	-	-
14.7	LMK-8A-15	1	14	0.02	1	-	-	-	1	960	-	-	-	-	-	-
16.7	LMK-8A-17															
	0.0 LMK-8A-17-2	3	41	0.07	-	1	450	350	3	1,370	1	900	2	1,150	-	-
	0.4 LMK-8A-17-1	4	89	0.15	-	1	400	400	3	2,930	-	-	3	3,260	-	-
	0.9 LMK-8A-17-3	6	73	0.12	-	3	150	450	4	2,180	1	1,300	5	3,070	-	-
	LMK-8A-17-3'	6	75	0.13	1	-	450	-	4	1,680	-	-	4	2,220	-	-
	0.9 LMK-8A-17-4	6	108	0.18	-	1	1,100	200	5	3,760	-	-	5	4,460	-	-
	2.2 LMK-8A-17-5	4	50	0.09	1	-	500	-	3	2,080	1	380	4	3,010	-	-
	2.2 LMK-8A-17-6	5	83	0.14	1	-	800	-	4	3,920	-	-	3	3,080	-	-
18.7	LMK-8A-19															
	0.0 LMK-8A-19-1	5	76	0.13	2	-	1,100	-	3	2,010	1	720	4	3,380	-	-
	0.6 LMK-8A-19-3	4	39	0.07	-	1	600	-	3	1,630	-	-	3	2,170	-	-
19.1	LMK-8A-21															
	0 LMK-8A-21-2	5	102	0.17	1	-	1,000	-	4	4,600	1	810	3	3,520	-	-
	1.2 LMK-8A-21-1	6	77	0.13	1	-	1,040	-	6	4,600	-	-	5	5,240	-	-
	Total for LMK-8A	282	4,174		21	41	33,200	33,200	212	148,890	27	26,520	207	162,595	0	0
LMK-8B																
0.0	LMK-8B-2A	4	56	0.10	-	1	900	-	4	2,420	1	850	3	2,260	-	-
1.9	LMK-8B-2B	5	122	0.21	-	1	900	300	4	4,030	1	1,120	4	3,920	-	-
2.6	LMK-8B-2	7	112	0.19	1	-	1,900	-	6	3,790	1	1,490	6	3,620	-	-
3.6	LMK-8B-4A	4	98	0.17	-	1	400	200	3	3,740	1	900	3	3,610	-	-
4.7	LMK-8B-4B	5	98	0.17	-	1	1,100	-	3	3,180	-	700	3	3,030	-	-
5.7	LMK-8B-6A	3	52	0.09	-	1	400	250	2	1,710	1	690	2	1,760	-	-
6.0	LMK-8B-3	4	65	0.11	-	1	450	250	4	2,440	-	-	4	2,660	-	-
6.0	LMK-8B-6B	3	52	0.09	1	-	700	-	3	2,210	1	480	3	2,370	-	-
7.2	LMK-8B-8	5	70	0.12	-	1	700	250	4	2,310	1	740	3	1,860	-	-
7.3	LMK-8B-5	4	50	0.09	1	-	600	-	2	1,770	1	540	2	1,310	-	-
7.9	LMK-8B-10	3	38	0.06	-	1	700	-	3	1,370	1	250	2	1,160	-	-

(to be continued)

Table F.29 Development Plan of On-farm Facilities in the Priority Project Area

Sta. km	On-farm Canal/ Field Canal	I.U. Nos.	Irr. Area A. (ha)	Irr. Area Q.(m3/s)	Nos. of OT. Reh.	Nos. of OT. New	S Field Canal Reh.(m)	S Field Canal New(m)	Field Ditch Nos.	Field Ditch L.(m)	SFDC Nos.	SFDC L.(m)	Field Drain Nos.	Field Drain Reh.(m)	Field Drain Nos.	Field Drain New(m)
	8.9 LMK-8B-12															
	0.4 LMK-8B-12-1	4	80	0.14	-	1	-	400	3	2,770	1	780	4	3,700	-	-
	1.1 LMK-8B-12-2	4	43	0.07	-	1	-	400	4	3,090	-	-	3	2,620		
	2.4 LMK-8B-12-3	9	197	0.33	-	2	900	800	7	6,920	-	-	7	7,540	-	-
	8.9 LMK-8B-12B	4	45	0.08	1	-	1,100	-	3	1,970	-	-	2	1,140	-	-
	11.7 LMK-8B-14															
	0.0 LMK-8B-14-1	2	38	0.06	1	-	450	-	2	1,740	1	460	2	1,820	-	-
	1.4 LMK-8B-14-2	7	106	0.18	-	1	950	-	5	3,340	-	-	4	3,040	-	-
	1.4 LMK-8B-14-3	7	86	0.15	-	1	950	-	5	2,880	1	640	6	3,530	-	-
	2.3 LMK-8B-14-4	7	81	0.14	-	1	1,100	-	5	2,920	2	660	6	3,140	-	-
	Total for LMK-8B	91	1,489		5	15	14,200	2,850	72	54,600	14	10,300	69	54,090	-	-
	LMK-8G															
	0.2 LMK-8G-1	8	62	0.11	-	2	900	400	4	1,440	1	900	5	2,180	-	-
	2.7 LMK-8G-2	5	69	0.12	-	2	900	900	4	2,620	-	-	4	3,480	-	-
	3.8 LMK-8G-2'	1	15	0.05	1	-	-	-	1	690	-	-	-	-	-	-
	Total for LMK-8G	14	146		1	4	1,800	1,300	9	4750	1	900	9	5,660	0	0
	LMK-9															
	0.5 LMK-9B															
	1.7 LMK-9A															
	1.5 LMK-9-A-1	5	100	0.17	1	-	800	-	3	3,040	1	810	3	3,340	-	-
	2.9 LMK-9-A-2	8	94	0.16	1	-	1,300	-	5	1,950	1	1,570	5	3,000	-	-
	3.5 LMK-9-A-4	8	108	0.18	-	2	1,500		4	2,740	1	350	4	3,060		
	2.7 LMK-9-2A															
	0.1 LMK-9-2A-1	8	117	0.20	-	1	-	1,300	4	2,850	1	1,510	5	4,050	-	-
	1.8 LMK-9-2A-3	2	19	0.03	1	-	300	-	1	550	1	720	1	750	-	-
	2.0 LMK-9-2A-2	9	25	0.04	1	-	-	-	1	1,470	1	1,500	-	-	-	-
	2.8 LMK-9-2B															
	1.1 LMK-9-2B-1	7	89	0.15	-	1	-	1,200	4	2,340	1	1,200	3	1,940	-	-
5.5	2.6 LMK-9-2B-3	4	44	0.07	-	1	-	550	3	1,800	1	760	2	1,400	-	-
6.1	3.2 LMK-9-2B-2	5	21	0.04	1	-	400	-	3	910	1	240	4	2,270	-	-
6.9	4.0 LMK-9-2B-5	5	60	0.10	1	-	800	-	3	1,900	1	760	3	2,080	-	-
7.9	5.0 LMK-9-2B-7	7	57	0.10	1	-	800	-	4	1,240	1	390	4	1,920	-	-
7.9	5.0 LMK-9-2B-4	3	46	0.08	-	1	-	600	3	2,830	1	1,550	2	1,930	-	-
7.9	5.0 LMK-9-2B-6	6	49	0.08	2	-	1,300	-	5	2,240	1	750	5	2,230	-	-
	4.6 LMK-9-2V	6	68	0.12	1	-	1,100	-	4	1,960	1	1,060	4	2,190	-	-
	5.2 LMK-9-2V'															
	0.0 LMK-9-2V'-2	5	61	0.10	-	1	-	1000	4	1,760	1	750	4	2,070	-	-
	0.0 LMK-9-2V'-2'	2	41	0.07	1	-	-	-	2	1,790	1	600	1	970	-	-
	0.8 LMK-9-2V'-4	4	37	0.06	1	-	900	-	4	2,410	-	-	3	1,630	-	-
	1.8 LMK-9-2V'-1	3	43	0.07	1	-	600	-	3	2,140	1	600	3	2,330	-	-
	7.55 LMK-9-2G															
	2.6 LMK-9-2G-1	5	69	0.12	-	1	-	1300	5	2,820	-	-	4	2,430	-	-
	2.6 LMK-9-2G-2	7	72	0.12	-	1	1,500	600	7	3,260	1	780	6	3,030	-	-
	2.6 LMK-9-2G-2'	3	20	0.03	1	-	350	-	2	950	-	-	2	1,070	-	-
	3.4 LMK-9-2G-3	6	72	0.12	-	1	-	800	4	2,840	-	-	5	3,720	-	-
	4.4 LMK-9-2G-5	7	98	0.17	1	-	-	1200	6	4,440	-	-	7	5,530	-	-
	4.5 LMK-9-2G-4	4	68	0.12	-	1	600	-	4	3,910	1	780	4	3,710	-	-
	7.2 LMK-9-2G-4'	1	12	0.02	1	-	600	-	1	550	1	300	1	660	-	-
	8.5 LMK-9-2G-6	7	129	0.22	-	2	700	450	6	5,060	-	-	6	5,730	-	-
	8.6 LMK-9D															
	0.3 LMK-9D-2	2	23	0.04	1	-	250	-	2	930	1	20	2	1,170	-	-
	0.5 LMK-9D-4	4	86	0.15	-	1	950	-	4	3,390	-	-	3	2,600	-	-
	10.2 LMK-9E	10	128	0.22	1	-	1,500	-	7	6,520	-	-	8	7,920	-	-
	11.9 LMK-9YO	8	105	0.18	1	-	1,000	-	6	4,490	-	-	7	5,570	-	-
	11.9 LMK-9-4															
	Total for LMK-9	161	1,961		19	14	17,250	9,000	114	75,080	21	17,000	111	80,350	0	0
	LMK-11V-3															
	3.9 LMK-11V-3-1	2	32	0.05	1	-	400	-	2	1,250	1	870	2	1,420	-	-
	3.9 LMK-11V-3-4															
	0.0 LMK-11V-3-4'	5	60	0.10	-	1	-	900	5	2,890	1	820	4	2,710	-	-
	1.8 LMK-11V-3-4-1	1	17	0.03	1	-	500	200	1	470	1	920	-	-	2	340
	2.0 LMK-11V-3-4-2	3	17	0.03	1	-	150	-	2	540	-	-	2	660	-	-
	2.0 LMK-11V-3-4-3	4	72	0.12	1	-	600	-	4	3,560	1	640	4	3,740	-	-
	2.5 LMK-11V-3-4-4	10	72	0.12	1	-	1,400	-	7	2,460	2	1,810	7	2,600	-	-
	3.7 LMK-11V-3-4-5	8	153	0.26	-	2	1,900	-	7	5,640	-	-	6	5,480	-	-
	4.5 LMK-11V-3-4-7	6	93	0.16	1	-	1,350	-	6	3,530	-	-	6	4,610	-	-
	4.6 LMK-11V-3-3	8	159	0.27	-	2	1,000	400	8	6,750	1	1,670	8	6,670	-	-
	1.7 LMK-11V-3-3'	2	46	0.08	1	-	500	-	2	1,910	-	-	2	1,940	-	-
	4.6 LMK-11V-3-6	4	64	0.11	1	-	800	-	4	2,340	1	850	4	2,620	-	-
	5.4 LMK-11V-3-8	6	132	0.22	1	-	1,200	-	6	5,280	-	-	6	5,840	-	-
	Total for LMK-11V-3	59	917		9	5	9,800	400	54	36,620	8	7,580	51	38,290	-	-
	LMK-11G															
	0.6 LMK-11G-1	6	54	0.09	2	-	800	-	4	1,110	1	980	4	2,040	-	-
	1.4 LMK-11G-2	6	66	0.11	-	2	-	200	5	2,560	2	1,500	5	3,300	-	-
	2.2 LMK-11G-3	5	58	0.10	-	1	-	600	3	1,190	-	-	3	2,180	-	-
	Total for LMK-11G	17	178		2	3	800	800	12	4,860	3	2,480	12	7,520		

Table F.29 Development Plan of On-farm Facilities in the Priority Project Area

Sta. km.	On-farm Canal/ Field Canal	I.U. Nos.	Irr. R. Area A. (ha)	Irr. R. Area Q.(m3/s)	Nos. of OT. Reh.	Nos. of OT. New	S Field Canal Reh (m)	S Field Canal New(m)	Field Ditch Nos.	Field Ditch L.(m)	SFDC Nos.	SFDC L.(m)	Field Drain Nos.	Field Drain Reh (m)	Field Drain Nos.	Field Drain New(m)
LMK-12																
0.3	LMK-12-A	4	41	0.07	1	-	900	-	3	2,040	1	1,050	3	1,710	-	-
3.2	LMK-12-B	10	136	0.23	-	1	-	1600	7	4,860	1	1,190	7	5,330	-	-
3.7	LMK-12-2															
0.0	LMK-12-2-1	5	99	0.17	1	-	1,000	-	5	5,390	1	650	4	4,720	-	-
1.0	LMK-12-2-2	6	116	0.20	1	-	1,200	-	5	4,270	-	-	6	5,430	-	-
1.0	LMK-12-2-3	7	110	0.19	1	-	1,300	-	5	3,860	-	-	7	4,660	-	-
4.6	LMK-12-4	3	37	0.06	1	-	400	-	3	1,760		300	3	2,150	-	-
4.9	LMK-12-7	6	147	0.25	-	1	200	600	5	7,060	-	-	6	7,960	-	-
7.1	LMK-12-9															
0	LMK-12-9-1	8	113	0.19	-	1	-	1800	6	4,760	1	1,510	5	4,370	-	-
0	LMK-12-9-2	5	60	0.10	1	-	700	-	4	2,990	-	-	4	3,010	-	-
0.9	LMK-12-9-3,4	8	57	0.10	2	2	1,550	-	5	1,510	2	1,250	5	1,820	-	-
1.4	LMK-12-9-5	6	92	0.16	-	1	-	-	6	4,040	-	-	6	3,860	-	-
	LMK-12-9-6	6	69	0.12	-	1	400	-	6	3,430	-	-	4	2,630	-	-
7.9	LMK-12-11	9	65	0.11	1	-	1,350	-	7	2,320	-	-	8	2,810	-	-
10.6	LMK-12-13	14	120	0.20	-	3	2,350	200	11	4,610	3	1,990	9	3,540	-	-
11.1	LMK-12-15															
1.6	LMK-12-15-1	5	41	0.07	-	1	1,000	-	4	1,410	-	-	4	1,790	-	-
1.6	LMK-12-15-4	8	66	0.11	-	1	770	630	7	2,900	1	1,580	7	3,140	-	-
3.5	LMK-12-15-3	6	84	0.14	-	1	1,300	-	6	3,880	-	-	5	3,810		
13.8	LMK-12-17															
2.3	LMK-12-17-1	9	49	0.08	-	2	-	1500	6	1,290	1	2,970	5	1,830	-	-
2.7	LMK-12-17-2	9	85	0.14	1	-	-	1200	7	2,860	-	-	6	2,190	-	-
17.1	LMK-12-17A	8	58	0.10	-	1	2,000	-	6	2,110	-	-	6	2,540	-	-
20.8	LMK-12-17B	17	206	0.35	-	3	3,050	-	12	7,290	1	2,960	13	8,600	-	-
23.1	LMK-12-19	11	106	0.18	-	2	2,100	-	6	2,600	2	2,150	7	3,530	-	-
24.6	LMK-12-21															
1.1	LMK-12-21-1	2	39	0.07	2	-	-	-	2	1,720	-	-	1	1,110	-	-
1.1	LMK-12-21-2	8	133	0.23	1	-	1,400	-	6	1,920	-	-	6	1,540	-	-
2.1	LMK-12-21-4	3	66	0.11	1	-	-	400	2	2,290	1	600	2	2,280	-	-
2.7	LMK-12-21-6	14	137	0.23	-	1	1,900	-	8	6,880	1	1,180	8	6,740	-	-
26.0	LMK-12-23A	9	187	0.32	-	2	1,600	-	6	6,010	1	1,810	7	7,490	-	-
27.6	LMK-12-23B	9	64	0.11	1	-	1,400	-	8	2,720	-	-	7	2,330	-	-
	Total for LMK-12	215	2,583		15	24	27,870	7,930	164	98,780	17	21,190	161	102,920	-	-
LMK-14																
4.7	LMK-14-2	4	42	0.07	-	1	900	-	4	2,080	-	-	3	1,740	-	-
6.4	LMK-16-6															
0.7	LMK-16-6-1	2	39	0.07	-	1	-	1390	2	1,780	-	-	1	1,130	-	-
7.0	LMK-16-6	5	45	0.07	-	1	-	950	3	890	1	1,060	3	1,040	-	-
7.7	LMK-16-11															
0.0	LMK-16-11-1	3	21	0.04	-	1	-	450	2	560	1	660	2	780	-	-
0.9	LMK-16-11-2	6	57	0.10	1	-	700	-	4	1,550	-	-	4	2,940	-	-
8.5	LMK-16-8B	5	43	0.07	-	3	-	800	4	2,170	1	300	4	1,880	-	-
8.7	LMK-16-8															
1.0	LMK-16-8-1	6	84	0.14	1	-	-	970	5	3,550	1	1,000	4	3,350	-	-
1.0	LMK-16-8-2	4	76	0.13	-	1	400	-	3	2,790	1	870	4	4,040	-	-
1.0	LMK-16-8-4	3	58	0.10	1	-	-	550	2	2,130	1	600	2	2,400	-	-
2.5	LMK-16-8-3	3	39	0.07	-	1	-	250	2	1,490	-	-	1	860	-	-
2.7	LMK-16-8-5	4	58	0.10	1	-	1,500	-	3	1,550	1	970	3	1,830	1	600
3.4	LMK-16-8-7	4	56	0.09	-	1	-	400	2	2,050	-	-	2	1,740	1	1,020
9.8	LMK-16-10	8	53	0.09	-	1	-	450	6	1,560	1	780	8	2,780	-	-
10.2	LMK-16-13	3	27	0.05	1	-	650	-	3	1,420	-	-	2	1,080	-	-
10.6	LMK-16-12	7	78	0.13	-	1	-	1000	5	2,820	-	-	4	2,680	1	460
10.8	LMK-16-15	4	48	0.08	1	-	750	-	2	690	-	-	1	420	1	150
	Total for LMK-14	71	824		6	12	4,900	7,210	52	29,080	8	6,240	48	30,690	4	2,230
LMK-16																
1.82	LMK-16-5															
0.6	LMK-16-5-2															
	LMK-16-5-2A	8	67	0.11	-	3	-	500	6	1,960	1	1,220	7	2,820	-	-
	LMK-16-5-2B	8	64	0.11	-	2		1,050	5	1,610	1	650	5	1,640	-	-
	LMK-16-5-2V	4	43	0.07	1	-	1,390	-	4	1,910	-	-	3	1,130	-	-
1.7	LMK-16-5A	3	20	0.03	2	-	630	520	3	1,890	1	850	3	1,940	-	-
2.5	LMK-16-5B	5	121		-	2	-	-	5	6,000	1	500	4	5,290	-	-
2.7	LMK-16-5-1	2	24	0.04	1	-	300	-	2	1,150	1	1,100	1	740	-	-
3.1	LMK-16-5-3	6	69	0.12	1	-	1,100	-	4	1,990	-	-	6	2,770	-	-
4.7	LMK-16-7															
1.6	LMK-16-7-1A	5	32	0.05	1	-	1,000	-	5	1,310	1	200	4	1,360	-	-
1.6	LMK-16-7-1B	6	78	0.13	1	-	1,450	-	5	2,390	-	-	4	2,580	-	-
5.6	LMK-16-7-3															
0.0	LMK-16-7-3A	9	61	0.10	-	1	-	1,500	7	1,830	1	880	6	2,240	-	-
1.0	LMK-16-7-3B	4	29	0.05	1	-	650	-	3	1,250	1	750	3	1,250	-	-
6.4	LMK-16-7-2	2	18	0.03	-	1	-	450	2	610	1	250	7	420	-	-
6.9	LMK-16-7-4	5	41	0.07	-	1	-	480	3	1,110	1	1,830	4	1,020	-	-
6.9	LMK-16-7-5	7	80	0.14	1	-	1,300	-	6	2,790	-	-	6	3,100	-	-
	Total for LMK-16	74	747		9	10	7,820	4,500	60	27,800	10	8,230	63	28,300	-	-

Table F.29 Development Plan of On-farm Facilities in the Priority Project Area

Sta. km	On-farm Canal/ Field Canal	LU.	Irr. R. Area		Nos. of OT.		S.Field Canal		Field Ditch		SFDC		Field Drain			
		Nos.	A. (ha)	Q.(m3/s)	Reh.	New	Reh.(m)	New.(m)	Nos.	L.(m)	Nos.	L.(m)	Nos.	Reh.(m)	Nos.	New.(m)
Total for Ilyasov (m)																
	LLMK-6	45	671	0	2	8	4,600	1,970	27	18,460	5	5,370	29	22,600	0	0
	LMK-8A	282	4,174	0	21	41	33,200	33,200	212	148,890	27	26,520	207	162,595	0	0
	LMK-8B	91	1,489	0	5	15	14,200	2,850	72	54,600	14	10,300	69	54,090	0	0
	LMK-8G	14	146	0	1	4	1800	1300	9	4,750	1	900	9	5,660	0	0
	Total	432	6,480	0	29	68	53,800	39,320	320	226,700	47	43,090	314	244,945	0	0
Total for Shagan (m)																
	LMK-9	161	1,961	0	19	14	17,250	9,000	114	75,080	21	17,000	111	80,350	0	0
	LMK-11V-3	59	917	0	9	5	9,800	400	54	36,620	8	7,580	51	38,290	0	0
	LMK-11G	17	178	0	2	3	800	800	12	4,860	3	2,480	12	7,520	0	0
	LMK-12	215	2,583	0	15	24	27,870	7,930	164	98,780	17	21,190	161	102,920	0	0
	LMK-14	71	824	0	6	12	4,900	7,210	52	29,080	8	6,240	48	30,690	4	2,230
	LMK-16	74	747	0	9	10	7,820	4,500	60	27,800	10	8,230	63	28,300	0	0
	Total	597	7,210	0	60	68	68,440	29,840	456	272,220	67	62,720	446	288,070	4	2,230
Grand Total (m)		1,029	13,690	0	89	136	122,240	69,160	776	498,920	114	105,810	760	533,015	4	2,230
Canal Density for Ilyasov			(ha/LU)	(ha/OT)			(m/ha)	(m/ha)		(m/ha)		(m/ha)		(m/ha)		(m/ha)
	LLMK-6		14.91	67.10			6.86	2.94		27.51		8.00		33.68		0
	LMK-8A		14.80	67.32			7.95	7.95		35.67		6.35		38.95		0
	LMK-8B		16.36	74.45			9.54	1.91		36.67		6.92		36.33		-
	LMK-8G		10.43	29.20			12.33	8.90		32.53		6.16		38.77		0
	Average		15.00	66.80			8.30	6.07		34.98		6.65		37.80		0
Canal Density for Shagan																
	LMK-9		12.18	59.42			8.80	4.59		38.29		8.67		40.97		0
	LMK-11V-3		15.54	65.50			10.69	0.44		39.93		8.27		41.76		-
	LMK-11G		10.47	35.60			4.49	4.49		27.30		13.93		42.25		0
	LMK-12		12.01	66.23			10.79	3.07		38.24		8.20		39.85		-
	LMK-14		11.61	45.78			5.95	8.75		35.29		7.57		37.25		2.71
	LMK-16		10.09	39.32			10.47	6.02		37.22		11.02		37.88		-
	Average		12.08	56.33			9.49	4.14		37.76		8.70		39.95		0.31
Total Average			13.30	60.84			8.93	5.05		36.44		7.73		38.93		0.16

Note : LU; Irrigation Land Unit
: Irr. R. Area; Irrigation Rotation Area
: OT; Offtake for Supplementary Field Canal
: S.Field Canal; Supplementary Field Canal
: SFDC; Supplementary Field Collector

Table F.30 Hydraulic Property of Left Main Canal

Description	Reach 1 N0 +00 N3+00	Reach 2 N3+00 273+27	Reach 3 273+27 396+73	Reach 4 396+73 497+25	Reach 5 497+25 604+30	Reach 6 604+30 709+15	Reach 7 709+15 853+51
Distance (m)	300	21,053	12,346	10,052	10,705	10,485	14,436
Hydraulic Gradient I	0.000028	0.00005	0.00006	0.00006	0.00006	0.00006	0.00006
Inside Slope 1:m	5.0 &2.5	2.0	2.0	2.0	2.0	2.0	2.0
Canal Base Width (m)	35.0	39.0	38.0	35.0	34.0	32.0	31.0
Combined Roughness Coefficient	0.015	0.01984	0.01985	0.01969	0.019686	0.0195937	0.0195073
Flow Area (m2)	258.701	249.9512	229.21	210.859	206.01903	193.23265	184.26066
Water Depth (m)	4.98	5.09	4.81	4.75	4.73	4.66	4.59
Velocity (m/sec)	0.867	0.897	0.943	0.932	0.927	0.916	0.905
Slope Lining Height (m)	5.5	5.6	5.4	5.3	5.3	5.2	5.1
Canal Freeboard (m)	1.5	0.5	0.5	0.5	0.5	0.5	0.5
Canal Height (m)	7.0	6.1	5.9	5.8	5.8	5.7	5.6

Table F.31 Salient Features of Irrigation Canals

Inter-farm/On-farm Canals

Type	Discharge (m3/sec)		Inside	Canal	Flume Height		Canal	Berm Width (m)		O&M Road
	from	to	Slope 1:m	Base (m)	H (m)	H1 (m)	Height (m)	W1	W2	Width(m)
F1	6.0	7.0	vertical	6.0	1.85	2.0	2.5	6.0	3.0	6.0
F2	5.0	6.0	vertical	5.0	1.85	2.0	2.5	6.0	3.0	6.0
F3	4.0	5.0	vertical	4.0	1.85	2.0	2.5	6.0	3.0	6.0
F4	2.5	4.0	vertical	3.0	1.85	2.0	2.5	6.0	3.0	6.0
F5	2.0	2.5	vertical	2.0	1.85	2.0	2.5	6.0	3.0	6.0
F6	1.0	2.0	vertical	1.5	1.85	2.0	2.5	6.0	3.0	6.0
F7	0.8	1.0	vertical	1.5	1.40	1.5	2.0	6.0	3.0	6.0
F8	0.5	0.8	vertical	1.2	1.40	1.5	2.0	6.0	3.0	6.0
F9	0.3	0.5	vertical	1.0	1.40	1.5	2.0	6.0	3.0	6.0
F10	<	0.3	vertical	0.8	0.92	1.0	1.5	6.0	3.0	6.0

Field Canals

Type	Discharge (m3/sec)		Inside	Canal	Canal	Berm Width (m)		O&M Road
	from	to	Slope 1:m	Base (m)	Height (m)	W1	W2	Width(m)
FC1	1.8	2.0	1.5	1.0	1.4	3.0	1.0	5.0
FC2	1.4	1.8	1.5	1.5	1.4	3.0	1.0	5.0
FC3	1.2	1.4	1.5	1.2	1.3	3.0	1.0	5.0
FC4	1.0	1.2	1.5	1.0	1.2	3.0	1.0	5.0
FC5	0.3	1.0	1.5	0.8	1.1	3.0	1.0	5.0
FC6	0.1	0.3	1.5	0.6	0.8	3.0	1.0	5.0
FC7	<	0.1	1.5	0.6	0.6	3.0	1.0	5.0

Field Ditches

Type	Discharge (m3/sec)		Inside	Canal	Canal	Berm Width (m)	
	from	to	Slope 1:m	Base (m)	Height (m)	W1	W2
FD			1.5	0.6	0.5	1.0	1.0

Table F.32 Hydraulic Property of the Collectors

North Main Collector

Reach	Station No.		Distance	Discharge	Base	Hydraulic	Inside	Roughness	Velocity	Water
	from	to	(m)	(m³/sec)	Width (m)	Gradient I	Slope 1:m	Coefficient	(m/sec)	Depth (m)
1	0+00	54+00	5,400	1.63	1.50	0.00016	2.25	0.03	0.33	1.20
2	54+00	121+50	6,750	2.28	2.00	0.00025	2.25	0.03	0.42	1.18
3	121+50	168+89	4,739	3.12	2.00	0.00025	2.25	0.03	0.45	1.36
4	168+89	186+30	1,741	3.91	3.00	0.00025	2.25	0.03	0.50	1.31
5	186+30	214+00	2,770	4.98	4.00	0.00025	2.25	0.03	0.53	1.34
6	214+00	268+00	5,400	5.39	8.00	0.00010	2.25	0.03	0.34	1.40
7	268+00	290+44	2,244	6.31	8.00	0.00012	2.25	0.03	0.38	1.45
8	290+44	364+00	7,356	7.23	8.00	0.00012	2.25	0.03	0.40	1.57
9	364+00	435+46	7,146	9.21	12.00	0.00012	2.25	0.03	0.41	1.48
10	435+46	514+85	7,939	12.21	12.00	0.00029	2.25	0.0275	0.64	1.29
11	514+85	630+00	11,515	12.21	12.00	0.00020	2.25	0.0275	0.56	1.43
12	630+00	744+50	11,450	14.31	15.00	0.00010	2.25	0.0275	0.45	1.70
13	744+50	863+40	11,890	16.89	15.00	0.00012	2.25	0.0275	0.50	1.77
14	863+40	950+00	8,660	23.29	18.00	0.00012	2.25	0.0275	0.54	1.94
15	950+00	1025+20	7,520	26.74	18.00	0.00018	2.25	0.0275	0.65	1.87
16	1025+20	1119+00	9,380	29.82	18.00	0.00020	2.25	0.0275	0.69	1.93

South Main Collector

Reach	Station No.		Distance	Discharge	Base	Hydraulic	Inside	Roughness	Velocity	Water
	from	to	(m)	(m³/sec)	Width (m)	Gradient I	Slope 1:m	Coefficient	(m/sec)	Depth (m)
1	0+00	69+00	6,900	3.31	4.00	0.00025	2.25	0.03	0.44	1.14
2	69+00	170+22	10,122	6.40	6.00	0.00025	2.25	0.03	0.52	1.36
3	170+22	220+00	4,978	6.40	6.00	0.00020	2.25	0.03	0.48	1.45
4	220+00	274+00	5,400	7.55	8.00	0.00020	2.25	0.03	0.49	1.40
5	274+00	298+00	2,400	7.55	10.00	0.00015	2.25	0.03	0.43	1.36
6	298+00	317+14	1,914	8.56	10.00	0.00015	2.25	0.03	0.44	1.46
7	317+14	368+00	5,086	8.56	12.00	0.00010	2.25	0.03	0.37	1.49
8	368+00	402+00	3,400	9.22	12.00	0.00010	2.25	0.03	0.38	1.56
9	402+00	485+20	8,320	10.65	15.00	0.00010	2.25	0.0275	0.41	1.43
10	485+20	538+93	5,373	10.65	15.00	0.00010	2.25	0.0275	0.41	1.43
11	538+93	652+00	11,307	15.00	15.00	0.00012	2.25	0.0275	0.48	1.66
12	652+00	780+00	12,800	19.07	15.00	0.00025	2.25	0.0275	0.67	1.54
13	780+00	832+00	5,200	19.82	15.00	0.00025	2.25	0.0275	0.68	1.57
14	832+00	917+00	8,500	27.96	18.00	0.00025	2.25	0.0275	0.73	1.74
15	917+00	1058+00	14,100	31.07	24.00	0.00013	2.25	0.0275	0.57	1.92
16	1058+00	1297+00	23,900	34.11	24.00	0.00013	2.25	0.0275	0.59	2.02
17	1297+00	1348+00	5,100	63.93	24.00	0.00010	3.50	0.0275	0.62	2.98
18	1348+00	1408+00	6,000	68.93	24.00	0.00010	3.50	0.0275	0.64	3.10
19	1408+00	1496+00	8,800	74.33	24.00	0.00010	3.50	0.0275	0.65	3.23

Table F.33 Salient Features of Collectors

Inter-farm/On-farm Collectors

Type	Discharge (m³/sec)		Inside	Canal	O&M Road
	from	to	Slope 1:m	Base (m)	Width(m)
D1	6.0	<	2.25	4.0	6.0
D2	4.0	6.0	2.25	3.0	6.0
D3	1.6	4.0	2.25	2.0	6.0
D4	1.5	1.6	2.00	1.5	6.0
D5	1.0	1.5	2.00	1.0	6.0
D6	0.5	1.0	2.00	0.8	6.0
D7	<	0.5	2.00	0.6	6.0

Field Collectors

Type	Discharge (m³/sec)		Inside	Canal	O&M Road
	from	to	Slope 1:m	Base (m)	Width(m)
D6	0.5	1.0	2.00	0.8	5.0
D7	<	0.5	2.00	0.6	5.0

Field Drains

Type	Discharge (m³/sec)		Inside	Canal
	from	to	Slope 1:m	Base (m)
FDD			1.5	0.6

Table F.34 Suspended Materials Quantity Flow to the Left Main Canal

Intake Volume and Sediment Concentration

Month	Discharge MCM	Concentration gr/litre Particle Size in mm			
		Total	2.0~0.25	0.25~0.1	< 0.10
April	140.1	0.164761209	9.45898E-05	0.001281459	0.16338516
May	465.4	0.225208654	0.000213406	0.002295808	0.222699441
June	468.6	0.127534408	8.08163E-05	0.001033693	0.126419898
July	449.0	0.086229879	3.35333E-05	0.000530411	0.085665934
August	275.3	0.039230013	1.64323E-06	6.88154E-05	0.039159554
September	0.2	0.010082378	0	4.35338E-07	0.010081942

Sediment Load

	Weight in kg Particle Size in mm				Volume in m^3 Particle Size in mm			
	Total	2.0~0.25	0.25~0.1	< 0.10	Total	2.0~0.25	0.25~0.1	< 0.10
April	23,083,045	13,252	179,532	22,890,261	12,278.22	7.05	95.50	12,175.67
May	104,812,108	99,319	1,068,469	103,644,320	55,751.12	52.83	568.33	55,129.96
June	59,762,624	37,871	484,389	59,240,364	31,788.63	20.14	257.65	31,510.83
July	38,717,216	15,056	238,155	38,464,005	20,594.26	8.01	126.68	20,459.58
August	10,800,022	452	18,945	10,780,625	5,744.69	0.24	10.08	5,734.38
September	2,016	0	0	2,016	1.07	0.00	0.00	1.07
Total	237,177,031	165,950	1,989,490	235,021,591	126,158.00	88.27	1,058.24	125,011.48