Ministry of Public Works and
Housing of Republic of Indonesia

DETAILED ENGINEERING DESIGN REPORT

REPORT 22

Accelerating Infrastructure Delivery through Better Engineering Services Project (ESP)

Project Preparation Consultant (PPC) Firm for Development of the Way Sekampung Irrigation System in Lampung, Sumatera Island

egis eau *in joint venture with* KWARSA HEXAGON PT. TATA GUNA PATRIA CONSULTANT PERANCANG ADHINUSA

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ABBREVIATIONS AND TERMINOLOGY

	English	Indonesian
ADB	Asian Development Bank	Bank Pembangunan Asia
AKNOP	Real Need Operation and Maintenance Figures	Angka Kebutuhan Nyata Operasi dan Pemeliharaan
AMDAL	Environmental Impact Assessment	Analisis Mengenai Dampak Lingkungan Hidup
ANDAL	Environmental Impact Analysis	Analisis Dampak Lingkungan Hidup
APW	Agency of Public Works	Dinas Pekerjaan Umum
ASN	State Civil Apparatus	Aparatur Sipil Negara
AWRM	Agency of Water Resource Management	Dinas Pengairan
AWRM	Agency of Water Resource Management	Dinas Pengairan
BAPPEDA	Regional Development Planning Agency	Badan Perencanaan Pembangunan Daerah
BAPPENAS	National Planning and Development Agency	Badan Perencanaan Pembangunan Nasional
BBWS	River Basin Management Organisation	Balai Besar Wilayah Sungai
BIG	Geospatial Information Agency	Badan Informasi Geospasial
BM	Bench Mark	Patok Penanda
BPS	Central Bureau of Statistics	Badan Pusat Statistik
BSN	National Standarisation Agency	Badan Standarisasi Nasional
CSRT	High Resolution Satellite Image	Citra Satelit Resolusi Tinggi
DAK	Special Allocation Fund	Dana Alokasi Khusus
DAK	Special Allocation Fund	Dana Alokasi Khusus
DCPT	Dutch Cone Penetration Test	Uji Sondir
DED	Detailed Engineering Design	Desain Rinci/Gambar Kerja/Gambar Detail
DELH	Environmental Evaluation Document	Dokumen Evaluasi Lingkungan Hidup
DGFC	Directorate General of Food Crops	Direktorat Jenderal Pertanian Tanaman Pangan
DGWR	Directorate General of Water Resources	Direktorat Jenderal Sumber Daya Air
DIL	Directorate of Irrigation and Lowland	Direktorat Irigasi dan Rawa
DIPA	Entry List of Implementation Budget	Daftar Isian Pelaksanaan Anggaran
DOMD	Directorate of Operational & Maintenance Development	Direktorat Bina Operasi dan Pemeliharaan
DOMD	Directorate of Operational & Maintenance Development	Direktorat Bina Operasi dan Pemeliharaan
DPH	Hypothetical Significant Impact	Dampak Penting Hipotetik
DPLH	Environmental Management Document	Dokumen Pengelolaan Lingkungan Hidup
DWRM	Directorate of Water Resources Management	Direktorat Bina Penatagunaan Sumber Daya Air
DWRM	Directorate of Water Resources Management	Direktorat Bina Penatagunaan Sumber Daya Air
DWRND	Directorate of Water Resources Network Development	Direktorat Pengembangan Jaringan Sumber Daya Air
EA	Executing Agency	Instansi Pelaksana
EFA	Economic and Financial Analysis	Analisa Ekonomi dan Keuangan

	English	Indonesian
EGIS	EGIS EAU	EGIS EAU
EIA	Environmental Impact Assessment	Analisis Dampak Lingkungan Hidup
EIRR	Economic Internal Rate of Return	Tingkat Pengembalian Internal Ekonomi
ELM	Elementary	
EOCC	Economic Opportunity Cost of Capital	Biaya Peluang Ekonomi Modal
ESP	Engineering Services Projects	Proyek Jasa Rekayasa
GCC	General Conditions of Contract	Ketentuan Umum Kontrak
GDEM	Global Digital Elevation Map	Peta Global Elevasi Digital
GKG	Milled Dry Grain	
GOI	Government of Indonesia	Pemerintah Indonesia
GP3A	Water User Farmers Association	Gabungan Perkumpulan Petani Pemakai Air
HDI	Human Development Index	Indeks Pembangunan Manusia
HSWRMA	Human Settlement and Water Resources Management Agency	Dinas Pekerjaan Umum dan Pengelolaan Sumber Daya Air
IC	Irrigation Commission	Komisi Irigasi
IC	Irrigation Commission	Komisi Irigasi
IDR	Indonesian Rupiah	Rupiah Indonesia
IEE	Initial Environmental Examination	Kajian Lingkungan Hidup Awal
IMP	Irrigation Management Plan	Rencana Pengelolaan Irigasi
IMP	Irrigation Management Plan	Rencana Pengelolaan Irigasi
IOL	Inventory of Losses	Daftar Kehilangan Aset
IP	Indigenous Peoples	Masyarakat Adat
IPP	Indigenous Peoples Plan	Rencana Penanganan Masyarakat Adat
IR	Involuntary Resettlement	Pemindahan Penduduk Tidak Suka Rela
ITB	Bandung Institute of Technology	Institut Teknologi Bandung
JV	Joint Venture	Bekerja sama
KA-ANDAL	Terms of Reference for Environmental Impact Analysis	Kerangka Acuan Analisis Dampak Lingkungan Hidup
KEPRES	Presidential Statement	Keputusan Presiden
KESDM	Ministry of Energy and Natural Resources	Kementerian Energi dan Sumberdaya Mineral
KH	PT Kwarsa Hexagon	PT Kwarsa Hexagon
KP	Design Criteria	Kriteria Perencanaan
KPSPI	Committee of Indonesian Appraisal Standards Development	Komite Penyusun Standar Penilaian Indonesia
KRB	Disaster Prone Area	Kawasan Rawan Bencana
LA	Loan Agreement	Perjanjian Pinjaman
LARP	Land Acquisition and Resettlement Plan	Rencana Pembebasan Lahan dan Pemukiman Kembali
LGWP	Local Government Work Plans	Rencana Kerja Pemerintah Daerah (RKPD)

	English	Indonesian
LiDAR	Light Detection and Ranging	Metode Inderaja Menggunakan Pulsa Laser
MAPPI	Indonesian Professional Appraiser Society	Masyarakat Profesi Penilai Indonesia
MMI	Modified Mercalli Intensity	Skala Modifikasi Intensitas Mercalli
MOA	Ministry of Agriculture	Kementerian Pertanian
MOU	Memorandum of Understanding	Nota Kesepahaman
MPWH	Ministry of Public Works and Housing	Kementerian Pekerjaan Umum dan Perumahan Rakyat
MSOHS	Management System of Occupational Health and Safety	Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3)
NSCWR	National Steering Committee for Water Resources	Komite Pengarah Nasional untuk Sumber Daya Air
NWRC	National Water Resources Council	Dewan Sumber Daya Air Nasional
O&M	Operation and Maintenance	Operasi dan Pemeliharaan
P2D2	Regional Government Loans and Decentralization	Pinjaman Pemerintah Daerah dan Desentralisasi
PA	PT Perancang Adhinusa	PT Perancang Adhinusa
PAI	Irrigation Asset Management System	Pengelolaan Aset Irigasi
PAI	Irrigation Asset Management System	Pengelolaan Aset Irigasi
PAM	Project Administration Manual	Manual Administrasi Proyek
PERMENTAN	Ministry of Agriculture Regulation	Peraturan Menteri Pertanian
PLTA	Hydro power plant	Pembangkit Listrik Tenaga Air
PPA	Gate keeper	Petugas Pintu Air
PPC	Project Preparation Consultant	Konsultan Persiapan Proyek
PPK	Commitment Officer	Pejabat Pembuat Komitmen
PPMB	Research Centre for Disaster Mitigation	Pusat Penelitian Mitigasi dan Bencana
PPPK	Government's Employee with Work Agreement	Pegawai Pemerintah dengan Perjanjian Kerja
PPSIP	Development and Participatory Irrigation Management Systems	Pengembangan dan Pengelolaan Sistem Irigasi Partisipatif
PSG	Geological Survey Institute	Pusat Survey Geologi
PT PLN	Electricity State Own Company	Perseroan Terbatas Perusahaan Listrik Negara
PUSKIM	Central of Housing and Settlement Research	Pusat Penelitian Perumahan dan Pemukiman
PVMBG	Central of Volcanology and Geological Hazard Mitigation	Pusat Vulkanologi Mitigasi dan Bencana Geologi
PWRC	Provincial Water Resources Council	Dewan Sumber Daya Air Provinsi
PWRC	Provincial Water Resources Council	Dewan Sumber Daya Air Provinsi
RBI	Indonesia Topographic Map	Rupa Bumi Indonesia
RKL	Environmental Management Plan and	Rencana Pengelolaan Lingkungan Hidup dan
RPJMD	Provincial Medium-Term Development Plan	Rencana Pembangunan Jangka Menengah Daerah

	English	Indonesian
RPL	Environmental Monitoring Plan	Rencana Pemantauan Lingkungan Hidup
SATKER	Work Unit	Satuan Kerja
SCC	Special Conditions of Contract	Ketentuan Khusus Kontrak
SES	Socio Economic Survey	Survei Sosial Ekonomi
SNI	Indonesian National Standard	Standar Nasional Indonesia
SNVT	Certain Non-Vertical Work Unit	Satuan Kerja Non Vertikal Tertentu
SPI	Indonesian Appraisal Standard	Standar Penilaian Indonesia
SPPL	Statement Letter of Ability on Environmental Management and Monitoring	Surat Pernyataan Kesanggupan Pengelolaan dan Pemantauan Lingkungan Hidup
SPS	Safeguard Policy Statement	Pernyataan Kebijakan Perlindungan Sosial
SPT	Standard Penetration Test	Uji Penetrasi Standar
SRI	System of Rice Intensification	Sistem Intensifikasi Padi
TGP	PT Tata Guna Patria	PT Tata Guna Patria
TOR	Terms of Reference	Kerangka acuan
ToT	Trainer of Trainers	Pelatih
TP OP	Co-Administration Task	Tugas Perbantuan Operasi dan Pemeliharaan (TP OP)
UKL	Environmental Management Measures	Upaya Pengelolaan Lingkungan Hidup
UPIM	Modern Irrigation Management Unit	Unit Pengelola Irigasi Modern
UPL	Environmental Monitoring Measures	Upaya Pemantauan Lingkungan Hidup
UPT/D	Technical Implementation Service Unit	Unit Pelaksana Teknis/Daerah
UPTD BPSDA Wilayah II	Regional Technical Implementation Unit Region II Seputih Sekampung	Unit Pelaksanan Teknis Daerah Balai Pengelolaan Sumber Daya Air Wilayah II
UU	Law	Undang-Undang
UUD	Constitution	Undang-undang Dasar
VAT	Value Added Tax	Pajak Pertambahan Nilai
WRMCT	Water Resources Management Coordination Team	Tim Koordinasi Pengelola Sumber Daya Air (TKPSDA)
WUA	Water Users Association	Asosiasi Pengguna Air
WUAA	Water Users Association Apex	Apex Asosiasi Pengguna Air
WUAF	Water Users Association Federation	Federasi Asosiasi Pengguna Air

1 - INTRODUCTION

The Way Sekampung Irrigation System is one of several irrigation areas designated by the Director General of Water Resources, Ministry of Public Works and Public Housing, for modernization, which is a national program including six other irrigation areas under the authority of the Central Government. To achieve the set target, the Government of Indonesia uses ADB Loan 3455-INO: Accelerating Infrastructure Delivery through Better Engineering Services Project (ESP) or Accelerated Provision of Irrigation Infrastructure through Better Technical Services Project to carry out preparatory activities for infrastructure projects involving technical assistance.

1.1 - Project Description

The Way Sekampung Irrigation System with a service area of 54,000 ha is under the authority of the Central Government through the Mesuji Sekampung River Basin Center (BBWS). The Way Sekampung Irrigation Project Proposal covers the downstream development area of Way Sekampung, about 80 km from Bandar Lampung, the capital of Lampung province. The area stretches along East Lampung Regency, Central Lampung Regency to Metro City.

Currently, there are several cropping pattern systems established in the Way Sekampung Irrigation System:

- Plant rice twice including in the Rendeng period (from November to April, depending on the water group), and in the Gadu period (from May to October)
- Plant rice twice by planting corn in the dry season – as found in some areas with special soil types
- Plant rice once or twice by planting corn in the dry season, in a small part of the paddy field.

The cropping pattern above reveals that the Way Sekampung Irrigation System has a structured cropping pattern, namely planting rice twice with a small portion of the area used for cultivating other crops.

THE AVERAGE PLANTING INTENSITY FROM 2016 TO 2019 WAS 183%.

Market access to agricultural products is considered adequate because of the availability of roads and markets near Metro City and Bandar Lampung City.

Based on the 2015 Irrigation Modernization Readiness Index study, the performance of Way Sekampung Irrigation Area can be seen in Table 1-1:

TABLE 1-1 STUDY OF READINESS INDEX FOR THE WAY SEKAMPUNG IRRIGATION MODERNIZATION

No	Indicator	Weight	High	Assessment	IKMI
1	Water Quality	20	81	Sufficient	16
2	Irrigation Infrastructure	25	84	Proper	21
3	Management	15	72	Sufficient	11
4	Institution	20	68	Sufficient	14
5	Human Resources	20	66	Sufficient	13
			IKMI Score		75

Source: IKMI Study, 2015

The results of the IKMI study shows the needs for the following:

- Detailed analysis of water availability, water demand and water balance in the context of modernizing the irrigation system.
- Planning to improve irrigation infrastructure, main Structures, primary, secondary and tertiary canals, waterways and other facilities. The improvement of sluices as part of modernization includes electromechanical and automatic sluice gates, if it is appropriate.

- Planning facilities and completeness of irrigation operations: observer officers and operating rooms, offices and warehouses, inspection roads and rice field roads, communication systems, transportation facilities, operational and maintenance equipment, and safety facilities.

The modernization of the management of the Way Sekampung Irrigation System is designed to address the aforementioned issues by providing solutions and approaches based on the current regulations regarding irrigation system management. In general, modernization is an adaptation of systems management and infrastructure to the environmental change, the needs and requirements of irrigation services, and watering. To improve the existing system management so that it is able to meet the demands of the new irrigation needs, a gradual process is required, including the need for changes to management and operating procedures, the current institutional and legal framework as well as facilities and infrastructure. The modernization of the Way Sekampung Irrigation System is needed for a number of areas:

- Development of institutional arrangements, governance structures and human resources in order to establish a participatory irrigation system management in the context of an approach to river basin management;
- Aspects of regulation and procedures for calculating, allocating, distributing and flowing water as well as proper water-carrying canals and their monitoring need to be considered in the context of climate change and land use change.

1.2 - Project Objective and Intention

1.2.1 - Project Objective

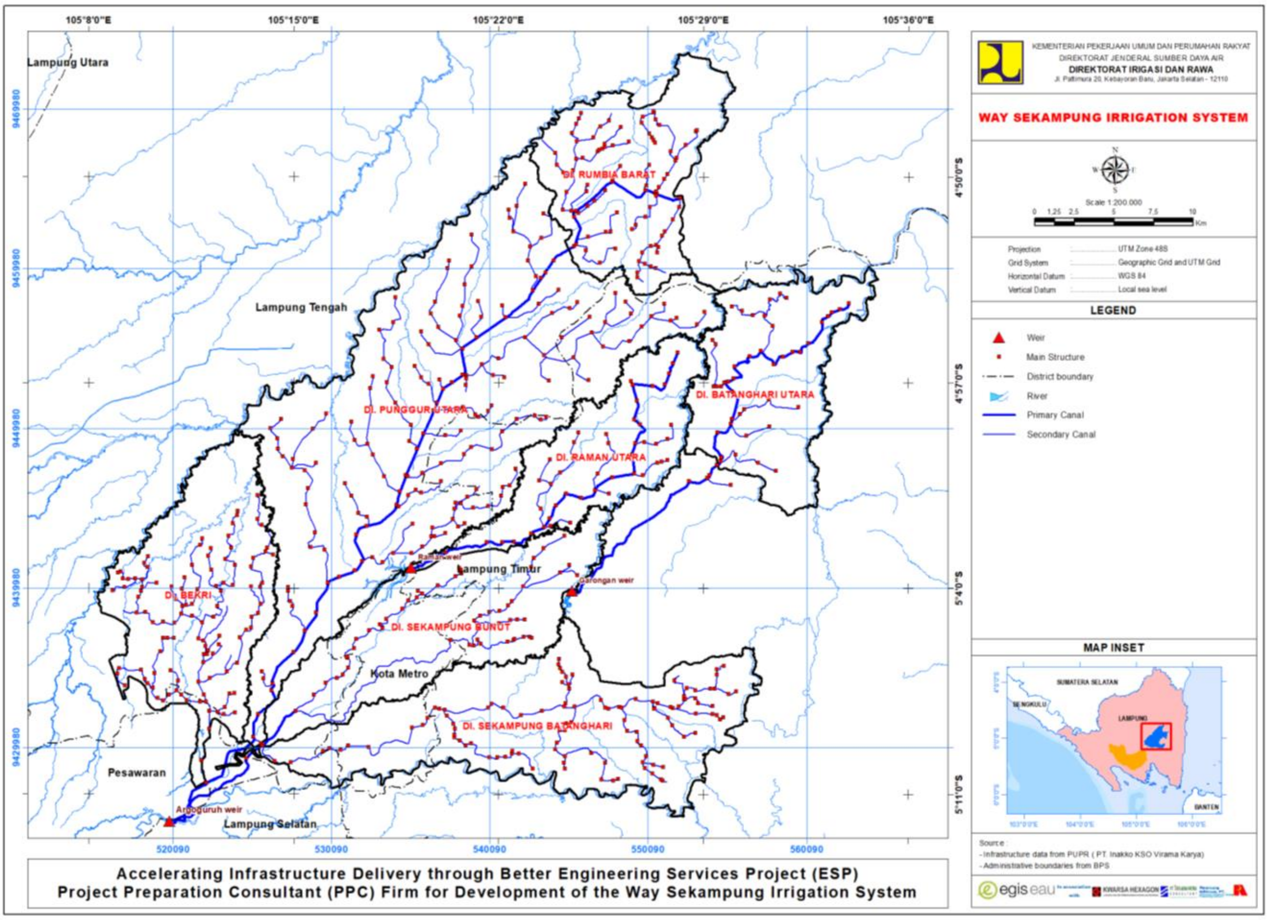
The consultant service project is intended to assist the Directorate General of Water Resources, Ministry of Public Works and Public Housing, through the development of the modernization plan for the institutional arrangement, management and infrastructure of the Way Sekampung Irrigation System, using the latest technical modernization guidelines with five pillars towards the modernization of the irrigation system through 45 steps.

1.2.2 - Project Intention

The main intention of consulting services is to help the Client develop a detailed plan for the modernization of the Way Sekampung irrigation system, including water availability in the irrigation system, complete water management process, institutional development of management, and development of infrastructure, facilities, management information and decision-making support system in accordance with the technical guidelines of irrigation system modernization. Project services include the preparation of:

- **Master Plan** for Irrigation Modernization (Irrigation System Assessment);
- **Feasibility Study** (Irrigation System Plan); and
- **Action Plan** for Implementation of the Way Sekampung Irrigation Modernization. The irrigation modernization action plan consists of water management plan, institutional development plan, human capital development plan, and water availability study, detailed engineering design for infrastructure, environmental impact assessment document, land acquisition and resettlement report.

FIGURE 1-1 REVIEW OF SUB-SYSTEMS IN WAY SEKAMPUNG IRRIGATION



After completing the tender process, the work contract of Consultant Services was signed on 1 March 2019, based on Contract Number KU.02.10/Ai/III/10, between the Directorate of Irrigation and Lowland, Directorate General of Water Resources, Ministry of Public Works and Public Housing (PUPR) with EGIS Eau-International in collaboration with PT. Kwarsa Hexagon, PT. Tara Guna Patria and PT. Adhinusa Designer, for the Construction of the Way Sekampung Irrigation System in Lampung, Sumatra, Indonesia. The Directorate of Irrigation and Lowland had issued a Notice to Proceed with Reference Number 40/ESP Way Sekampung/SPMK/SKDIR/III/2019, to Egis Eau, dated 21 March 2019, and the Project Preparation Consultant (PPC) for the Way Sekampung Irrigation System had started in March-April 2019.

The first version of the Master Plan (Irrigation System Assessment) was submitted in November 2019 and updated based on responses from clients (January 2020) and BBWS (July/August 2020). The Feasibility Study Report (Irrigation System Plan) is an intermediate Work Results report that is prepared before the Action Plan and DED, or decided as a precursor to the preparation of tender documents. The Feasibility Study Report (Irrigation System Plan) consists of six interrelated volumes:

- Volume 1, Water Availability Study
- Volume II, Water Management Plan
- Volume III, Institutional Development Plan,
- Volume IV, Infrastructure Development Plan
- Volume V, Community Development Plan
- Volume VI, Irrigation System Modernization Plan

The purpose of preparing the Irrigation Modernization System Plan is to help the Ministry of Public Works and Public Housing develops a detailed plan for the modernization of the Way Sekampung Irrigation System. The Infrastructure Development Plan is an integral part of the Feasibility Study providing guidance on design alternatives in order to lead to the preparation of a Detailed Engineering Design (DED) and the preparation of tender documents. This plan is related to Pillar 2 Description of Irrigation Modernization, Attachment 4, Circular Letter of the Director General of Water Resources No. 01/SE/D/2019 concerning Technical Guidelines for Irrigation Modernization.

The Modernization of the Way Sekampung Irrigation System was stipulated in the Circular Letter of the Director General of Water Resources *No. 01/SE/D/2019 concerning Technical Guidelines for Irrigation Modernization*. Attachment 4 of the Circular Letter explains the 5 Pillars of Irrigation Modernization, namely Water Availability, Irrigation Infrastructure, Water Management, Irrigation Institutions and Human Resources.

1.2.3 - Action Plan for Implementation of the Way Sekampung Irrigation Modernization

Based on the irrigation modernization system plan, the irrigation modernization action plan consists of water management plan, institutional development plan, human capital development plan and water availability, Infrastructure DED, Environmental Impact Assessment Document, Land Acquisition and Resettlement Plan.

a. **Detailed Engineering Design** (DED) is based on the options selected from the Irrigation Modernization System Plan and the Infrastructure Development Plan, and it follows the principles of modernization-based irrigation system planning. In the process of preparing this detailed technical plan (DED), irrigation standards are applied, especially the Indonesian Irrigation Planning Standard and other standards. Its activities include:
   i. Supervision of topography survey in 54,000 ha irrigation area using LiDAR and geotechnical and geology research
   ii. Detailed engineering design (DED) of irrigation and drainage canals as well as related Structures;
   iii. Quantity calculation and cost estimation;
   iv. Preparation of work methods, schedules and cost estimates;
   v. Preparation of general and technical specifications;
   vi. Preparation of tender documents for civil works contracts.

b. The **Environmental Impact Assessment** document comprises an analysis of environmental impacts based on applicable regulations in Indonesia such as AMDAL, UPL/UKL, SPPL and other documents (as required), and refers to the basic design of the DED. The need of the preparation of this document is based on the basic design criteria of the DED. Prior to preparing the DED, the consultant will: (1) develop a categorization in accordance with Indonesian regulations and the ADB Safeguard Policy Statement (2009); (ii) compile environmental impact assessment(AMDAL), and/or environmental monitoring/management efforts (UPL/UKL) depending on the potential environmental impacts that will be generated; (iii) support the AMDAL or UPL/UKL approval process from ADB and the government.

c. The **Land Acquisition and Resettlement Plan** is implemented in accordance with the land acquisition plan based on Indonesian regulations and ADB's Safeguard Policy Statement (SPS) 2009. Before preparing the DED, the consultant will: (i) compile a categorization in accordance with ADB's Safeguard Policy Statement (2009) and Indonesian government regulations; (ii) prepare socio-economic surveys and consultations; (iii) develop a land acquisition and resettlement plan (LARP) in accordance with ADB's Safeguard Policy Statement (2009) and Indonesian government regulations, including preparing cost estimates to ensure in which appropriate measures are implemented regarding the mitigation of negative social impacts that may arise, and special attention is given to vulnerable groups and project-affected communities; (iv) coordinate with local governments regarding the preparation of livelihood recovery programs, if necessary; and (v) support the implementing agencies in obtaining location permits and in implementing the LARP until compensation is paid.

Ensuring that all project activities comply with the applicable regulatory framework in Indonesia, e.g. enumeration of the number of project-affected communities based on detailed project plans, and conducting socio-economic surveys include:

i. Resettlement plan;
ii. Compensation for both land and non-land assets along with the budget for social security activities;
iii. A relocation strategy that takes into account the current social, economic and cultural parameters for both project-affected communities and other local residents;
iv. Community livelihood restoration program plan;
v. Schedule of LARP or IPP or SIMP activities and their implementation, as well as alignment of project civil works schedule.

d. **Capacity Structure training** concerns social security and asset transfer along with monitoring and coordinating these social security activities;

1.3.Scope of Report

This document comprise the main DED report (Report Number 22), according to TOR, it is an integral part of the supporting reports that must be submitted number 17 to 21. The DED study report consists of 10 reports as mentioned in Table 1-2.

TABLE 1-2 THE OVERVIEW OF THE SCOPE OF THE FEASIBILITY STUDY STAGE REPORT

No	Report Description	Plan (week)
17	**Geotechnical Report** consists of: a) Geotechnical reports on designs of weir, irrigation and drainage structures b) Report on geological information of the project area through field inspections, mapping and reports c) Report on existing data, and identification of additional data required d) Report on potential sources of construction materials and their suitable locations and how to dispose of excavated soil; e) Geotechnical research reports and related laboratory work; f) Report on interpretation and recording of data from geotechnical research results and laboratory test to obtain information supporting the preparation of the design.	42
18 19	**Biological and Chemical Environment Reports** are based on Special TOR prepared by consultant as referred to in paragraph 3.6.2. item 21). **Irrigation Operation and Maintenance Management** Report contents include but are not limited to:	42 46
	a) Report on the existing O&M guidelines and PPSIP changes (if necessary); b) Report on the results of the field evaluation of current O&M activities and implementation procedures by service staff; c) Report on operation and maintenance schedule; d) Report on guide for sluice gate operation related to river flow and the water level of the river to prevent flooding and destroy the river; e) Report on irrigation system operation manual to ensure water is properly distributed as needed; f) Report on the maintenance of irrigation canals and related Structures; g) Report on the O&M cost for short and long term; h) Irrigation system performance monitoring framework.	

No	Report Description	Plan (week)
20	**Environmental Impact Assessment Report** The Environmental Impact Assessment Report is prepared based on a special TOR prepared by the consultant as referred to in paragraph 3.6.2 point 14).	52
21	**Report on Social Security and Land Acquisition and Resettlement** Report contents include but are not limited to:	56
	i. Report on the categorization in accordance with the *ADB Safeguard Policy Statement* (2009) and government regulations;	
	ii. Project screening report to determine the impact of land acquisition activities and land acquisition and resettlement (LAR) and indigenous peoples (IP)	
	iii. Land Acquisition and Resettlement Plan Report (LARP) According to ADB Safeguards Policy Statement (2009) and government regulations Including the preparation of cost estimates to ensure proper steps are taken in the context of mitigating negative social impacts and special attention to vulnerable groups and project-affected Communities;	
	iv. Coordination report with local government Related to the preparation of livelihood recovery programs, if necessary;	
	v. Enumeration reports/IOL is the rightful parties/communities affected by the project (EP/AP) and their project impacts (EP/AP) and their losses (objects of land acquisition or perceived impacts); Conducting socio-economic survey (SES) of EP/AP, including vulnerable groups and the most affected EPs/Aps.	
	vi. Socio-Economic Report includes: a) Resettlement plan; b) Compensation costs for land and non-land assets along with the budget for social security Activities; c) Relocation strategy by taking into account the existing social, economic and cultural parameters for both the affected community and other local communities; d) Designing livelihood restoration programs; e) Schedule of LARP or IPP or SIMP activities and their implementation, as well as alignment of project civil works schedules; f) Capacity Structure training related to social security and asset transfer as well as monitoring and coordination of these social security activities.	
22	**DED Report**: This report is based on options selected from the Irrigation Modernization System Plan and the Infrastructure Development Plan and follows the principles of modernization-based irrigation system planning. In the process of preparing this detailed technical plan (DED), irrigation standards are applied, especially the Indonesian Irrigation Planning Standard and other standards. Activities include: a) Supervision of topographic surveys in irrigation areas covering an area of 54,000 ha using LiDAR14 and geotechnical and geological research; b) Detailed engineering design (DED) of irrigation and drainage canals and related Structures; c) Calculation of the amount and estimated cost; d) Preparation of work methods, schedules and cost estimates; e) Preparation of general and technical specifications for the preparation of tender documents for civil works contracts f) Construction design drawings both in softcopy and in print in A3 format.	66

No	Report Description	Plan (week)
23	**Structural Design Report**. The report contents include but are not limited to: a) Structure plan report using situation map; b) Irrigation and drainage Structure design report; c) Report on the source of Structure materials (quarry) for material procurement and conduct research and surveys required to ensure compliance with the specified quality and quantity d) Design drawings including detailed descriptions, dimensions and other required information e) Reports on technical specifications.	66
24	**Hydro Mechanical Report** consists of: Reports on the status and condition of all mechanical components of weirs and irrigation and drainage structures.	66
25	**SCADA system report.** The report contents include but are not limited to: a) Information technology technical design, DSS consisting of selection of SCADA facilities, field measurement instrumentation, display devices, database servers, internet network devices, printer equipment and transmission technology equipment to be used including irrigation databases, complete with analysis of various technical and commercial options; b) Technical tools for matters related to DSS, SCADA and control systems and c) Specification of tender documents according to ADB's guidelines on public procurement of SCADA equipment.	66
26	**Procurement and Quantity Report** consists of: a) TOR Collection Report prepared by relevant experts and the preparation of tender documents for sub-consultants for topographic surveys, geotechnical investigations and laboratory tests, b) Technical specification report prepared by the design team and the preparation of civil works contract tender documents, basic price surveys, materials and energy materials and equipment, calculation of the volume of construction work c) Report on the estimated cost of the construction phase as well as maintenance and construction work schedule.	74

This document, which is the main report of the DED study, contains the following chapters as listed in the Table of Contents as directed by ADB:

1. INTRODUCTION, containing the project description and explaining the purpose and objectives of the project. And the scope of this report
2. IMPLEMENTATION OF TOPOGRAPHIC SURVEYS, describing the topography and other surveys carried out
3. GEOTECHNICAL AND GEOLOGICAL INVESTIGATIONS, describing the geotechnical and geological causes and analyzing the data collected for the stability of structures and canals.
4. STUDY OF HYDROLOGICAL AND HYDRODYNAMIC MODEL, describing the collection and analysis of hydrological data, analysis of water availability and hydrodynamic modeling carried out.
5. DETAILS OF IRRIGATION DESIGN AND OTHER SUPPORTING STRUCTURES, describing the detailed technical design of irrigation Structures and canals from water availability, existing situation to irrigation system planning and detailed design.
6. CONSTRUCTION METHODOLOGY, WORK IMPLEMENTATION SCHEDULE AND CONSTRUCTION COSTS, describing the work method to be used, the planned implementation schedule of the work and the estimated cost of each stage and irrigation scheme.
7. PREPARATION OF AUCTION DOCUMENTS AND TECHNICAL SPECIFICATIONS, describing the required tender documents.
8. OPERATION AND MAINTENANCE MANUAL, describing how the operation of the irrigation system should be carried out and how maintenance should be organized and carried out.

9. INSTITUTIONAL & HUMAN RESOURCES: Additional chapter intended to address human resource development needs.

2 - IMPLEMENTATION OF TOPOGRAPHIC SURVEY

2.1 - Topographic Survey

In the implementation of irrigation modernization, one of the pillars concerns the issue of good infrastructure. Therefore, clear, precise and thorough information is needed regarding the description of the existing irrigation infrastructure, including the primary and secondary canals as well as the existing Structures along the canal. To achieve this, it is necessary to measure the work of measuring primary and secondary irrigation canals along with the existing Structures along the canal, and this is manifested in the work of Topographic Surveys and Mapping on the Way Sekampung Irrigation System and Topographic Measurements of the Sediment Trap Planned Locations at the Downstream of Argoguruh Weir, Lampung Province. The measurements are made using the applicable national reference and projection system, so that the final result of this work will be in line with the One Map Policy.

To support the work that is the responsibility of PPC ESP Way Sekampung, it is necessary to provide data containing topographic information and section of the existing canal. Therefore, PPC ESP Way Sekampung is delegating work carried out by third parties, namely the Topographic Survey and Mapping Work on the Way Sekampung Irrigation System carried out by PT. Amythas with Contract Number: 001/KK/PS-SS/ESPSWS/I/2020 dated 2 January 2020 and the work on Topographic Measurement of the Sediment Trap Planned Location in the Lower Argoguruh Weir, Lampung Province is carried out by PT Rekadaya Sentosa with Contract Number: 01/KK/PS-ST/ESPWS/IX/2020 dated 21 September 2020. From these activities, the PPC ESP Way Sekampung team has carried out their duties as a supervisory function during the work.

The Topographic Survey and Mapping work on the Way Sekampung irrigation system and the Topographic Measurement of the Sediment Trap Planned Location in the Downstream of Argoguruh Weir, Lampung Province, intend to collect and retrieve the latest data and provide complete and thorough information about the area being the object of the work.

The purpose of this work is to provide accurate geospatial data and information from measurement, processing and analysis of data containing spatial data in the form of horizontal and vertical positions of primary and secondary canals as well as Structures along the canal and plans for the location of Sediment Trap Structures presented in the form of maps and drawings in order to support the next stage of irrigation modernization work, especially in the infrastructure section.

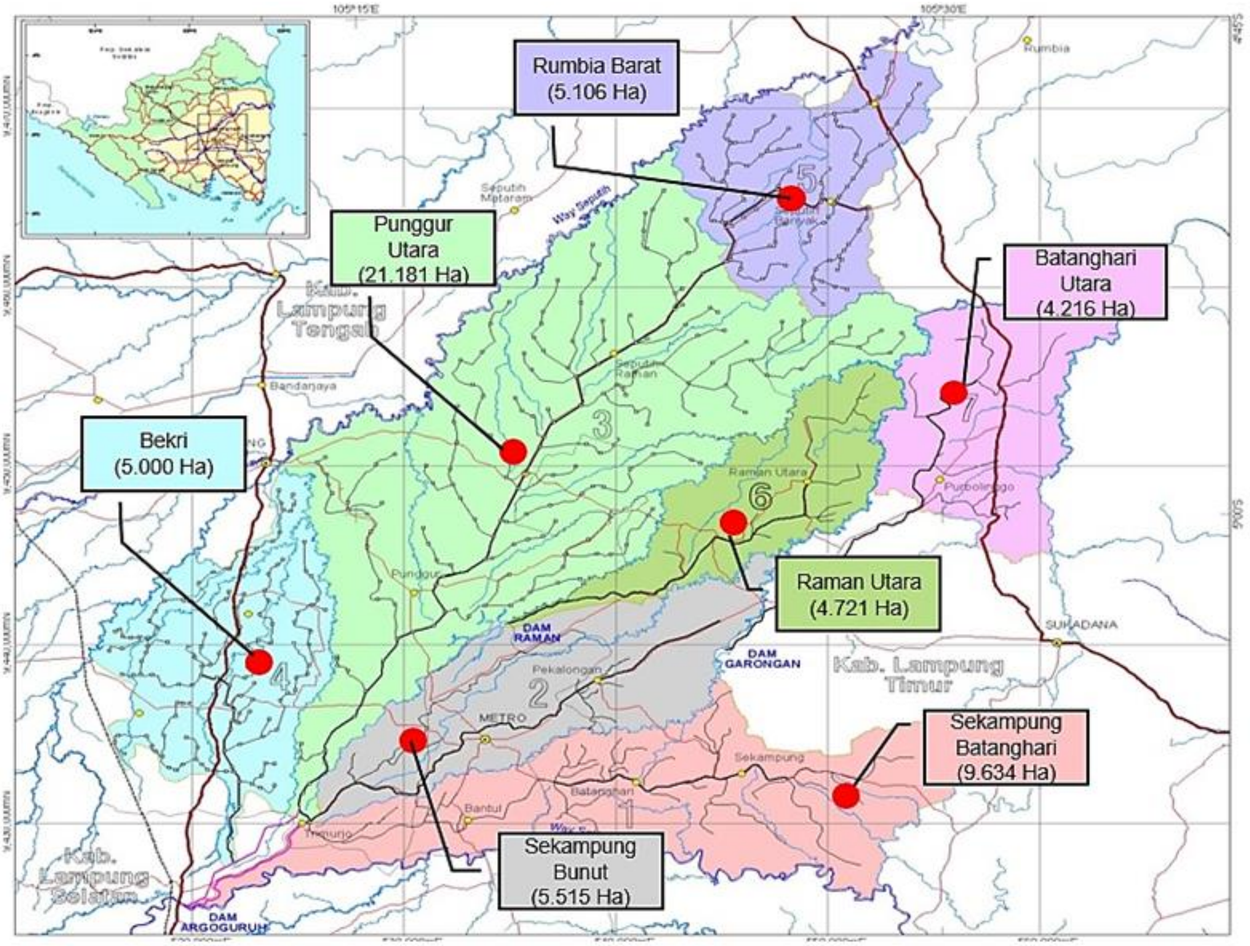
2.2 - Scope of Work

The scope of survey work carried out is as follows:

- Topographic Survey and Mapping on the Way Sekampung Irrigation System, this work has the following scopes:
  - Ground Control Points (GCP), including 292 Benchmarks and 292 Control Points.
  - Measurement of longitudinal cross-sections and cross-sections of primary and secondary irrigation canals with a horizontal scale of 1: 2,000 and a vertical scale of 1: 200 for approximately 669 km, checking the horizontal and vertical control framework of primary and secondary canals in the Batanghari Utara Irrigation Area of approximately 61 km, and measuring a 50 meter long canal from the tapping Structure to the tertiary plot, in carrying out the strip survey measurement, the surveyor will follow the path stated in the base map issued by BIG as attached.
  - Measurements of existing Structures along the primary and secondary canals are approximately 2,500 units. With a scale of 1: 200 or 1: 500 according to the area of the Structure being measured.

- Topographical Measurement of the Sediment Trap Planned Location in the Downstream of Argoguruh Weir, Lampung Province, this work has the following scopes:
  - Situation Mapping with a scale of 1:2,000, covering an area of approximately 35 Ha.
  - Measurement of longitudinal section with a scale of 1:2,000 for horizontal and 1:200 for vertical scale and cross section of Feeder Canal 1, Feeder Canal 2 and Way Sekampung River with a scale of 1: 200 for horizontal scale and vertical scale which are in the situation area.

FIGURE 2-1 TOTAL AREA OF WAY SEKAMPUNG IRRIGATION AREA



2.3 - LiDAR Survey Work

For LiDAR work, in the process, it is being replaced by the use of satellite imagery. This replacement was made with several considerations:

- The total area of about 54,000 ha in the TOR is a functional area, while to carry out the LiDAR acquisition for the Way Sekampung area, the total is around 114,000 ha.
- Analysis of the functional area is carried out with SPOT images obtained from the Client.
- Strip survey work is prioritized to be carried out in relation to infrastructure improvements, especially for DED purposes.

Based on the whole series of activities of the ESP Way Sekampung PPC team, especially regarding the Topography section, the following conclusions can be conveyed:

- Installation and measurement of Ground Control Point (GCP) has been carried out as many as 292 section of BM and 292 section of CP.
- Measurement of Horizontal Control Framework and Vertical Control Framework has been carried out on all primary and secondary canals in the Way Sekampung Irrigation Area.

- Reference for horizontal measurement (X,Y) using point or BM 0PJG with coordinates (535,547,669 meters East; 9,395,351,633 meters North) and BM N1.1061 with coordinates (569,807,436 meters East; 9,482,632,566 meters North)
- Reference for measurement of height/elevation refers to the Argoguruh Weir system (El. +61.65 m).
- The total measured primary and secondary canals are 702,663 km with details of 29,807 km of unlined canals and 672,856 km of lining canals.
- Total Structures (special site) measured are 2,653 units and 8 priority Structures.
- As for the cut of tertiary canals up to 50 meters from the intake gate, the measured is 1,304 section.
- The planned location for the Sediment Trap Structure has been completed with an area of approximately 38 hectares, along with longitudinal and cross sections of Feeder Canal1, Feeder Canal2 and Way Sekampung river.
- The drawing has been completed with the scale and size are as follows:
  - Longitudinal cross-section maps are drawn using a vertical scale of 1:200 and a horizontal scale of 1:2,000.
  - A cross-sectional map is drawn using a vertical scale of 1:200 and a horizontal scale of 1:200.
  - The Sediment Trap Situation Map uses a 1:2,000 scale.
  - The Structure Situation Map (special site) uses a scale of 1:100, 1:200, 1:250 and 1:500 according to the Structure area.
  - Maps are printed in A1 and A3 paper sizes.
  - Digital map data in CA application and .pdf file format.

The results reveals that the Topographic Survey Report and Mapping on the Way Sekampung Irrigation System was conducted by PT Amythas and the work on Topographic Measurement of the Sediment Trap Planned Location in the Lower Argoguruh Weir, Lampung Province was conducted PT Sentosa Engineering and its Appendices are presented separately but it is in the part of this report.

3 - GEOTECHNICAL AND GEOLOGICAL INVESTIGATIONS

This chapter contains the calculation results of geotechnical analysis both in terms of models and the results of empirical calculations. Further information and details of the sections in this chapter are listed in the report:

- Engineering Report Vol 17-I Geotechnical Investigation – Data Compiling and Analysis
- Engineering Report Vol 17-II Geotechnical Recommendation for Design Structure

3.1 - Geological Studies and Its Use

Geological studies have many beneficial roles in the field of engineering Structure planning, such as reservoirs, dams, weirs, tunnels, highways, high-rise foundations, and many Structures that are expensive and contain potential hazards. The structure, dimensions, and durability of a Structure are largely determined by the basic soil physical properties in which it also determines the price of a Structure. Geology for planning includes in its study of the safety of the entire Structure against the physical environment and the various processes that take place in which the Structure is erected. Factors that affect the physical environment include topography, type and position of rock layers, geological structure, hydrogeology, geological structure, seismicity, and volcanism activity specifically for areas in volcanic environments.

Special studies in the field of geology for engineering Structure planning are referred to as Geological Engineering and geotechnical studies that in their development, have their own place in the special sub-study of applied geology.

The geotechnical studies in the report provide geological and geotechnical information for numerical and model design purposes. The purpose of a Geotechnical Investigation is to provide information for foundation design and construction planning, assist in site development, provide an assessment of the existing subsurface conditions at the project site, present, explain and summarize the procedures and findings of any geotechnical analysis carried out, and provide appropriate recommendations for the design and construction of foundations, retaining structures, embankments, cuts, and other necessary facilities .

3.2 - Geological Mapping

3.2.1 - Geology – Distribution and Correlation

The Way Sekampung Irrigation System is located in a large area in the Alluvial East Coast Plain Zone in the Sekampung Block. The area contains rock outcrops, sedimentation denudation and alluvial/fluvial processes, which range in age from the Paleozoic to the Contemporary Period.

The modernization is designed to be developed in the same area as the existing Structures. In addition, new Structures are proposed to be constructed in identical geological units with Paleozoic and Pleistocene rocks, although project work is mainly located in the Upper Paleozoic and Upper Tertiary Cainozoic to the Quaternary. These rocks have a high degree of exposure and are associated mainly with sedimentary deposits, continental volcanic sedimentary rocks such as welded tuff/tuff, conglomerates, and igneous discordant rocks, and metamorphic sedimentary rocks. Regionally, these rocks are part of the formations Qa (Alluvium), Qpt (Terbanggi Fm.), QTl (Lampung Fm.), Kds (Sekampung foliated diorite), and Pzgm (Trimulyo marble). Outcrops in the field will be explained referring to regional geological data to ensure the existence of specific geological conditions.

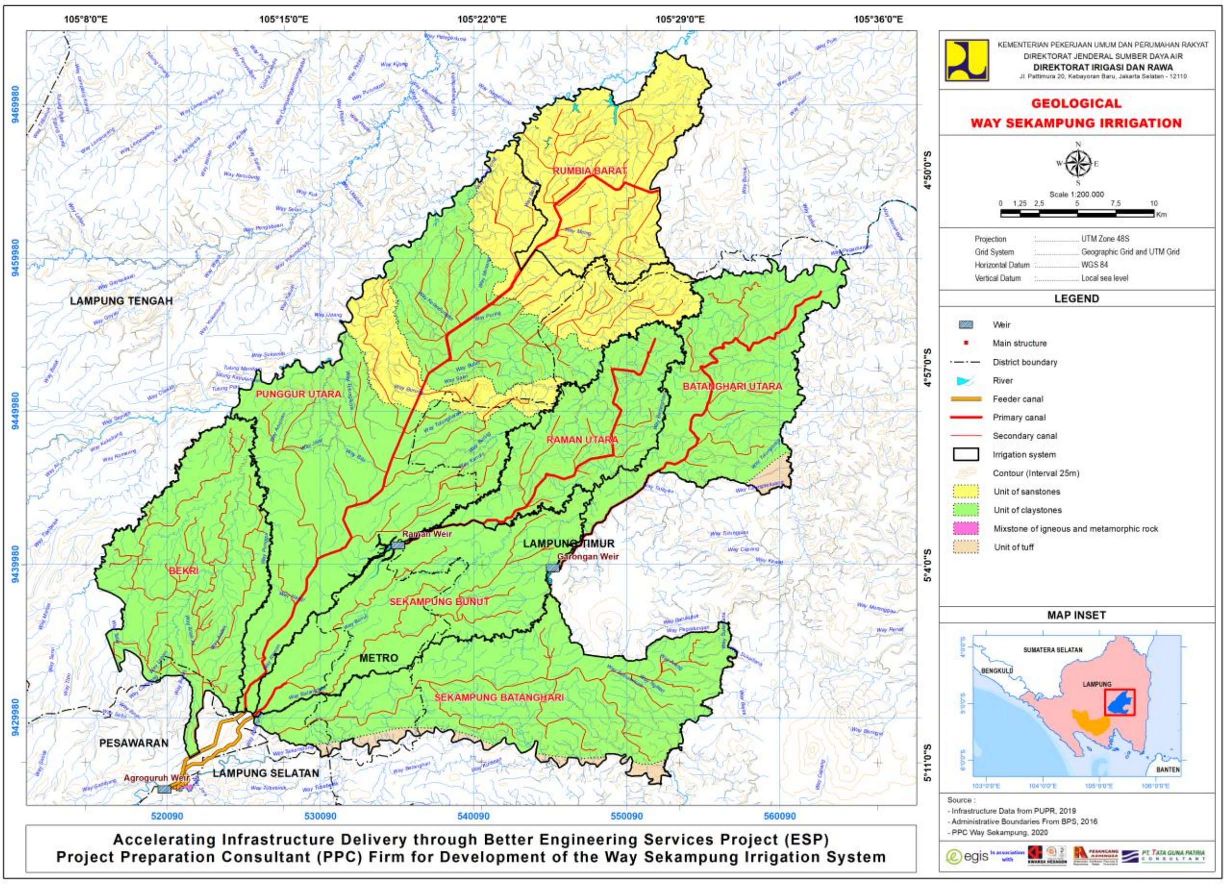
3.2.2 - Geological Units Present in the Area of Study

Most of the project sites are located in sedimentary rock, and later volcanic rock and continental rock, mainly from the Quaternary Era and in some cases from the Upper Tertiary and/or Paleozoic.

The geological units identified in the project area, from new to old include:

- Unit of Tuff
- Unit of Silty-Claystone
- Unit of Sandstone
- Mixture of Magmatic and Metamorphic Rock (Jundeng Migmatite)

FIGURE 3-1 GEOLOGICAL MAP OF WAY SEKAMPUNG IRRIGATION SYSTEM



Source: PPC Way Sekampung

3.2.3 - Geological Structure

In the Way Sekampung irrigation area, there are generally Quaternary sedimentary rock formations with a tendency to spread from Northwest to Southeast. It consists of claystone and sandstone, and a mixture of clay with fine sedimentary material. In the South, the outer underlying rocks of the Argoguruh Weir and canal feeders are Upper Tertiary and/or Paleozoic rocks with a mixture of igneous and metamorphic rocks, and Quaternary tuff units or the Kasai formation. Igneous rock with local granite intrusion, andesitic lahar, granite, diorite, gneiss, and mica schist. Mica schists appear in a Northwest to Southeast trend and are layered with andesite and diorite in a North to South or Northeast to Southwest trend.

Geomorphologically and geologically, the area is shaped in a sedimentary basin (deposition basin). The geomorphological conditions show the terrain resulting from the denudation process, where the exogenous dominant is substantial, and filled with alluvium deposits. The overall tertiary depositional heap in the Way Sekampung area started in the Pliocene-Pleistocene with continental sediment deposition (terrestrial, fluvial, and paralic) originating from local erosion. Moreover, the formation of the basement has been started from the Paleozoic.

Locally, intrusive granite emerges at the bottom of the Argoguruh Weir. Cut layers of andesite and diorite. Meta-sedimentary or metamorphic crop with a trend from Northwest to Southeast with a high slope. And there have been a lot of rock fractures. The most important thing is that this place is a zone of folds, cracks, and intrusions. Based on the density of the constituent rock, it can be a subduction zone or a strong/extraordinary tectonic zone.

According to the regional scale, geological structure activity in South Sumatra is related to geological structural patterns that affect the whole of Sumatra. There are three tectonic systems, namely the Sumatran Subduction System, the Mentawai Fault System and the Sumatran Fault System. Pulonggono (1992) explains that the Sumatran tectonic system consists of several stages, namely Compression Phase, which was started from the early Jurassic to Cretaceous that causes the WNW-ESE dextral fault (Lematang, Kepayang, Saka, Coastal South Lampung, Musi Linearity and NS trend. Activity tectonic causes wrench movement and granite intrusion; 2) tensional phase, which was starting from Upper Cretaceous to Early Tertiary, which produces Normal Fault and North-South Confidence Fault and WNW-ESE. These faults create basins filled with sedimentation processes along with volcanism; 3) Intra Miocene tectonic phase, is activity between the Miocene age and uplift formation occurred at the edge of the basin and was followed by sedimentation of clastic sediments; 4) Compressive mobile phase: starting from Plio-Plistocene, this movement caused some of the Benakat Water Formation and Muara Enim Formation to be eroded into highlands, while for terrain that decreased to a lower elevation the Kasai Formation was deposited where this formation is the main structural basis that placed in the project area.

3.3 - Geological Engineering

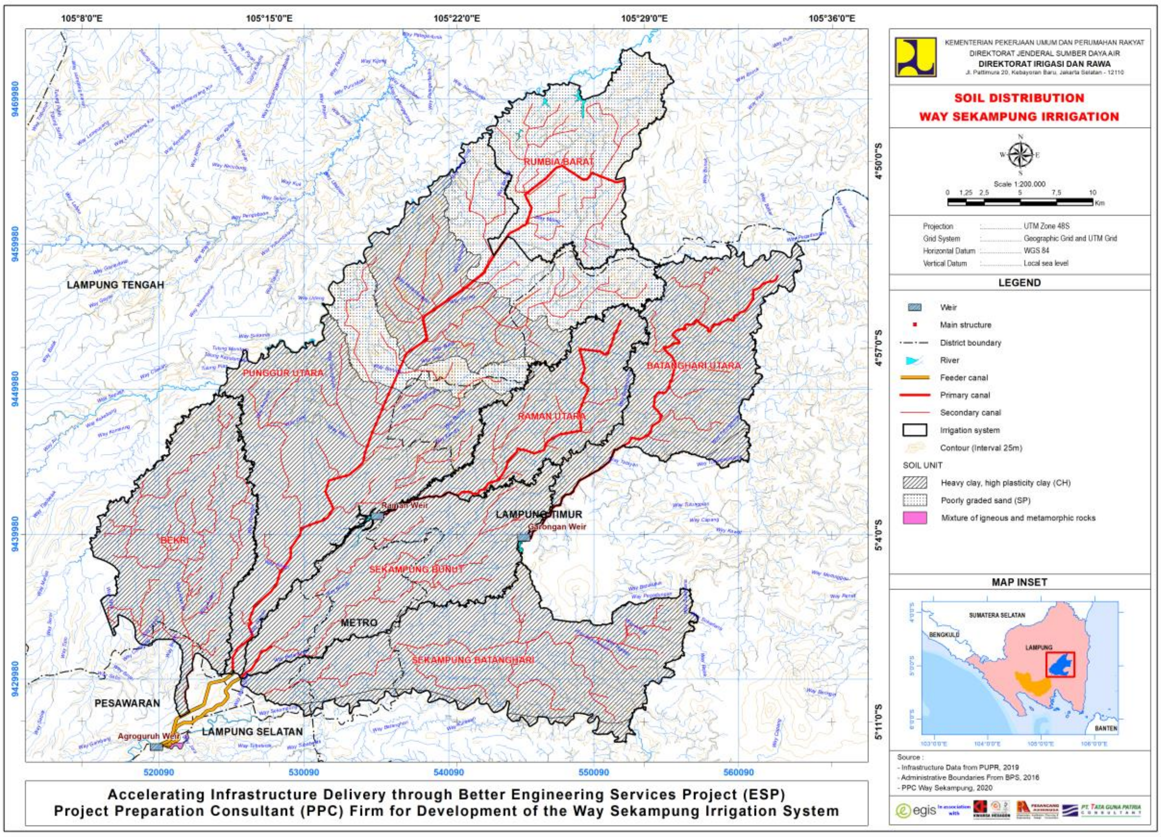
Geological Engineering is the study of geological phenomena from aspects of geology's strengths and/or weaknesses, applied for the benefit of infrastructure development, especially at the design stage and construction stages of Structures (Zakaria, 2010)[1].

3.3.1 - Soil Distribution

Soil classification using USCS (Unified Soil Classification System) is adopted by ASTM D-2487-98 and IS:1498-1970 for classification and identification of soils for general engineering purposes.

[1] *Zakaria, Zufialdi. 2010. Praktikum Geologi Teknik. Laboratorium Geologi Teknik, Fakultas Teknik Geologi, Universitas Padjadjaran.*

FIGURE 3-2 SOIL DISTRIBUTION MAP OF WAY SEKAMPUNG IRRIGATION SYSTEM



Sourece: PPC Way Sekampung

The research area generally consists of three groups of sediment/soil material, namely gravel (G), sand (S), and silt or clay (M/C). Gravel and sand are categorized in the group of coarse-grained soils, and silt/clay is fine-grained soil. Although it is still in the megascopic stage, and lab tests have not yet been carried out. In the following statement referred to in the literature, a fine-grained soil is a soil that passes a 200-mesh sieve by more than 50%. Coarse grained soil has a size > 200 mesh if it has more than 50% of the material. Thus, this classification is approved upon by referring to the megascopic view, namely the dominance of properties that are more characteristic and or refer to.

Dominantly, they are categorized into: 1) Poorly Graded Sand and Muddy Sand (SP/SM); 2) Poorly Graded Sand (SP); 3) Poorly Graded Sand/Poor Graded Gravel (SP/GP); 4) Mud Clay with Gravel (CL(s-g)); 5) Heavy Clays/Silty Clays (CH/CL) (see Figure 3–1 for map).

3.4 - Surface Observation and Sedimentation

Based on basic terrain information, such as drainage network characteristics and lithology, it is possible to identify at the regional or reconnaissance of areas with high sediment emission risk. This information can be used to make decisions about soil conservation plans, the location of new Structures, etc. One of the limitations of the model is the number of field variables used openly combine other terrain characteristics such as vegetation, landscape, slope, etc. to improve prediction results. Hence, this approach can be implemented in a GIS environment to automate the production of sediment emission risk maps.

PPC Way Sekampung also explains the application of the sediment connectivity index (IC) from Borselli et al. (2008) for a large area, the Way Sekampung watershed, and its adaptation by calculating the lowland runoff process. Distributed parameters reflecting landscape infiltration and saturation properties are added to the revised index. The two indices are used qualitatively to compare the average value of connectivity on the watershed scale.

In this large area with characteristically diverse landscape types, IC only reflects high connectivity from the hillsides to the river network in the rugged region, whereas the lowland areas appear to be barely connected to the river network. In areas with hillside runoff dependent on soil saturation, the topographic index does not reflect the true sediment connectivity due to lithological properties.

The change in connectivity class caused by this modification affects 51.5% of the watershed with 24.1% increasing connectivity according to areas dominated by mud-clay, low permeability areas of granite bedrock around Argoguruh Weir, and areas with shallow aquifers and 27.4 % of connectivity decreases in areas of intensive fracture bedrock and shrinking clay sediment formations.

A new map of hillside connectivity is proposed. An interesting perspective to define another highly connected area on a country scale. The Way Sekampung irrigation system is a very contrasting landscape that has >50% of its surface area with a slope of <2%, of which 58% of its area has more infiltration than runoff property.

Further research is needed on the connectivity of low-lying areas, and the hillsides proposed in this study should be combined with existing river connectivity indices and erosion maps and compared with suspended sediment flows for the same area. The choice was made to merge the cells into a larger unit (watershed). Other divisions and administrative areas can be used to provide additional insight into areas that are not interconnected according to decision-making.

3.5 - Hydrogeological Condition and Groundwater Behavior in Way Sekampung Irrigation System

In the Way Sekampung Utara Irrigation area, Southeast Asia, there is a plan to expand the water distribution infrastructure to a new tertiary block. A lot of irrigation water is needed for rice fields, but there are many rice fields that do not have an irrigation system. This study provides information that farmers can use groundwater if there is a shortage of water.

However, more observation sites are needed to monitor groundwater, rain, flooding and river water, and determine the hydrogeological behavior and groundwater in the lowlands with flooding, 7 locations of rain meters, 14 locations of river water level and 40 locations of groundwater observation wells in this study location. The cross-sectional geological map uses length data at several drilling sites and discusses hydrological conditions and groundwater behavior using these data.

Monitoring of the date of rainfall, river water level, and groundwater level in low-lying and flooded areas is carried out for 1 year. Based on this data, PPC Way Sekampung creates a groundwater distribution map and graph of groundwater level changes and discussed groundwater behavior in typical areas and periods such as near rivers, high infiltration areas, near commercial sand pits in flooded and non-flooded areas. As a result, there are differences in groundwater table behavior in each case.

The groundwater level in some of these areas is strongly influenced by river water levels and flood water levels through direct connections. This information is very useful for understanding floodplain fields and conducting groundwater analysis. In this area, farmers use groundwater for irrigation and household water. Therefore, the groundwater level at depth decreases from year to year. Surface-subsurface analysis is needed to control flooding and groundwater subsidence. In future research, this data will be used for numerical analysis to predict groundwater used as additional water availability in the Way Sekampung Irrigation System.

Measuring the interaction between groundwater and surface water is an important component of integrated watershed management. There are many methods for measuring these interactions that are applied in aquifers, in surface water, or in the transition zone itself.

Methods differ in resolution, sample volume, and the timescale they represent. Often, the choice of method is a trade-off between the resolution of heterogeneities and the subsurface volume of the sample. In addition, the scale of measurement with the chosen operating technique may have a significant influence on the results, leading to discrepancies between the estimates obtained from the point measurement grid and the estimates obtained from the point measurement grid and the estimates obtained from the large-scale technique. Therefore, a better representation of local conditions including the effect of scale on measurement results can be achieved by taking measurements at multiple scales in one study site. The attention must be taken to distinguish between groundwater discharges and hyporheic exchange flows. Small-scale flow measurements in shallow streams may not be sufficient to make up this distinction, so additional measurements to identify water sources are recommended.

The purpose of the study plays a decisive role in selecting the appropriate method. For regional investigations, large-scale techniques may be more suitable, whereas process studies may require measurements that allow high resolution. All methods have limitations and uncertainties. A multi-scale approach combining various techniques can greatly reduce uncertainty and limit the estimation of flux between groundwater and surface water.

3.6 - Percolation and Infiltration

This study examines percolation and water seepage through rice fields in both flat and terraced rice fields. The water saturation of various types of bunds is measured to determine the surface characteristics of unsaturated slopes in terraced rice fields. A simple calculation based on hydraulic conductivity is then applied to simulate percolation and seepage along the embankment with and without the plow boundary below. In the flux flat paddy field, the percolation through the bund with the plow bed underneath is 0.4 m/h-1, which is the same as the water infiltration flux through the central rice field. However, if there is no plow sol under the embankment, the percolation flux is 0.85cm.d-1 or doubles the water infiltration flux through the central rice fields.

In terraced rice fields, the middle rice percolation is mainly vertical downwards, while lateral seepage dominates the flow near the bunds. The field near the embankment is under a high hydraulic gradient. The simulated infiltration flux in the bunds exceeded that in the central rice fields by a factor of 2.72. the simulated final percolation flux from the bund also exceeds. The percolation flux of the plow bed with a factor of 1.82. the downward and upward lateral seepage fluxes from the embankment along the slope surface were 2.01 and -2.12 cm.d-1, respectively.

However, the lateral seepage flux does not completely fill the hillside soil surface. The simulation clearly shows that the water that seeps from the rice fields is reused as subsurface backflow for irrigation. Both experimental and simulation results show the mechanism of water movement in the terraced rice fields and confirm the presence of an unsaturated seepage surface along the slope surface in the terraced field. Subsurface backflow is unlikely to develop on the slope surface. Most of the water infiltration from terraced rice fields seeps and recharges into shallow groundwater aquifers.

3.7 - Seismic Consideration

The research location has a peak ground acceleration (PGA) value of 0.25 - 0.3, for an acceleration response spectrum of 1.0 second (S1) with 5% attenuation in bedrock (SB) with a probability of 2% being exceeded in 50 years. Furthermore, for the acceleration of the response spectrum of 0.2 seconds (Ss) with 5% attenuation in bedrock (SB) with a probability of exceeding 2% in 50 years (Figure 13-4), the value is 0.5-0.6 g. The calculation of this earthquake factor is obtained from the map published by SNI 1726 in 2017, which is about the procedures for planning earthquake resistance for Structure structures and not Structures.

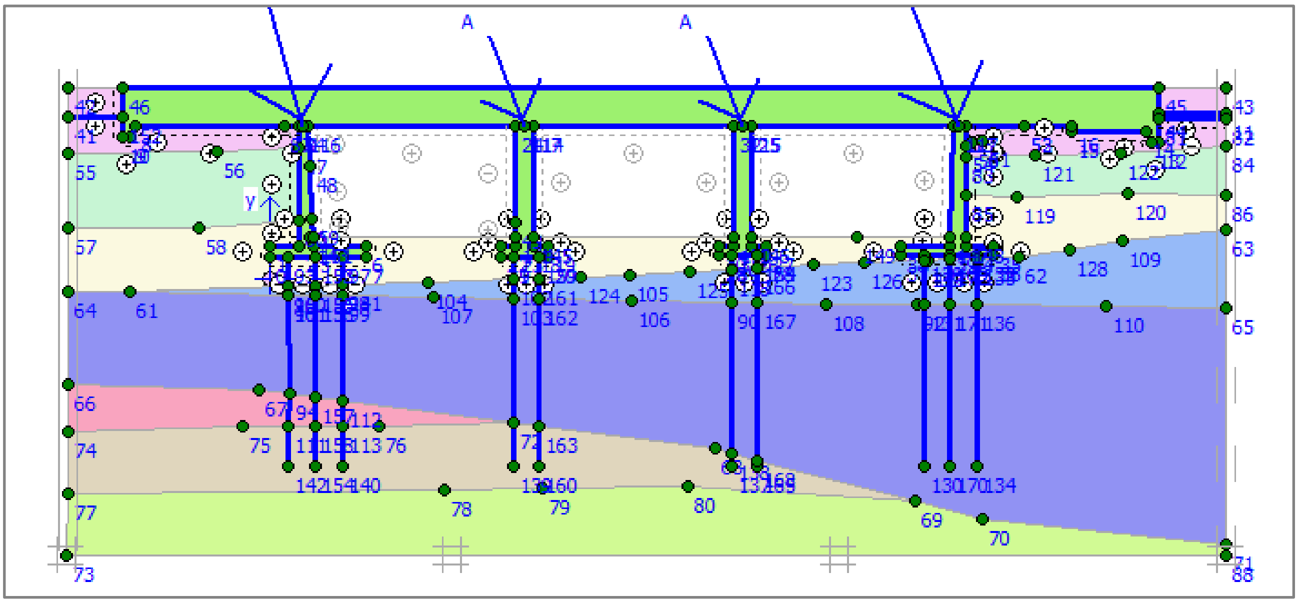
3.8 - Geotechnical Analysis

In this sub-chapter, a special calculation of the structure is presented, namely Aqueduct. For other Structures, see Engineering Report Vol 17-II. The results of the geotechnical calculations for the SN3b location, namely the Aqueduct Structure, can be seen below. For more details, see the Engineering Report Vol 17-II report.

3.8.1.1 - Foundation reinforcement recommendations

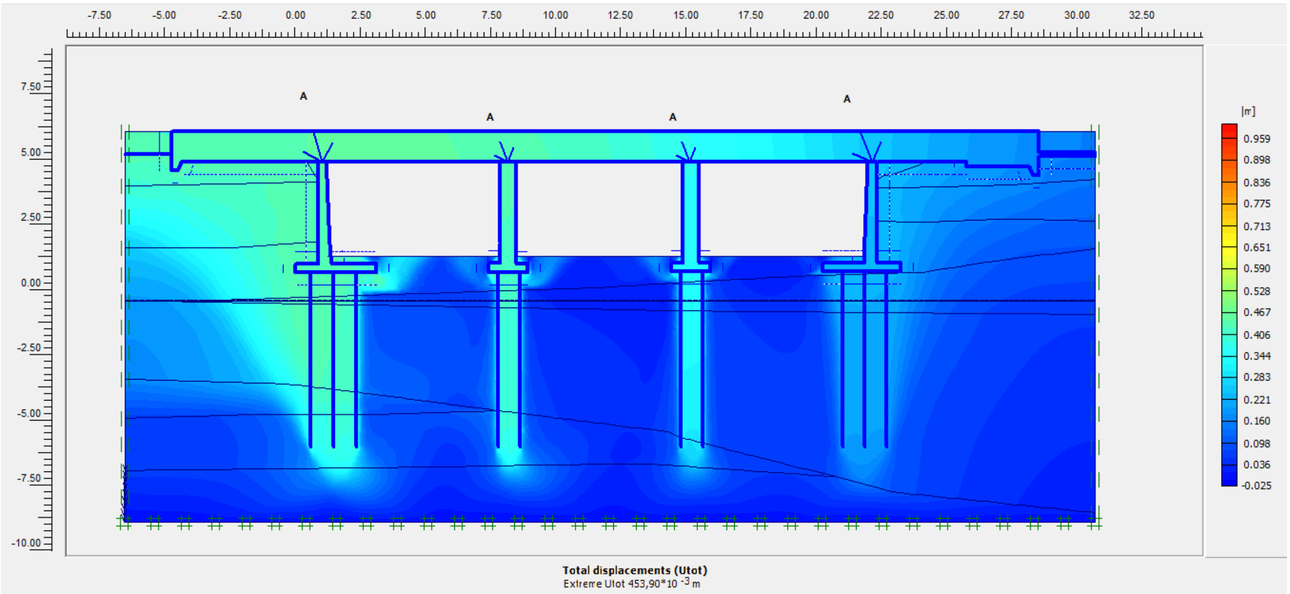
In order to reduce the overturning force on the abutments, it is recommended to eliminate slope reinforcement and reduce the slope of the left and right abutments. Then due to vertical deformation, it is recommended to add a Bore Pile foundation.

FIGURE 3-3 GEOMETRY DESIGN OF STRUCTURE RECOMMENDATION OF SN3B AQUEDUCT



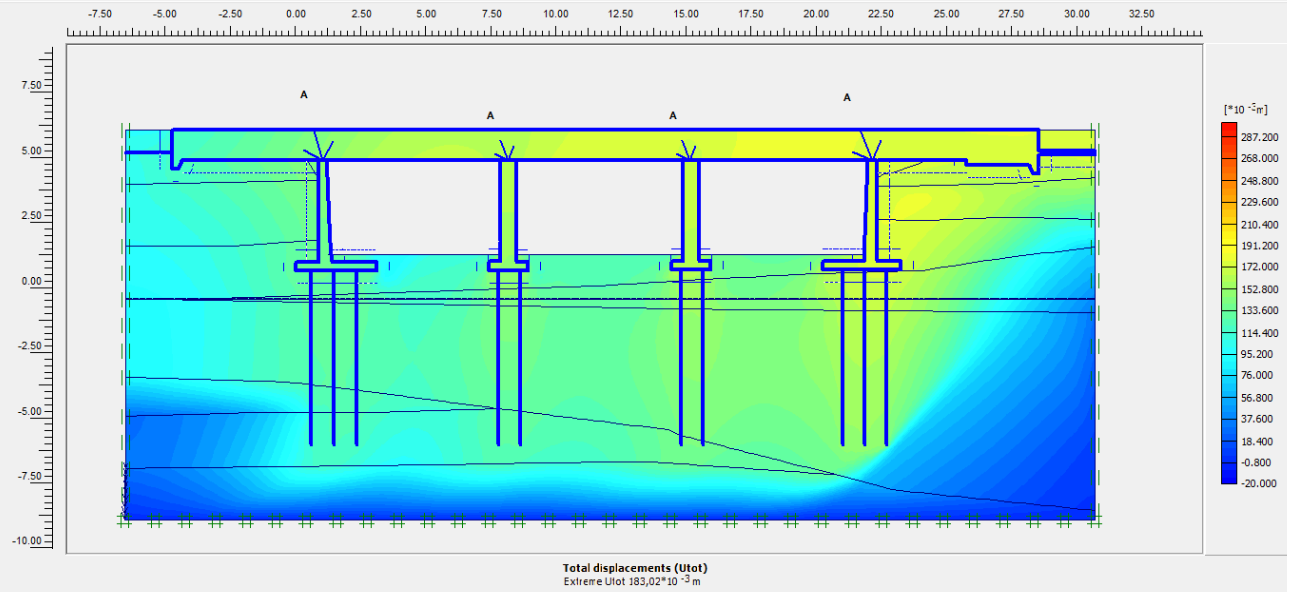
PPC Way Sekampung, February 2021 from PLAXIS 2D Model

FIGURE 3-4 TOTAL DISPLACEMENTS UNDER NORMAL CONDITION AT AQUEDUCT DESIGN STRUCTURE



PPC Way Sekampung, February 2021 from PLAXIS 2D Model

FIGURE 3-5 TOTAL DISPLACEMENTS UNDER SEISMIC CONDITIO AT AQUEDUCT DESIGN STRUCTURE



PPC Way Sekampung, February 2021 from PLAXIS 2D Model

The simulation results show the soil bearing capacity using a bore pile foundation for the gutten with a significant reduction in pile cap deformation. Initial maximum deformation from 1.95 m to 0.18 m. With the value of Safety Factor (SF) of 2.407, the axial bearing capacity and soil stability are classified as safe.

4 - HYDROLOGICAL STUDY AND HYDRODYNAMIC MODEL

4.1 - Hydrological Study

This chapter is a summary of the key points from several available reports. Further information and details of the sections in this chapter are contained in the report:

1. Report of Volume 2: Water Availability Master Plan stage
2. Report of Annexe 7: Hydrology Master Plan stage
3. Report of Annexe 8: Hydraulic Model Master Plan stage
4. Report of Volume 1: Water Availability Feasibility Study stage
5. Report of Number 13: Agronomy for Feasibility Study stage

4.1.1 - Rainfall analysis

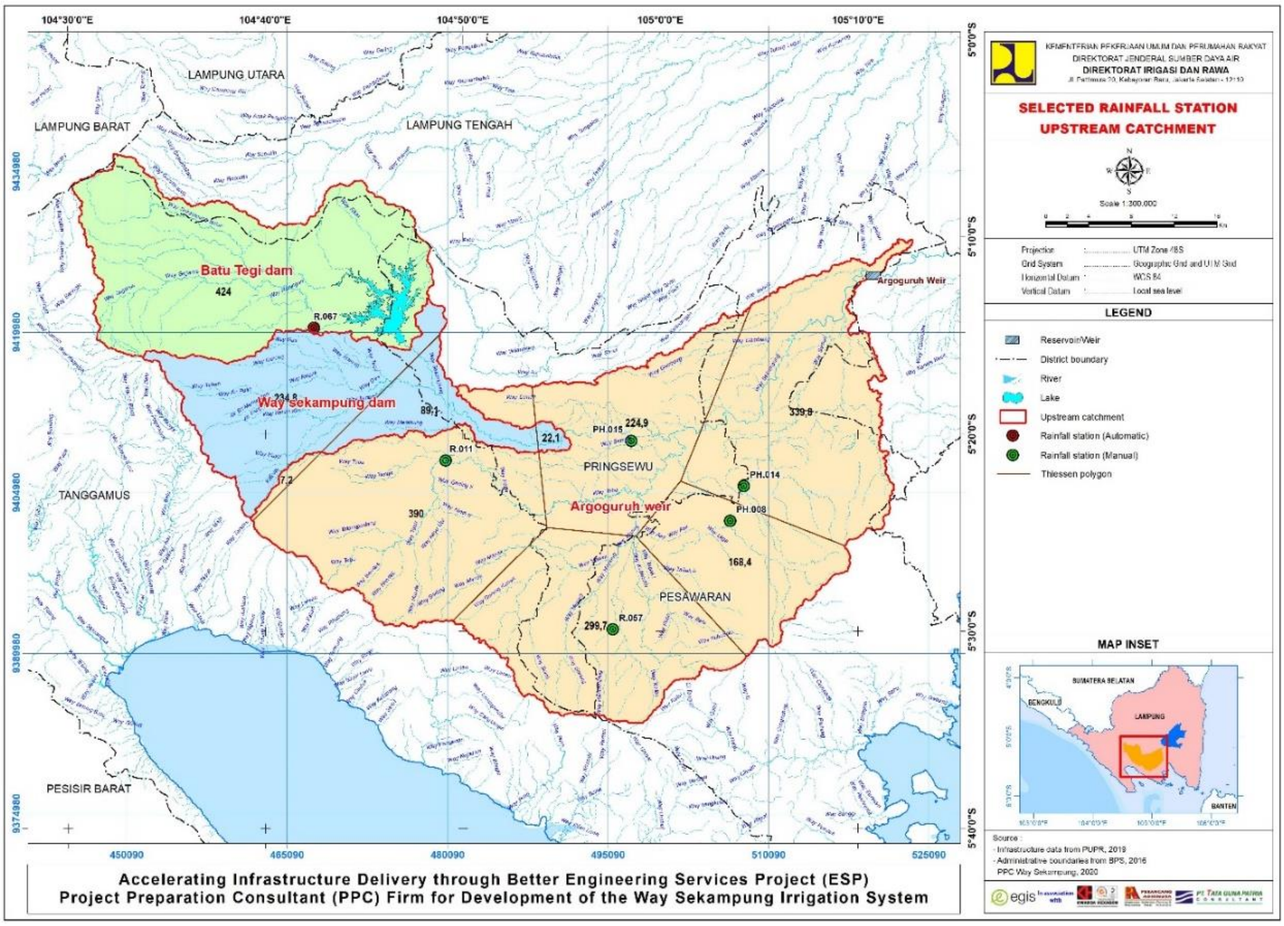
The study of analysis of rainfall is started with the collection of data from available rainfall stations for:

a. The Watershed (DAS) Batutegi, Way Sekampung, Argoguruh

b. The Way Sekampung Irrigation System Area

The next step is to analyze the existing data using the double mass curve analysis, and the Weibull distribution probability method. The result of the analysis is that the quality and reliability of data from rainfall stations had limitations. The use of rainfall from satellite image data is not recommended by the Client because of the limitations of the image quality. After selecting the rainfall station to be used, the area rainfall calculation is carried out using the Thiessen polygon method or also known as the Voronoi diagram. This process is carried out for the two areas listed in point a. and b. on.

FIGURE 4-1 AREAL RAINFALL (EXAMPLE FOR POINT A)



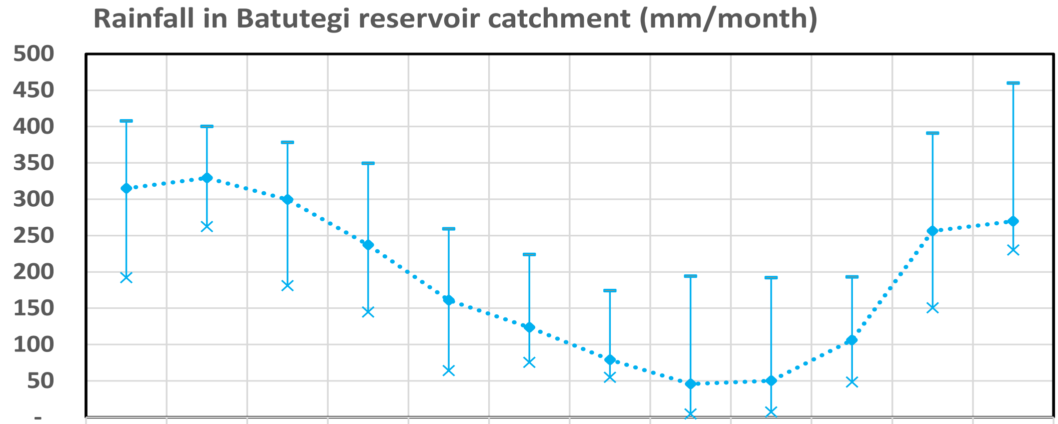
The figure above shows the location of the rainfall stations that are calculated to represent the area rainfall for the three watersheds upstream of the Argoguruh weir.

The number of rain stations selected to represent the study zone is:

- **a.** 8 rainfall stations for the Batutegi watersheds, Way Sekampung, Argoguruh
- **b.** 7 rainfall stations for Way Sekampung Irrigation System

As an example of the results obtained after using the Thiessen polygon, the following graph shows the rainfall pattern obtained for each Batutegi watershed:

FIGURE 4-2 RAINFALL IN BATUTEGI WATERSHEDS



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
80% Exc.	192	262	181	145	64	75	55	4	7	48	151	230
20% Exc.	408	400	378	349	259	224	174	194	192	193	391	460
Median	315	329	299	237	161	123	79	46	50	106	256	270

In 10 years of rainfall data obtained and analyzed, in addition to the basic data calculated, the presentation of climate data was also carried out using the 80%, 20% and 50% reliable statistical analysis.

Further information is contained in chapter 3 of the Report of Annex 7: Hydrology Master Plan stage.

4.1.2 - Floods Discharges

Analysis of flood discharge from the Batutegi upstream dam to Argoguruh dam by analyzing:

- Inflow and outflow records of Batutegi dam

TABLE 4-1 THE 10 BIGGEST INFLOW DISCHARGES FROM BATUTEGI DAM LISTED FROM 2010-2019

		at 30 days after inflow	
Date	Batutegi inflow [m3/s]	Batutegi outflow [m3/s]	% reduction
18-Feb-10	101	0	100%
27-Mar-10	91	31	66%
11-Apr-12	107	30	72%
13-Feb-13	131	27	79%
30-Dec-13	87	23	74%
01-Apr-16	107	0	100%
31-May-16	94	43	54%
09-May-17	89	19	79%
02-Aug-17	93	23	75%

		at 30 days after inflow	
Date	Batutegi inflow [m3/s]	Batutegi outflow [m3/s]	% reduction
17-Feb-19	147	4	97%
Rata-rata	105		80%

The table above shows the records of the 10 largest inflow discharges from the Batutegi dam from 2010 to 2019 and the outflow from the Batutegi dam 30 days after the largest discharge occurred. From the % reduction, it is stated that on average, the Batutegi dam has the function of reducing flood discharge by 80%.

- Data records of the 10 largest Argoguruh weir runoff

TABLE 4-2 THE 10 BIGGEST RUNOFF DISCHARGES FROM ARGOGURUH WEIR LISTED FROM 2010-2019

Date	Argoguruh Weir Spillway [m3/s]
19-Feb-10	731
17-Dec-13	822
19-Dec-13	602
30-Dec-13	562
10-Feb-15	644
11-Feb-15	644
02-Apr-16	731
03-Apr-16	731
22-Feb-17	917
23-Feb-17	731
Average	**712**

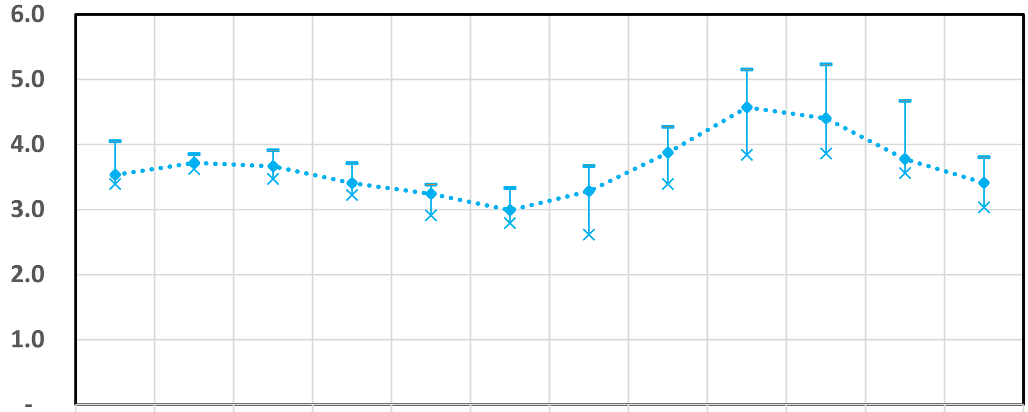
The average of the 10 largest runoff discharges at the Argoguruh weir is 712 m3/s. The peak flow of this spillway will decrease after the Way Sekampung dam is operational.

4.1.3 - Water Demand Analysis

From domestic, urban, industrial, irrigation, ecological flow to atmospheric water requirement, all water demands can be listed as follows:

1. **The DMI for 3 sub-watersheds** located at the Argoguruh upstream weir is calculated based on the applicable per capita consumption guidelines from Cipta Karya (2006) and population data from BPS (2016). DMI requirement for each watershed: 0.008 m3/s for the Batutegi watershed, 0.026 m3/s for the Way Sekampung watershed and 0.22 m3/s for the Argoguruh watershed.
2. **Offtake for Bandar Lampung City and Metro City** is calculated using the applicable per capita consumption guidelines from Cipta Karya (2006) and data from BBWS Mesuji-Sekampung. In 2021, the offtake of Bandar Lampung City is 2 m3/s and Metro City is 0.24 m3/s. As for the year 2040 with the addition of the population, the offtake for Bandar Lampung City is 3.5 m3/s and Metro City is 0.27 m3/s.
3. **The irrigation water requirement** is calculated based on the PUPR design standard for irrigation, regulation KP-01 of 2013, appendix 2 (PUPR, 2013) using effective rainfall and actual percolation data in paddy fields.
4. **Evapotranspiration** is calculated in the calculation of irrigation water requirement (ET0 to ETC) and direct evaporation from puddles located in each of Batutegi and Way Sekampung dams is calculated using guidelines according to KP01, namely the Pen method.

FIGURE 4-3 EVAPOTRANSPIRATION (ETO)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
80% Exc.	3.4	3.6	3.5	3.2	2.9	2.8	2.6	3.4	3.8	3.9	3.6	3.0
20% Exc.	4.1	3.9	3.9	3.7	3.4	3.3	3.7	4.3	5.2	5.2	4.7	3.8
Median	3.5	3.7	3.7	3.4	3.2	3.0	3.3	3.9	4.6	4.4	3.8	3.4

5. **The ecological flow** for the river of Argoguruh downstream weir has been calculated in accordance with Government Regulation of the Republic of Indonesia Number: 38/2011 concerning Rivers that river maintenance flow is carried out by controlling the availability of reliable discharge by 95%. If the 95% (ninety five percent) reliable discharge is not achieved, the management of water resources must control the use of water upstream [Article 25 paragraph (3), (4)] from the calculation results of the ecological flow found.

4.1.4 - Cropping Pattern and Diversion Water Requirement

The cropping pattern to be adopted has considered all aspects listed as follows:

- **a.** The climatic context (evapotranspiration, rainfall) that exists in the entire study zone. Details are listed in the Reports of Annexe 7: Hydrology Report for the Master Plan stage and Annexe 13: Agronomy for the Feasibility Study stage.
- **b.** The historical cropping pattern plan is based on the Governor's Decree as well as the revisions that have been made and historical data on crop yieds. The details are listed in the Report of Annex 13: Agronomy for the Feasibility Study stage.
- **c.** Varieties of rice and *palawija* (secondary crop) are the choice of farmers throughout the Way Sekampung Irrigation System.
- **d.** Irrigation water requirement using effective rainfall.

FIGURE 4-4 MAP OF RAIN STATION DISTRIBUTION

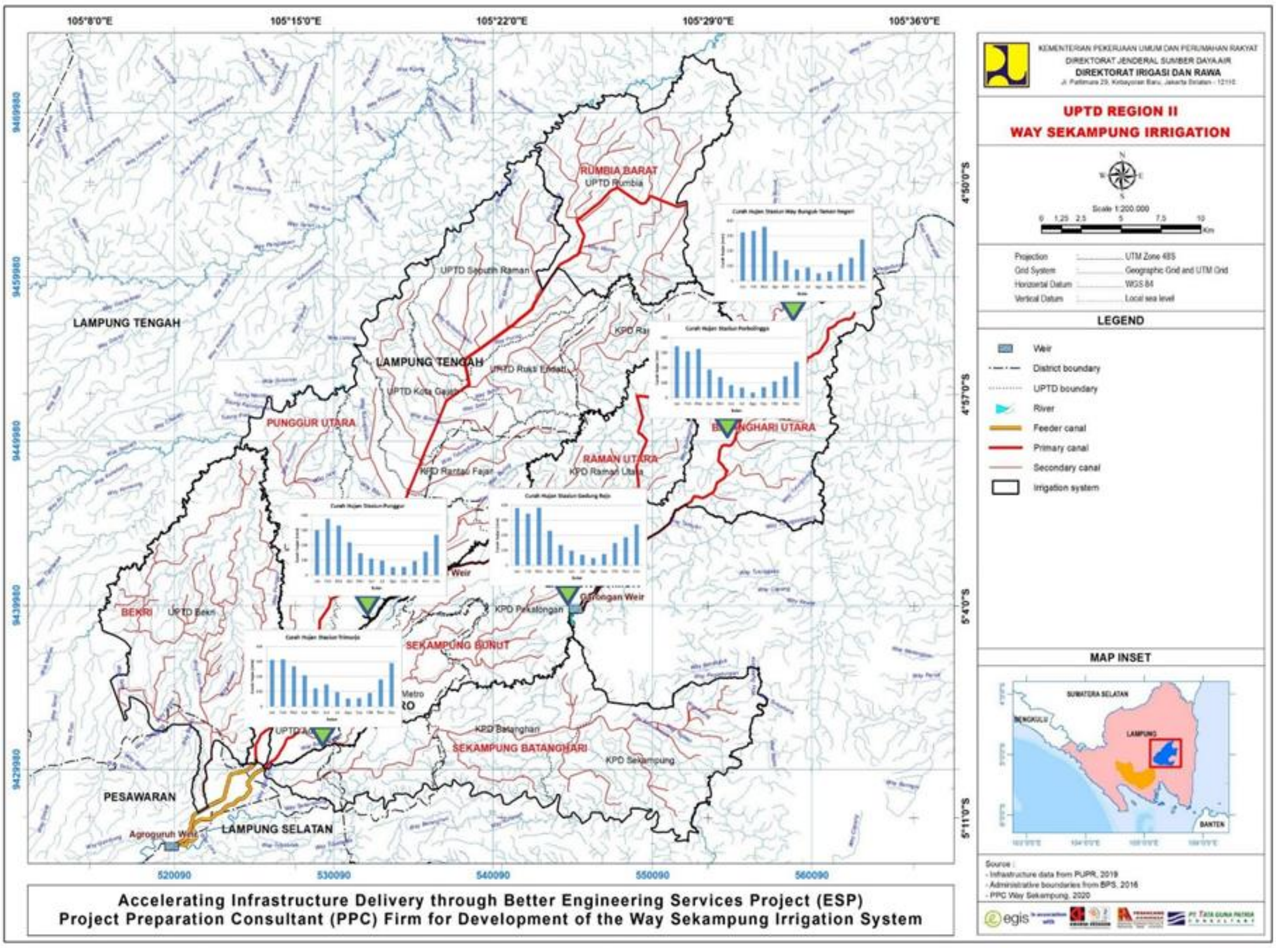
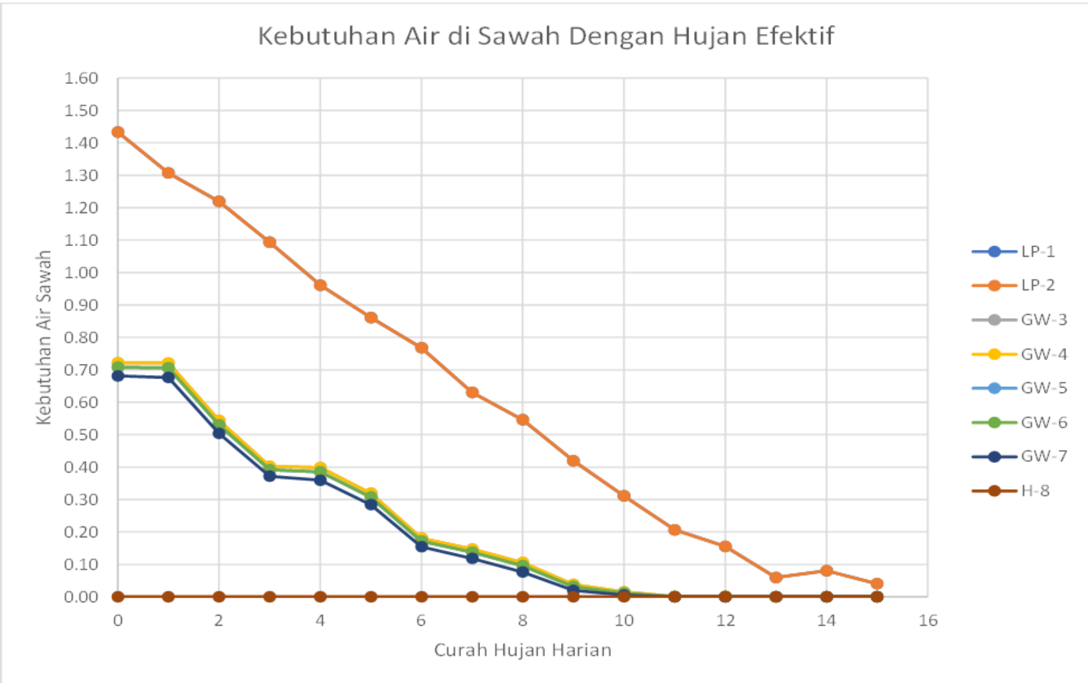


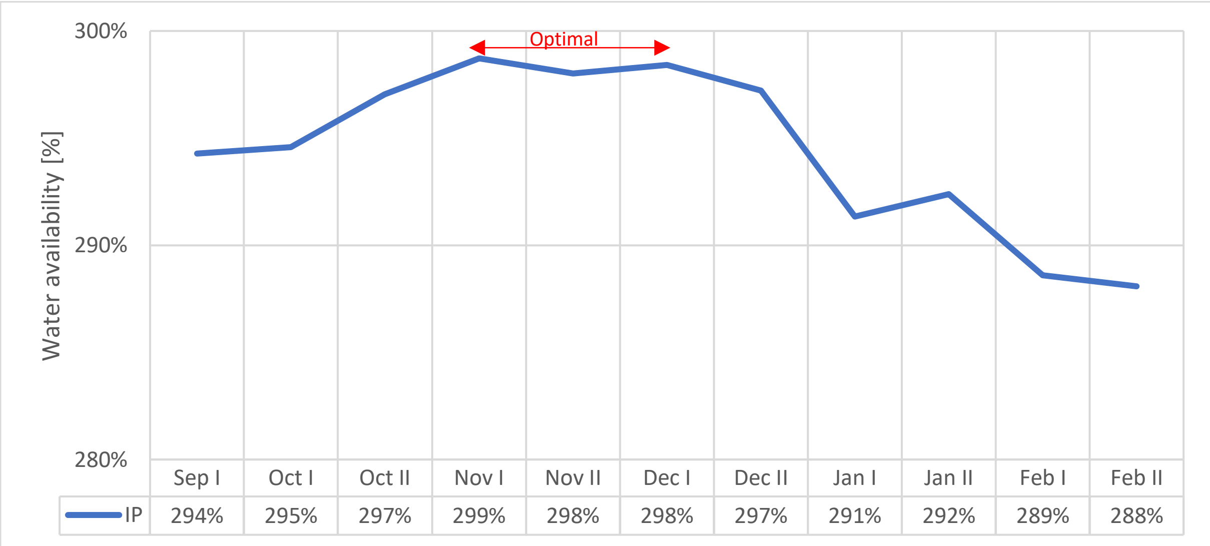
FIGURE 4-5 WATER REQUIREMENT IN RICE FIELDS



The conclusions stated in the Report of Volume 1 regarding the Feasibility Study stage show that:

- **a.** The water availability in Argoguruh weir is sufficient to fulfill the water requirement of WSIS with a 300% IP (rice-rice-*palawija*).
- **b.** The best planting season 1 start date is between November and December.

FIGURE 4-6 CHART OF WATER AVAILABILITY



The graph above shows the average water availability in Argoguruh weir to fulfill irrigation water requirement if MT1 starts in Sep I until MT1 starts in Feb II for 10 years of observation. From the graph above, the difference in the beginning of the growing season can give a different pattern of water availability for 1 year of planting. The water availability in Argoguruh weir ranges from 288% for planting in Feb II to 299% in Nov I.

In addition, it can be seen that if MT1 is carried out during Nov I, Nov II and Dec I; the water availability in Argoguruh weir is sufficient to fulfill irrigation water requirement with the highest IP potential from the start date of planting other MT1. From these results, optimal planting starts is obtained if MT 1 starts in the period Nov I – Dec I.

c. The best ratio of rice per growing season is 100% rice-rice-*palawija*

TABLE 4-3 PLANTING INTENSITY

MT1 % of rice planted area	MT2 % rice planted area --> 40	50	60	70	80	90	100
60	274%	280%	285%	288%	290%	294%	297%
70	278%	285%	287%	290%	294%	297%	297%
80	282%	287%	289%	291%	297%	297%	297%
90	285%	288%	292%	294%	296%	297%	297%
100	288%	290%	295%	295%	295%	297%	299%

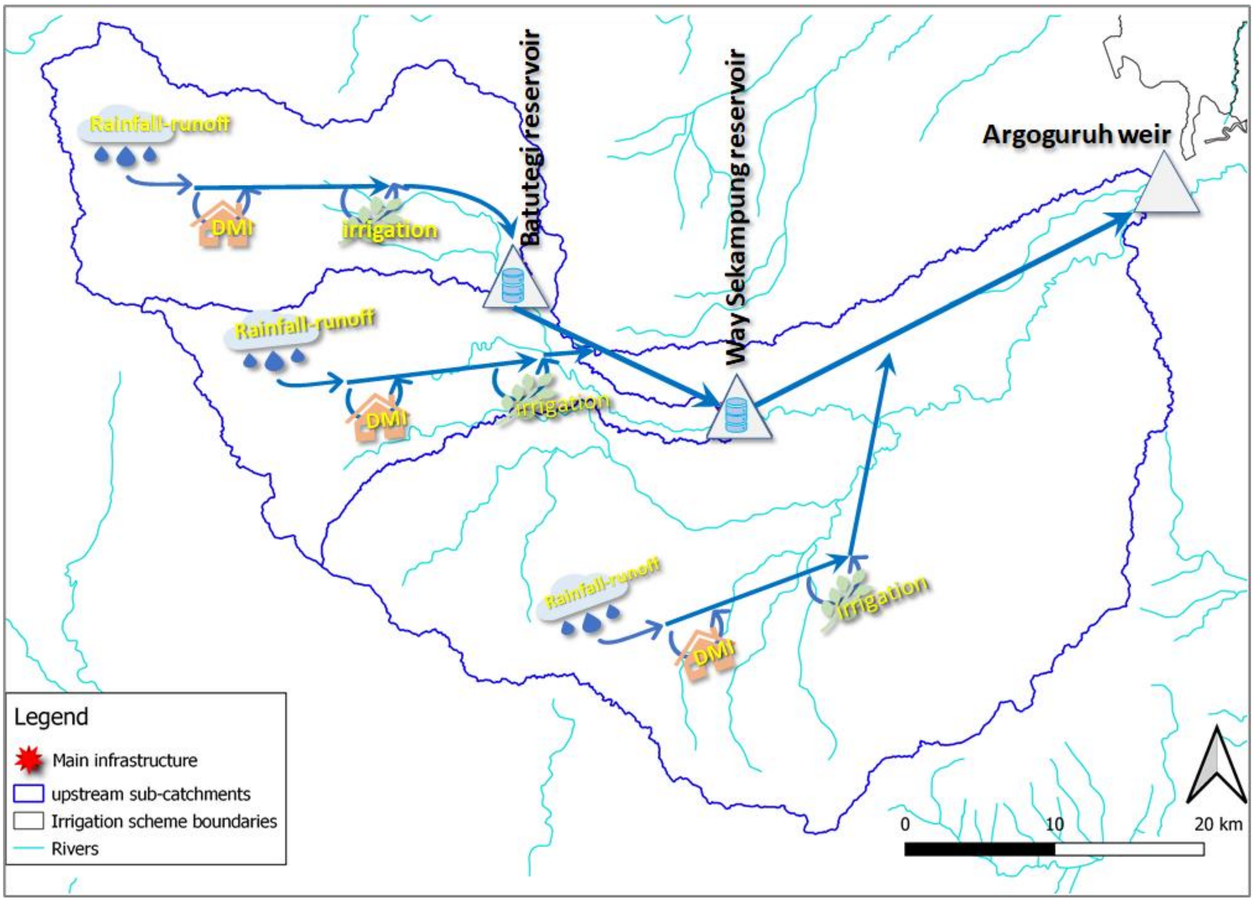
The table above shows the average water availability in Argoguruh weir during the 10 years of observation. The average water availability in Argoguruh weir ranges from sufficient to fulfill irrigation water requirement for 274% IP to sufficient for irrigation water requirement for 299%. The combination of the ratio of the amount of rice planted in each MT and the pattern of rainfall in Lampung result in different numbers of irrigation water requirement. Thus, the optimal ratio carried out in the Way Sekampung Irrigation System is 100% rice at MT1, 100% rice at MT2 and 100% palawija at MT3 so that the water availability in Argoguruh weir can meet irrigation water requirement with an IP of 299%.

d. With the modernization project, the targeted planting intensity is 230%. The water availability in Argoguruh weir has been and will continue to be (for 2040) sufficient to fulfill WSIS irrigation needs. These details are listed in the Report of Annexe 13: Agronomy for the Feasibility Study stage.

4.2 - Hydrodynamic Model Study

The hydraulics model is a water balance model used to simulate the balance and distribution of water in a system. The water balance consists of several modules in which each describe one part of the hydrological system: Runoff flow from each sub-watershed, evaporation from the reservoir, transpiration from existing vegetation, reservoir discharge, delta (Δ) holding in the reservoir and finally water availability in the reservoir. Argoguruh weir as shown in Figure 4-7:

FIGURE 4-7 MAP OF UPSTREAM CONDITION



Based on Figure 4-7, the hydraulic model consists of the following components:

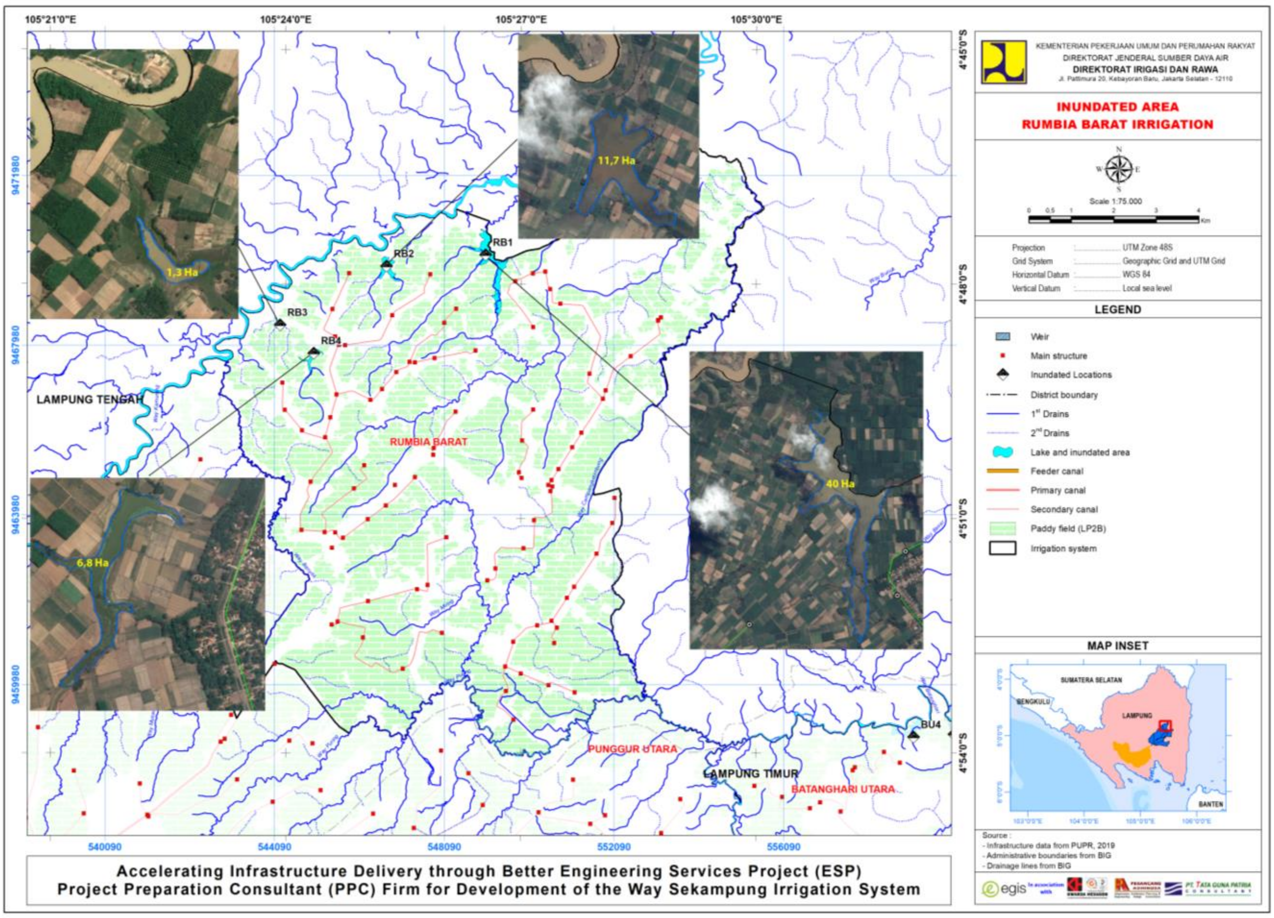
1. Calculation of **rainfall-runoff** for each sub-watershed. This is carried out off-line (previously) using a Mock model approved by PUPR regulations. Results are entered as time series inputs in the hydraulic model.
2. **Operation of reservoirs in Batutegi and Way Sekampung**: to find out how much water comes out of the reservoir, it is necessary to enter a rule curve as formulated for the reservoir. It determines the water level and the rules between the water level and how much water is released through which gate under each regime.
3. **Use of DMI clean water**: For each sub-catchment, use of DMI clean water is applied as described in Table 2-8.
4. **Use of clean water for diversion of upstream irrigation**: the three sub-catchments (can) have irrigated rice fields. According to the available data, only Argoguruh watershed has a significant irrigation requirement and this clean water consumption is applied as described in Table 2-11.
5. **Other water users in Argoguruh weir**: This concerns the DMI Bandar Lampung and Metro city as well as the release of the required ecological flow in Argoguruh weir.
6. **Request for diversion of the Way Sekampung irrigation system**: Since the release of the reservoir depends on this requirement, it is included in the calculation according to the PUPR regulations for irrigation diversion water requirements.

4.3 - Evaluate Flood Disaster Information Including Cause of Flooding

4.3.1 - Area of Inundation Due to Floods

Flood areas, which are also irrigated agricultural areas, are rarely found in the Way Sekampung irrigation system due to the abundance of natural drainage canals and the natural slope of the land. Inundation areas of more than 10 ha are only found at the downstream end near rivers, such as Way Seputih in Rumbia Barat Irrigation Area and near Way Batanghari and Way Sukadana in Batanghari Utara DI. The total area is less than 100 ha. An example of a map of Rumbia Barat is presented in Figure 4-8.

FIGURE 4-8 FLOOD LOCATION OF RUMBIA BARAT IRRIGATION AREA



4.3.2 - Drainage Modulus

The drainage modulus is the amount of excess water that must be drained per plot. The drainage modulus depends on several components, namely:

a. Rainfall during a certain period;
b. Provision of irrigation water;
c. Plant water requirements;
d. Ground Percolation;
e. Storage in the fields during or at the end of the period in question;
f. The size of the area;
g. Other sources of excess water

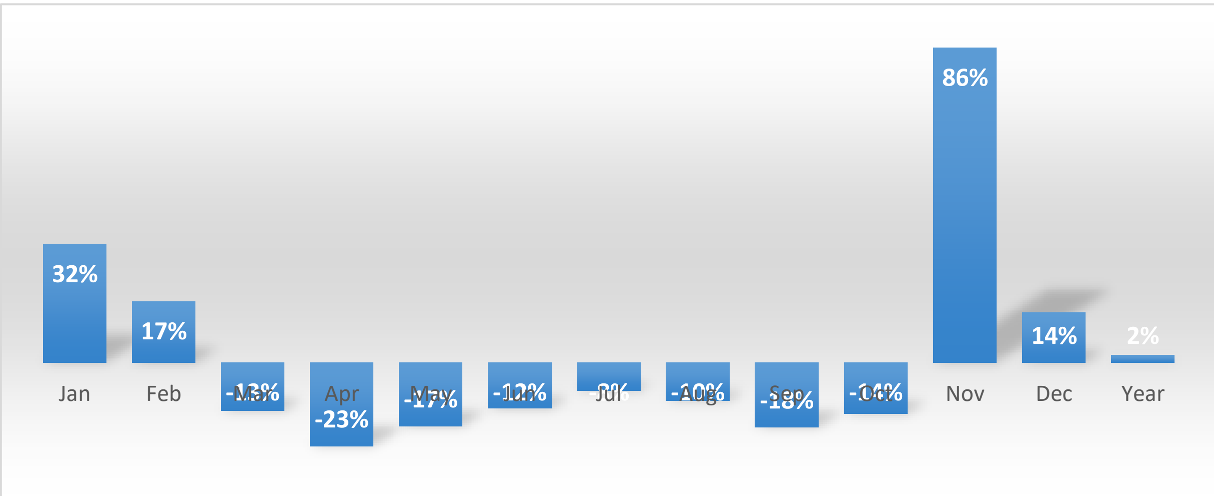
TABLE 4-4 DRAINAGE MODULUS OF THE WAY SEKAMPUNG IRRIGATION AREA

No	Irrigation Sub-Area	Tertiary Plot Area (ha)	Drainage Modulus (m^3/s)	
			Rainfall in the last 1 year	Rainfall in the last 5 year
1	Punggur Utara	22,499	76.8810	153.9241
2	Raman Utara	4,375	17.0059	33.9155
3	Batanghari Utara	5,431	20.3927	39.9824
4	Sekampung Bunut	5,532	15.8137	45.6729
5	Sekampung Batanghari	9,311	28.6678	81.7961
6	Rumbia Barat	5,665	21.6143	43.1062
7	Bekri	5,507	13.0239	50.1983
Total	**Way Sekampung**	**58,320**	**193.3993**	**448.5995**

The difference from the drainage modulus value is the calculation using the rainfall in the last 1 year and the last 5 year period. The drainage modulus calculation for the last 5 years has a larger discharge of 448.5995 m3/second than the 1-year rainfall period of 1933993 m3/second. This is due to the higher variation of rainfall in the last 5 years.

4.4 - Climate change and land use change impacts on water availability

FIGURE 4-9 MONTHLY INDEX VARIATIONS OF RAINFALL IN 2040



The table above is an index used for 10 years of calculated rainfall data. Thus, prediction of rainfall, prediction of runoff (from the FJ Mock model), prediction of irrigation water requirement and water availability for the Way Sekampung Irrigation System can be carried out. Details of the climate predictions for 2040 are listed in chapter 7 in the Report of Annex 7: the Hydrology. The conclusion from the analysis of water availability is that there is still enough water available in 2040 considering the impacts of climate change in the form of rainfall and evapotranspiration, increased DMI water requirement and changes in land use. This is because the increased rainfall in the wet season is at least partially stored in the two reservoirs, which reduces the problem of shortages due to lower rainfall in the dry season.

5 - DETAILED IRRIGATION DESIGN AND OTHER SUPPORTING STRUCTURES

5.1 - Irrigation System Planning

5.1.1 - Water Availability and Requirement

This sub-chapter contains the calculation results of the analysis of water requirement and availability both by model and the results of empirical calculations. Further information and details of the sections in this sub-chapter are contained in the report:

- **a.** Feasibility study volume I water availability report
- **b.** Irrigation and Planning design report

5.1.1.1 - Water requirement

Water requirement in Way Sekampung are prepared with 3 scenarios, namely:

1. Scenario 1 – Current condition without project (Batutegi Reservoir and Way Sekampung)
2. Scenario 2 – Conditions with the project (Batutegi Reservoir, Way Sekampung and irrigation modernization project)
3. Scenario 3 – Conditions with the project, climate change and land use

The cropping pattern simulation aims at determining the optimum water availability for the Way Sekampung irrigation area with a functional area of 56,854 ha. After experimenting with various planting times, it turns out that the best planting start that produces a high planting intensity is shown in Table 5-1.

TABLE 5-1 CROPPING INTENSITY OF 3 SCENARIOS

Scenario	Description	System efficiency [%]	Daily water demand	
			IP daily	Area [ha]
Scenario 1	Way Sekampung reservoir Without project	64.8%	287%	163,186
Scenario 2	With project	82%	299%	169,993
Scenario 3	With project + Climate + land use change	82%	300%	162,043

Simulation is carried out with the following conditions:

1. Land preparation time for 30 days
2. With a 15 day rotation, all functional areas are divided into 3 rotations; rotation 1 = 10,241 ha (Bekri = 4,858 ha, Sekampung Bunut = 5,383 ha); rotation 2 = 22,241 ha (Punggur Utara = 22,241 ha); rotation 3 = 15,062 ha (Batanghari Utara = 4,979 ha, Raman Utara = 4,386 ha, Rumbia Barat = 5,697 ha)
3. The resulting cropping intensity is as follows:
   a. Scenario 2, the current conditions Planting intensity = 299%
   b. Scenario 3, the current conditions Planting intensity = 300%

TABLE 5-2 SIMULATION OF SCENARIO 2

No	Irrigation system	Functional area (ha)	Cropped area	Start (bimonthly)
	Planting Season 1	56,854	56,854	

No	Irrigation system	Functional area (ha)	Cropped area	Start (bimonthly)
1	Batanghari Utara 1	2,490	2,490	24
2	Batanghari Utara 2	2,490	2,490	01
3	Raman Utara 1	2,193	2,193	24
4	Raman Utara 2	2,193	2,193	01
5	Bekri 1	2,429	2,429	21
6	Bekri 2	2,429	2,429	22
7	Sekampung Bunut 1	2,691	2,691	21
8	Sekampung Bunut 2	2,691	2,691	22
9	Sekampung Batanghari 1	4,655	4,655	23
10	Sekampung Batanghari 2	4,655	4,655	24
11	Punggur Utara 1	13,315	13,315	22
12	Punggur Utara 2	8,926	8,926	23
13	Rumbia Barat	5,697	5,697	24

FIGURE 5-1 IRRIGATION WATER AVAILABILITY AND IRRIGATION NEEDS IN SCENARIO 2

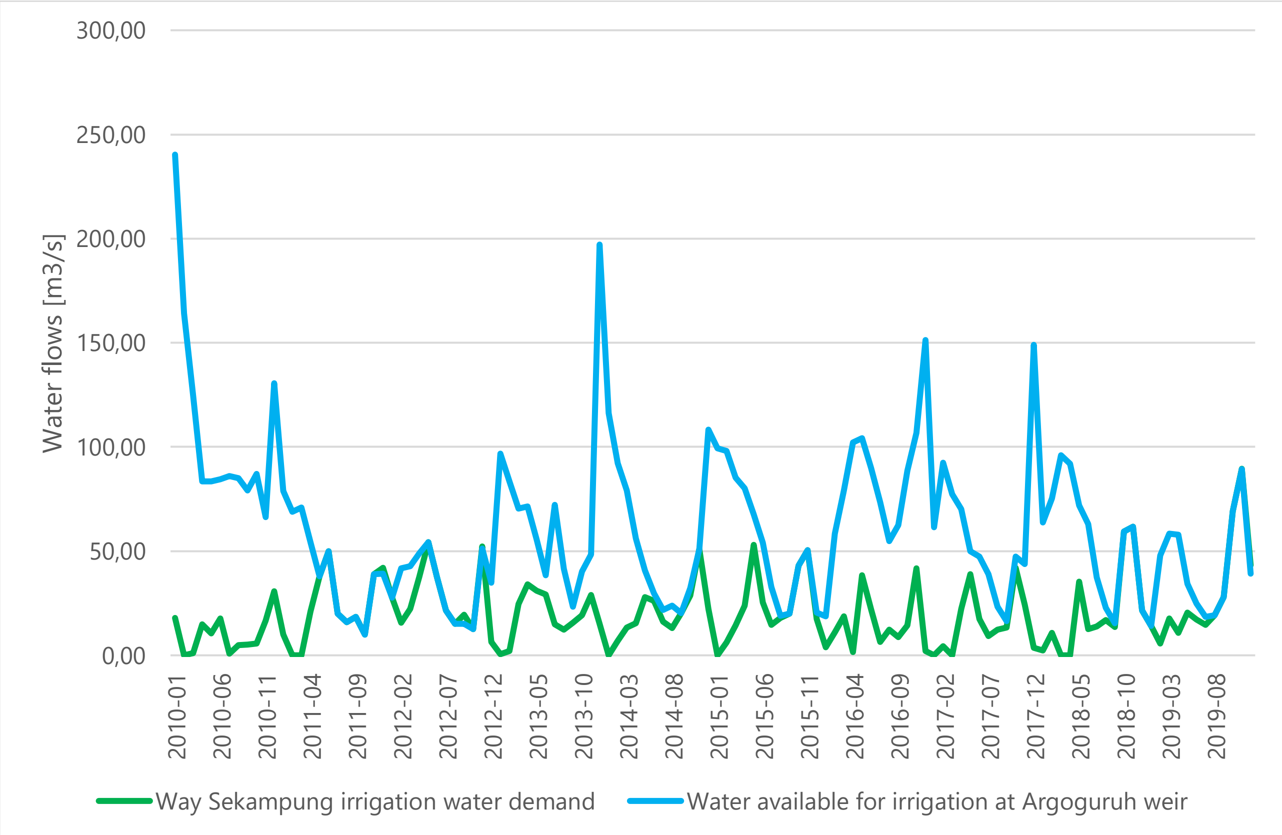
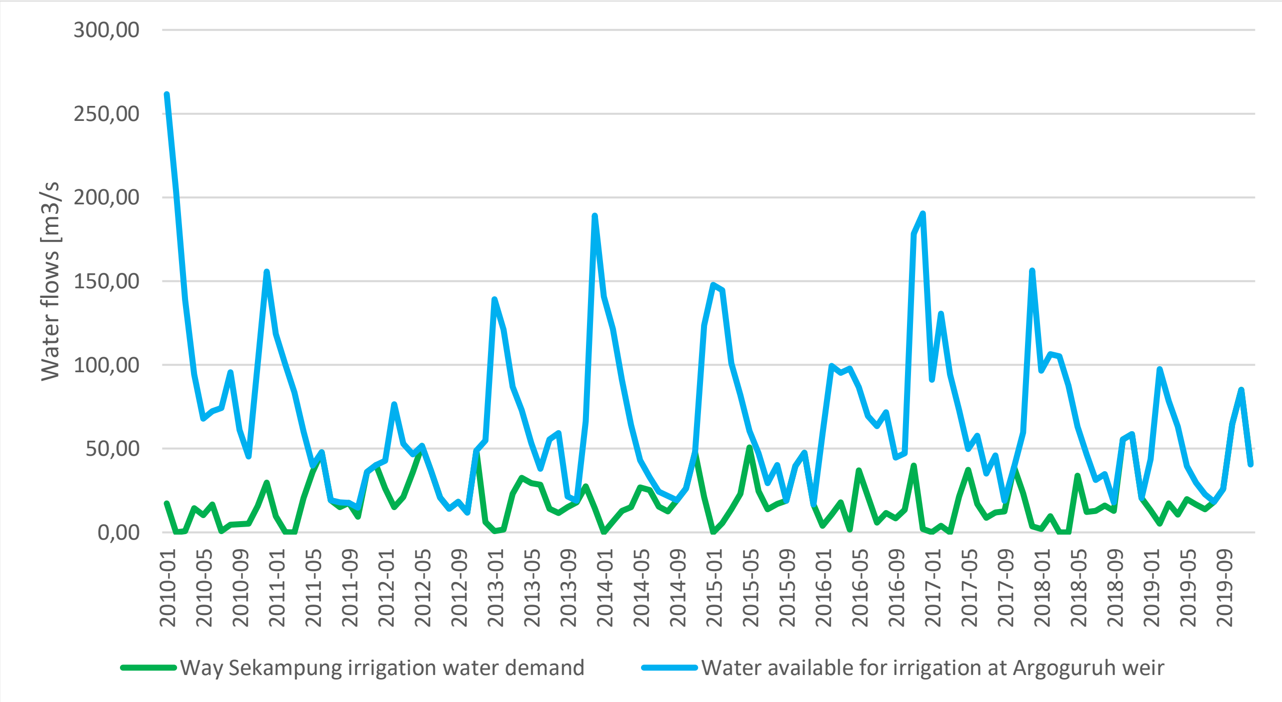


TABLE 5-3 SIMULATION OF SCENARIO 3

	Irrigation system	Functional area (ha)	Cropped area	Start (bimonthly)
	Planting Season 1	56,854	56,854	
1	Batanghari Utara 1	2,490	2,490	24
2	Batanghari Utara 2	2,490	2,490	01
3	Raman Utara 1	2,193	2,193	24
4	Raman Utara 2	2,193	2,193	01

	Irrigation system	Functional area (ha)	Cropped area	Start (bimonthly)
5	Bekri 1	2,429	2,429	21
6	Bekri 2	2,429	2,429	22
7	Sekampung Bunut 1	2,691	2,691	21
8	Sekampung Bunut 2	2,691	2,691	22
9	Sekampung Batanghari 1	4,655	4,655	23
10	Sekampung Batanghari 2	4,655	4,655	24
11	Punggur Utara 1	13,315	13,315	22
12	Punggur Utara 2	8,926	8,926	23
13	Rumbia Barat	5,697	5,697	24

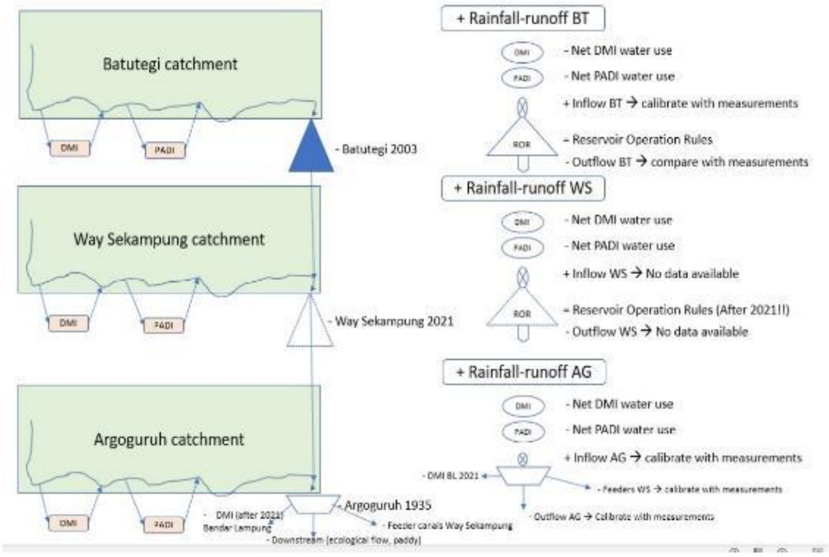
FIGURE 5-2 IRRIGATION WATER AVAILABILITY AND IRRIGATION NEEDS IN SCENARIO 3



5.1.1.2 - Water Availability Allocation

The condition of water sources in the Way Sekampung irrigation area consists of the upstream Batutegi reservoir, the Way Sekampung reservoir in the middle and the Argoguruh weir as irrigation intake. The three water sources work together to provide water for irrigation in the operation of the cascade reservoir.

FIGURE 5-3 CONDITION OF THE WAY SEKAMPUNG IRRIGATION AREA



The water balance in this case is between the available water and its users by considering the balance and environmental sustainability. The water availability from the three watersheds in the upstream part of Argoguruh weir, before being used for the Way Sekampung Irrigation System, has been reduced for the purposes of the Domestic Industry (DMI) for the existing community, as well as the technical needs of existing upstream and rainfed irrigation and rainfed rice fields.

- The water allocation that must be calculated upstream of Argoguruh Weir is;

1. Domestic Industry (DMI) of Bandar Lampung City and Branti City of 2.28 m3/s
2. Domestic Industry (DMI) of Metro City of 0.95 m3/s
3. Domestic Industry (DMI) of Pringsewu City of 0.50 m3/s
4. Need for irrigation water
5. Demand for ecological flow water

TABLE 5-4 WATER AVAILABILITY AND ANNUAL AVERAGE PER MONTH (CLIMATE CHANGE CONDITIONS)

No.	Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Batutegi Reservoir												
1	DMI Bandar Lampung, Branti, Metro	3.23	3.23	3.23	3.23	3.23	3.23	3.23	3.23	3.23	3.23	3.23	3.23
	Way Sekampung Reservoir												
1	Irrigation Way Tebu	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
2	DMI Pringsewu	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Total outflow	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93	4.93

Source: PPC Way Sekampung

Water allocation for Way Sekampung irrigation is sourced from the catchment area, which enters Argoguruh and two reservoirs (Batutegi and Way Sekampung).

The watershed between the Way Sekampung Reservoir and the Argoguruh Weir has operated several irrigation areas with water sources from several tributaries such as; Way Bulok (river of order 2) has a tributary called Way Tebu (river of order 3). Based on the 2013 Geospatial Information Agency (BIG) land use map for the Way Sekampung River Basin next to Argoguruh weir, there are rice fields; in the watershed between Batutegi and

Way Sekampung it is 1,176 ha, in the watershed between Way Sekampung and Argoguruh it is 25,520 ha (including the Way Tebu irrigation area of 500 ha), while in the upstream Batutegi watershed there are no rice fields. The need for irrigation water to return to the river is estimated at 20% and water for DMI returns to the river at 80%. Water requirements of Argoguruh downstream weir:

1. Domestic Industry (DMI) residents and business entities;
2. Way Kandis irrigation area of 3,500 ha from the Way Kandir tributary of the Way Sekampung tributary;
3. Jabung irrigation area leaves 3,638 ha of Jabung flexible weir in the Way Sekampung river;
4. Jabung Kanan irrigation area of 10,950 ha (plan not yet developed);
5. The ecological flow is 95% reliable.

By seeing the graph of the operation of the cascade reservoir (Batutegi and Way Sekampung) to supply the Way Sekampung irrigation area in Figure 5-1 and Figure 5-2 Chart of Water Availability and irrigation needs, it shows the water availability at a certain time (rainy season) is still higher than the demand irrigation, this means that there is still excess water for use in the downstream area of Argoguruh weir.

The downstream condition of the river is Argoguruh Weir; The river's ecological requirements have been set at 95% reliable flow, at certain times there is still a lot of excess water from the available discharge after deducting irrigation needs at Argoguruh weir.

5.1.2 - Existing Condition of Irrigation Scheme

5.1.2.1 - Increase in Rice Production

The technology package introduced to farmers to increase crop production includes integrated crop management and the System of Rice Intensification (SRI).

- Integrated Crop Management (PTT – *Pengelolaan Tanaman Terpadu*)

Integrated crop management is an approach to managing land, water, pests and diseases, and climate that is managed in a sustainable manner to increase farm productivity, farmers' income, and is environmentally friendly. Rice plants in integrated crop management are specifically designed based on the experience of various programs and activities of previously developed intensification systems in the country. Integrated crop management includes four main elements, namely: integration, interaction, dynamics, and participation.

The basic components of PTT Irrigated rice are.

1. Modern varieties
    a. New Superior Varieties (VUB – *Varietas Unggul Baru*), such as IR64 and Ciherang
    b. New Type Rice (PTB – *Padi Tipe Baru*), such as Fatmawati, Cimelati, galur BP360 and B11143
    c. Hybrid Rice (Hipa 5, Hipa 6, Jete and Civa)
2. Quality and healthy seeds
3. Setting the *Jajar Legowo* planting system
4. Balanced and efficient fertilization using BWD and Minister of Agriculture Regulation No. 40 of 2007
5. Integrated Pest Management (IPM) according to Plant Destruction Organisms (OPT)

Optional Components of PTT Rice Field Irrigation

1. Organic matter/manure/ameliorant
2. Age of seeds
3. Good tillage

4. Optimal water management
5. Liquid fertilizer (PPC, organic fertilizer, bio-biological fertilizer)/ZPT, micro fertilizer
6. Harvest and postharvest handling

- System of Rice Intensification (SRI)

System of Rice Intensification a methodology to increase rice productivity by changing the management of crops, soil, water and nutrients. Th System of Rice Intensification does not depend on the two pillars of the crop improvement paradigm of the green revolution - varietal improvement, and external inputs but rather only some changes in agro-economic practices such as using very young seedlings, careful transplanting, wider spacing, active aeration soil during weeding, there is no continuous inundation and rely more on compost.

The principle of the system of rice intensification is explained as follows:

a. Transferring very young seedlings

It is recommended to use seedlings aged 8-12 days and no more than 15 days. This is because young seedlings have a lot of tillering potential and productive root growth compared to older seedlings.

b. Single planting

Planting 3-4 plants in clumps inhibited the growth of roots and shoots of rice plants. It must be understood that any soft root growth then damages the performance of the rice plant.

c. Wider distance

The recommended spacing in the system of rice intensification is 25 × 25 cm, which is 16 plants/m^2. Spacing in a square pattern, not in rows, allows rice plants to get better sun and air exposure on all sides. Wider spacing helps to achieve an 'edge effect' across the field as all leaves will get enough sunlight for photosynthesis and none of the leaves need to be subsidized by the photosynthesis of other leaves due to shade. In the practice of non-system of rice intensification, the spacing between hills is too narrow for the best crop growth.

d. The soil should be kept moist with occasional inundation, but not continuous saturation

Most farmers believe that rice plants grow better in flooded conditions which is not true. Rice is not an aquatic plant, nor will it grow well if grown under hypoxic, submerged soil conditions. Farmers may inundate their land to control weed growth.

e. Soil aeration

In the practice of the system of rice intensification, rice fields are not continuously flooded, thus triggering more weed problems. Hence the practice of SRI requires more weeding. The use of soil mixers and burying weeds allows more oxygen and nitrogen in the soil. This causes soil aeration which increases rice yield.

f. Use of organic fertilizer

The effectiveness of organic fertilizers is lower than chemical fertilizers, but the value comes from the stimulation of growth and biotic activity in the soil, while chemical fertilizers inhibit these activities. Organic fertilizers in sufficient quantities improve soil structure and biodiversity so as to provide the best SRI results. Chemical fertilizers can also be used with the Rice Intensification System in addition to compost, mulch, manure etc. as much as possible. Soils with a higher organic content have a relatively higher water storage capacity and allow better root development of plants.

g. The SRI method is developed and applied in many countries in the world

The system of rice intensification was also introduced by the Agriculture Service of Metro, Central Lampung, and East Lampung Regencies through pilot areas implemented in these areas, but until now farmers have not duplicated the pilot areas.

- Varieties

An increase in air temperature will cause an increase in plant transpiration and a decrease in crop production. An increase in temperature and accompanied by an increase in humidity will cause an increase in pest and disease attacks. Drought may not occur frequently in the irrigation area of the Way Sekampung Irrigation System, due to the water availability from the reservoir. To overcome crop failure due to the negative impact of climate change, new crop varieties have been developed by the Indonesian Agricultural Research Institute as mentioned below.

TABLE 5-5 VARIETIES TO OVERCOME THE POSSIBILITY OF HARVEST FAILURE

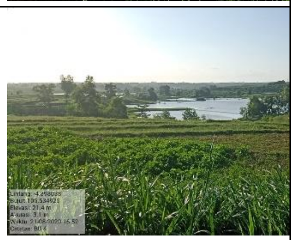
No	Description	Varieties
1	Flood Resistant	*Inpara 5, Inpara 6, Inpara 29, Inpara 30, Kapuas, Batanghari, Banyuasin, Siak Raya, Lembur, Dendang*
2	Drought Resistant	*Inpari 1, Inpari 10, Inpari 13, Inpari 14, Inpari 15, Inpari 16, Inpari 18, Inpari 19, Inpari 20, Inpari 38, Inpari 39, Inpari 40, Inpari 41, Situ Patenggang, Limboto, Batutegi, Situ Bagendit, Silugonggo, Inpago 6, Inpago 6, Inpago 7, Inpago 8, Inpago10*
3	Resistant to early maturing varieties	*Dodokan, Silugonngo, Inpari 1, Inpari 11, Inpari 12, inpari 13*
4	Resistant to pests and diseases	
	Brown planthopper	*Inpari 6,* Inpari *13, Inpari 18, Inpari 19, Mekongga, Inpari 31, Inpari 32, Inpari 33*
	Blast	*Batang Piaman, Situ Patenggang, Batutegi, Inpari 28, Inpari 32 HDB*
	Tungro	*Inpari 4, Inpari 5, Inpari 7, Inpari 8, Inpari 9, Inpari 21, Inpari 31, Inpari 33, Tukad Unda, Tukad Petanu, Kalimas, Bodoyudo*

- Post Harvest

To increase the value of crop production, post-harvest processing is needed. Harvesting rice using a sickle requires threshing (power / threshing pedal) to separate the grain from the stalk. If harvesting is done with a combine harvester, threshing is no longer needed. Before further processing, harvested dry grain (GKP – *Gabah Kering Panen*) is dried into milled dry grain (GKG – *Gabah Kering Giling*). Several dryers are available in the area such as solar dryers or mechanical dryers belonging to farmer groups and grants from the Ministry of Agriculture and local governments. In addition, rice milling units owned by rice producers and farmer groups are also available.

5.1.2.2 - Impact of Inundation

Code/DI	Inundation Duration		Landform	Right of ownership	IA/ Not	Cropping pattern		Photo
	2019	2020				2019	2020	
RU 1 Raman Utara	6 months	7 months	Palm oil/swamp	Yes	Yes	Cassava(Jul I)	Cassava (Jul II)	
	Jan I - Jun I	Jan I - Jul I				Corn (Jul I)	Corn (Jul II)	
RU 2 Raman Utara	3 months	8 months	Farmland / Lowland	Yes	Yes	Rice (Sept I) - Puddle-*palawija* (Jul I)	Puddle	
	Jan I - Mar I	Jan-Now				Cassava (Apr I)	Puddle-cassava	
						None	None	
RB 1 Rumbia Barat	7 months	7 months	Farmland	Yes	Yes	Rice (Jul II)	Rice (Jul II)	
	Jan I - Jul I	Jan I - Jul I						

Code/DI	Inundation Duration		Landform	Right of ownership	IA/ Not	Cropping pattern		Photo
	2019	2020				2019	2020	
RB 2 Rumbia Barat	7 months	8 months	Farmland	Yes	Yes	Rice (Feb I)-Padi (Jun I)	Rice (May II)	
	Jan I - Jul I	Jan - Now				None	None	
SB Sekampung Batanghari	3 weeks	3 weeks	Farmland	Yes	No	Rice (Aug I)	Rice (Aug I)	
	Jan I, Mar I, Jun I	Jan I, Mar I, Jul I				Rice (Jul I)-Rice (Oct I)		
BU Batanghari Utara	7 months	8 months	Farmland	Yes	Yes	Rice (Jul II)	-	
	Jan I - Jul I	Jan-Now				Top of *Palawija* (Jul I)"	Top of *Palawija* (Aug I)"	

5.2 - Detail of Design

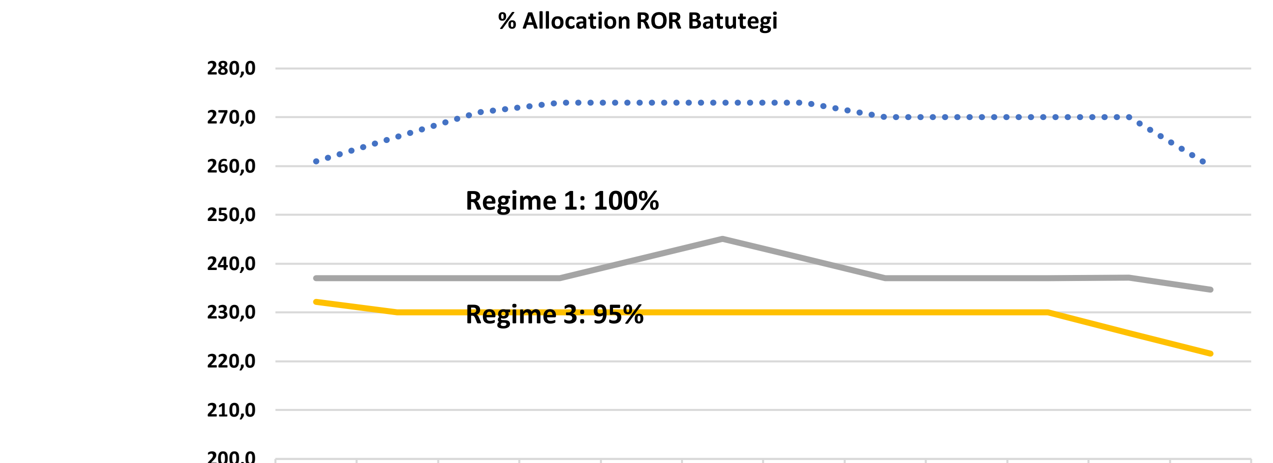
5.2.1 - Headwork

5.2.1.1 - Reservoir Operation (Cascade)

In the initial situation, the hydraulics model of scenario 1B (without the Way Sekampung reservoir) is able to provide enough water for 208% of the 215% requested, meaning that there is only a 7% gap to achieve full water availability for a Rice-Rice planting calendar – (50%) *Palawija*.

With the Way Sekampung reservoir and after optimization of the ROR in scenario 2, sufficient water can be provided for 213%, meaning that the gap is reduced from 7% to only 2%. Moreover, the fixed electric power that must be available from a flow of 10 m^3/s in the Batutegi reservoir is able to reach 98%, while for a flow of 5 m^3/s in the Way Sekampung reservoir, the permanent electric power is also recorded at 98%.

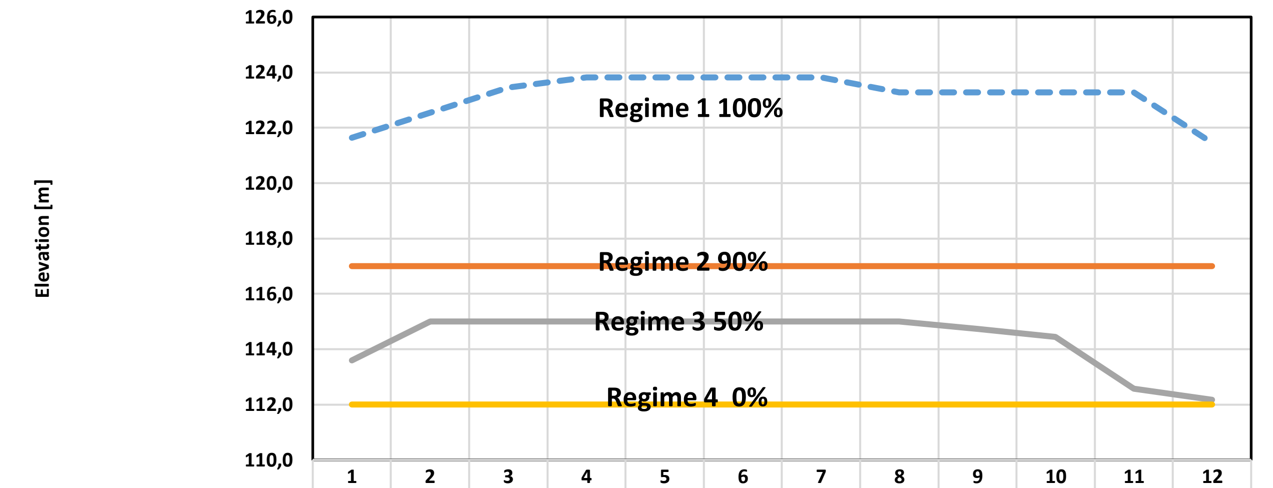
FIGURE 5-4 RESULTS OF OPERATING PATTERNS FOR BATUTEGI RESERVOIR



	1	2	3	4	5	6	7	8	9	10	11	12
Flood prot. [m]	261,0	266,0	271,0	273,0	273,0	273,0	273,0	270,0	270,0	270,0	270,0	260,0
Lower limit [m]	237,0	237,0	237,0	237,0	241,1	245,1	241,1	237,0	237,0	237,0	237,2	234,7
Critical limit [m]	232,2	230,0	230,0	230,0	230,0	230,0	230,0	230,0	230,0	230,0	225,8	221,6

Source: PPC Way Sekampung

FIGURE 5-5 RESULTS OF OPERATING PATTERNS FOR WAY SEKAMPUNG RESERVOIR

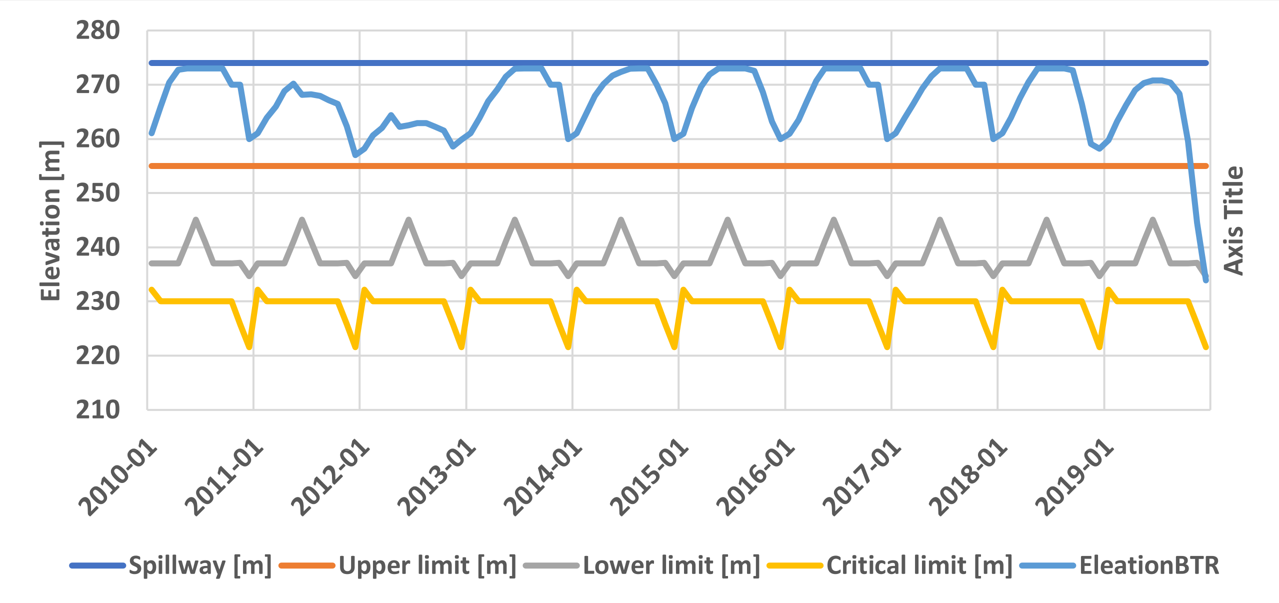


	1	2	3	4	5	6	7	8	9	10	11	12
Flood prot. WSR [m]	121,6	122,5	123,5	123,8	123,8	123,8	123,8	123,3	123,3	123,3	123,3	121,5
Upper limit [m]	117,0	117,0	117,0	117,0	117,0	117,0	117,0	117,0	117,0	117,0	117,0	117,0
Lower limit [m]	113,6	115,0	115,0	115,0	115,0	115,0	115,0	115,0	114,7	114,4	112,6	112,2
Critical limit [m]	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0	112,0

Source: PPC Way Sekampung

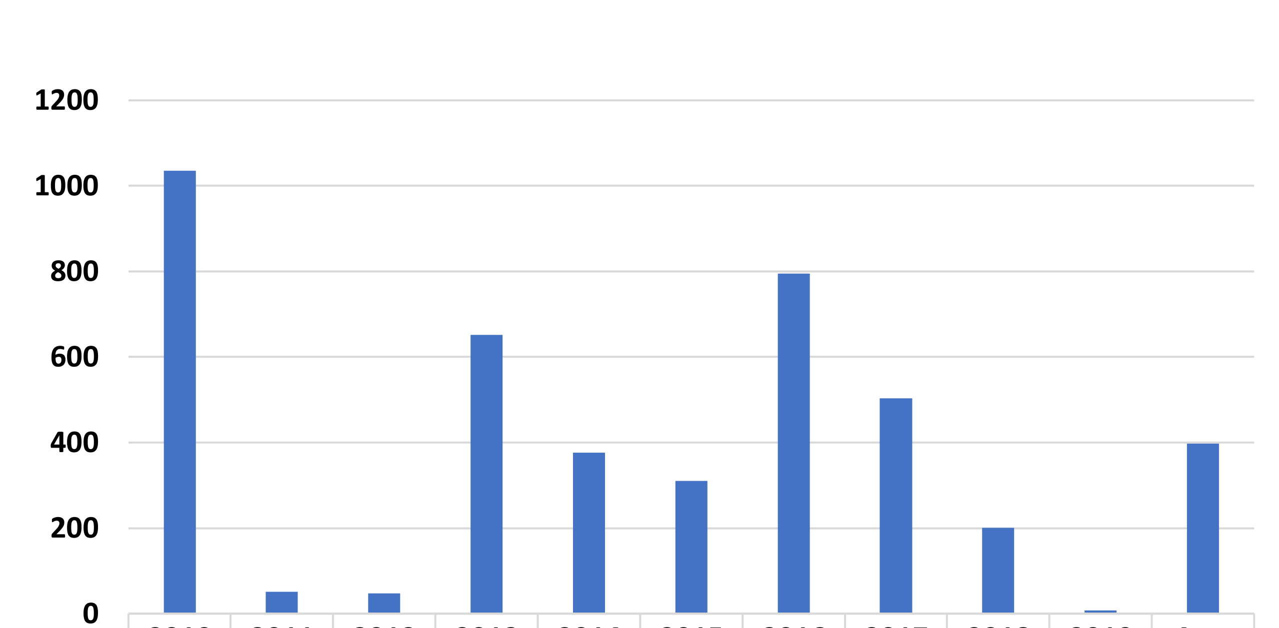
It should be noted that the elevation of the ROR operating pattern above is not always related to the water availability, meaning that the results of the water availability do not always change when the elevation of the operating pattern changes. Thus, the values above show the results of the smoothing process. The remaining peak or trough is considered relevant because if it changes, it will affect the final result. The reservoir elevation in Batutegi according to these operating guidelines was recorded to be very low only at the end of 2012 due to two consecutive years of drought. The second half of 2019 was also low, however, due more to the underestimation of runoff predicted using the Mock model, where on-the-ground measurements show a large amount of runoff over the last few months of 2019. Since the Mock model does not include these results, As a result, the model implemented noted a shortage of water to meet the demand and the water level of the reservoir fell.

FIGURE 5-6 WATER LEVEL OF BATUTEGI RESERVATION IN SCENARIO 2



Source: PPC Way Sekampung

FIGURE 5-7 ADDITIONAL WATER RELEASE AS FLOOD CONTROL IN BATUTEGI RESERVOIR



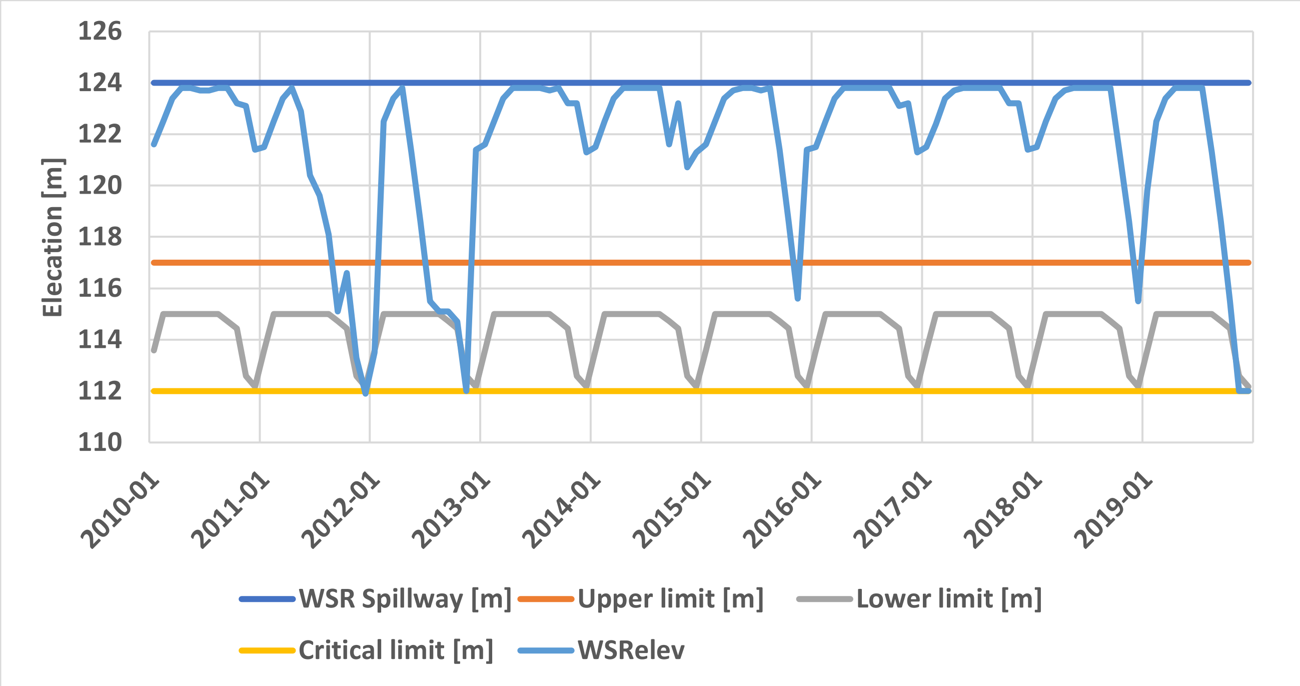
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Avg.
MCM	1036	52	47	652	377	311	795	503	200	8	398

Source: PPC Way Sekampung

Figure 5-7 shows additional water that needs to be released as a flood control effort. In a wet year like 2010, the additional water release reached 1036 MCM. In dry years such as 2011, 2012 (recovering water levels that fell sharply) and 2019, the value was recorded at zero. The water level for the Way Sekampung reservoir emerges in

Figure 5-8. It can be seen that in 2012, the reservoir experienced a drought, while at other times the full allocation could be served normally, except for the end of 2016 and 2019 when the water allocation fell by 90%.

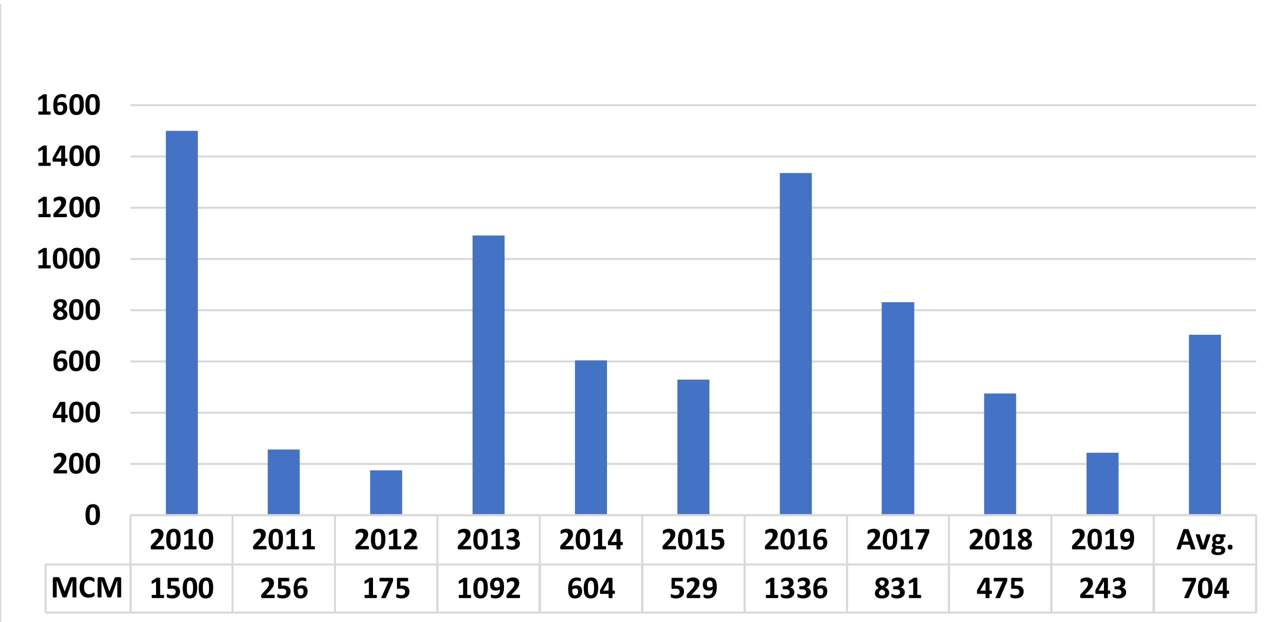
FIGURE 5-8 WATER LEVEL OF WAY SEKAMPUNG RESERVATION IN SCENARIO 2



Source: PPC Way Sekampung

Additional water releases as flood control in Way Sekampung occur more frequently and with larger volumes as shown in Figure 5-9.

FIGURE 5-9 ADDITIONAL WATER RELEASE AS FLOOD CONTROL IN WAY SEKAMPUNG RESERVOIR

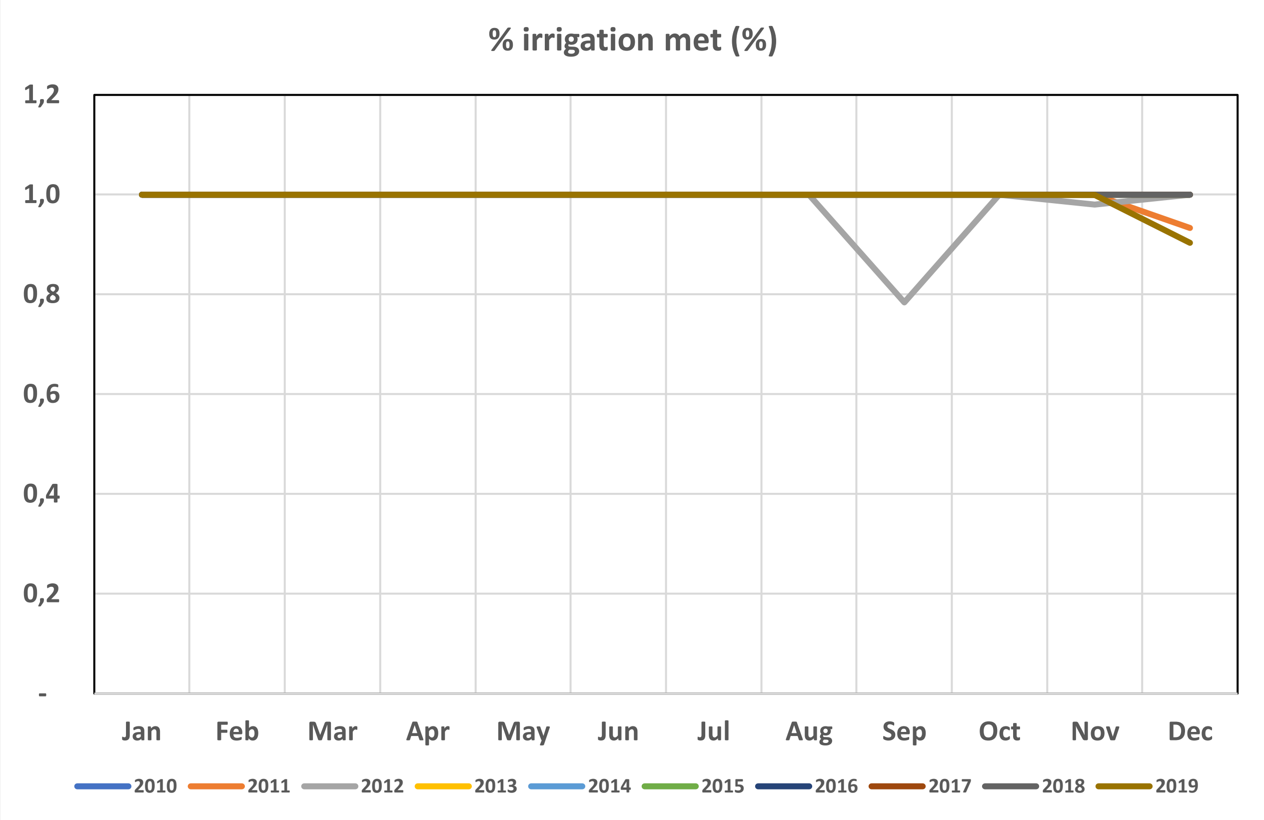


Source: PPC Way Sekampung

It is interesting to note that overall, the discharge water is known to be higher than in Batutegi reservoir. The reasons are 1) there is a new catchment area that supports the occurrence of (peak) runoff and 2) the volume of water in the Batutegi reservoir is much higher and able to hold more water before releasing additional water.

- Conclusion and recommendation
  - In general, the cascade reservoir system is able to guarantee water availability in scenario 2. Able to serve all existing demand (100%), except for November – December 2019 and September 2012 where the water availability is slightly reduced to above 80 %

FIGURE 5-10 PERCENTAGE OF FULFILLED IRRIGATION WATER REQUIREMENT BY YEAR AND MONTH



Source: PPC Way Sekampung

  - The results of the hydraulics model combined with the Microsoft Excel Solver Add-in show promising results:
    - Water availability gap is reduced by 5% compared to scenario 1b
    - The desired planting calendar, namely rice – rice – *palawija* is achieved for 10 years
    - Fixed electricity that must be available from the hydropower in Batutegi with an average discharge of 10 m3/s reaches 100% and can be used to generate maximum electricity during peak hours between 17:00 – 22:00.
    - Fixed electric power that must be available from hydropower in Way Sekampung with an average discharge of 5 m^3/s was recorded at 96%. Because this value is the maximum value, the turbine that can provide electrical power can be used as a constant source of electricity.
  - Reservoir operating guidelines have a limited effect on water availability. It is known that in optimization many ROR elevations do not affect water availability, but some of them are very important.
  - Considering the complete set of data, it is clear that two consecutive years of drought (2011, followed by 2012) have created problems. The only way to solve this problem is to take advantage of rainfall forecasts so that decisions are made based on those forecasts if the allocation needs to be reduced first. For a growing season, it is better to reduce it to a certain lower allocation than having to face the risk of failure for a whole month, because it will damage the plant itself. The challenge is how to get reliable rainfall predictions for long periods of time. For a period of up to sixteen days there is already a forecast (Global Forecast System – GFS – from NOAA – see *https://www.ncdc.noaa.gov/data-access/model-data/model-datasets/global-forecast-system-gfs*). However, it only covers a small part of a growing season. Forecasts based on IOD and La Nina / El Nino can be helpful once the supporting indicators are accurately estimated.

Weir

- Argoguruh Weir

FIGURE 5-11 UPSTREAM SEDIMENT DEPOSITS FROM THE RIGHT SIDE OF THE WEIR

Nowadays, sediment deposition has not hampered it, but in the future if the deposition is shaped like an island, the river flow during high floods will be concentrated to the left of the weir and the flow intensity will be increased to the left, which will damage the downstream bottom. Therefore, this deposition must be removed by using an excavator and tipper if necessary.

- Raman Weir

a. Drainage modulus to Raman Weir

Raman Weir is a weir that gets its water supply from Argoguruh weir and drainage modulus that enters Raman River. The drainage system in the Way Sekampung irrigation system, all natural canals are used to drain excess water from the rice fields, in the case of Raman Weir, the supply from the Sub-System of Punggur Utara Irrigation Area is 7,878 m^3/sec and Sekampung Bunut 8,771 m^3/sec. Table 5-6 is the detail of the drainage modulus that can enter Raman Weir.

TABLE 5-6 DRAINAGE MODULUS TO RAMAN WEIR

No	Irrigation Sub-System	Drainage Canal	Discharge (m^3/s)
1	Punggur Utara	dA	0.285
2	Punggur Utara	dF	0.361
3	Punggur Utara	dI	0.376
4	Punggur Utara	dN	0.252
5	Punggur Utara	dP	0.164
6	Punggur Utara	dQ	0.201
7	Punggur Utara	dR	0.48
8	Punggur Utara	dW	1.140
9	Punggur Utara	dAB	1.534

No	Irrigation Sub-System	Drainage Canal	Discharge (m^3/s)
10	Punggur Utara	dAJ	0.181
11	Punggur Utara	dAK	0.181
12	Punggur Utara	dAM	1.733
13	Punggur Utara	dGL	0.159
14	Punggur Utara	dPrimer 17	0.469
15	Punggur Utara	dPrimer 18	0.362
Total Punggur Utara		**Sungai Way Raman**	**7.878**
1	Sekampung Bunut	dADL	0.116
2	Sekampung Bunut	dADS	0.211
3	Sekampung Bunut	dADT	0.211
4	Sekampung Bunut	dADU	0.211
5	Sekampung Bunut	dADV	0.211
6	Sekampung Bunut	dAEE	0.189
7	Sekampung Bunut	dAEJ	0.133
8	Sekampung Bunut	dAEK	0.032
9	Sekampung Bunut	dAEG	1.393
10	Sekampung Bunut	dAIX	0.376
11	Sekampung Bunut	dAIZ	0.25
12	Sekampung Bunut	dAJA	0.203
13	Sekampung Bunut	dAJB	1.045
14	Sekampung Bunut	dAJO	1.555
15	Sekampung Bunut	dAJT	0.355
16	Sekampung Bunut	dAJU	0.135
17	Sekampung Bunut	dAJV	0.135
18	Sekampung Bunut	dAJW	0.147
19	Sekampung Bunut	dAJX	0.147
20	Sekampung Bunut	dALM	0.067
21	Sekampung Bunut	dALL	0.067
22	Sekampung Bunut	dALK	0.115
23	Sekampung Bunut	dPrimer 251	0.087
24	Sekampung Bunut	dPrimer 252	1.38
Total Sekampung Bunut		**Sungai Way Raman**	**8.771**
Suplai Bendung Raman dari 2 Sub DI			**16.649**

b. Existing Conditions

The condition of Raman weir was damaged on the slopes so that it requires the existing slope protection work to be carried out with gabions, at the downstream weir found damage on both the right and left sides. The left side of the upstream weir is protected by a gabion wall while the right side slope must be protected by providing gabion work together with the launch pad.

FIGURE 5-12 DAMAGE PROTECTIVE WEIR AND GABION NEED

c. Detail of gabion work design from Raman weir

FIGURE 5-13 DEPICTION OF GABION DESIGN IN RAMAN WEIR

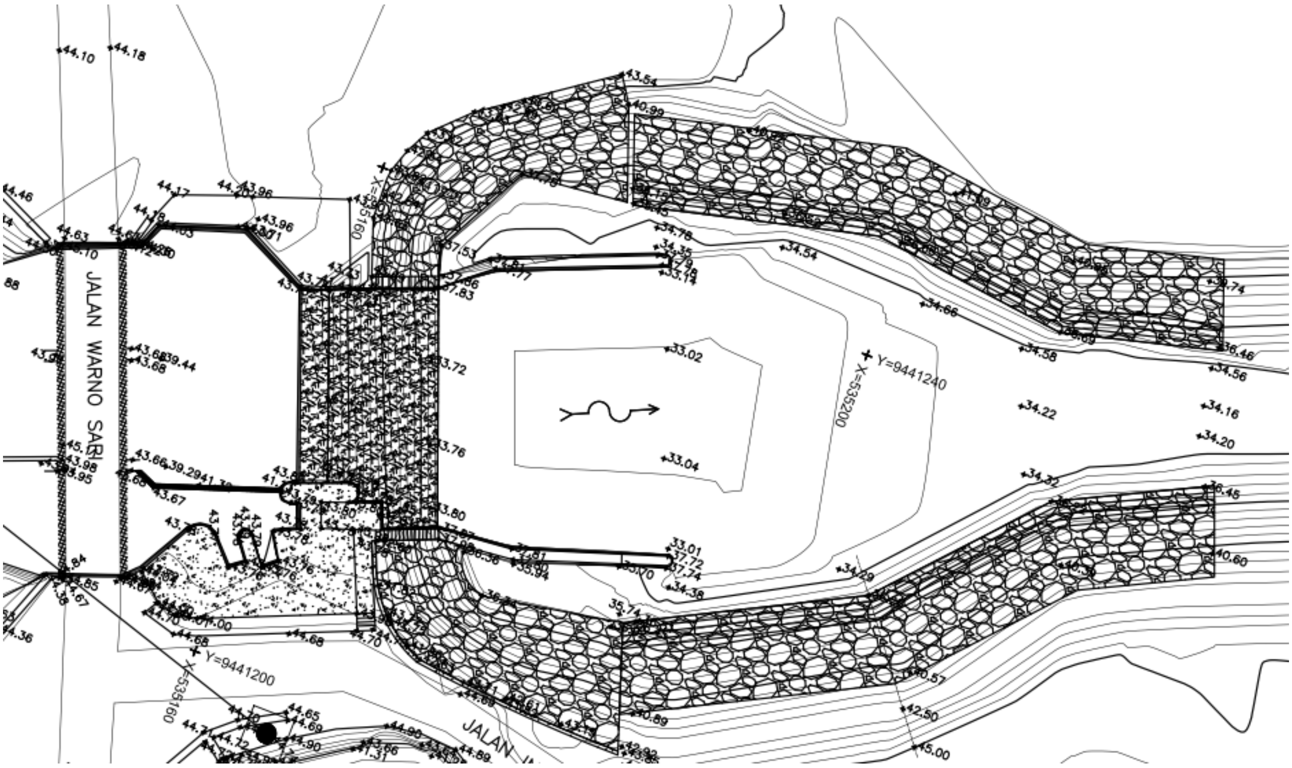
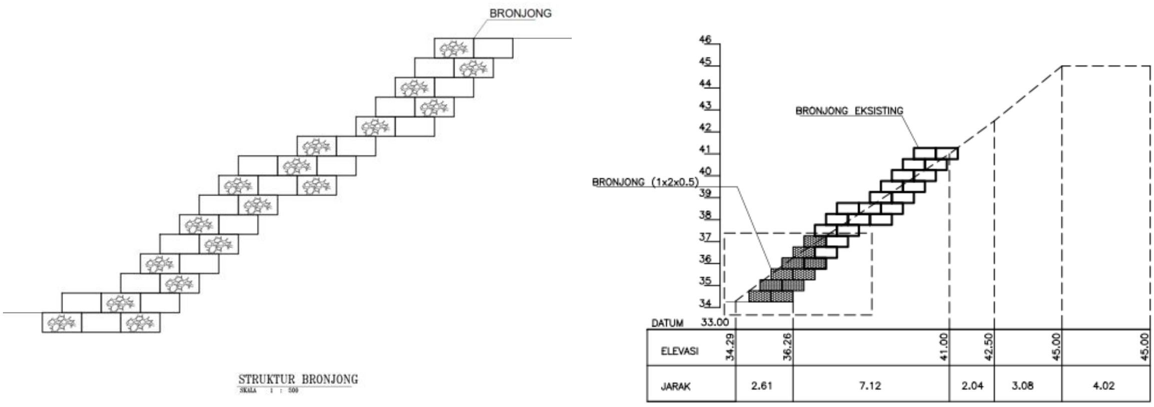


FIGURE 5-14 GABLON STRUCTURE IN RAMAN UTARA



Construction of gabions for Raman Weir in the Raman Utara Irrigation Area using stone masonry with a size of 1 x 2 x 0.5 m with a dolken pair of (Ø 0.1 x 2) m. Details of the gabion construction design drawings can be seen in the design drawings on a separate print. The following is the volume of the Raman weir rehabilitation work from demolition to construction of gabions.

TABLE 5-7 VOLUME OF GABION REHABILITATION WORK IN RAMAN WEIR

No	Job	Unit	Volume
1	Digging	m^3	1,670.01
2	Heap	m^3	295.53
3	Field cleaning	m^2	1,349.30
4	Stone masonry	m^3	475.37
5	A pair of stones	m^3	1,896.20
6	Dolken installation	m	120

- Garongan Weir
  a. Drainage Modulus to Garongan Weir

Garongan Weir is a weir that gets its water supply from the Argoguruh weir and the drainage modulus that enters the Batanghari River. The drainage system in the Way Sekampung irrigation system, all natural canals are used to drain excess water from the rice fields, in the case of Garongan Weir the supply from the Sub-Systems in Sekampung Bunut Irrigation Area of 12.27 m^3/sec and Sekampung Batanghari 24.17 m3/sec. is the detail of the drainage modulus that can enter the Garongan Weir..

TABLE 5-8 DRAINAGE MODULUS TO GARONGAN WEIR

No	Sub-Irrigation Area	Drainage Canal	Discharge (m^3/s)
1	Sekampung Batanghari	dAPA	0.075
2	Sekampung Batanghari	dAPB	0.337
3	Sekampung Batanghari	dAPC	0.128
4	Sekampung Batanghari	dAPD	0.264
5	Sekampung Batanghari	dAPH	2.514
6	Sekampung Batanghari	dAQY	1.049
7	Sekampung Batanghari	dARD	0.206
8	Sekampung Batanghari	dARE	0.342
9	Sekampung Batanghari	dPrimer 64	0.365
10	Sekampung Batanghari	dPrimer 64a	3.01
11	Sekampung Batanghari	dAUX	0.151
12	Sekampung Batanghari	dAVD	0.121
13	Sekampung Batanghari	dAVG	0.124
14	Sekampung Batanghari	dAVF	0.113
15	Sekampung Batanghari	dPrimer 87	1.579
16	Sekampung Batanghari	dPrimer 89	2.304
17	Sekampung Batanghari	dAVY	0.438
18	Sekampung Batanghari	dAWB	0.288
19	Sekampung Batanghari	dPrimer 93	0.661
20	Sekampung Batanghari	dAWE	0.303
21	Sekampung Batanghari	dPrimer 94	4.572
22	Sekampung Batanghari	dBEV	0.387
23	Sekampung Batanghari	dBES	0.099

No	Sub-Irrigation Area	Drainage Canal	Discharge (m^3/s)
24	Sekampung Batanghari	dPrimer 96	4.74
Total Sekampung Batanghari		**Sungai Way Batanghari**	**24.17**
1	Sekampung Bunut	dADP	0.724
2	Sekampung Bunut	dADX	0.105
3	Sekampung Bunut	dADY	0.13
4	Sekampung Bunut	dADZ	0.099
5	Sekampung Bunut	dAEA	0.099
6	Sekampung Bunut	dAEB	0.122
7	Sekampung Bunut	dAEX	1.198
8	Sekampung Bunut	dAEY	0.282
9	Sekampung Bunut	dAEZ	0.226
10	Sekampung Bunut	dAFA	0.019
11	Sekampung Bunut	dAFB	0.019
12	Sekampung Bunut	dAFC	0.158
13	Sekampung Bunut	dAFD	0.19
14	Sekampung Bunut	dAFE	0.101
15	Sekampung Bunut	dAFF	0.069
16	Sekampung Bunut	dAFL	0.023
17	Sekampung Bunut	DAFN	0.054
18	Sekampung Bunut	dAFO	0.072
19	Sekampung Bunut	dAFP	0.049
20	Sekampung Bunut	dAFK	0.641
21	Sekampung Bunut	dAFV	0.201
22	Sekampung Bunut	dPrimer 266	0.172
23	Sekampung Bunut	dAGO	0.081
24	Sekampung Bunut	dAGP	0.081
25	Sekampung Bunut	dAGQ	0.165
26	Sekampung Bunut	dAGR	0.358
27	Sekampung Bunut	dAGS	0.991
28	Sekampung Bunut	dAGZ	0.229
29	Sekampung Bunut	dAHC	0.311
30	Sekampung Bunut	dPrimer 264	0.68
31	Sekampung Bunut	dAMW	0.125
32	Sekampung Bunut	dAMX	0.167
33	Sekampung Bunut	dANA	0.629
34	Sekampung Bunut	dANC	0.307
35	Sekampung Bunut	dANC1	0.065
36	Sekampung Bunut	dAOY	0.527
37	Sekampung Bunut	dAOZ	0.258
38	Sekampung Bunut	dAOU	0.29
39	Sekampung Bunut	dAOX	0.146
40	Sekampung Bunut	dPrimer 263	2.111
Total Sekampung Bunut		**Sungai Way Batanghari**	**12.27**
Suplai Bendung Garongan dari 2 Sub DI			**36.44**

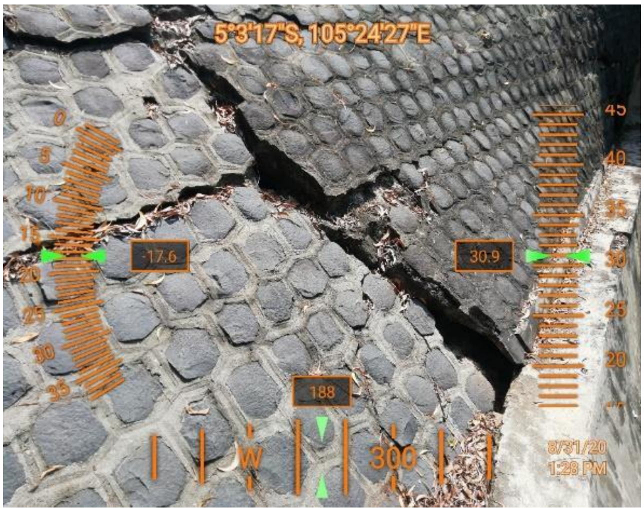
b. Existing condition

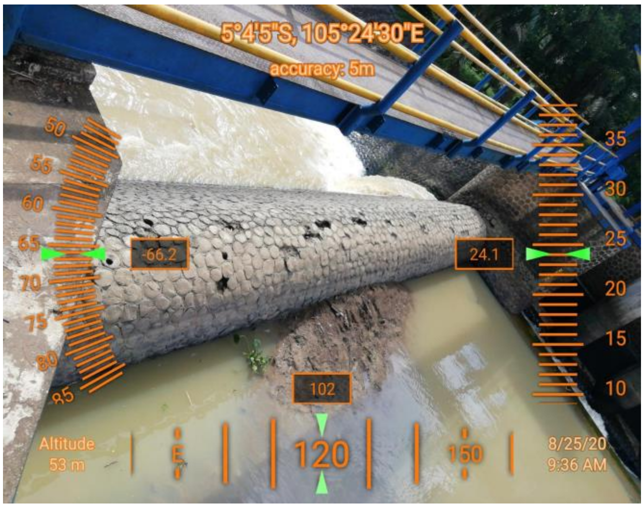
This sub-chapter is the result of a visual geotechnical investigation of the Garongan dam so that it can be used to improve irrigation modernization. Detailed analysis results can be seen in the geotechnical investigation report.

- Based on Structure Identification

Based on the results of the identification survey, the Garongan weir location has lining cracks due to soil subsidence, pore water pressure, there is no pipe hole to drain the pore water pressure, so recommendations for improvement are needed.

FIGURE 5-15 DAMAGE CONDITION OF GARONGAN WEIR





- Observations from geological results

Based on the results of field investigations and geological maps in the Garongan weir area, which is known as the Lampung Formation (QTl), this formation consists of pumice tuff, rhyolitic tuff, tuffy solid tuff, tuffaceous claystone and tuffaceous sandstone. The permeability level at this location is 1.21E-05 – 1.92E-05, the permeability level category is low permeability. Based on the results of observations in the field, the Garongan weir area has a GWL depth value of 4-5 m.

- Earthquake data

Sumatra is one of the areas with high seismic activity. The slip rate movement of the Indo-Australian plate into the Eurasian plate is 5-7 cm/year (RSNI Earthquake Map, 2010). According to the Lampung Regency KRB Earthquake Map (PVMBG, Geological Agency, MEMR), the Way Sekampung irrigation area is a low earthquake-prone area. The research location has a peak ground acceleration (PGA) value of 0.25 - 0.3, for a response spectrum acceleration of 1.0 seconds (S1) with 5% attenuation in bedrock (SB) for a 2% probability of being exceeded in 50 years. From the results of the soil investigation that the average value of NSPT <15 to >15 blows/feet, it is classified as medium soil (SD) and has a Maximum Acceleration (Spectral Acceleration, SA) value of 0.51.

- Slope stability of Garongan weir

The results of calculations using plaxis 2D find the existing slopes of the Garongan weir with retaining wall construction using stone and concreate. The results of the total displacement with extreme conditions are 88.62E-03 m and the stability of the SF is 2.263 so that according to the SNI, the slope stability of the Garongan weir is safe.

The results of calculations using plaxis 2D find the damaged existing slopes in the Garongan weir area with retaining wall construction using lining concreate. The results of the total displacement with extreme conditions are 134.67E-03 m and the stability of the SF is 2.269 so that according to the SNI, the slope stability of the Garongan weir is safe.

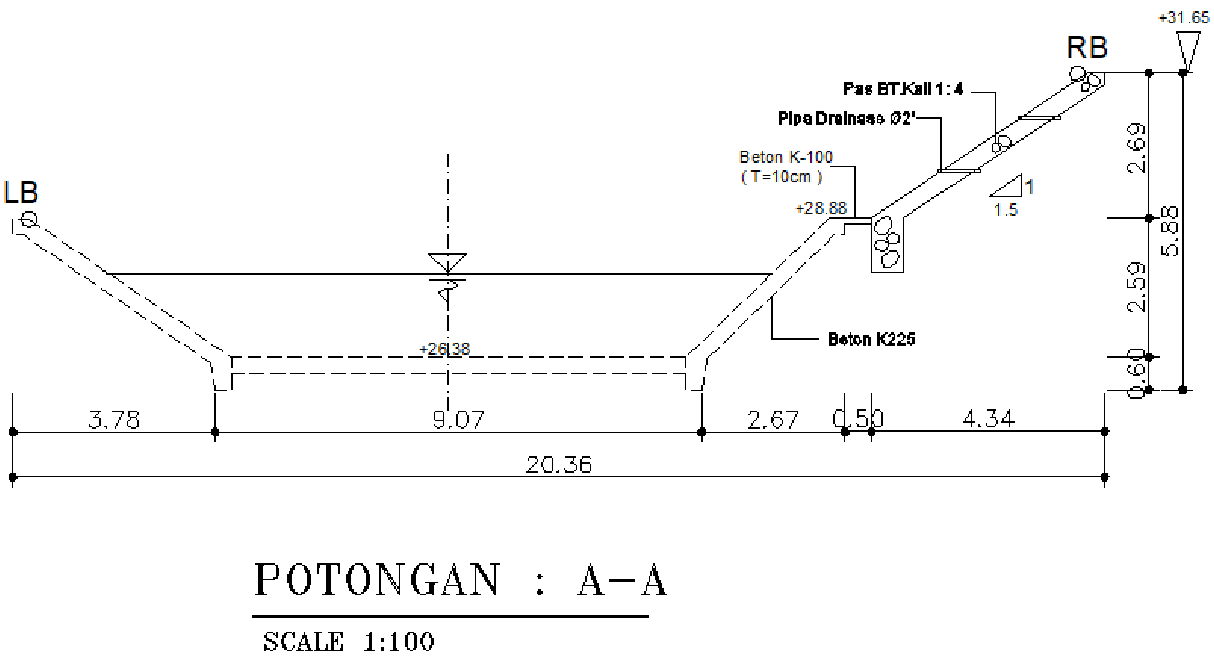
- Liquifaction analysis

The results of empirical calculations using Drilling data GA-01 and GA-02 reveal at the Garongan weir location in general the lithology of the dominant soil layer is clay, soil drainage is rigid, the results of the calculation of soil gradation are well-graded, so that at the Garongan weir location there is no liquefaction potential.

The calculation results from drilling data, in situ test and laboratory test results for the GA-01 area are 0.1 meters in 12180 days or about 33.4 years. The calculation results from the drilling data, in situ test and laboratory test results for the GA-01 area are 0.08 meters in 14,816 days or about 40.6 years.

c. Design details for Garongan weir

FIGURE 5-16 DESIGN SECTION OF GARONGAN WEIR



The Garongan weir was damaged so it is required to be rehabilitated. Garongan weir rehabilitation consists of retaining wall works and weir renovation. The following is the volume of work for DPT and weir renovation.

TABLE 5-9 VOLUME OF INTAKE RETAINING WALL WORK

No	Work	Unit	Volume
	Digging	m^3	44.98
	Painting	m^2	0.72
	Field cleaning	m^2	50.40
	Stone masonry	m^3	27.47
	Pairs of stones	m^3	27.47
	Broadcast	m^2	65.02
	Concrete	m^3	0.48
	Wipehole	m	2.05

The retaining wall works uses masonry and K-225 concrete. Installation of wipeholes/drainage holes are used to drain water and are embedded in the ground. The function of the wipehole itself is to reduce water pressure on the retaining wall Structure so as to reduce the level of Structure damage. Wipehole installed in Garongan Weir with a diameter of 2 inches using PVC pipe.

TABLE 5-10 VOLUME OF REHABILITATION WORKS IN GARONGAN DAM

No	Work	Unit	Volume
1	Digging	m^3	180.00
2	Bouwplank	m	88.00
3	Field cleaning	m^2	88.00
4	Stone masonry	m^3	753.00
5	Formwork	m^2	165.00
6	Broadcast	m^2	825.00
7	Concrete	m^3	85.80

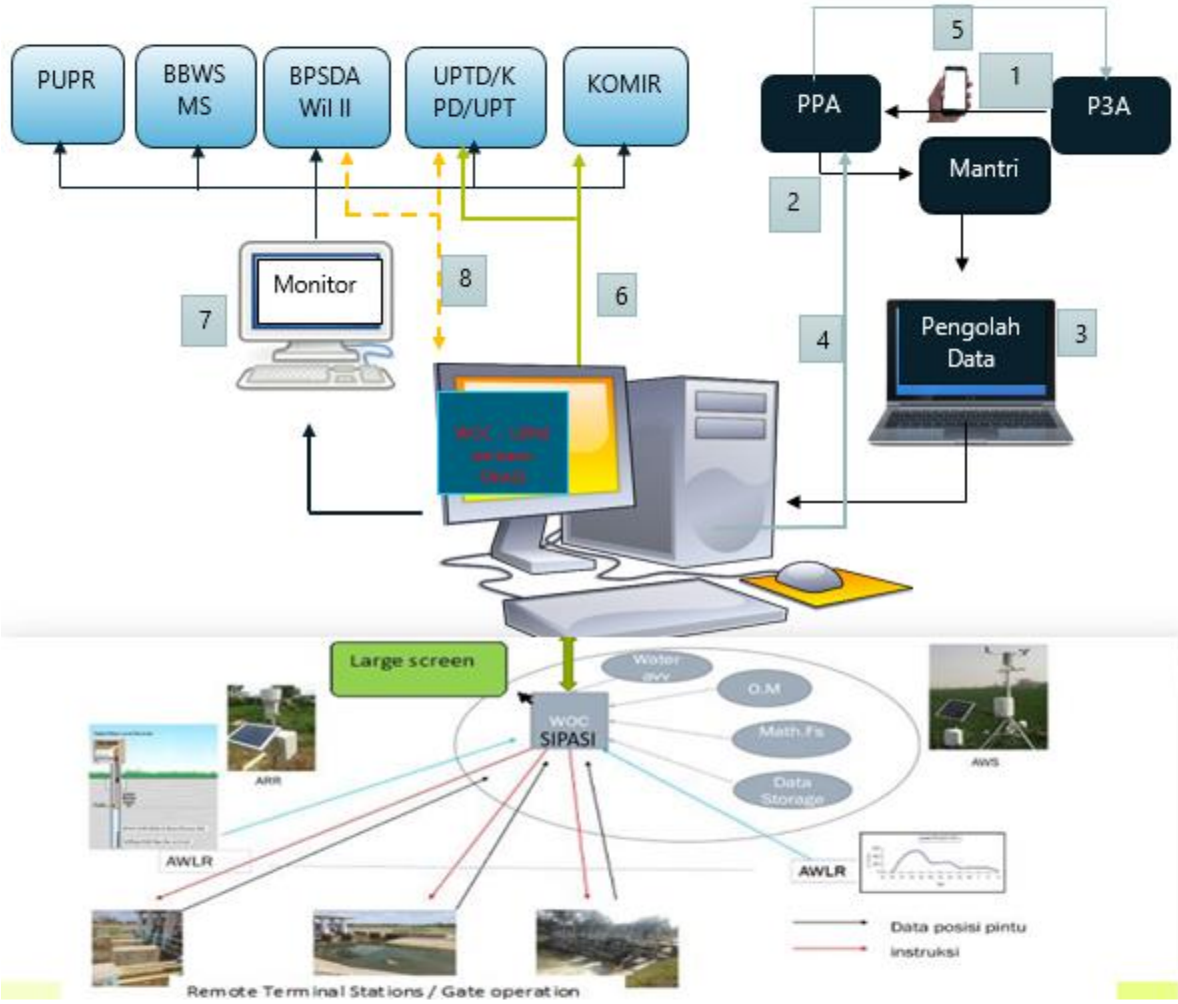
Garongan weir rehabilitation work uses concrete work K-225 with Wiremesh M8 (Ready mix)

5.2.1.2 - Board Crested Weir

Board crested weir in the modernization of irrigation uses an automatic measuring instrument based on volume accumulation. In connection with the modernization of the Way Sekampung Irrigation Area, SIPASI is used. SIPASI is a system used to accumulate automatic measuring instruments such as Automatic Water Level Recorder (AWLR) to detect and record water level, rainfall monitoring station Automatic Rainfall Recorder (ARR), and Automatic Weather Stations (AWS) an integrated system designed to automatic weather data collection. Several automatic measuring instruments will be managed in an integrated manner with the WOC which will then be accumulated with the water discharge needs of each tertiary plot.

THE MAIN FUNCTION OF THE WOC IS AS A CENTRAL CONTROL SYSTEM IN IRRIGATION MANAGEMENT BY RECEIVING SENSOR INFORMATION AND USING THE DECISION SUPPORT SYSTEM (DSS) TO CALCULATE THE ARRANGEMENT OF THE GATES ACCORDING TO THE PLAN. THESE ARRANGEMENTS ARE THEN COMMUNICATED TO THE FIELD SITE. THE DATA IN THE WOC CONTAINS THE LATEST INFORMATION AND PREVIOUS INSTRUCTIONS, PLANNING INSTRUCTIONS, EXECUTION INSTRUCTIONS STORED IN A VERY LARGE MEMORY CAPACITY (TERA BYTE) IN A SECURE WAY TO ENSURE THAT INFORMATION FROM INSTRUMENTS IN THE FIELD IN THE FORM OF HISTORICAL DATA AND OTHER DATA IS AVAILABLE IF NEEDED SUCH AS HISTORICAL DATA. NEEDED TO RESOLVE WATER DISPUTES, SYSTEM PLANNING, EQUIPMENT PROBLEMS, AND MAINTENANCE ISSUES. WOC HERE FUNCTIONS AS A MASTER TERMINAL UNIT. IN ITS OPERATION, THE WOC AS THE MASTER TERMINAL UNIT IS A COMPUTER WITH VARIOUS DEVICES IN THE SCADA SYSTEM THAT FUNCTIONS AS THE CENTER OF THE ENTIRE SCADA SYSTEM. THIS MTU PROVIDES HMI (HUMAN MACHINE INTERFACE) FACILITIES FOR USERS AND WILL AUTOMATICALLY ADJUST THE SYSTEM ACCORDING TO THE INPUT DATA RECEIVED BY SENSORS IN REAL TIME. THE WATER DISTRIBUTION SCHEME IS PRESENTED IN

FIGURE 5-17 PROCESS AND RESPONSIBLE FOR WATER DISTRIBUTION THROUGH SIPASI



Information:

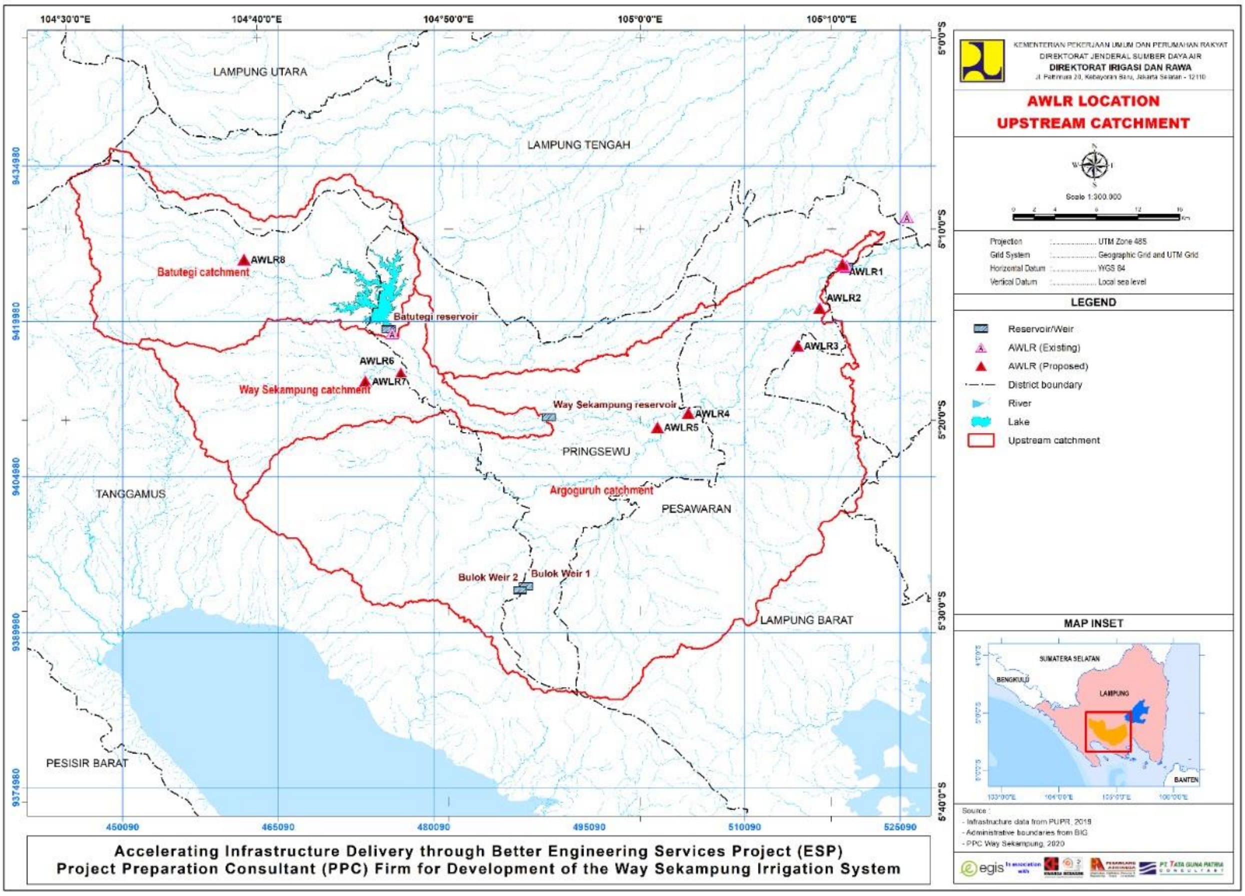
1. Farmers through P3A propose requests for water distribution in tertiary plots to PPA by submitting information on the area to be irrigated and the desired time/schedule.
2. PPA directly or by telephone/SMS/WA submits the P3A request to the waterworkers/*mantri* along with the time and extent.
3. Water take notes through the CPU/tablet provided at the UPTD/waterworkers office, and asks the WOC to provide water to P3A.
4. WOC realizes the provision of water to the PPA to open the gates at the intended tertiary.
5. PPA opens the gates through the command button on the gate Structure in the tertiary.
6. WOC can provide data needed for Irrigation Commission and UPTD/KPD/UPT for Planting System planning and Water Distribution Plan and for UPTD in making policy on water distribution.
7. PUPR, BBWS dan BPSDA Region II can monitor in real time the water distribution process and can provide feedback in the form of policies.
8. As the implementing unit controlling the operation of irrigation networks, BPSDA Region II at the Lampung Province PSDA Service and UPTD/KPD/UPT districts/cities have the authority to monitor WOC through existing monitor screens and coordinate with each other between these units to ensure that services run effectively.

- *Automatic Water Level Recorder* (AWLR)

AWLR IS A MEASURING INSTRUMENT USED TO MEASURE WATER LEVEL (TMA) AUTOMATICALLY USING SENSORS AND DATA STORAGE MEDIA. THE AWLR INSTALLATION LOCATION IS PROVIDED IN FIGURE 5-18 AND TABLE 5-11

Figure 5-19.

FIGURE 5-18 LOCATION OF AWLR UPSTREAM AREA



The installation of AWLR in the upstream area is intended to measure the discharge in water catchment areas such as the Batutegi Dam, Way Sekampung Dam and Argoguruh Weir. The installation of AWLR is the installation of 8 new units which are divided into 3 catchment areas. In the catchment area of the Batutegi Dam, 1 new unit of AWLR has been installed. In the catchment area from Batutegi Dam to Way Sekampung Dam, 2 AWLR units. Meanwhile, for rivers from Way Sekampung Dam to Argoguruh Weir, 5 AWLR units were installed.

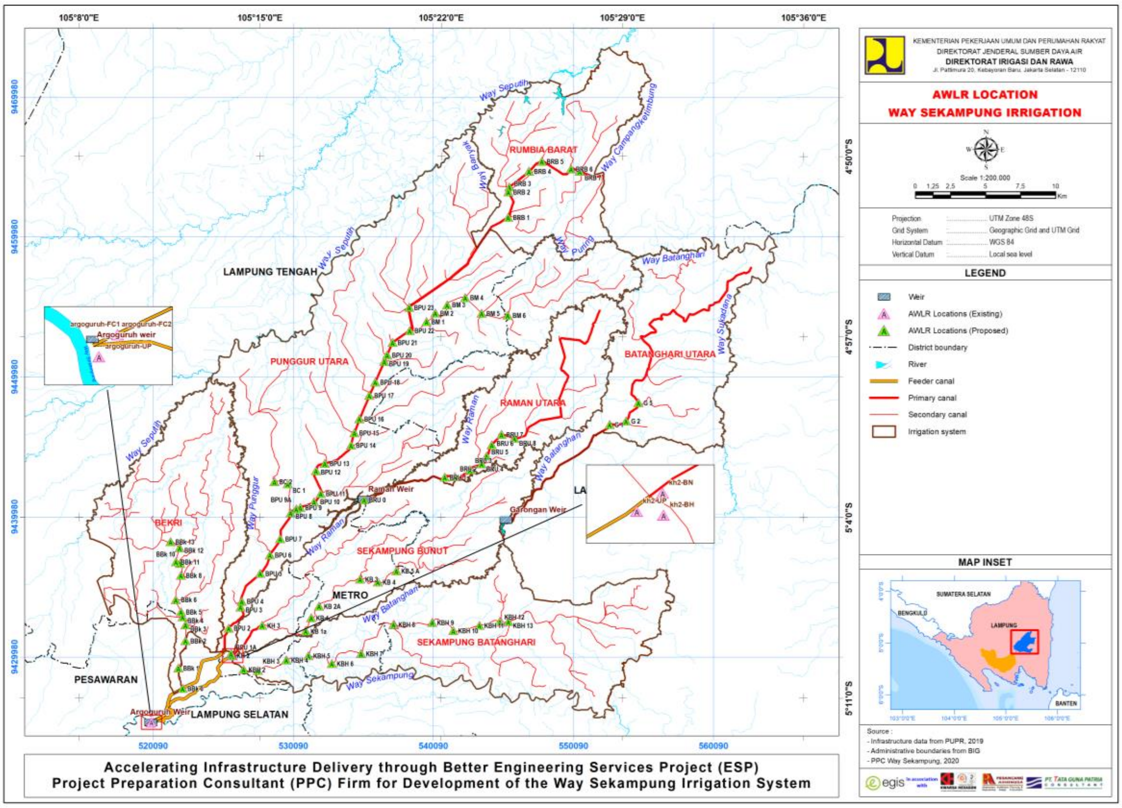
TABLE 5-11 LOCATION OF AWLR INSTALLATION IN DOWNSTREAM AREA

No	Nomenclature	Sub-Irrigation Area	AWLR Upstream Structure	AWLR Downstream Structure	Total AWLR
1	G0 (Bendung)	Batanghari Utara	3		3
2	G1	Batanghari Utara	1	1	2
3	G5	Batanghari Utara	1	1	2
4	BPU0	Bekri	1	1	2
5	BBk1	Bekri	1	1	2
6	BBk2	Bekri	1	1	2
7	BBk3	Bekri	1	1	2
8	BBk4	Bekri	1	1	2
9	BBk5	Bekri	1	2	3
10	BBk6	Bekri	1	2	3
11	BBk8	Bekri	1	2	3

No	Nomenclature	Sub-Irrigation Area	AWLR Upstream Structure	AWLR Downstream Structure	Total AWLR
12	BBk10	Bekri	1	3	4
13	BBk11	Bekri	1	2	3
14	BBk12	Bekri	1	2	3
15	BBk13	Bekri	1	2	3
16	BPU2	Punggur Utara	1	2	3
17	BPU3	Punggur Utara	1	2	3
18	BPU4	Punggur Utara	1	4	5
19	BPU5	Punggur Utara	1	5	6
20	BPU6	Punggur Utara	1	5	6
21	BPU7	Punggur Utara	1	4	5
22	BPU8	Punggur Utara	1	4	5
23	BPU9	Punggur Utara	1	2	3
24	BPU10	Punggur Utara	1	2	3
25	BPU11	Punggur Utara	1	3	4
26	BPU12	Punggur Utara	1	2	3
27	BPU13	Punggur Utara	1	4	5
28	BPU14	Punggur Utara	1	2	3
29	BPU15	Punggur Utara	1	4	5
30	BPU16	Punggur Utara	1	2	3
31	BPU17	Punggur Utara	1	4	5
32	BPU18	Punggur Utara	1	2	3
33	BPU19	Punggur Utara	1	5	6
34	BPU20	Punggur Utara	1	5	6
35	BPU21	Punggur Utara	1	3	4
36	BPU22	Punggur Utara	1	4	5
37	BPU23	Punggur Utara	1		1
38	BPU1ARU	Punggur Utara	1	2	3
39	BC1	Punggur Utara	1	2	3
40	BC2	Punggur Utara	1	3	4
41	BM1	Punggur Utara	1		1
42	BM2	Punggur Utara	1		1
43	BM3	Punggur Utara	1		1
44	BM4	Punggur Utara	1		1
45	BM5	Punggur Utara	1		1
46	BM6	Punggur Utara	1		1
47	BRU0 (Bendung)	Raman Utara	2		2
48	BRU1	Raman Utara	1	2	3
49	BRU2	Raman Utara	1	1	2
50	BRU3	Raman Utara	1	2	3
51	BRU4	Raman Utara	1	2	3
52	BRU5	Raman Utara	1	2	3
53	BRU6	Raman Utara	1	2	3
54	BRU7	Raman Utara	1	3	4

No	Nomenclature	Sub-Irrigation Area	AWLR Upstream Structure	AWLR Downstream Structure	Total AWLR
55	BRU8	Raman Utara	1	2	3
56	BRU9	Raman Utara	1	6	7
57	KBH2	Sekampung Batanghari	1	1	2
58	KBH3	Sekampung Batanghari	1	2	3
59	KBH4	Sekampung Batanghari	1	1	2
60	KBH5	Sekampung Batanghari	1	3	4
61	KBH6	Sekampung Batanghari	1	3	4
62	KBH7	Sekampung Batanghari	1	3	4
63	KBH8	Sekampung Batanghari	1	5	6
64	KBH9	Sekampung Batanghari	1	4	5
65	KBH10	Sekampung Batanghari	1	2	3
66	KBH11	Sekampung Batanghari	1	2	3
67	KBH12	Sekampung Batanghari	1	4	5
68	KBH13	Sekampung Batanghari	1	3	4
69	BRB1	Rumbia Barat	1	1	2
70	BRB3	Rumbia Barat	1	2	3
71	BRB5	Rumbia Barat	1	1	2
72	BRB6	Rumbia Barat	1	1	2
73	BRB7	Rumbia Barat	1	1	2
74	KH2	Sekampung Bunut	1	5	6
75	KH3	Sekampung Bunut	1	4	5
76	BKB1	Sekampung Bunut	1	2	3
77	BKB3	Sekampung Bunut	1	3	4
78	BKB4	Sekampung Bunut	1	2	3
79	BKB5A	Sekampung Bunut	1	1	2

FIGURE 5-19 MAP OF AWLR LOCATION IN WAY SEKAMPUNG IRRIGATION AREA



In Feeder Canal 1, which serves 4 irrigation sub-areas, it includes the irrigation sub-areas of Sekampung Bunut, Sekampung Batanghari, Batanghari Utara, and Raman Utara. The installation of AWLR in the Sub-Systems in Sekampung Bunut Irrigation Area starting from the KH.2 gate, which is the intake gate to the BKB.5A gate, requires the installation of 23 units. In the Sub-Systems in Sekampung Batanghari Irrigation Area, starting from the KH.2 gate that is the intake gate to the KBH.13 gate required 45 units are required to be installed. Meanwhile, Sub-Systems in Batanghari Utara and Raman Utara Irrigation Area also receive supplements from Feeder Canal 1 or more precisely from KH.2 gate to Garongan Weir (Sub-Systems in Batanghari Utara Irrigation Area) and Raman Weir (Sub-Systems in Raman Utara Irrigation Area).

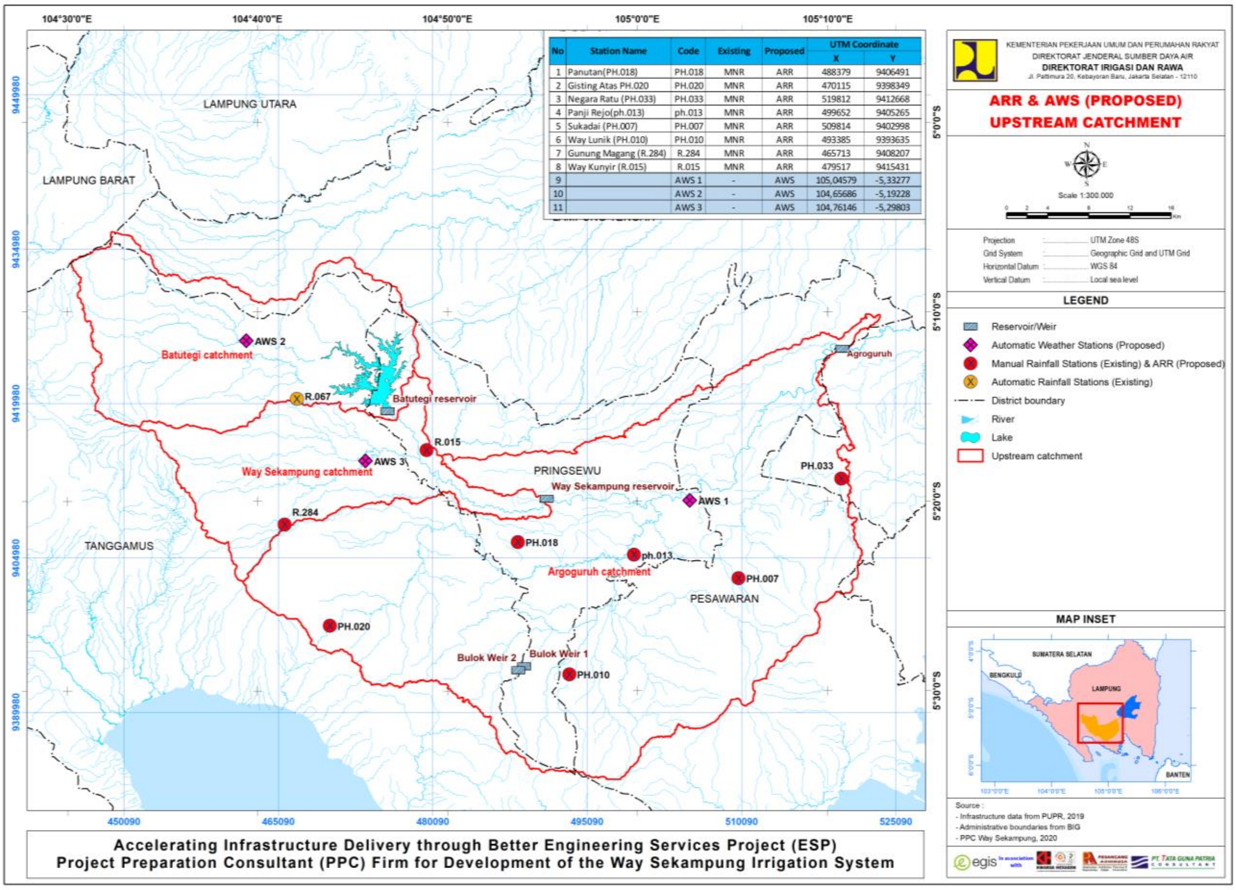
The installation of the AWLR device at the supplementary gate at the BPU.1A gate for the Sub-Systems in Raman Utara Irrigation Area, and the KH.2 gate for the Sub-Systems in Batanghari Utara Irrigation Area aims at determining the amount of supplementation allocated. The installation of AWLR in the Sub-Systems in Raman Utara Irrigation Area starting from the intake gate is in the form of the Raman weir to the BRU.9 gate as many as 33 units. Meanwhile, in the Sub-Systems in Batanghari Utara Irrigation Area, which starts from the intake gate, is in the form of the Garongan Weir to the BG.5 gate, there are 7 units.

In Feeder Canal 2, which serves 3 irrigation areas, including the Bekri, Punggur Utara, and Rumbia Barat irrigation areas. Sub-Systems in Bekri and Punggur Utara Irrigation Area have the same intake gate, namely the BPU.0 gate. From the BPU.0 gate to the BBK.13 gate including in the Sub-Systems in Bekri Irrigation Area, 32 units of AWLR are installed. Meanwhile, from the BPU.0 to the BPU.23 gates, including the Punggur Utara Irrigation Area, 92 units of AWLR are installed. In the Punggur Utara irrigation Area, the installation of AWLR is not only carried out on the main canal, some secondary canals are also installed with AWLR between the BC secondary canal and the BM secondary canal. Next, the intake gate for the Sub-Systems in Rumbia Barat Irrigation Area is located at the BPU.22 gate, which belongs to the Punggur Utara area. Installation of AWLR equipment in the Sub-Systems in Rumbia Barat Irrigation Area starting from the BPU.22 to BRB.7 gates requires the installation of 11 units.

- *Automatic Rainfall Rercorder* (ARR) and *Automatic Weather Stations* (AWS)

ARR is a station to measure the amount of rainfall automatically. Measurement of the amount of rainfall is used to determine the amount of rainfall in a particular area. Meanwhile, AWS is a tool that measures climate in an integrated manner such as temperature, humidity, solar intensity, and others. The following are the locations of ARR and AWS installations upstream and downstream of the Argoguruh weir.

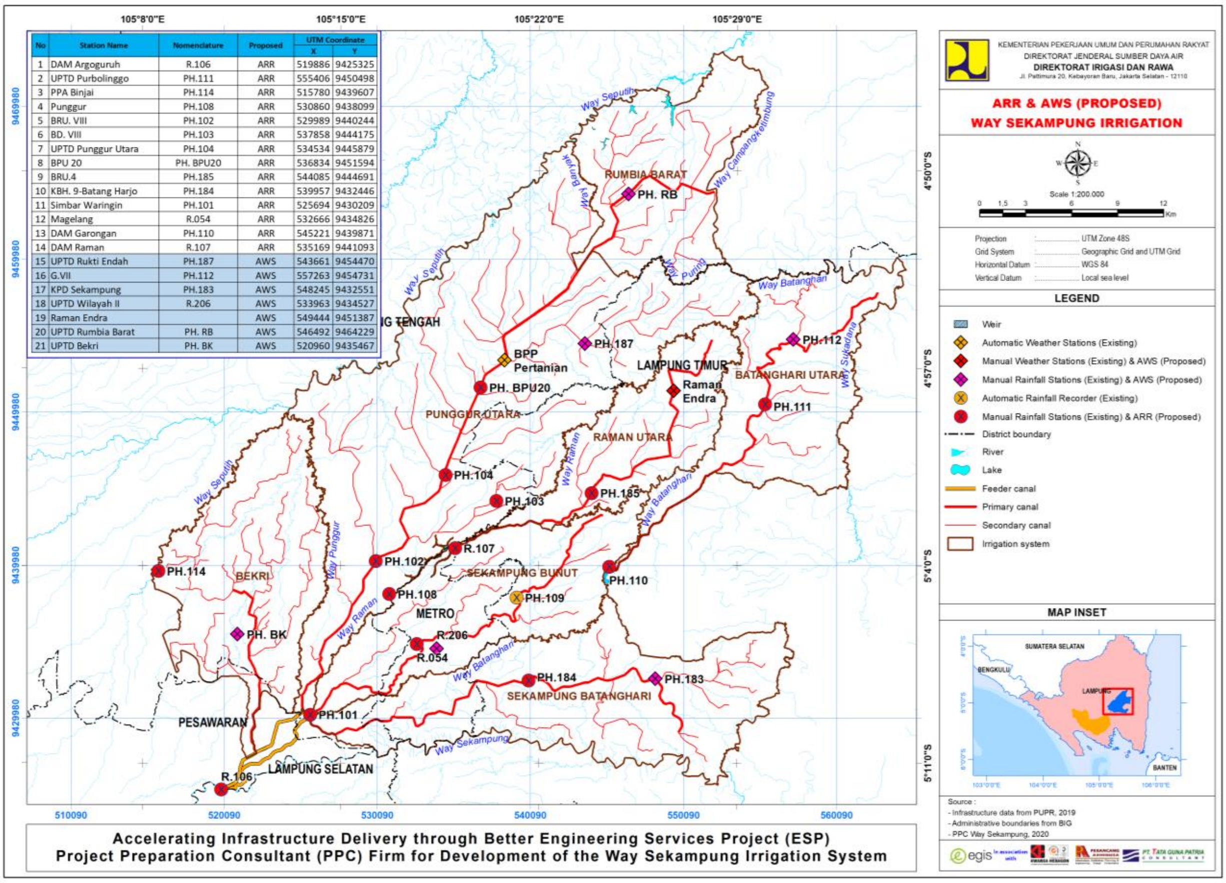
FIGURE 5-20 INSTALLATION OF ARR AND AWS IN UPSTREAM AREA



The installed ARR device is a modification of the previous device which still uses manual/semi-automatic measuring instruments. The installation of ARR in the upstream area of Argoguruh amounted to 8 ARR installed in 2 water catchment areas, namely 6 sub-systems in Argoguruh weir and 2 locations placed in sub-systems in Way Sekampung weir.

AWS devices are installed in 3 water catchment areas with 1 unit each, namely the Batutegi dam, the Way Sekampung dam and the Argoguruh dam.

FIGURE 5-21 INSTALLATION OF ARR AND AWS IN DOWNSTREAM AREA



The installation of ARR in the upstream area of Argoguruh is the Way Sekampung Irrigation Area which has 7 sub-irrigation areas. The installation of ARR in Way Sekampung District totaled 14 ARR which was installed in 1 Sub-System in Batanghari Utara Irrigation Area, 1 Sub-System in Bekri Irrigation Area, 5 Sub-Systems in Punggur Utara Irrigation Area, 1 Sub-System in Raman Utara Irrigation Area, 1 Sub-System in North Sekampung Batanghari and 4 Sub-Systems in Sekampung Bunut Irrigation Area.

AWS devices were installed totaling 7 units which were divided into each sub-irrigation area, namely Punggur Utara, Rumbia Barat, Bekri, Sekampung Bunut, Sekampung Batanghari, Raman Utara and Batanghari Utara.

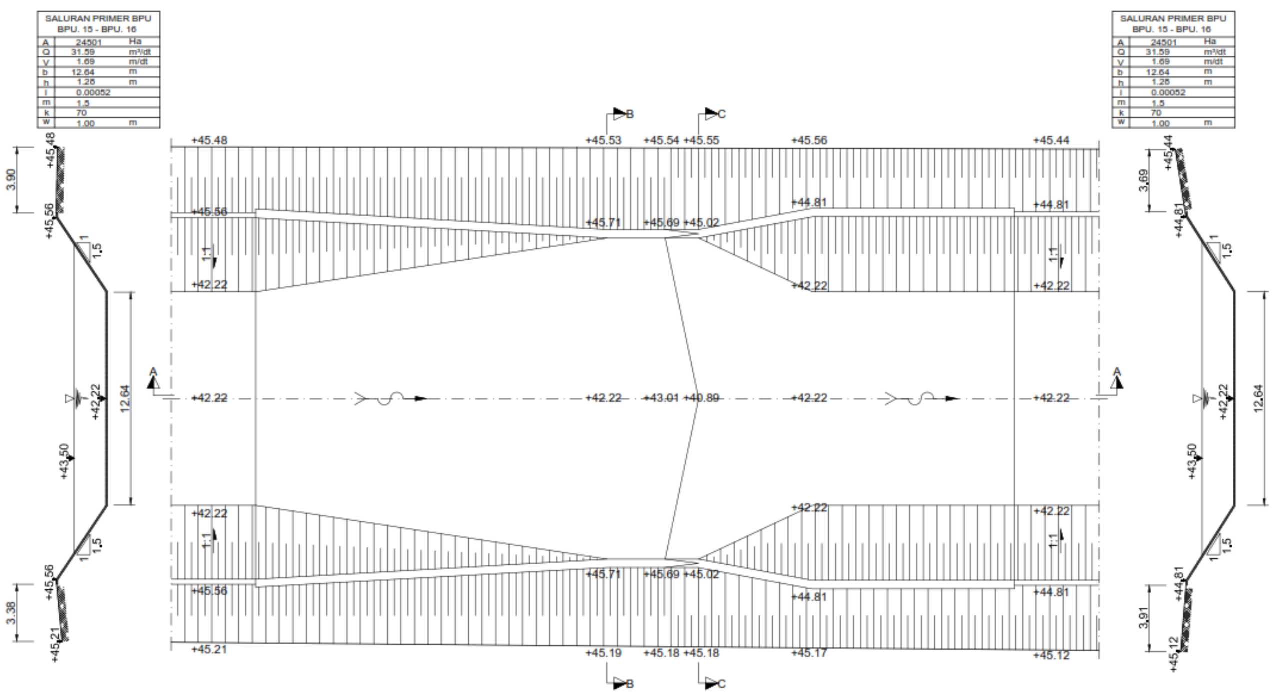
- Board crested weir of canals

TABLE 5-12 REHABILITATION OF BOARD CRESTED WEIR

No	Irrigation Area	UPTD	Canal Label	Location
1	Punggur Utara	Trimurjo	Induk BPU	BPU3b
2	Punggur Utara	Trimurjo	Sekunder BA	BA1a
3	Punggur Utara	Trimurjo	Sekunder BB	BB1a
4	Punggur Utara	Trimurjo	Sekunder BC	BC1a
5	Punggur Utara	Punggur	Sekunder BD	BD10a
6	Punggur Utara	Kota Gajah	Induk BPU	BPU.16a
7	Rumbia Barat	Rumbia Barat	Induk BRB	BRB1a
8	Rumbia Barat	Rumbia Barat	Induk BRB	BRB6b
9	Bekri	Bekri	Sekunder BA	BBa14a
10	Bekri	Bekri	Sekunder SR	BSr9a

No	Irrigation Area	UPTD	Canal Label	Location
11	Bekri	Bekri	Sekunder BS	BBs18a
12	Sekampung Bunut	Adipuro	Feeder KH	KH3A1
13	Sekampung Bunut	Pekalongan	Sekunder KB	KB3a
14	Sekampung Bunut	Pekalongan	Sekunder KBM	KBM1a1
15	Sekampung Bunut	Pekalongan	Sekunder KBO	KBO1a1
16	Batanghari Utara	Purbolinggo	Sekunder TB	TB0
17	Batanghari Utara	Purbolinggo	Sekunder TE	TE0
18	Batanghari Utara	Purbolinggo	Sekunder TP	TP1a2
19	Batanghari Utara	Purbolinggo	Sekunder TK	TK0
20	Batanghari Utara	Purbolinggo	Sekunder P	P0
21	Raman Utara	Raman Utara	Induk BRU	BRU1k
22	Raman Utara	Raman Utara	Sekunder BD	BD1b
23	Raman Utara	Raman Utara	Sekunder BH	BH1a

FIGURE 5-22 EXAMPLE OF BOARD CRESTED WEIR DESIGN IN CANAL

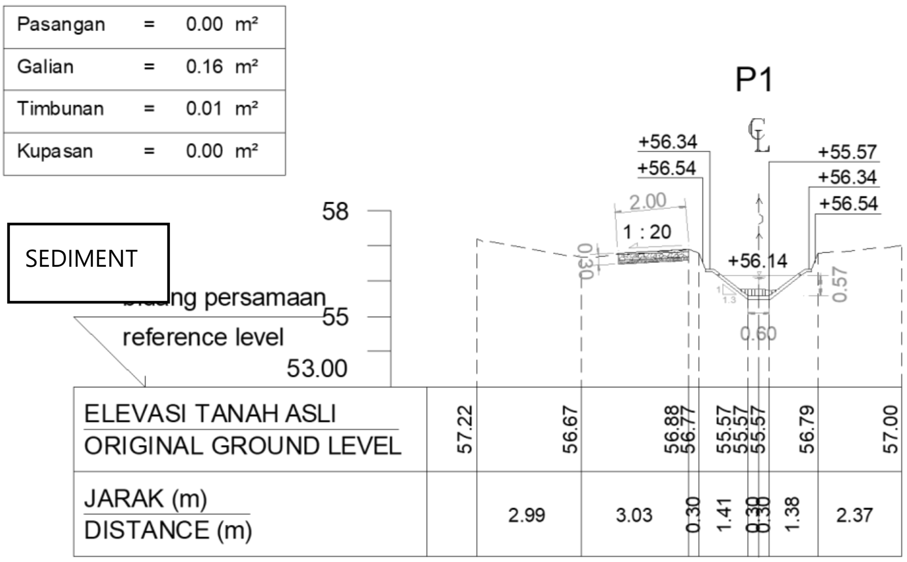


5.2.2 - Irrigation Canals

5.2.2.1 - Canal Capacity

Sedimentation found in irrigation canals is formed from the processes of weathering, erosion, transportation and deposition (hardening). In the Way Sekampung rehabilitation project, there are several locations experiencing sedimentation, for example in UPTD Bekri which experienced sedimentation in the canal BK 3 – BSK 1 sta 3+576 – sta 4+152 with a length of 576 m, a width of 1.2 m, and a height of 0.3 m. the sedimentation volume is 207 m3. The following is an example of a lining design that experienced sedimentation in Bekri and more details are in the appendix:

FIGURE 5-23 EXAMPLE OF SEDIMENTATION IN BEKRI IRRIGATION AREA



There are two methods in sediment excavation work, namely ordinary soil excavation (man power) and mechanical sediment excavation (using heavy equipment). The following is data on locations that experience sedimentation, including:

TABLE 5-13 LOCATION OF SEDIMENT EXCAVATION

NO	IRRIGATION AREA	UPTD	VOLUME (M^3)
	SEDIMENT EXCUREMENT IN CANALS WITH MECHANICAL		
1	PUNGGUR UTARA 1	SEPUTIH RAMAN	19017
2		RUKTI ENDAH	11519
3		RANTAU FAJAR	5580
4	PUNGGUR UTARA 2	TRIMURJO	2768
5		PUNGUR	943
6		KOTA GAJAH	36
7	BEKRI	BEKRI	10565
8	SEKAMPUNG BATANGHARI	SEKAMPUNG	856
9	RUMBIA BARAT	RUMBIA	8981
10	SEKAMPUNG BUNUT	PEKALONGAN	340
11	BATANGHARI UTARA	PURBOLINGGO	47
		TOTAL	60651

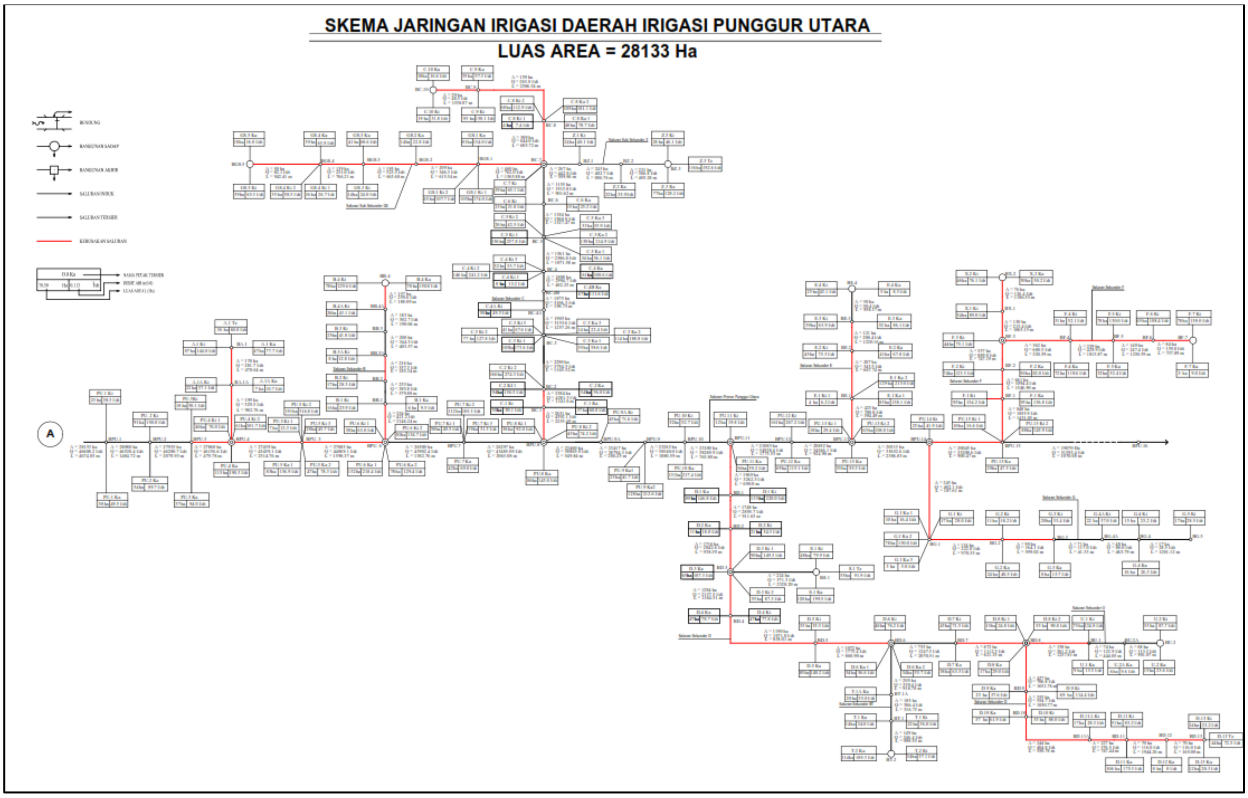
NO	DI	UPTD	VOLUME (M3)
	REGULAR SOIL EXCURSION up to 1m		
1	PUNGGUR UTARA 1	SEPUTIH RAMAN	1999
2		RANTAU FAJAR	791
		TOTAL	2790

5.2.2.2 - Lining

The irrigation canal in the Way Sekampung Rehabilitation project has some damage to the ground floor and lining such as porous, growong, cracks, landslides and the canal is still soiled. For the rehabilitation of damaged canals, they are repaired using precast concrete linings, while for canals that are still soiled, new precast linings are made. The work on the rehabilitation of the ground floor, foundation, cap-ing (cap) is carried out on-site using K-225 ready mix concrete, while for canal wall panels using K-225 precast concrete panels which are printed in the batching plant and then transported to the construction site, if necessary. If there is more than one panel, then they are connected using dowels. The following is an example of the location of damage to the northern Batanghari irrigation area and the lining design of the Way Sekampung irrigation canal:

Description Damage is marked with (Red line)

FIGURE 5-24 DAMAGED LINING IN PUNGGUR UTARA 1 & 2 IRRIGATION AREA



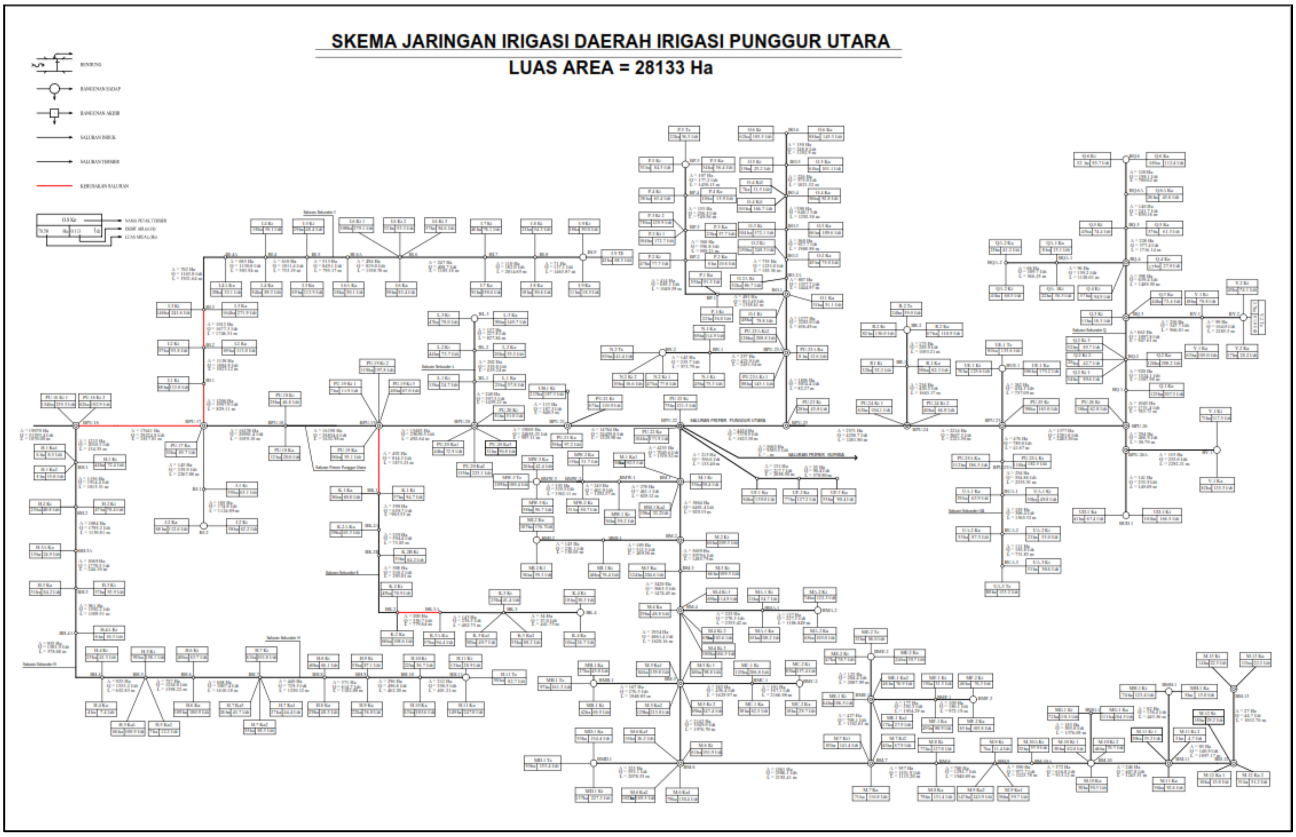


FIGURE 5-25 DAMAGED LINING IN BATANGHARI UTARA IRRIGATION AREA

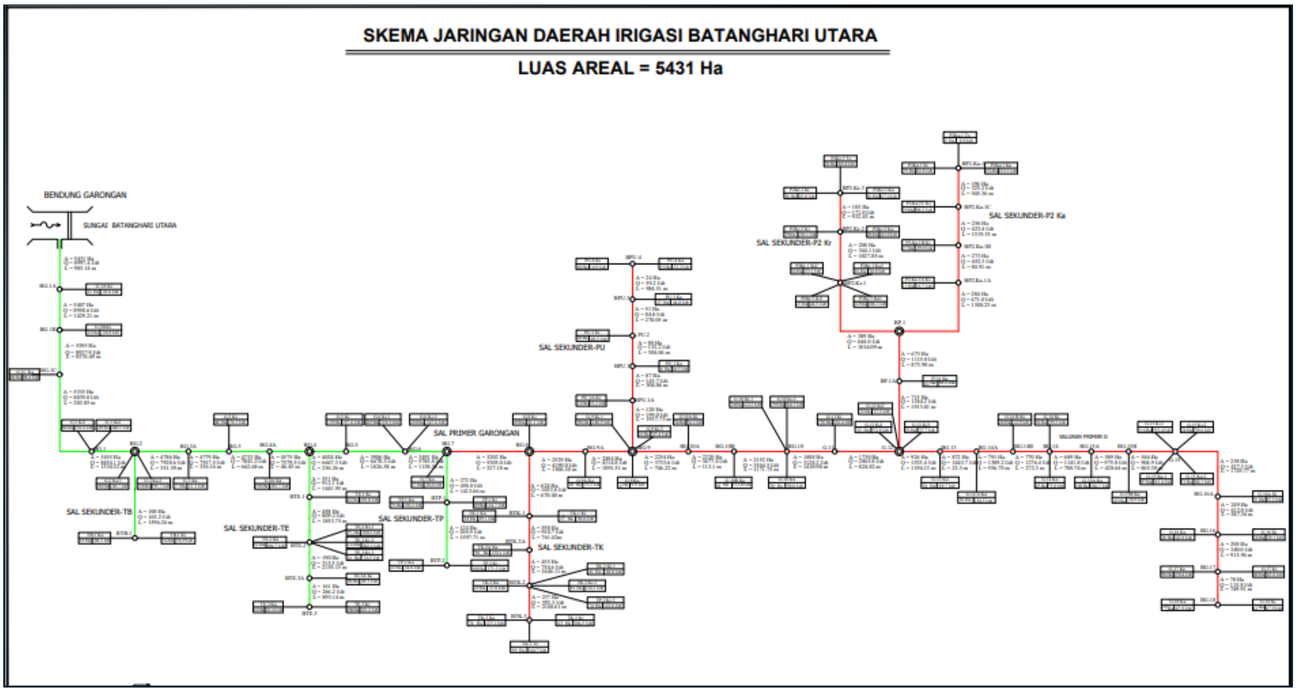


FIGURE 5-26 DAMAGED LINING IN SEKAMPUNG BATANGHARI IRRIGATION AREA

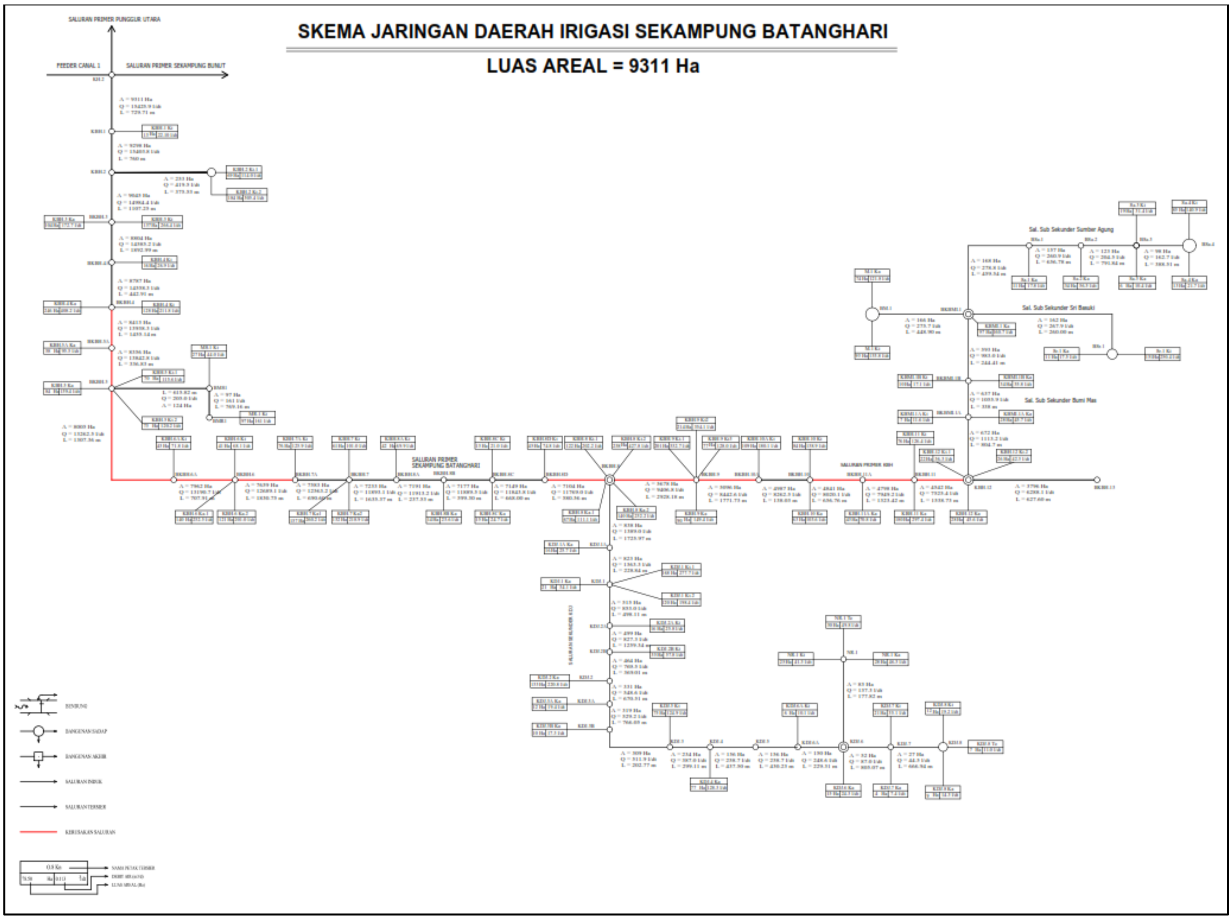


FIGURE 5-27 DAMAGED LINING IN SEKAMPUNG BATANGHARI IRRIGATION AREA

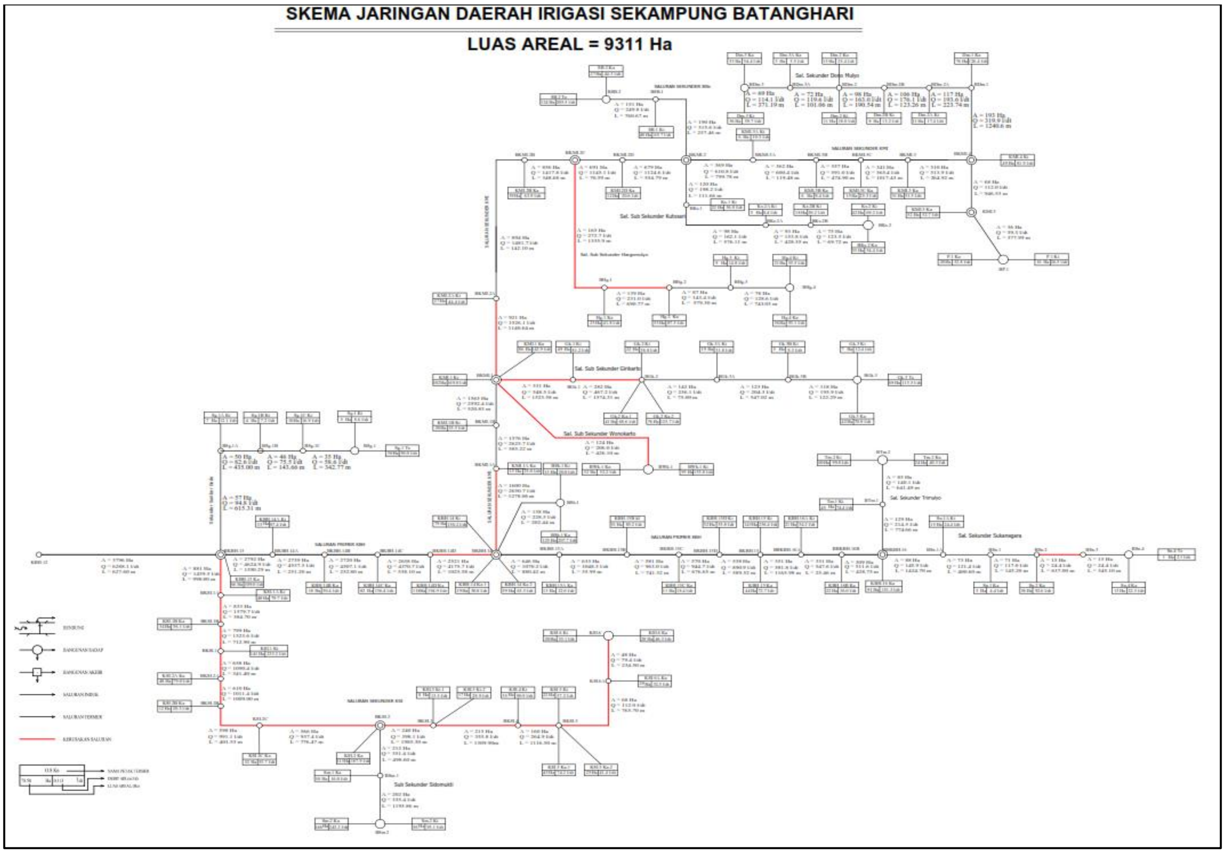


FIGURE 5-28 DAMAGED LINING IN RAMAN UTARA IRRIGATION AREA

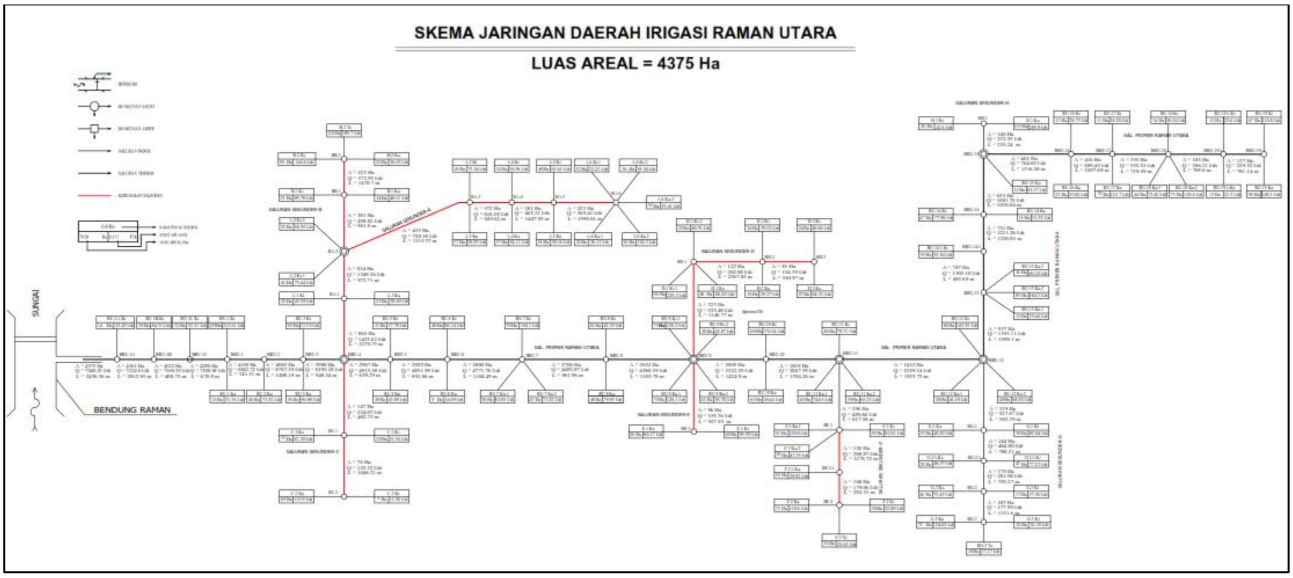


FIGURE 5-29 DAMAGED LINING IN SEKAMPUNG BUNUT IRRIGATION AREA

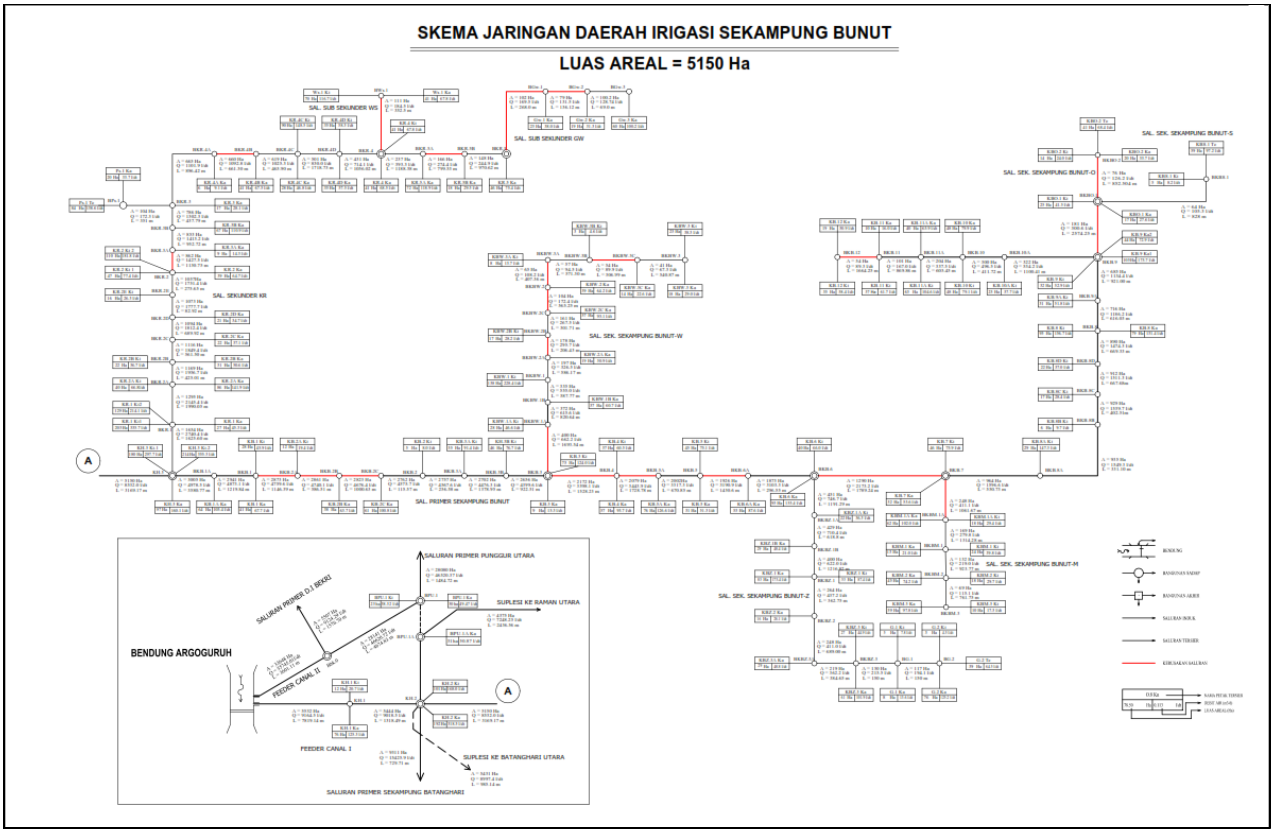


FIGURE 5-30 DAMAGED LINING IN RUMBIA BARAT IRRIGATION AREA

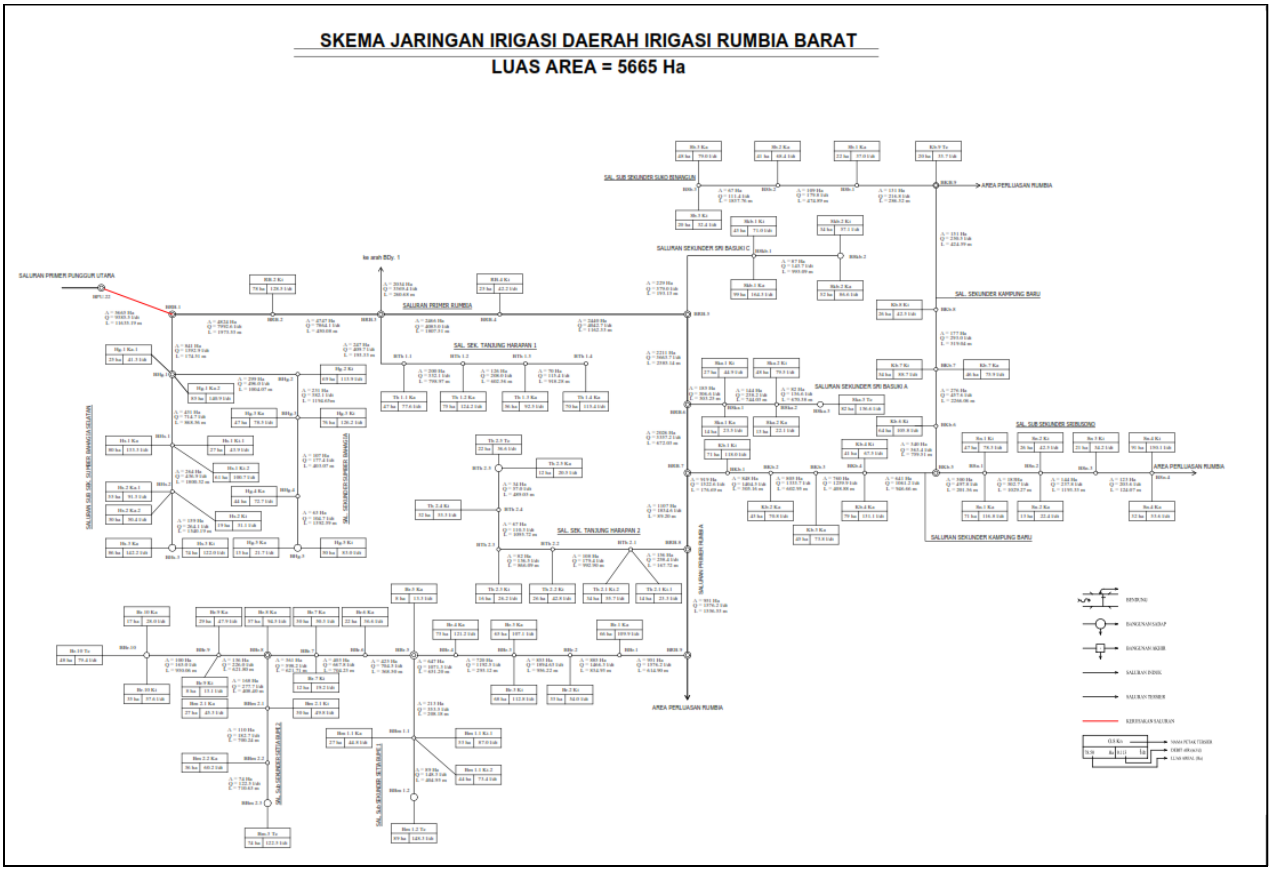


FIGURE 5-31 DAMAGED LINING IN RUMBIA BARAT IRRIGATION AREA

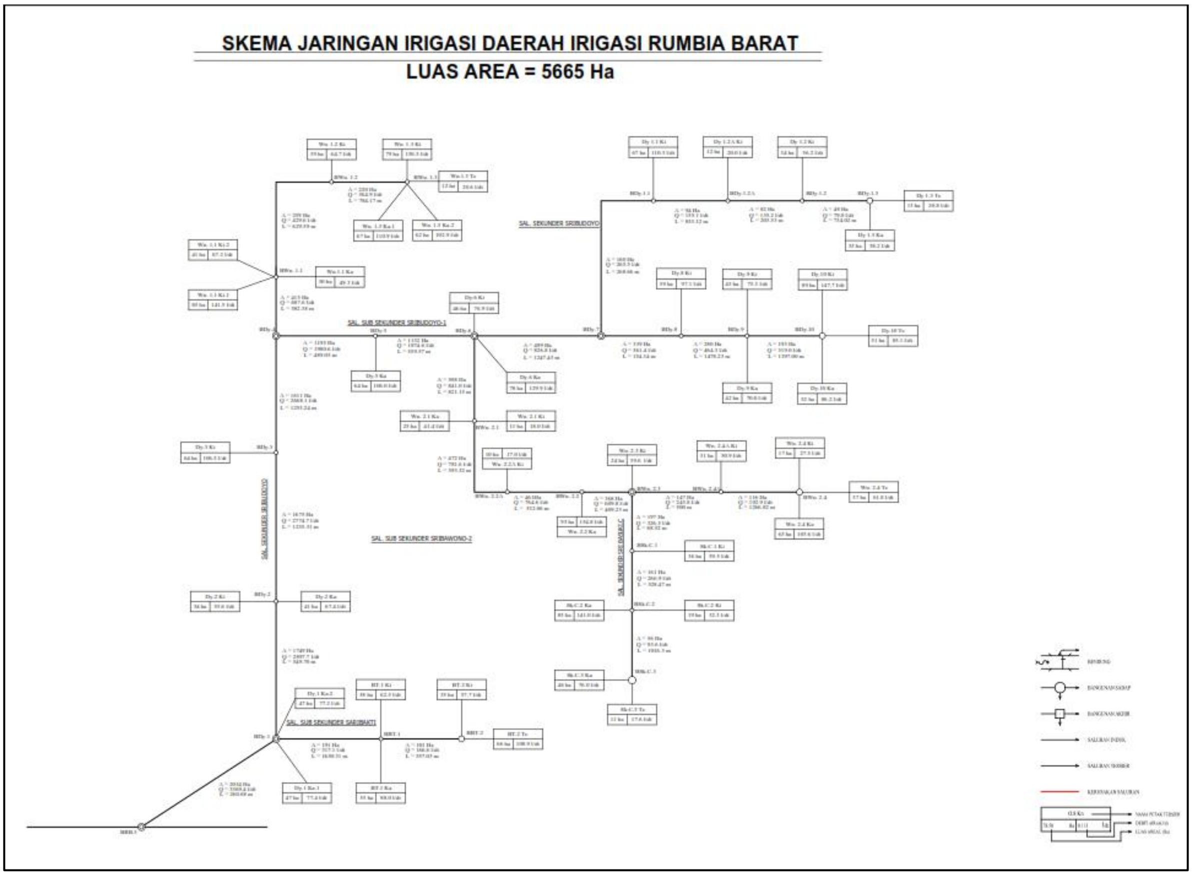


FIGURE 5-32 DAMAGED LINING IN BEKRI IRRIGATION AREA

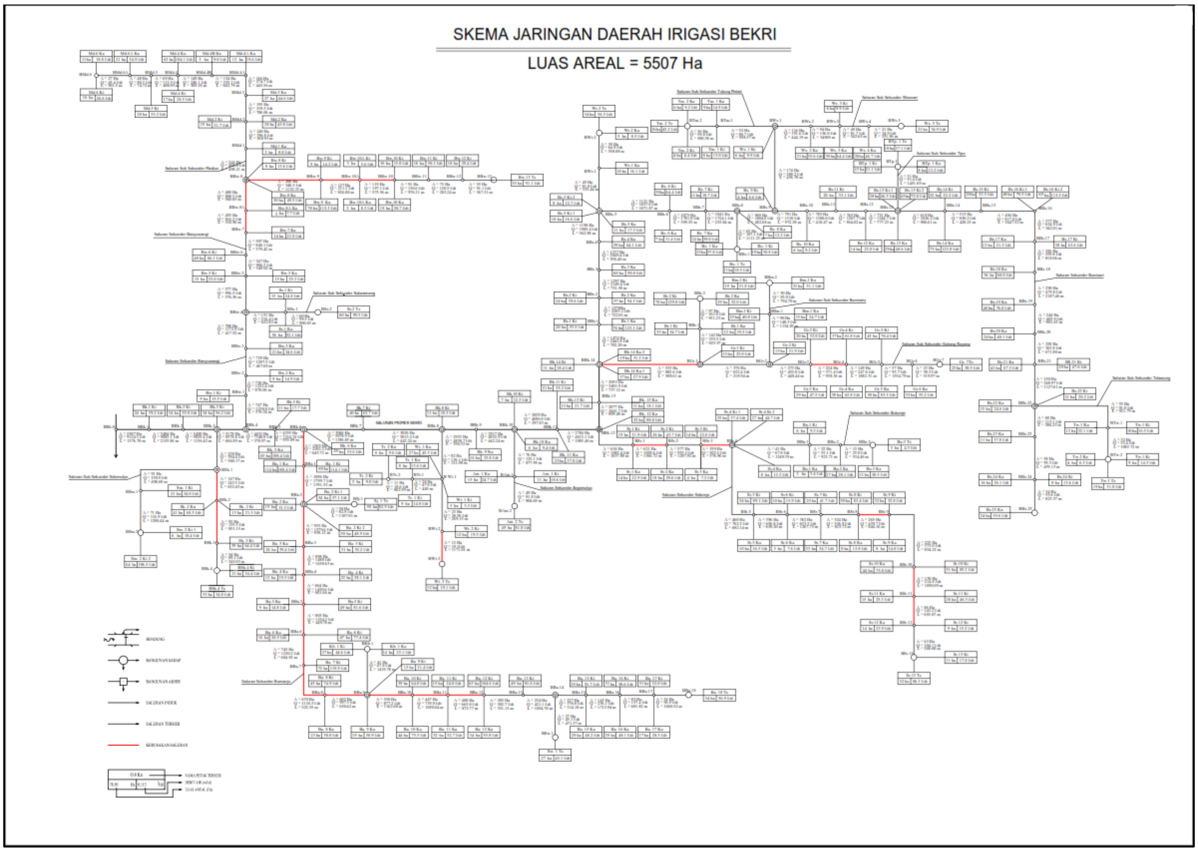
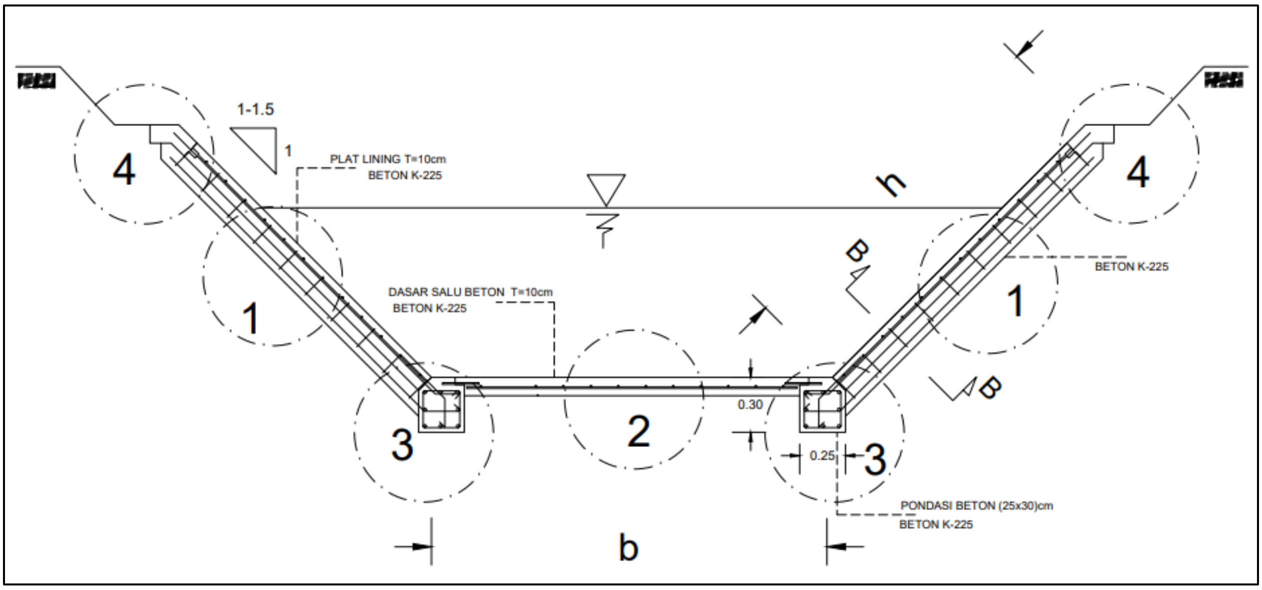
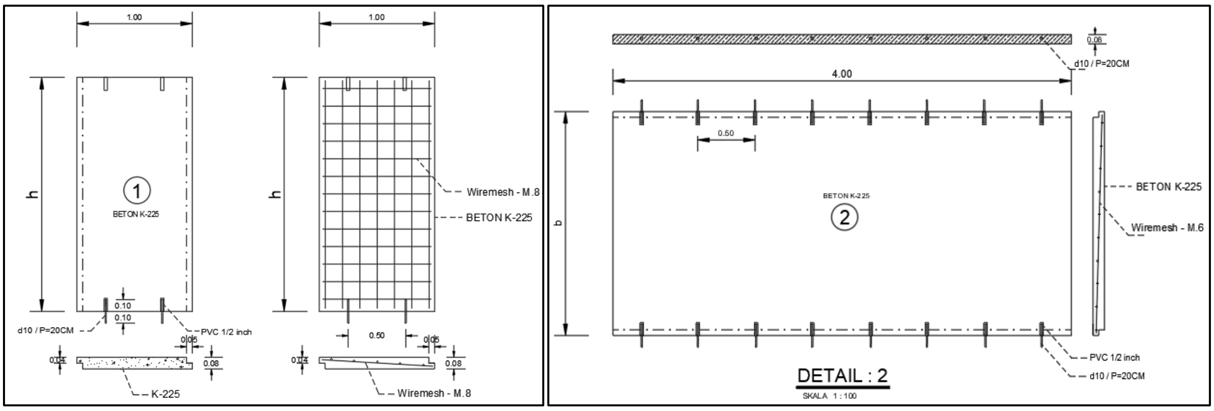
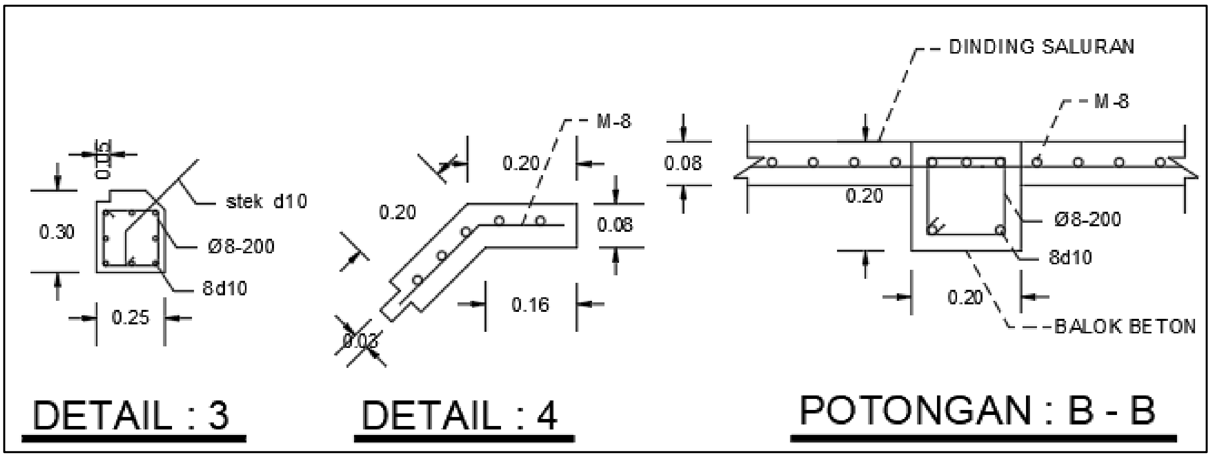


FIGURE 5-33 CANAL LINING DESIGN OF WAY SEKAMPUNG REHABILITATION







Some locations of irrigation areas with damaged linings and soil canals must be repaired so that water requirement can be fulfilled and water flow becomes smoother to irrigate agricultural areas. The following is the total length of canal damage in each UPTD.

TABLE 5-14 REHABILITATION OF IRRIGATION CANALS

NO	IRRIGATION AREA	UPTD	REHAB (m)	NEW (m)
1	PUNGGUR UTARA 1	SEPUTIH RAMAN	7366	155
2		RUKTI ENDAH	1314	5567
3		RANTAU FAJAR	1463	11775
4	RAMAN UTARA	RAMAN	14600.46	10487.91
5	PUNGGUR UTARA 2	TRIMURJO	4153.92	1540.38
6		PUNGUR	6063.45	9532.67
7		KOTA GAJAH	41	0
8	BEKRI	BEKRI	11027.68	0
9	SEKAMPUNG BATANGHARI	BATANGHARI	608.4	0
10		METRO	1187.76	0
11		SEKAMPUNG	5900.84	5641.58
12	RUMBIA BARAT	RUMBIA	3392.61	0.00
13	SEKAMPUNG BUNUT	ADIPURO	142.8	0
14		PUNGGUR	1885.09	0
15		METRO	125.6	0
16		PEKALONGAN	1059	286

NO	IRRIGATION AREA	UPTD	REHAB (m)	NEW (m)
17	BATANGHARI UTARA	PURBOLINGGO	37257.85	3105.2
		TOTAL	97589.46	48090.74

5.2.2.3 - Borders, Hm Pegs and Km Pegs

Irrigation network border line is a security limit for irrigation canals and/or Structures with a certain distance along the left and right canals. Pegs function as distance markers per 1 km (kilometer) and per 100 m (hectometer peg). The pegs are made using K-175 concrete and casting is carried out on the spot, along with details of borders, km stakes, and hm stakes.

FIGURE 5-34 BORDER PEGS

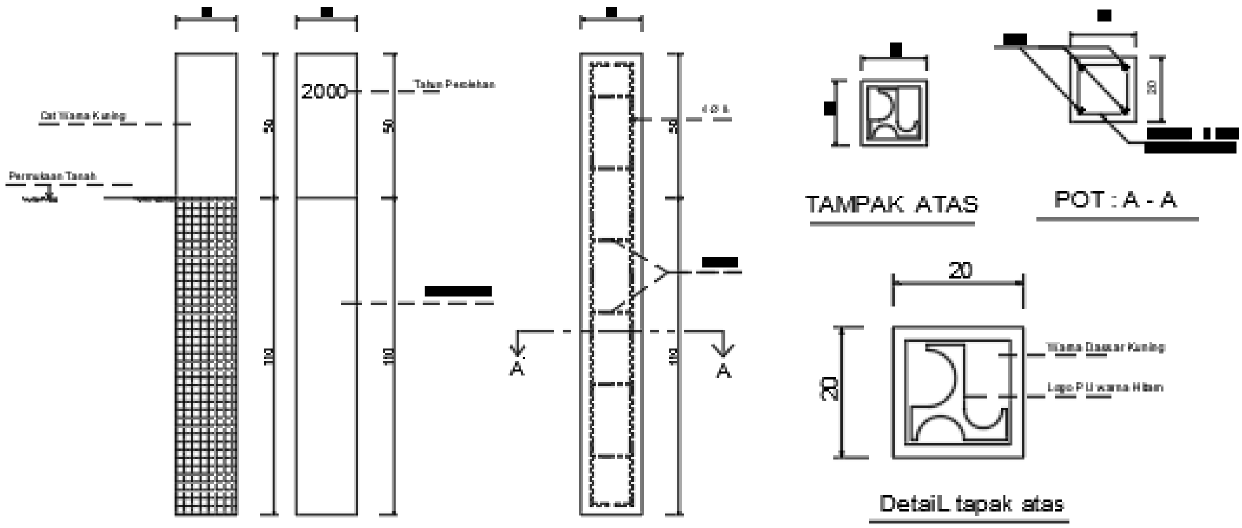


FIGURE 5-35 HECTOMETER PEGS

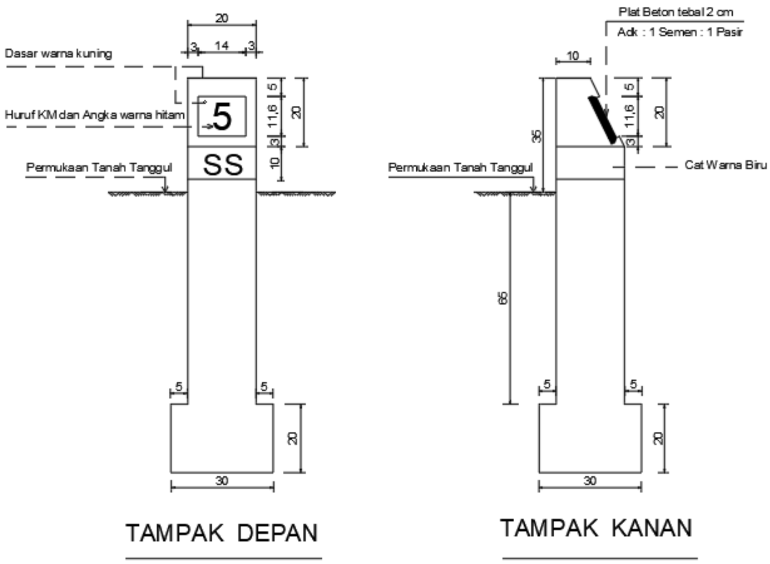
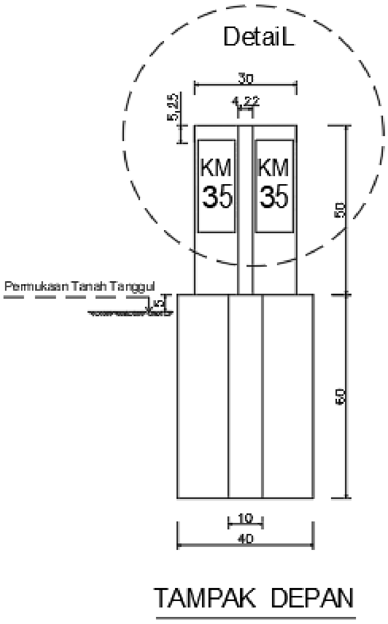


FIGURE 5-36 KILOMETER PEGS



The number of locations for the installation of borders, Hm pegs, and Km pegs in the Way Sekampung rehabilitation project is as follows:

TABLE 5-15 INSTALLATION OF BORDER PEGS, KM PEGS, HM PEGS

NOMENCLATURE	BORDER	KM	HM
PRIMARY CANAL OF PUNGGUR UTARA	2652	61	593
SECONDARY CANAL OF PUNGGUR UTARA	2416	222	1688
PRIMARY CANAL OF BEKRI	440	22	197
SECONDARY CANAL OF BEKRI	1960	110	881
PRIMARY CANAL OF RAMAN UTARA	560	28	251
SECONDARY CANAL OF RAMAN UTARA	446	29	200
CANAL OF SEKAMPUNG BATANGHARI	646	42	370
BRB CANAL OF RUMBIA	1762	16	115
DY CANAL OF RUMBIA	2686	62	531
SECONDARY CANAL OF KR BUNUT	326	17	145
PRIMARY CANAL OF KB BUNUT	594	46	346
SECONDARY CANAL OF BATANGHARI UTARA	560	35	251
PRIMARY CANAL OF BATANGHARI UTARA	646	33	290
TOTAL	15694	723	5858

5.2.3 - Irrigation Structures (Sediment Trap)

5.2.3.1 - Sediment Trap

Sediment trap or mud bag serves to deposit fine sediment that is carried into the irrigation canal. The mud bag is located after the take-up Structure, namely from the Argoguruh Weir, it is canalized into the mud bag, the mud bag is made wider than the irrigation canal with a certain length in order to create a slower flow velocity so as to provide an opportunity for fine sediment to settle, the bottom of the sediment trap canal is also made more which serves as a reservoir for these fine sediment deposits. In Way Sekampung rehabilitation, there are two sediment traps, namely feeder canal 1 and feeder canal 2, each of which will drain water into various irrigation canals.

Sediment trap feeder canal 1 conveys to the irrigation area supplementation:

1. Garongan weir, recanalized to Batanghari Utara Irrigation Area,
2. Raman weir, recanalized to Raman Utara Irrigation Area,
3. The village of Bunut
4. The village of Batanghari

Sediment trap feeder for canal 2 delivers water to the irrigation area:

1. Punggur Utara 1 and 2
2. Rumbia Barat
3. Bekri

The steps for planning a mud bag are as follows:

1) Determine the particle size of the plan to be transported to the irrigation network.
2) Determine the volume of the mud bag (V) required.
3) Make an initial estimate of the average surface area of the mud bag using the following formula:

$$L \cdot B = \frac{Q}{w}$$

Where:

L = Length of the mud bag, m
B = Width of the mud bag, m
Q = Canal discharge, m^3/second
w = Settling velocity of sediment particles, m/second

4) Determine the energy slope in the mud bag during normal exploitation using the Strickler formula:

$$v_n = k_s \ R^{2/3} \ i_n^{1/2} \qquad ; \qquad Q_n = v_n \ A_n$$

Where:

v_n = Average speed during rinsing, m/second
k_s = roughness coefficient, $m^{1/3}$/second
R_n = Hydraulic radius, m during normal exploitation
i_n = Energy slope during normal exploitation
Q_n = Need for planning
A_n = Normal exploitation wet area (m^2)

5) Determine the energy slope in the mud bag during flushing with an empty pond and use the Strickler formula:

$$v_s = k_s \ R_s^{2/3} \ i_s^{1/2} \qquad ; \qquad Q_s = v_s \ A_s$$

Where :

v_s = average speed during flushing,m/second
i_s = Energy slope during flushing
Q_s = Discharge for flushing, 1.2 Q_n
A_s = Wet area during flushing
R_s = Radius of the hydraulics during flushing

6) Determine the dimensions and elevation of the mud bag
7) Check whether flushing is still possible during flood discharge in $Q_{1/5}$ river?

8) If No. 7 is no problem, check the sedimentation efficiency of sediment particles with the Camp diagram.

   Data required are:

1) Distribution of grain size of sediment, bottom and fly sediments.
2) The amount of sediment that enters the extraction during one period between one and the next flushing.
3) The relationship between Q – h of the river at the flushing gates
4) The need for irrigation water intake
5) Topographic data on the location of the mud pocket

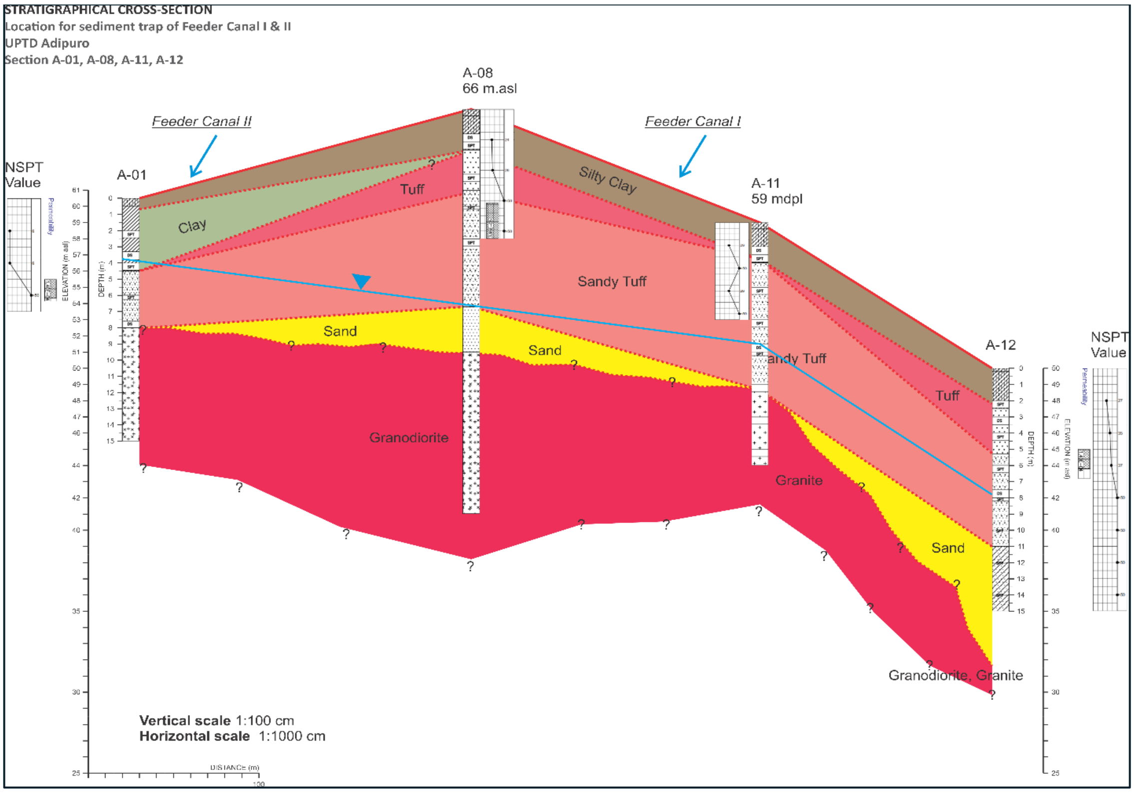
Feeder Canal 1 & 2 Structure Work of Sediment Trap

In the sediment trap feeder canal there are slope stability work, lining structures and box curvert designs. Among these works, prior soil research is required to determine the type of soil in the sediment trap feeder canal 1 & 2 area because in the lining work there is soil excavation and embankment which has a large enough volume. From the results of taking samples to test the soil type, there are several types of soil and testing is carried out. In situ tests were carried out, including standard penetration tests, permeability tests, and rock sampling for laboratory tests. The standard penetration test results are generally in the medium dense to very dense category. The GWL value is at a depth of 3.9 to 4 m.

TABLE 5-16 RECAPITULATION PERMEABILITY TEST THE WAY SEKAMPUNG IRRIGATION SYSTEM

No	*Location*	Bore Hole	Depth (m)	K (cm/sec)	*Soil Type*	*Clasification*	*Method*
1	*The New Sediment Trap – Feeder Canal I & II, near Argoguruh Weir*	A-01	4.00 - 5.00	1.40E-04	*Sandy tuff*	*Medium Permeability*	*Falling Head*
2		A-02	3.30 - 5.00	2.73E-06	*Sandy tuff*	*Low Permeability*	*Falling Head*
3		A-03	4.30 - 5.00	9.56E-06	*Sandy tuff*	*Low Permeability*	*Falling Head*
4		A-05	2.90 - 5.00	5.31E-05	*Silty clay*	*Medium Permeability*	*Falling Head*
5		A-08	2.90 - 5.00	3.95E-05	*Sandy tuff*	*Medium Permeability*	*Falling Head*
6		A-10	2.90 - 5.00	3.08E-05	*Tuff*	*Medium Permeability*	*Falling Head*

FIGURE 5-37 GEOLOGICAL CROOS SECTION A01, A08, C A11, A12 WAY SEKAMPUNG IRRIGATION

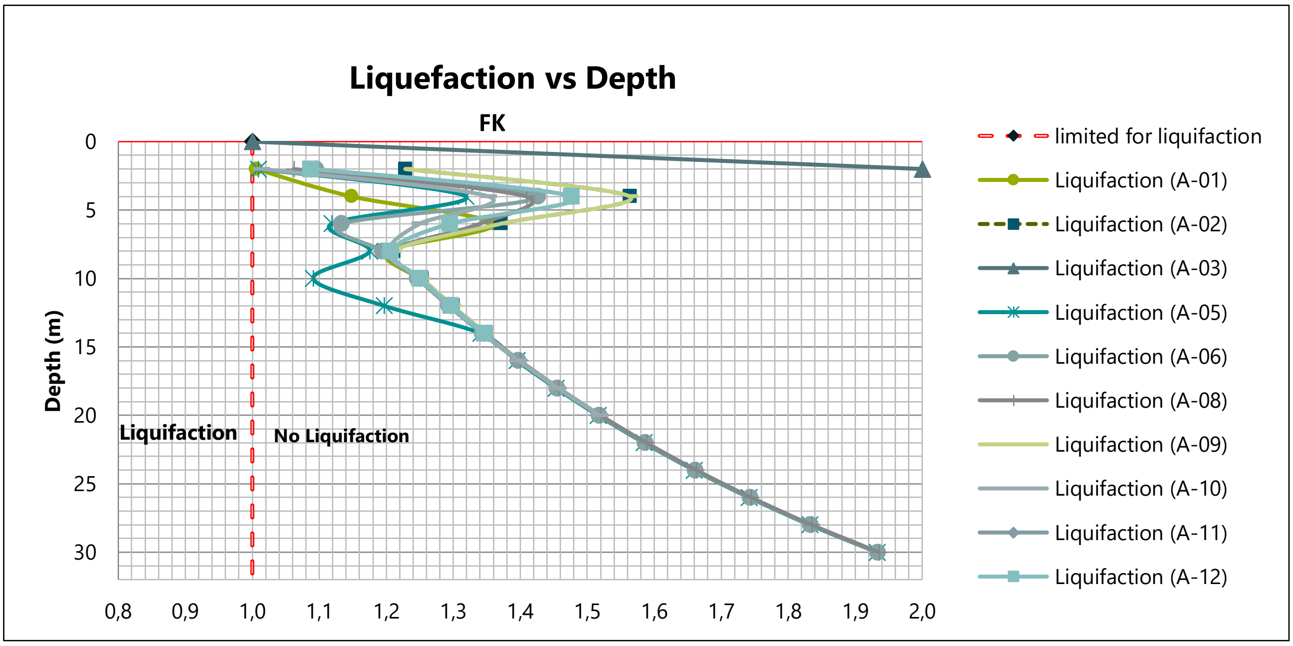


The results of research from drilling data that calcification using the Deere method, 1989. Rock Quality Design (RQD) on average from drill point A01 to A12 is Very Poor to Excellent with a value of 0% - 100%. Analysis of Rock Mass Rating (RMR) in the Vol I report. Geology and Geotechnical Report is the lowest value of 3 and the highest value of 20.

The earthquake factor for the location of feeder canals 1 & 2 is in the confluence zone between the Indo-autralian plate and the Eurasian plate. Structure and non-Structure risk categories for earthquake loads are included in category IV, from the results of the analysis, the SA 0.508 earthquake value is used (earthquake resistance planning procedures for Structure and non-Structure structures.

The results of the calculation of liquefaction for the location of the Fedder Canal Sediment Trap I & II using the Valera and Donovan (1977) method.

FIGURE 5-38 CHART OF LIQUIFACTION POTENTIAL VS DEPTH



It can be seen from the graph above that the location of sediment trap feeder canals 1 and 2 has no potential for liquefaction, so it is safe for Structure stability. For more details, see the Feeder Canal 1 and 2 Calculation reports.

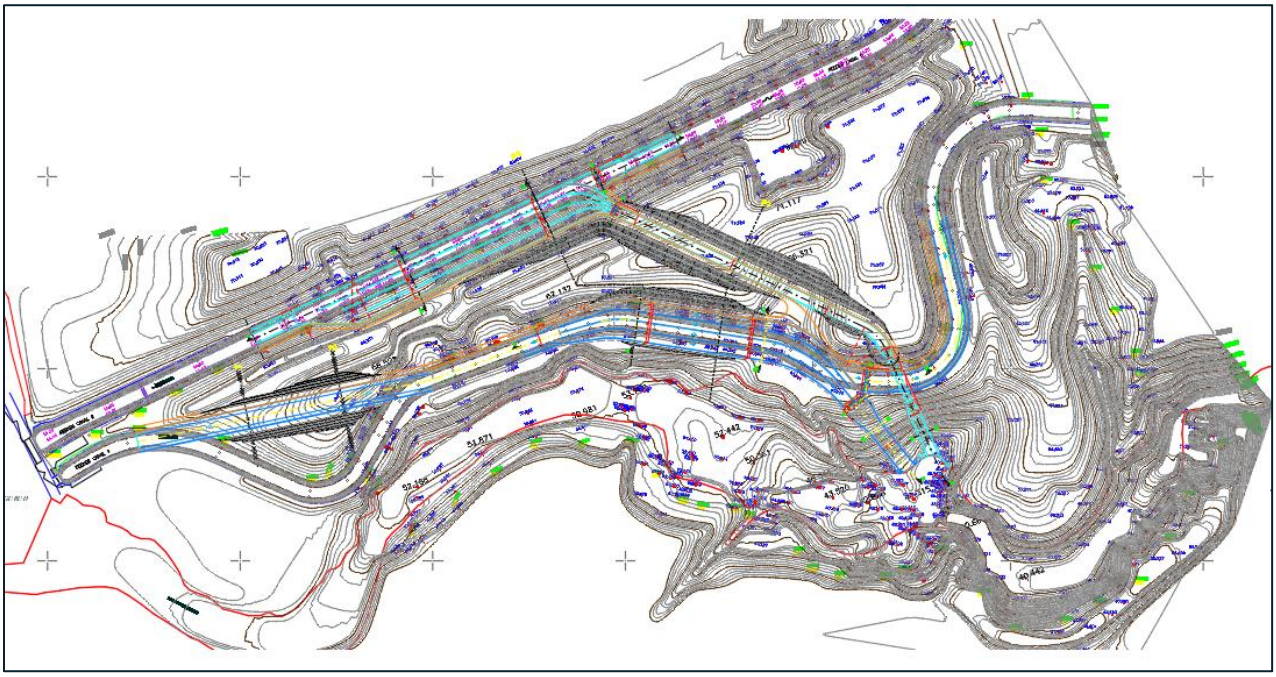
The potential of Swelling Clay to calculate soil development can be determined by the Activity Number (AC) value introduced by Skepton with the formula :

AC = Plastic Index (IP)/Grain Fineness (%) <2υ

From the calculation results that the physical properties of the soil in the sediment trap fedder canal I & II area, show the nature of the soil development that is not active up to normal with an average value of 0.78 AC, so it will not affect a structure to be built. For more details, see the sediment trap feeder canal 1 and 2 reports.

The design of the disposal area for feeder canals 1 and 2 which has a large enough soil excavation, the disposal area must be planned in such a way that it can accommodate soil disposal from the feeder canal 1 and 2 areas. The disposal area is determined as close as possible to the excavation location.

FIGURE 5-39 SEDIMENT TRAP FEEDER CANAL 1 & 2



1. SEDIMENT TRAP FEEDER CANAL 1

Example of mud bag calculation

Planned particle size

It is assumed that the particles transported as suspended sediment and into the irrigation network are 0.07 mm = 70 x 10^{-6} meters.

Mud bag volume

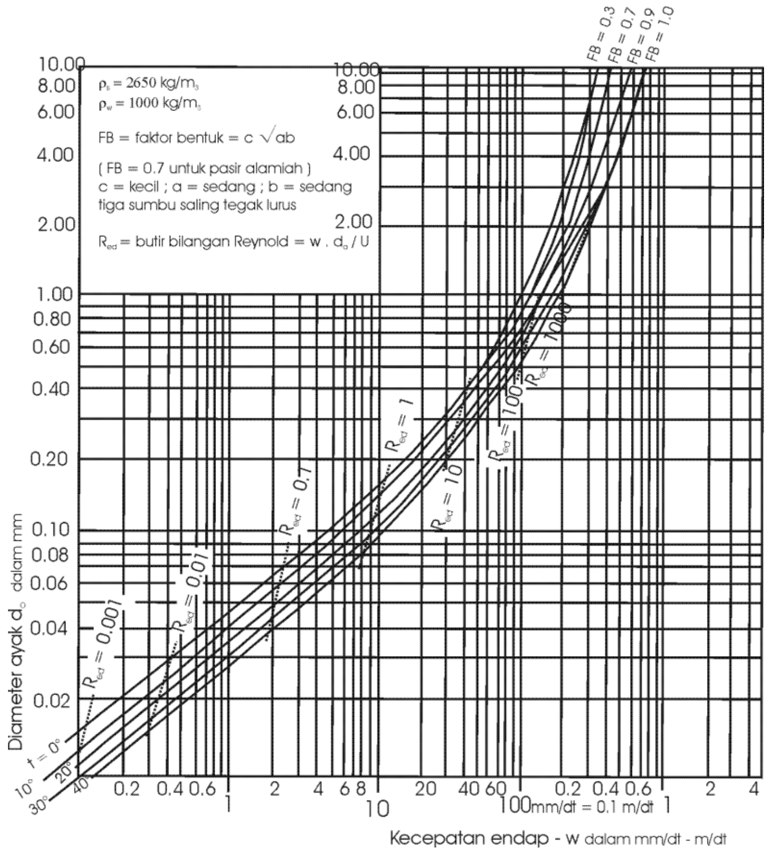
In this feeder canal 1:

- sediment content to be discharged 0.5 $^{o}/_{oo}$
- use a 3 wall divider
- the discharge flowed by the main line is 52.58 : 3 = 17.53 m^3/second.
- one week rinsing interval = 7 days.
- sediment concentration at the study site = 0.0127 (mean)

So the volume of the mud bag needed is: V = 0.0127 x 17.53 x 7 x 24 x 3600 = 134100 m^3.

Sedimentary field area (L.B)

The magnitude of the settling velocity for grain diameter of 0.07 mm and a temperature of 20o C, based on the graph of the relationship between the diameter of the sieve and the settling velocity in still water, the settling velocity (w) is 0.004 m/s. So the area of the deposition field is:



$$L \cdot B = \frac{Q_n}{w} = \frac{17.53}{0.004} = 4382 \text{ m}^2$$

because L/B > 8 it will get B = 20.65 meters and L > 165.00 meters.

Normal slope calculation

This calculation is based on normal exploitation conditions and the sediment pocket is almost full. The normal speed is taken to be 0.40 meters/second with the following considerations:

- Prevent the growth of vegetation
- Larger particles do not settle directly downstream of the uptake

The required cross-sectional area based on the velocity is:

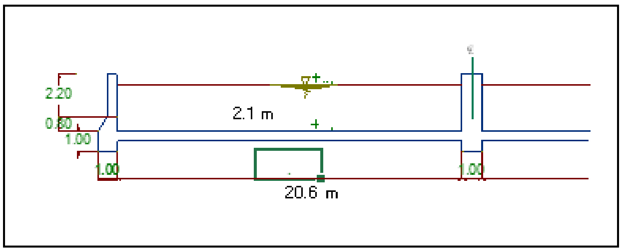
$$A_n = \frac{Q_n}{v_n} = \frac{17.53}{0.40} = 43.82 \text{ m}^2$$

With an average width (B) = 20.65 meters, the required depth is:

$$h_n = \frac{A_n}{B} = \frac{43.82}{20.65} = 2.1 \text{ meter.}$$

With such a depth and a cliff slope of 1 : 0, it will get a cross section like the following.

FIGURE 5-40 MUD BAG CROSS SECTION ON QN



The magnitude of the base width (b) is calculated as follows:

B = (b + 4 h) → 20.65 = b + 4 . 2.1
b = 20.65 – 2.94 = 12.62 meter.

Wet perimeter : $P = b + 2 (h_n\sqrt{(1^2 + 2^2)}) = 12.62 + 2.1.47 . 2.23 = 19.18$ meter.

Hydraulic radius : $R_n = \frac{A_n}{P} = \frac{27.25}{19.18} = 1.42$ meter.

So, the normal slope is:

$$i_n = \frac{v_n^2}{\left(R^{2/3} . k_s\right)^2} = \frac{0.40^2}{\left(1.42^{2/3} . 45\right)^2} = 0.495 \times 10^{-4}$$

Actually, this slope is not valid for the entire length of the mud pocket because its area will increase downstream. The resulting elevation difference is very small and can be ignored.

Transition section

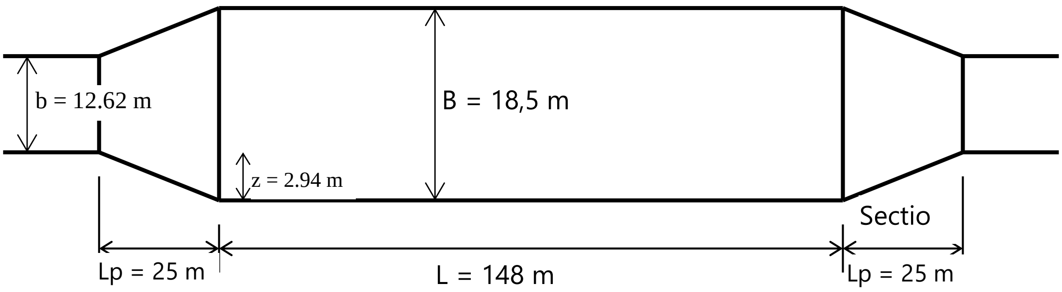
As described earlier, the length of this transitional section is calculated according to the formula:

Lp = 8 to 10 z

Where : z = (B – b) / 2

If b = 12.62 meter and B = 18.5 (according to the calculation above), then z = (18.5 – 12.62)/2 = 2.94. The length of the training section: Lp < 10 x 2.94 m = 29.4 meter and Lp > 8 z = 8 x 2.94 = 23.52, so Lp is taken = 25 meters. The image of the transition section is as in Figure 5-31.

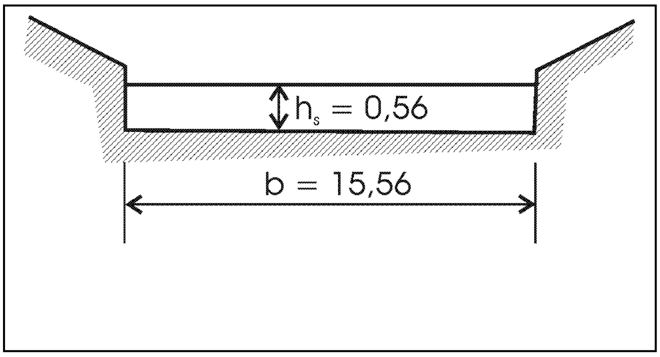
FIGURE 5-41 TRANSITION SECTION IN THE CALCULATION SAMPLE.



Energy slope in the slurry bag during flushing

At the time of rinsing and the mud bag is empty, the slope of the flushing energy will be equal to the slope of the length of the reservoir. The cross-section of the reservoir is taken square and the flow rate during flushing is $Q_s = 1.2 \times Qn = 1.2 \times 10.9 = 13.1\ m^3$/second.

FIGURE 5-42 ROSS SECTION DURING RINSING



The base width of the reservoir is taken equal to the width of the bottom of the mud bag: b = 12.62 meters.

The estimated speed is 1.5 m/s, so the required cross-sectional area is:

$$A_s = \frac{Q_s}{v_s} = \frac{13{,}1}{1{,}5} = 8{,}73\,m^2$$

For that the required depth: hs = As / b = 8.73 /12.62 = 0.70 meter.

$$R_s = \frac{A_s}{P} = \frac{8{,}73}{12{,}62 + 2.\,0{,}7} = 0{,}623\text{ meter.}$$

For flushing of the roughness coefficient is taken: k = 40, so the magnitude of the slope is:

$$i_s = \frac{v_s^2}{\left(R_s^{2/3}.\,k_s\right)^2} = \frac{1{,}5^2}{\left(0{,}623^{2/3}.\,40\right)^2} = 26{,}5 \times 10^{-4}$$

In order for flushing to be carried out properly, the flow velocity must be kept subcritical or Freude number: Fr < 1.

$$Fr = \frac{v}{\sqrt{gh}} = \frac{1.5}{\sqrt{(9.8.0.7)}} = 0.57 \rightarrow <1 \text{ sehingga benar aliran sub kritis}$$

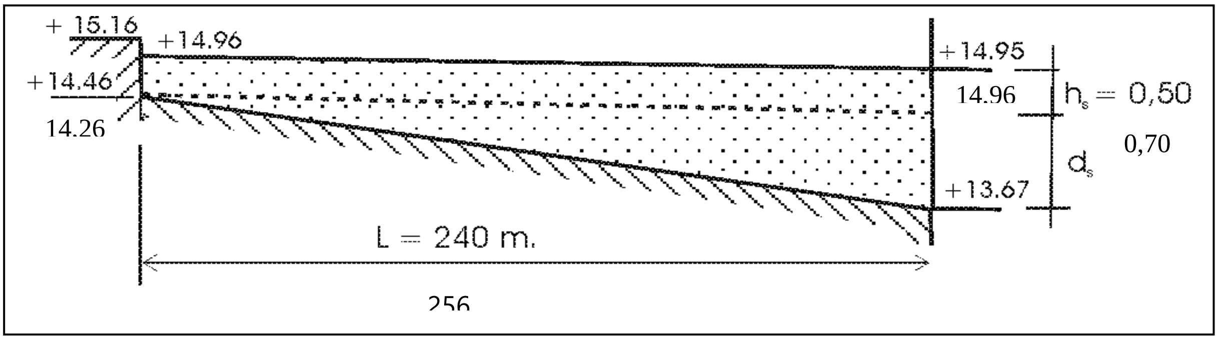
To find out whether at that speed 0.07 mm grains will be flushed, we use the Shileds Graph in Figure VI.11. where for the above conditions the magnitude of the critical shear stress is: $\tau = \rho \,.\, g \,.\, h_s \,.\, i_s$ = 1,000 x 9.8 x 0.7 x 26,5 x 10^{-4} = 18.2 N/m^2

In Chart 7.11, the value of τcr is the ordinate (vertical line) to the right and for the value of = 18.2 N/m^2, the maximum grain diameter that is washed away is 2.5 mm. Thus, the sediment with a diameter below 2.5 mm will be flushed.

Mud bag length

From the calculation of the depositional area (L.B) it is found that the length of the mud bag is: L > 147.30 meters. Determination of this length must meet the criteria for storage volume, meaning that the storage volume with the specified length can accommodate sediment that should be deposited, where from the previous calculation the volume that must be deposited is obtained: V = 3,300 m^3.

FIGURE 5-43 ONGITUDINAL CUTS IN THE RESERVOIR



Based on the figure above, the size of the storage volume is:
V = H_S X B X L + ½ D_S X B X L WHERE D_S = (I_S – I_N) L
V = h_s x b x L + ½ (i_s – i_n) L^2 x b
= 0.70 x 12.62 x L + ½ (26.5.10^{-4} – 0.495.10^{-4}) x L^2 x 12.62

$V = 8.834\ L + 0.016\ L^2 = 3300$

From this equation, it will be obtained L = 256 meters.

Feeder Canal 1 Structure Work of Sediment Trap

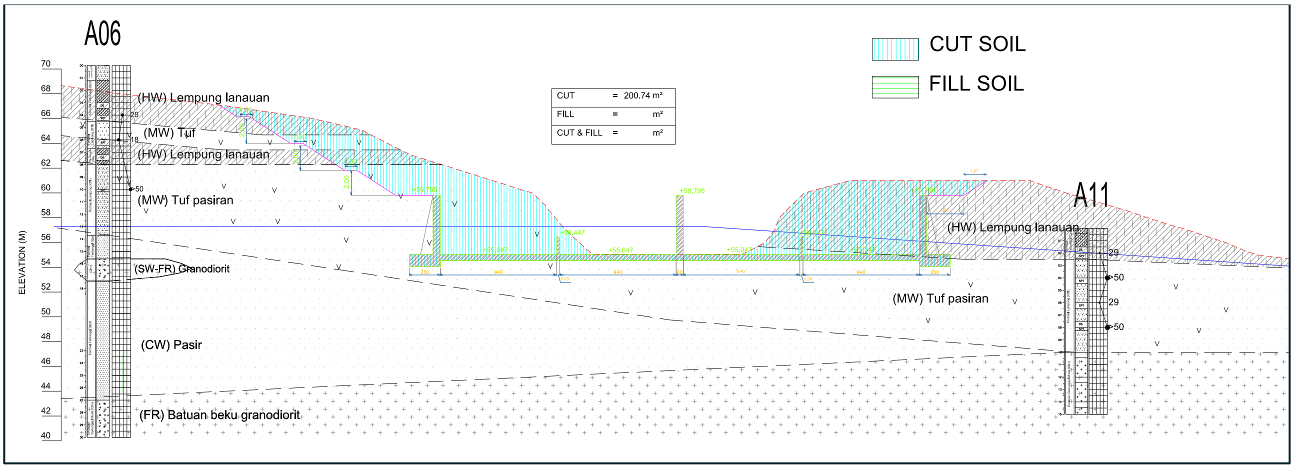
The recommendation phase of the construction process consists of:

1. The process of excavating and stockpiling soil.
2. The safety of the excavation process against the ground water level.
3. Soil stability after construction of sediment trap feeder canal 1.

Calculation of slope stability in the process of excavation and embankment of feeder canal 1 is a very important factor in terms of human safety (workers), security and smooth development. The PPC Way Sekampung Geological Engineering team uses the Plaxis 2D software method with a computerized system. From the method seen from the safety factor, if the FK > 1.5 then it indicates the condition of the excavation slope is safe. If FK < 1.5, it indicates an unsafe condition. So that other alternatives are needed such as sloping inclined angles or with soil reinforcement.

Slope stability analysis in the feder canal 1 area has 3 cross sections samples C, D, E, and F. For example, the C-C cross section is a silt clay layer with characteristics of high plasticity, rigid hardness, cohesiveness and a sandy tuff layer.

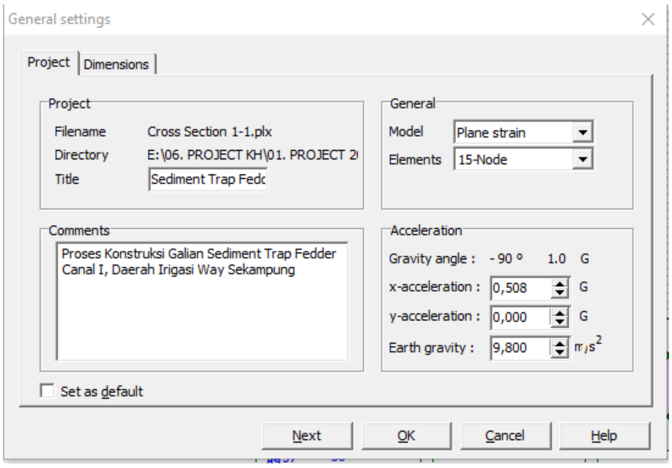
FIGURE 5-44 GEOLOGICAL CROSS SECTION C-C



PPC Way Sekampung

The results of modeling soil parameters using the PLAXIS 2D application.

FIGURE 5-45 GENERAL SETTING ON MODEL



Plaxis 2D & PPC Way Sekampung

FIGURE 5-46 SOIL PARAMETERS IN SOIL EXCUREMENT CONSTRUCTION

ID	Name	Type	γ_{unsat}	γ_{sat}	k_x	k_y	ν	E_{ref}	c_{ref}	φ
			[kN/m^3]	[kN/m^3]	[m/day]	[m/day]	[-]	[kN/m^2]	[kN/m^2]	[°]
1	Silty Clay	Drained	18,3	20,0	3,0800E-3	3,0800E-3	0,30	11600,0	125,0	5,0
2	Tuff Sand	Drained	20,4	22,0	3,0800E-3	3,0800E-3	0,30	11600,0	10,0	20,0
3	Sand	Drained	20,4	22,0	3,0800E-3	3,0800E-3	0,30	11600,0	10,0	30,0
4	Garnodiorite	Drained	24,0	24,0	0,0000	0,0000	0,30	20000,0	500,0	0,0
5	Fill	Drained	18,3	20,0	3,0800E-3	3,0800E-3	0,30	11600,0	125,0	5,0

Plaxis 2D & PPC Way Sekampung

The picture above is the soil parameters used to model soil stability, obtained based on the results of geological investigations and observations of soil mechanics in the field.

FIGURE 5-47 ACTIVE PORE PRESSURES THAT HAPPENED IN CROSS SECTION C-C AREA

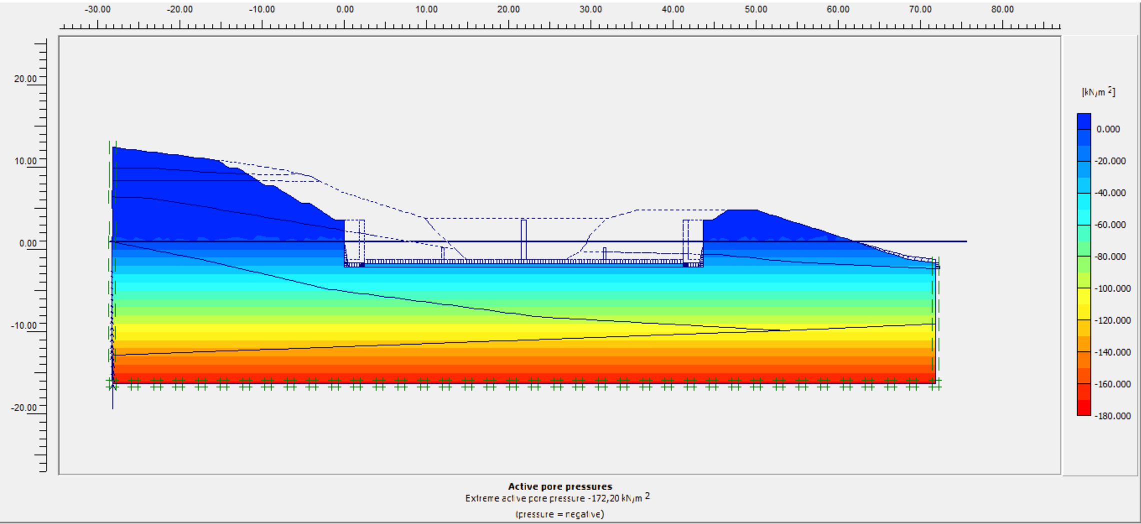
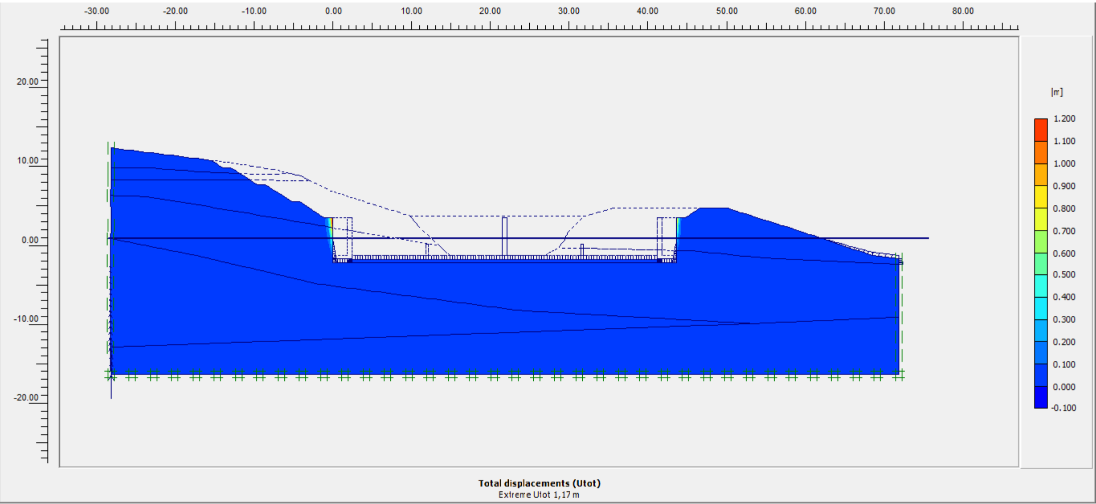


FIGURE 5-48 DEFORMATION THAT HAPPENED IN CROSS SECTION C-C AREA



In Figure 5-47 above, it shows that the saturated soil condition is in the channel excavation construction plan, active pore pressures are 172.20 kN/m2, so that the cross section excavation area shows that the maximum deformation that occurs in Figure 5-48 cross excavation construction. CC section is 1.17 meters and the safety factor is 0.1. So the bearing capacity of the soil in the excavation area of the slope cannot withstand when the excavation construction is caused by the condition of the gwound water level. Therefore it requires a technical recommendation.

Recommendations for Geological Engineering for soil stability in the excavation process.

The process of excavation work on the sediment trap fedder canal I, assumes the value of the depth of the ground water level that has been dewatered or dried in the area to be excavated. The estimate taken for the depth of the ground water level is below the excavation construction and the construction to be built. The results are presented below:

FIGURE 5-49 DEFORMATION THAT HAPPENED IN CROSS SECTION C-C AREA

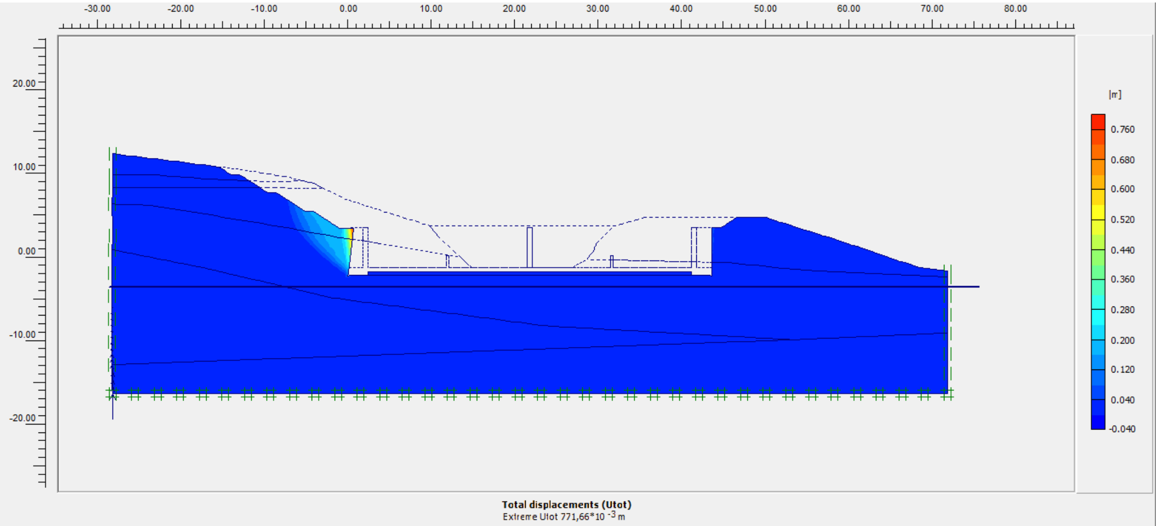


FIGURE 5-50 SECURITY FACTOR CONTROL OF CROSS SECTION C-C

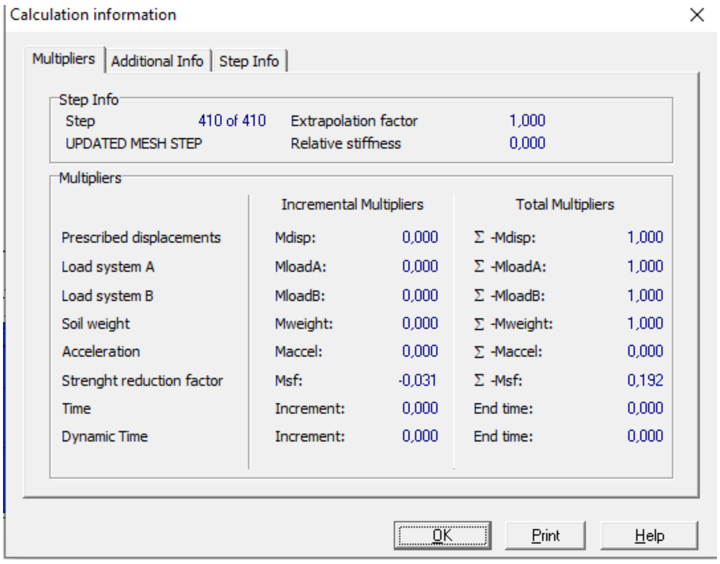


Figure 5-50 shows the stability of the soil in excavation work with a decrease in deformation of 0.77 meters and a safety factor of 0.19. For more details, see the feeder canal 1 . engineering geological report.

Soil Stability Analysis After Construction

Planning the structure of sediment trap feeder canal 1 to drain water and anticipate fine sediment, it is necessary to analyze the structure of lining, Structure and accurate soil stability with the right method. In order to get optimal planning results. The steps for calculating the Plaxis 2D program are as follows:

1. Calculation of structural stability
2. Calculation of the safety value obtained from the graph of the relationship between Msf and displacement.
3. Deformation of the slope shown from the total displacement.

Geometric Model Cross Section C-C

The following are the results of soil stability modeling using plaxis 2D, for soil stability at the cross section location C-C, the plan for the construction of sediment trap fedder canal I, Way Sekampung irrigation area.

FIGURE 5-51 TOTAL DISPLACEMENT CROSS SECTION C-C

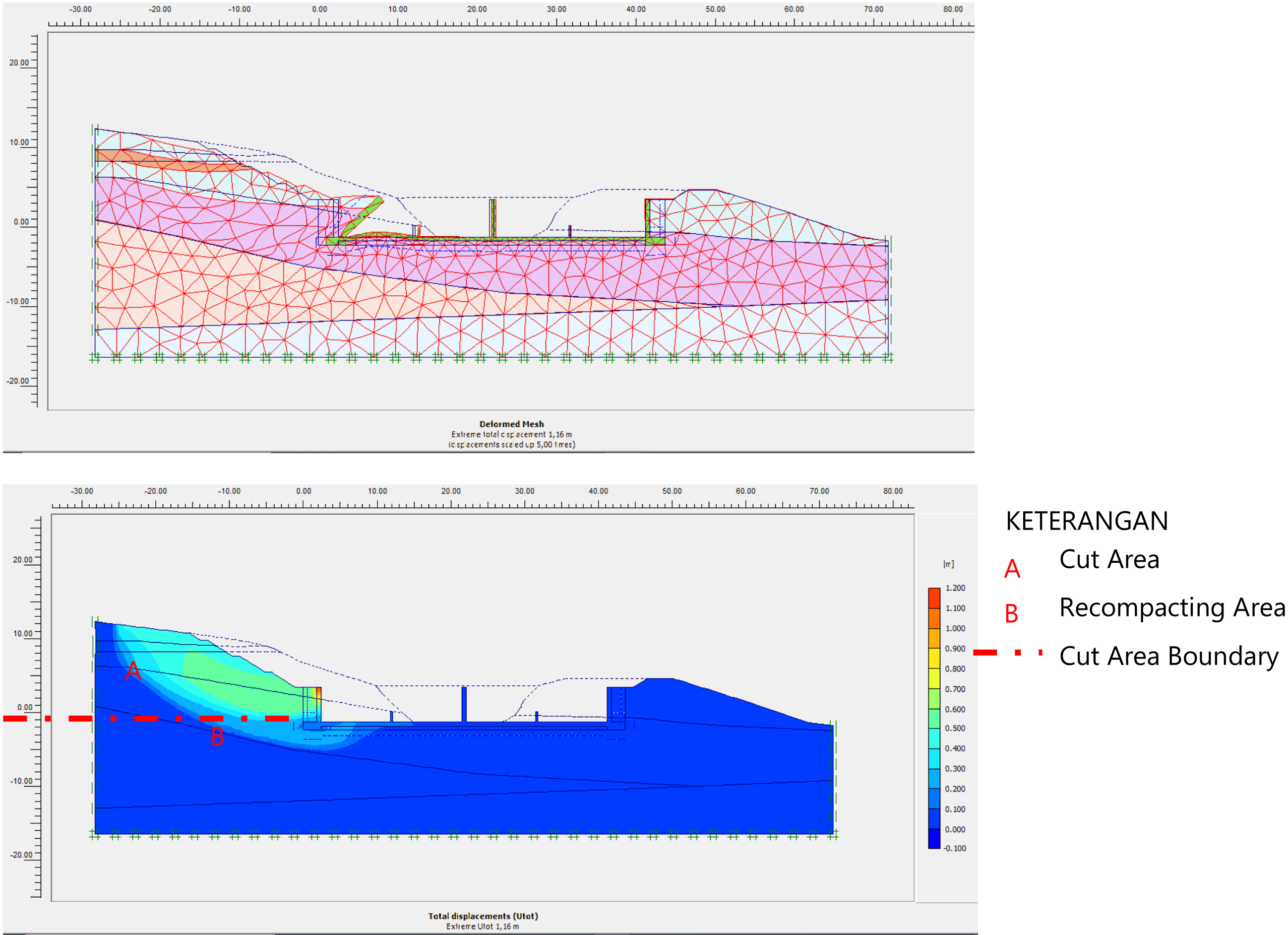
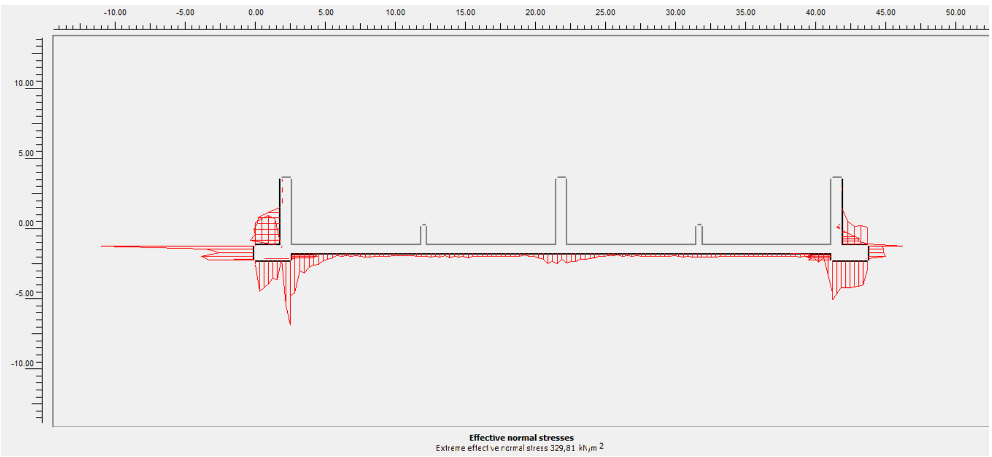
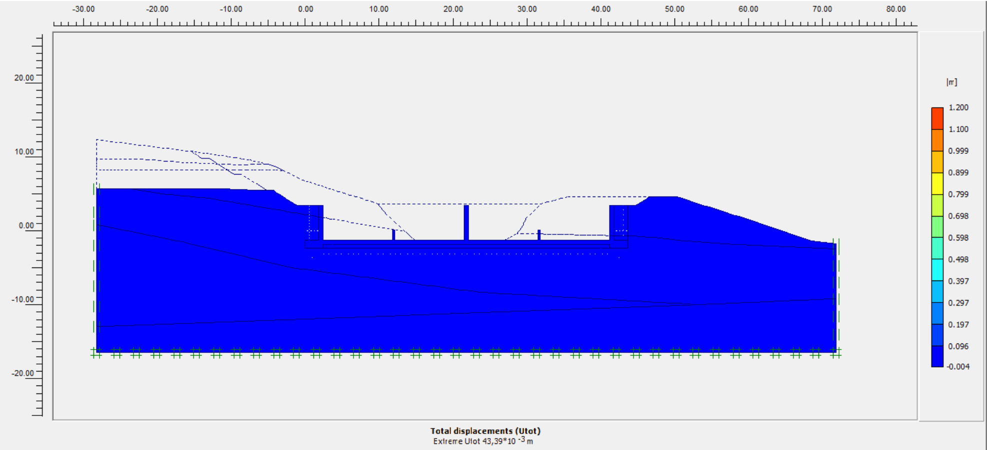


FIGURE 5-52 EFFECTIVE NORMAL STRESSES ON STRUCTURE CROSS SECTION C-C



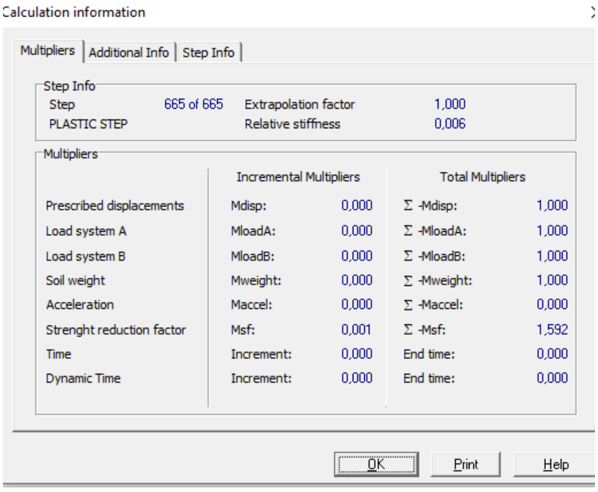
Based on Figure 5-51, that the simulation results of soil stability are unstable because the soil stability cannot withstand so that it collapses on the slope above the channel with a maximum deformation of 1.16 meters, the largest normal pressure (P) is in the area of the left retaining wall, namely amounted to 261.88 kN/m2, resulting in collapse of the retaining wall construction and landslides.

FIGURE 5-53 DISPLACEMENT CROSS SECTION C-C (RECOMMENDATION)



The recommendation put forward by the Way Sekampung PPC Geological Engineering team was to fill hill areas or cut soil processes that experienced landslides (figure 5-51A) and compaction of unstable soil areas (figure 5-51B). The simulation results in (figure 5-52) after it is recommended for a collapsed slope, that is, it will be cut in the landslide part. So that the deformation experienced a significant decrease from 1.16 to 0.42 m.

FIGURE 5-54 SAFETY FACTOR CONTROL

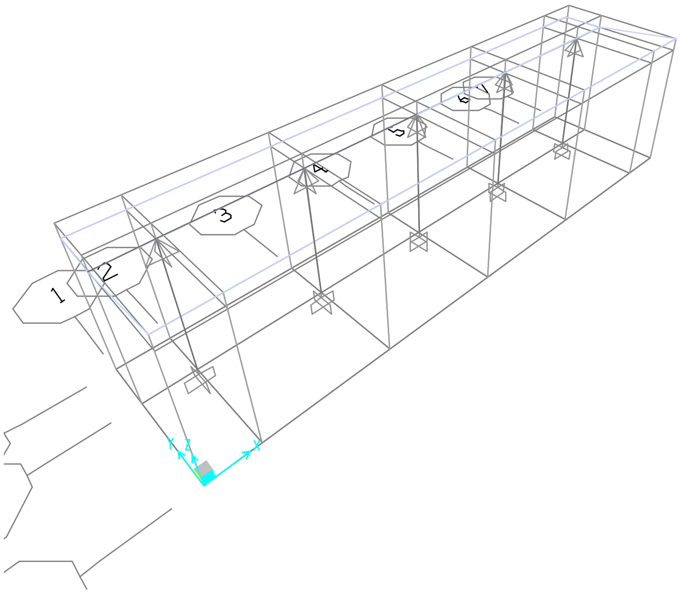


In 5-54 Safety Factor Control, the safety factor in the recommended model has a value of more than 1.5 so that the soil conditions in the C-C cross section area can withstand the structure above the ground. For more details, please refer to the feeder canal 1 Geological Engineering report.

Shelter Gate Feeder Canal Structure Load

According to the Load Planning Regulations for Houses and Structures 1983 by Public Works, the vertical loads are divided into Dead Loads, Live Loads, Wind Loads, and Earthquake Loads. The results of calculations using SAP2000 that the load on the shelter gate Structure, the weight of the gate as a whole / uniform load (q) is 179,928 KN. The load is converted into a concentrated load on each seat of the shelter gate Structure.

FIGURE 5-55 SHELTER GATE



Plaxis 2D & PPC Way Sekampung

The results of the analysis using SAP2000, that the large centralized load is in the central area of the shelter gate Structure.

Soil And Structural Parameters In Plaxis

FIGURE 5-56 SOIL DATA PARAMETERS CROSS SECTION E-E

ID	Name	Type	γ_{unsat} [kN/m³]	γ_{sat} [kN/m³]	k_x [m/day]	k_y [m/day]	ν [-]	E_{ref} [kN/m²]	c_{ref} [kN/m²]	φ [°]
1	Fill	Drained	16,0	20,0	1,0000	1,0000	0,30	8000,0	1,0	30,0
3	Garnodiorite	Drained	24,0	24,0	0,0000	0,0000	0,30	20000,0	500,0	0,0
5	Tuff Sand	Drained	20,4	22,0	3,0800E-3	3,0800E-3	0,30	11600,0	10,0	20,0
6	Silty Clay	Drained	18,3	20,0	3,0800E-3	3,0800E-3	0,30	11600,0	125,0	5,0

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FIGURE 5-57 STRUCTURE DATA PARAMETERS CROSS SECTION E-E

ID	Name	Type	γ_{unsat} [kN/m³]	γ_{sat} [kN/m³]	k_x [m/day]	k_y [m/day]	ν [-]	E_{ref} [kN/m²]	E_{incr} [kN/m³]
2	Beton K225	Undrained	24,0	24,0	0,0000	0,0000	0,20	21840,0	0,0
4	Interface Beton	Undrained	24,0	24,0	0,0000	0,0000	0,20	21840,0	0,0

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FIGURE 5-58 TOTAL DISPLACEMENT CROSS SECTION E-E

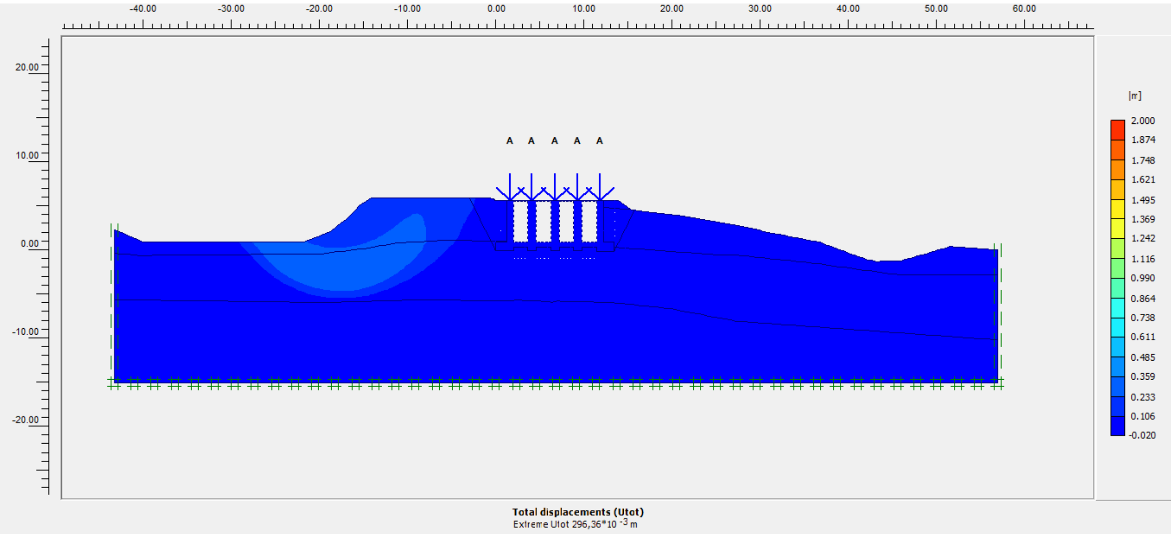
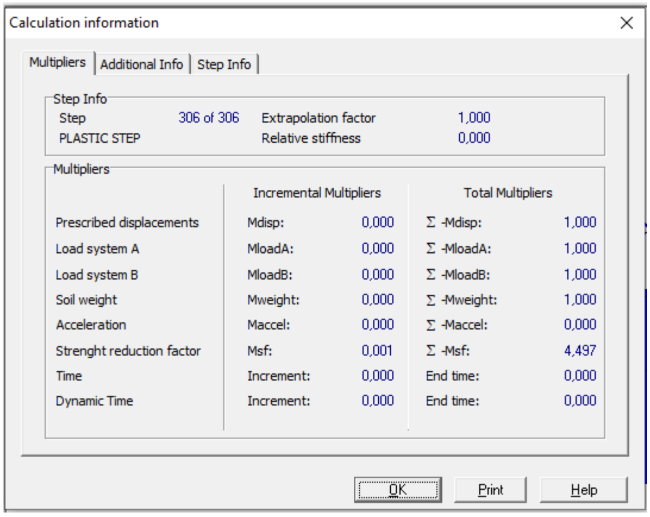


FIGURE 5-59 SAFETY FACTOR CONTROL CROSS SECTION E-E


Calculation information

Multipliers | Additional Info | Step Info

Step Info

Step	306 of 306	Extrapolation factor	1,000
PLASTIC STEP		Relative stiffness	0,000

Multipliers

	Incremental Multipliers		Total Multipliers	
Prescribed displacements	Mdisp:	0,000	Σ -Mdisp:	1,000
Load system A	MloadA:	0,000	Σ -MloadA:	1,000
Load system B	MloadB:	0,000	Σ -MloadB:	1,000
Soil weight	Mweight:	0,000	Σ -Mweight:	1,000
Acceleration	Maccel:	0,000	Σ -Maccel:	0,000
Strenght reduction factor	Msf:	0,001	Σ -Msf:	4,497
Time	Increment:	0,000	End time:	0,000
Dynamic Time	Increment:	0,000	End time:	0,000

OK Print Help

Figure 5-58 shows the results of the analysis of the total land subsidence of 0.29 meters, according to SNI geotechnical 8640:2017 the requirements for the safety factor of soil stability are 1.5, figure 5-59 shows the safety factor is 4.49 so that the soil stability in the mud disposal gate plan can withstand the load of the sherter gate Structure. and the accessories.

FIGURE 5-60 TOTAL STRESSES CROSS SECTION E-E

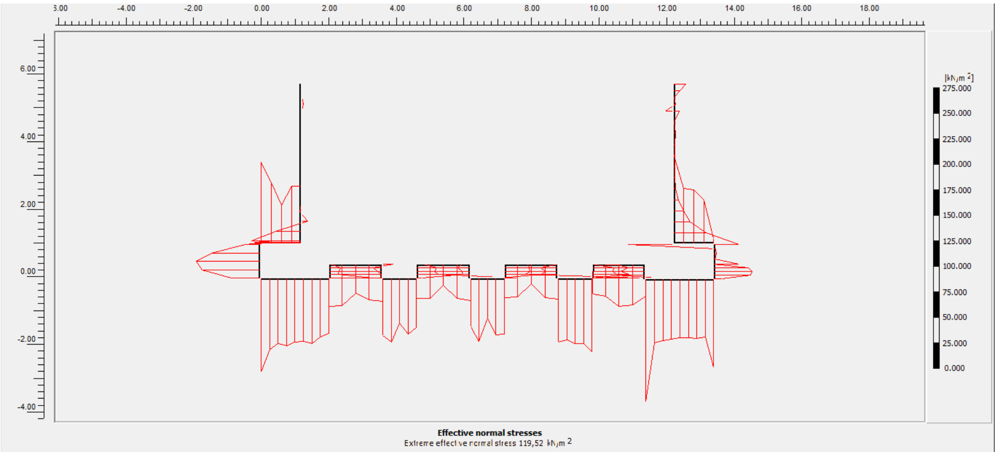
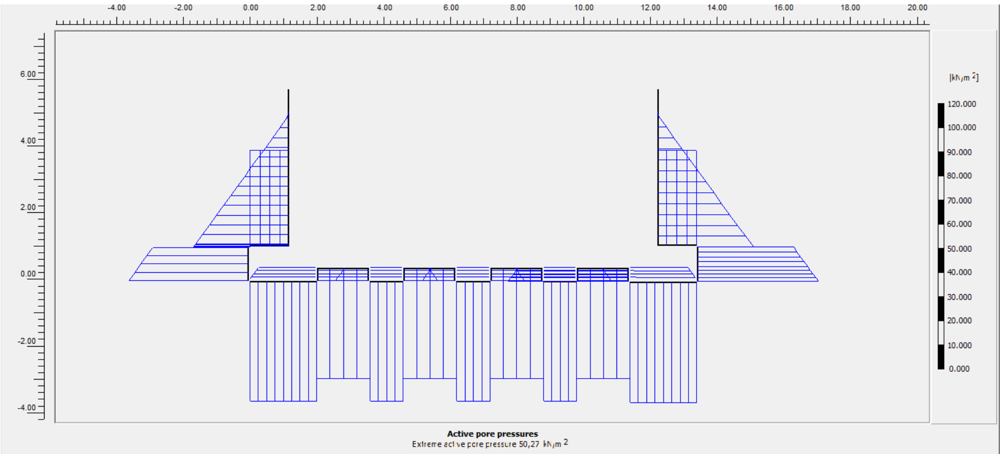


FIGURE 5-61 ACTIVE PORE PRESSURES CROSS SECTION E-E



Normal earth pressure on the mud drain gate Structure is 119.52 kN/m2 (can be seen in figure 5-60) and active pore pressures are 50.27 kN/m2 (can be seen in figure 5-61). Basically, the material used is reinforced concrete with a compressive strength of K 225 or 19 MPa, so that according to SNI, the loading of Structures and non-Structures can withstand both soil pressure and water pressure..

2. SEDIMENT TRAP FEEDER CANAL 2

Mud bag calculation

Planned particle size

It is assumed that the particles transported as suspended sediment and into the irrigation network are 0.07 mm = 70 x 10^{-6} meter.

Mud bag volume

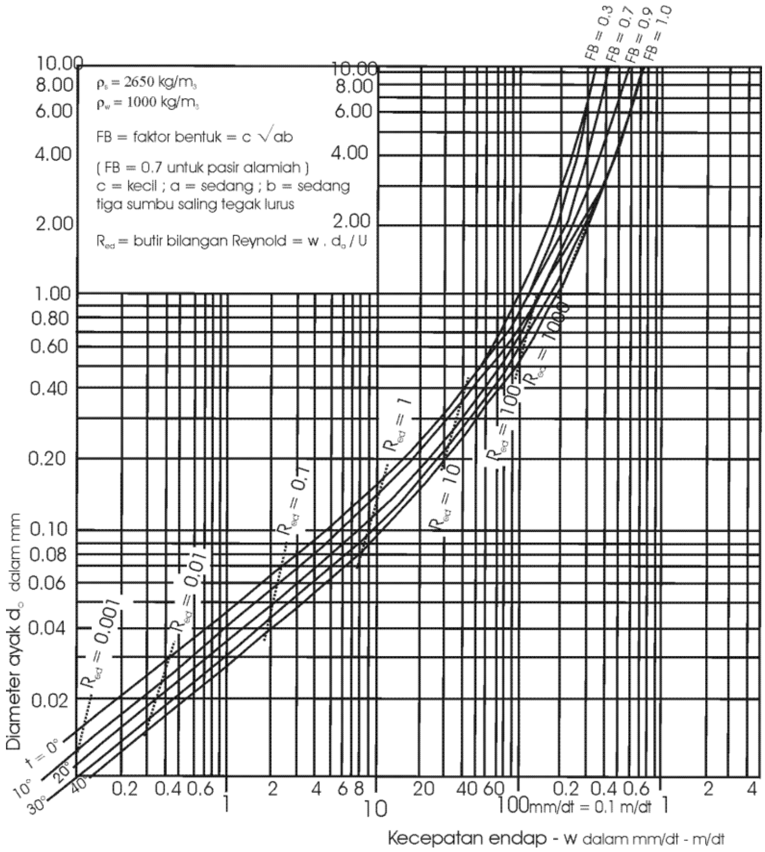
In this feeder of canal 2:

- sediment content to be deposited 0.5 $^{o}/_{oo}$
- use a 3 wall divider
- discharge flowed by the main line is 24.33 : 4 = 6,083 m^3/second
- two weeks of flushing time = 14 days

So that the volume of the mud bag required is: V = 0.05% x 29.20 x 14 x 24 x 3600 = 14,717 m^3.

Sedimentary field area (L.B)

The magnitude of the settling velocity for grain diameter of 0.07 mm and a temperature of 20° C, based on the graph of the relationship between the diameter of the sieve and the settling velocity in still water, the settling velocity (w) is 0.004 m/s. So the area of the deposition field is:



(assuming full canal without partition wall)

(assuming on the canal of each partition)

Based on the basic design the width of the mud bag is 40 meters, so it takes a mud bag length of 320 meters to meet the L/B requirements > 8. The basic design with a width of 40 meters and a length of 320 meters has an area of 12,800 m^2, much larger than the required 6,083 m^2.

Normal slope calculation

This calculation is based on normal exploitation conditions and the sediment pocket is almost full. The normal speed is taken to be 0.40 meters/second with the following considerations:

- prevent the growth of vegetation.
- larger particles do not settle directly downstream of the uptake.

The required cross-sectional area based on the velocity is:

With an average width (B) = 40 meters, the required depth is:

With such a depth and a cliff slope of 1 : 0, it will get a cross section like the following.
Wet circumference: $P = b + 2\,(h_n\sqrt{(1^2 + 0^2)}) = 43.04$ meter.

Hydraulic radius:

Hence, the normal slope is:

Actually, this slope is not valid for the entire length of the mud pocket because its area will increase downstream. The resulting elevation difference is very small and can be ignored.

Energy slope in the mud bag during flushing

At the time of flushing and the mud bag is empty, the slope of the flushing energy will be equal to the slope of the length of the reservoir. The cross-section of the reservoir is taken square and the flow rate during flushing is Q_s = 1.2 x Q_n = 1.2 x 24.33 = 29.20 m^3/second.

The bottom width of the reservoir is taken equal to the width of the bottom of the mud bag: b = 40 meter.

The estimated speed is 2 m/s, so the required cross-sectional area is:

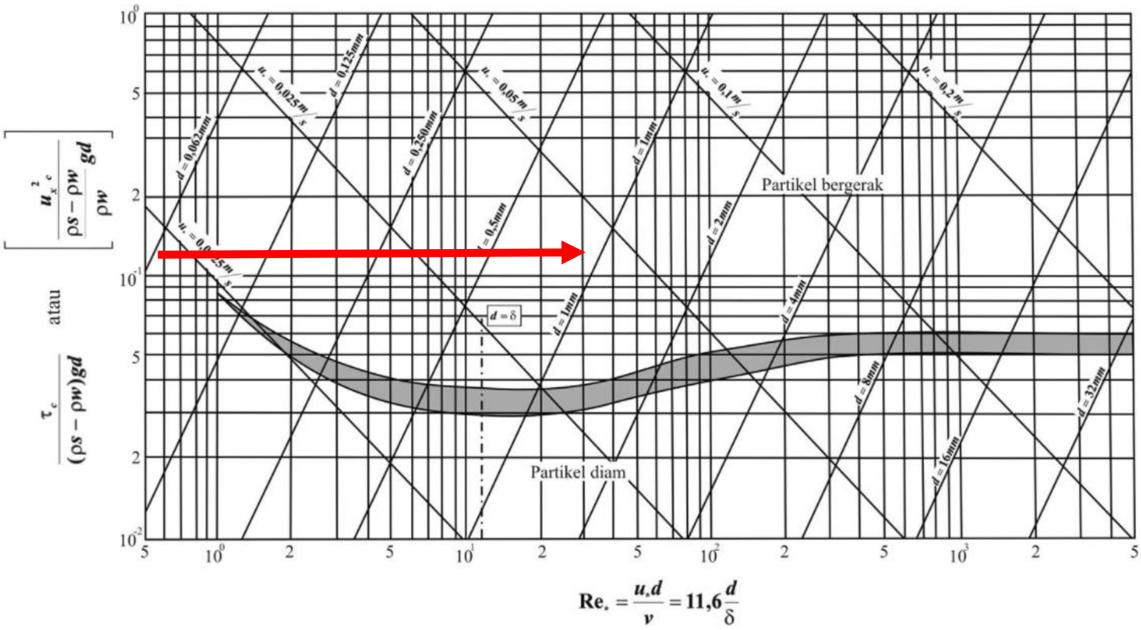
For that the required depth: $h_s = A_s$ / b = 14.6 / 10 = 1.46 meter.

For flushing of the roughness coefficient is taken: k = 40, so the magnitude of the slope is:

In order for flushing to be carried out properly, the flow velocity must be kept subcritical or Froude number: Fr < 1.

To find out whether at that speed 0.07 mm grains will be rinsed, we use the Shileds Graph, where for the above conditions the magnitude of the critical shear stress is:

$\tau = \rho . g . h_s . i_s$ = 1,000 x 9,8 x 1,46 x 1,3608 x 10 $^{-4}$ = 1,428 N/m^2



In the Shield Graph, the value of τcr is the ordinate (vertical line) to the right and for the value of τ = 1.428 N/m^2 , the particles are in motion.

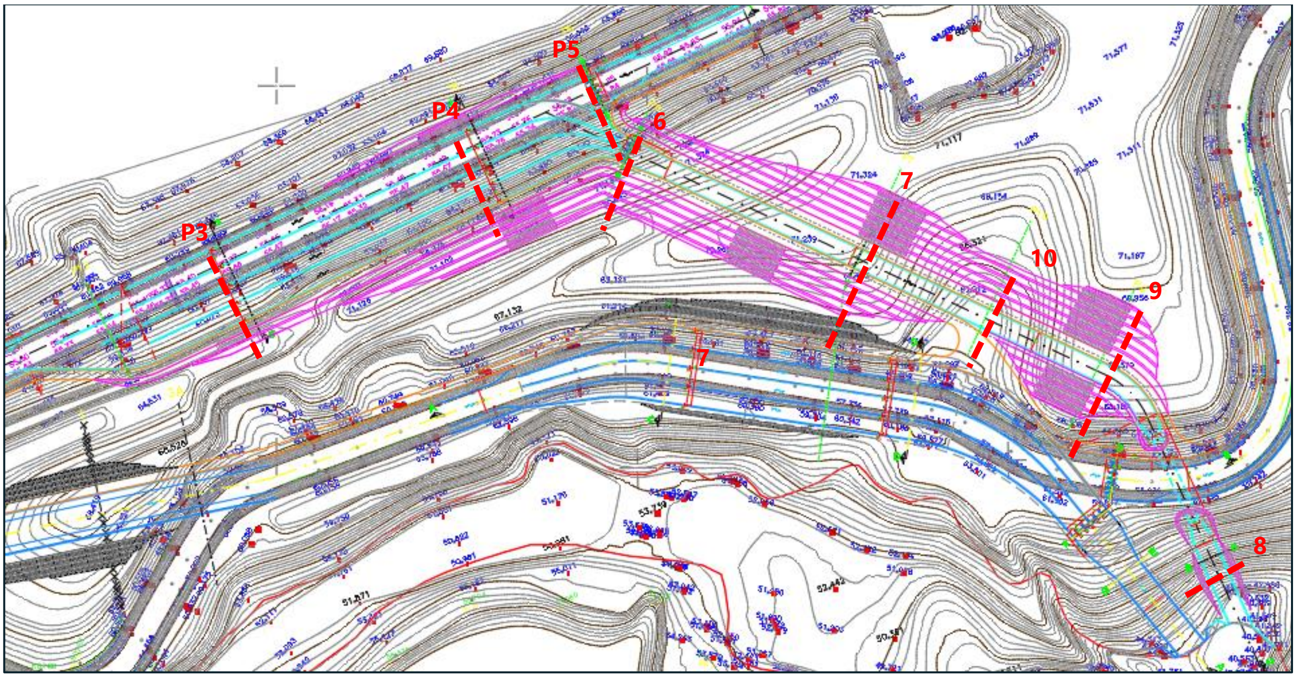
Mud bag deposit volume

From the calculation of the duration of rinsing time of 14 days, the sediment volume was 14,717 m3. Based on the design, the volume of sediment that can be accommodated is:

Based on the figure above, the size of the storage volume is:
V = H_S X B X L + ½ D_S X B X L   WHERE D_S = ($I_S - I_N$) L
V = h_s x b x L + ½ ($i_s - i_n$) L^2 x b
= 1.46 x 40 x 320 + ½ ($1,36.10^{-4} - 0,498.10^{-4}$) x 320^2 x 40
V = 18,798 m^3 > 14.717 m^3 (Sediment Volume for 14 Days)

Pekerjaan Struktur Sedimen Trap Feeder Canal II

FIGURE 5-62 SEDIMENT TRAP FEEDER CANAL II



PPC Way Sekampung

Stability Anallysis of Cross Section 3, 4 dan 5

In this area, the Way Sekampung PPC team choose three cross-section samples, namely cross-sections P4, 5, and 13. At the bottom of the soil layer in the cross-section area above, it is generally the same as the type of soil layer in Feeder Canal I.

**Feeder Canal II Area Stability Analysis M
odeling**

The purpose of the analysis of soil stability is to observe the condition of the soil structure and structural stability of the Structure area of Feeder canal I. The design parameters used are the result of measurements in the field. The software used to model the soil stability analysis are PLAXIS 2D 2-dimensional model simulations. The following are the soil parameters used to create the model.

The value of x-acceleration is an acceleration of the earthquake on the location of the review, in this case the value of seismic acceleration is used by 0.508 G. Figure 563 Feeder Canal Sediment Trap 2.

FIGURE 5-63 SOIL PARAMENTERS

ID	Nama	Jenis	$\gamma_{takjenuh}$ [kN/m ^{3}]	γ_{jenuh} [kN/m ^{3}]	k_x [m/hari]	k_y [m/hari]	ν [-]	E_{ref} [kN/m ^{2}]	c_{ref} [kN/m ^{2}]	ϕ [°]
1	Layer 1	Terdrainase	20,4	22,4	0,0083	0,0083	0,23	20000,0	10,0	30,0
2	Layer 2	Terdrainase	20,4	22,4	0,0083	0,0083	0,23	20000,0	5,0	30,0
3	Layer 3	Tidak porous	20,4	20,4	0,0000	0,0000	0,23	20000,0	5,0	30,0
4	Interface Concrete	Tidak porous	24,0	24,0	0,0000	0,0000	0,30	20000,0	200,0	30,0

Plaxis 2D & PPC Way Sekampung

Soil parameters used to model soil stability in each model. Soil parameters were obtained based on the results of geological and soil mechanics investigations and observations carried out in the field.

Soil Stability Modeling Results at Point 3

Geometry models for Area 3 are:

FIGURE 5-64 GEOLOGICAL CROSS SECTION P3

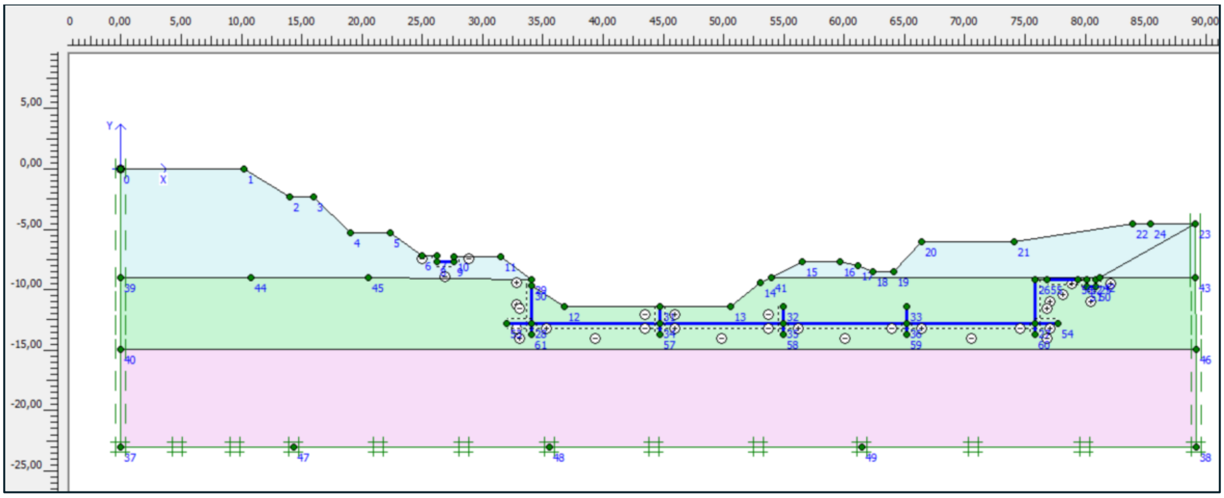
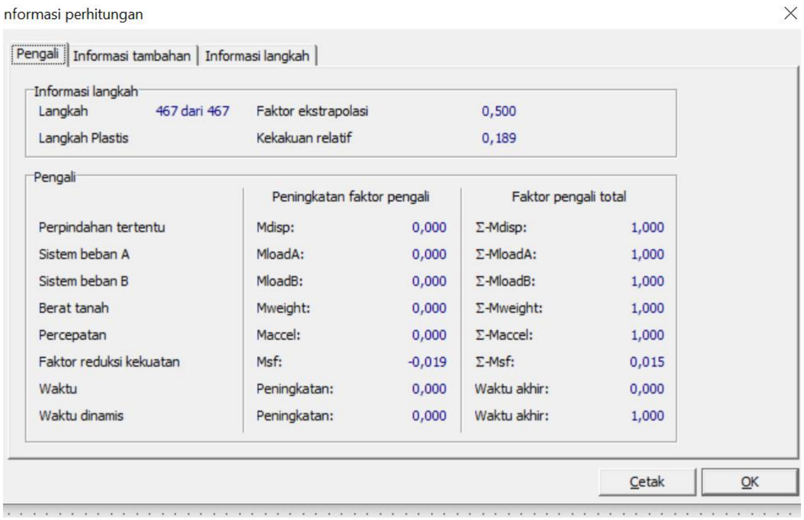


FIGURE 5-65 SAFETY FACTOR CROSS SECTION P3 *(EARTHQUAKE)*



The results of the analysis that the stability of the piece without earthquake loading P3 represents the movement of land totaling 284.3 M, with a safety factor of 2 when burdened with a 2-fold, this movement occurs on the right side of the channel slope and soil movement on the loading condition of the earthquake of 14.36 M with a safety factor of 0.01, according to SNI geotechnical that the stability of land with SF value> 1.5 was safe, the results of the simulation that the area is not safe pot 13 against the potential damage to the slope / landslide. Therefore, the PPC Way team in the village recommends strengthening the slopes. Strengthening of slopes in sub chapter geotechnical recommendations. For more detail can be in clay in Geologyical report.

Stability Analysis of Cross Section P6, P7 and P9

Quoting from the geological report and the results of the site investigation, that in the drainage area of the soil layer to be excavated is a silty clay layer with characteristics of high plasticity, rigid hardness, cohesiveness and a second layer of sandy tuff, weathered brownish white color with non-plastic characteristics, very compact hardness. and there is material in the form of gravel

Stability Analysis Modeling Construction diversion Feeder Canal Excavation Area II

Here are the ground parameters used to create the model. And the value of x-acceleration is an acceleration of the earthquake on the location of the review, in this case the value of seismic acceleration is used at 0.508

FIGURE 5-66 SOIL PARAMETERS

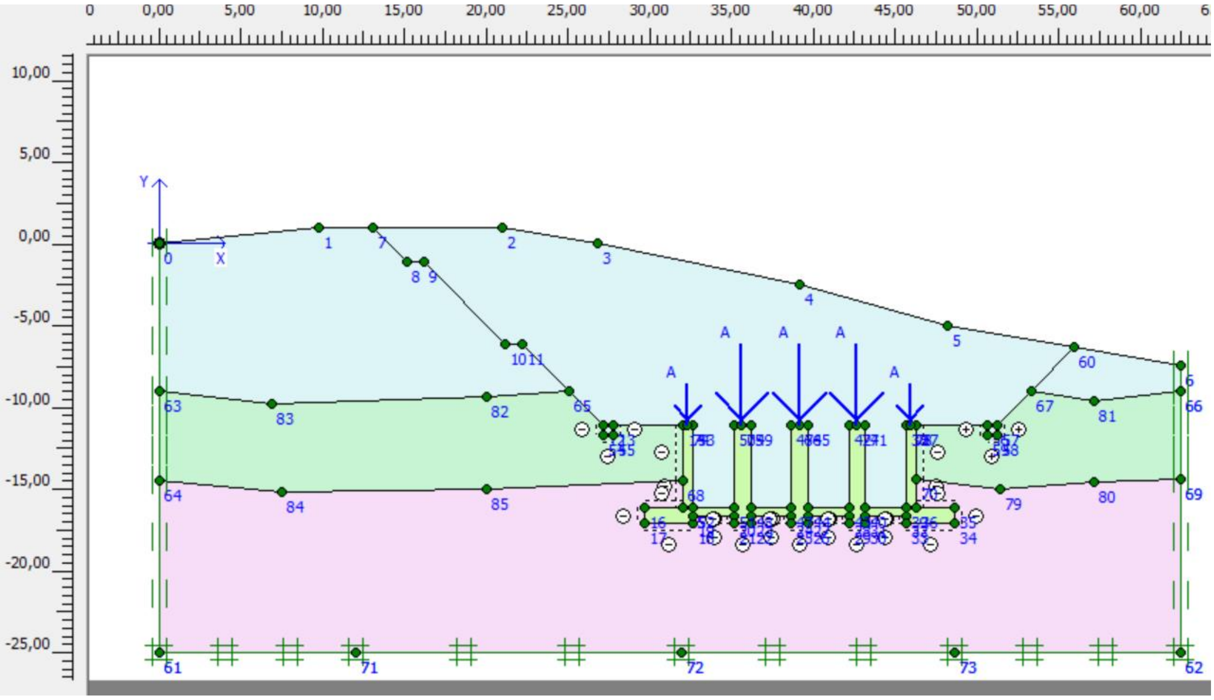
ID	Nama	Jenis	$\gamma_{takjenuh}$ [kN/m³]	γ_{jenuh} [kN/m³]	k_x [m/hari]	k_y [m/hari]	ν [-]	E_{ref} [kN/m²]	c_{ref} [kN/m²]	ϕ [°]	ψ [°]
1	Layer 1 (BH-08)	Terdrainase	17,7	19,5	0,0341	0,0341	0,32	9600,0	104,0	5,0	0,0
2	Layer 2 (BH-08)	Terdrainase	17,9	19,7	0,0341	0,0341	0,32	10401,0	113,0	5,0	0,0
3	Layer 3 (BH-08)	Terdrainase	19,9	21,9	0,0341	0,0341	0,25	18000,0	10,0	40,5	0,0
4	Layer 4 (BH-08)	Terdrainase	20,0	22,0	0,0341	0,0341	0,30	10400,0	10,0	30,0	0,0
5	Garnodiorite	Terdrainase	24,0	24,0	0,0000	0,0000	0,30	20000,0	500,0	0,0	0,0
6	Interface Concrete	Tidak porous	24,0	24,0	0,0000	0,0000	0,30	20000,0	200,0	30,0	0,0

Plaxis 2D & PPC Way Sekampung

Soil parameters are used to model the stability of the soil in each model. Soil parameters obtained by the results of the investigation and geology and soil mechanics observations done in the field.

P6 cross-sectional model geometry Geomteri model penampang potongan P6

FIGURE 5-67 GEOMETRY MODEL CROSS SECTION P6



PPC Way Sekampung

FIGURE 5-68 DEFORMASI YANG TERJADI AREA CROSS SECTION P6

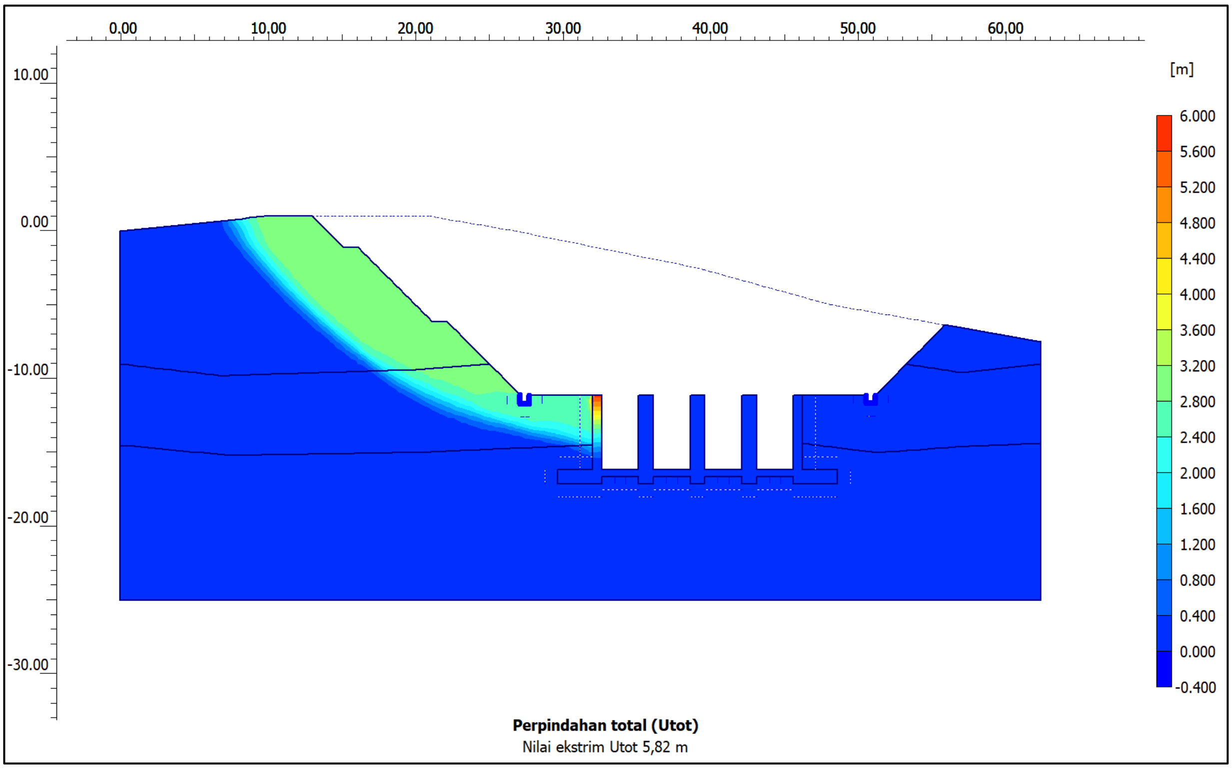
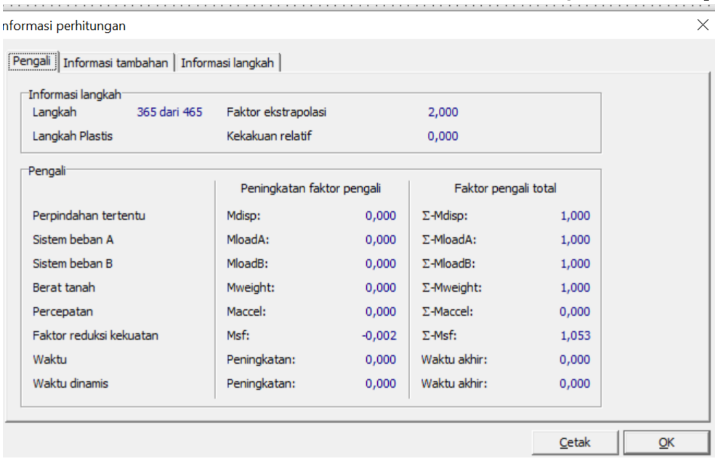


FIGURE 5-69 SAFETY FACTOR CROSS SECTION P3 *(NO EARTHQUAKE)*



Plaxis 2D & PPC Way Sekampung

FIGURE 5-70 DEFORMATION THAT HAPPENED AREA CROSS SECTION 6 (*EARTHQUAKE*)

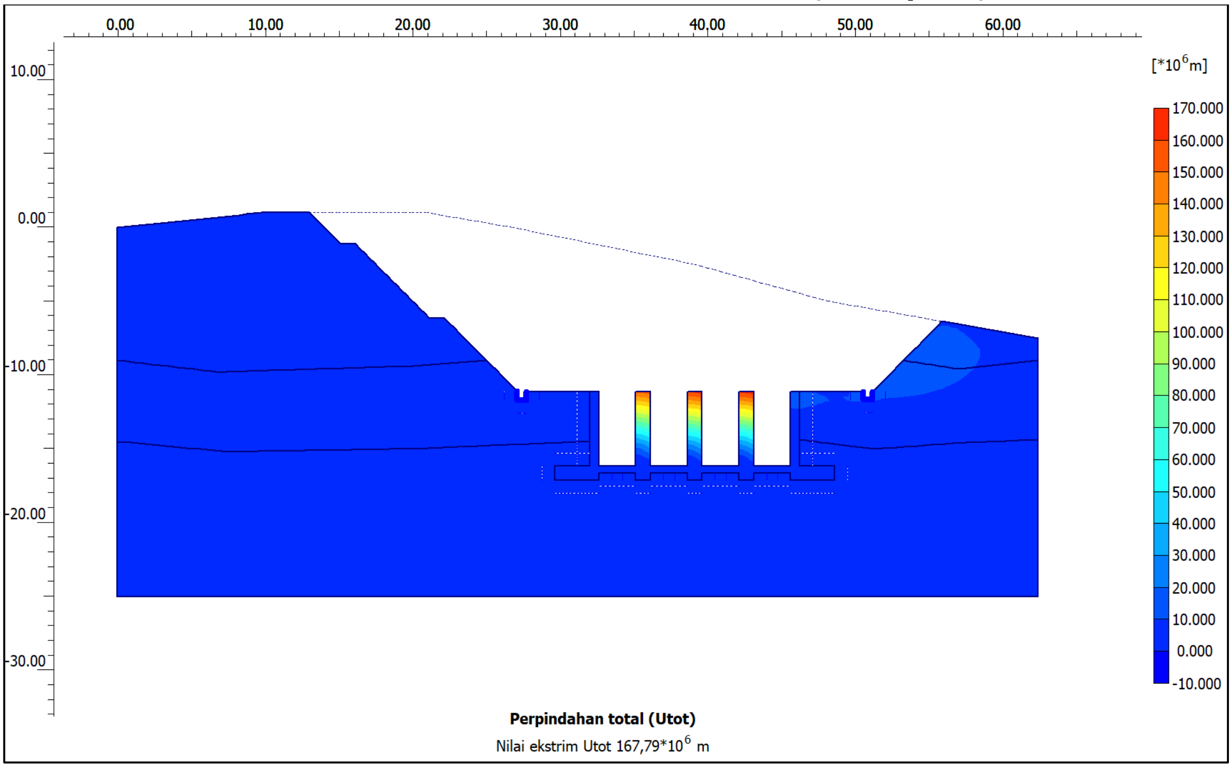


FIGURE 5-71 SAFETY FACTOR CROSS SECTION P3 *(EARTHQUAKE)*

	Peningkatan faktor pengali		Faktor pengali total	
Perpindahan tertentu	Mdisp:	0,000	Σ-Mdisp:	1,000
Sistem beban A	MloadA:	0,000	Σ-MloadA:	1,000
Sistem beban B	MloadB:	0,000	Σ-MloadB:	1,000
Berat tanah	Mweight:	0,000	Σ-Mweight:	1,000
Percepatan	Maccel:	0,000	Σ-Maccel:	1,000
Faktor reduksi kekuatan	Msf:	0,010	Σ-Msf:	0,382
Waktu	Peningkatan:	0,000	Waktu akhir:	0,000
Waktu dinamis	Peningkatan:	0,000	Waktu akhir:	1,000

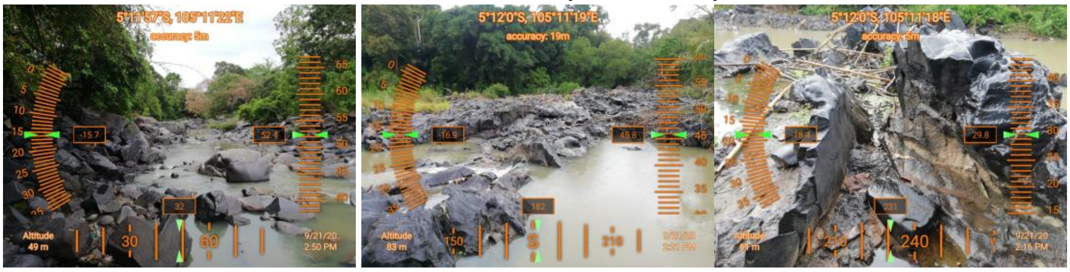
Plaxis 2D & PPC Way Sekampung 2021

The results of the analysis that the stability of the piece P6 with the imposition without earthquake ground motion shows a total of 5.82 M with SF 1.05, and the movement of soil on the condition that 167 mete earthquake with SF 0.38. Area construction of slope at this point is not safe because PLAXIS simulation results show the stability of <1.5 to require retrofitting of slopes. For more details can be seen in the feeder canal Geological report II

Recommendations Area Cross Section A-A

At the location of the A-A cross is an exhaust channel into the river, the nearby river conditions are igneous rocks (geological survey results), so the placement of the foundation of the channel in the rock layers, the following documentation photographs of riparian areas, namely:

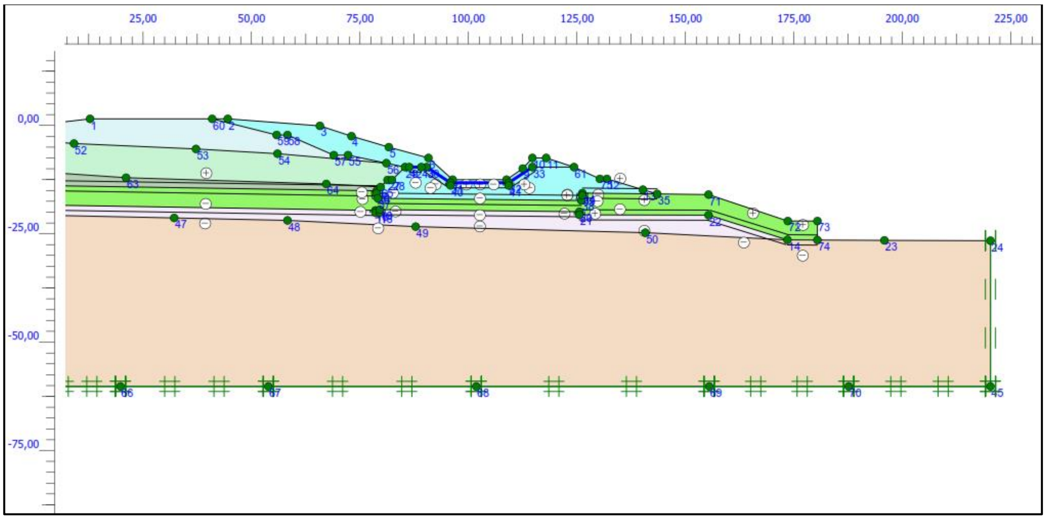
FIGURE 5-72 SAFETY FACTOR CROSS SECTION P8 (EARTQUAKE)



Geological Report PPC way Sekampung

Model geometry cross section A-A, lithological soil in this area geological survey, namely:

FIGURE 5-73 GEOMETRY MODEL CROSS SECTION A-A



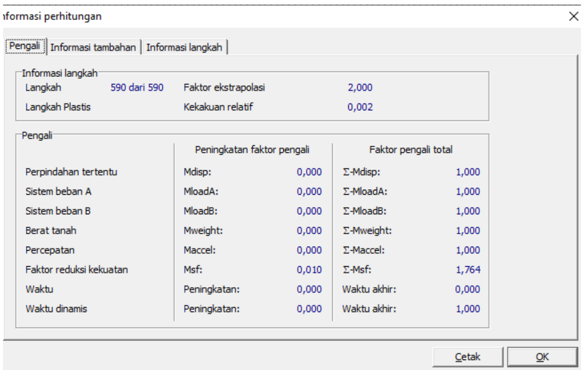
PPC way Sekampung

Here the material used for the stability analysis, soil parameters used were based on the results of the geological survey team in the area compatriot way PPC Feeder plan canal I and II, namely:

FIGURE 5-74 SOIL PARAMETERS

ID	Nama	Jenis	EA [kN/m]	EI [kNm ^{2}/m]	w [kN/m ^{2}]	ν [-]	M_p [kNm/m]	N_p [kN/m]
1	Layer 1 Beton Box	Elastis	6,15E7	1,15E5	2,4E4	0,30	1E15	1E15
2	Layer 2 Beton Jalan	Elastis	4,92E6	3,69E6	1,9	0,30	1E15	1E15
3	Layer 3 Lining Beton	Elastis	6,75E7	10700,0	26,3	0,30	1E15	1E15

ID	Nama	Jenis	$\gamma_{takjenuh}$ [kN/m^3]	γ_{jenuh} [kN/m^3]	k_x [m/hari]	k_y [m/hari]	ν [-]	E_{ref} [kN/m^2]	c_{ref} [kN/m^2]
1	Layer 1	Terdrainase	18,1	20,8	0,0266	0,0266	0,30	10798,0	117,0
2	Layer 2	Terdrainase	18,9	20,8	0,0266	0,0266	0,30	14000,0	5,0
3	Interface Concrete	Tidak porous	24,0	24,0	0,0000	0,0000	0,30	20000,0	200,0
4	Gamodiorite	Tidak porous	24,0	24,0	0,0000	0,0000	0,30	20000,0	500,0
5	Layer 4	Terdrainase	20,4	22,4	0,0259	0,0259	0,23	20000,0	10,0
6	Layer 3	Terdrainase	18,3	20,1	0,0259	0,0259	0,31	11600,0	10,0
7	Concrete	Tidak porous	24,0	24,0	0,0000	0,0000	0,20	2,0487E7	500,0
8	Timbunan	Terdrainase	18,1	20,8	0,0266	0,0266	0,30	10798,0	117,0



Stability under normal conditions for the location of Cross Section A-A potential landslides as far as SF 11.6 3.6 M premises stability and the conditions earthquake ground motion a total of 1.63 M with the stability of SF 1.7. Conditions sufficient slope ± 15 meters around construction causes longor potential, and therefore to reduce soil movements should use the slope reinforcement. For more details, see the feeder canal II engineering geology report

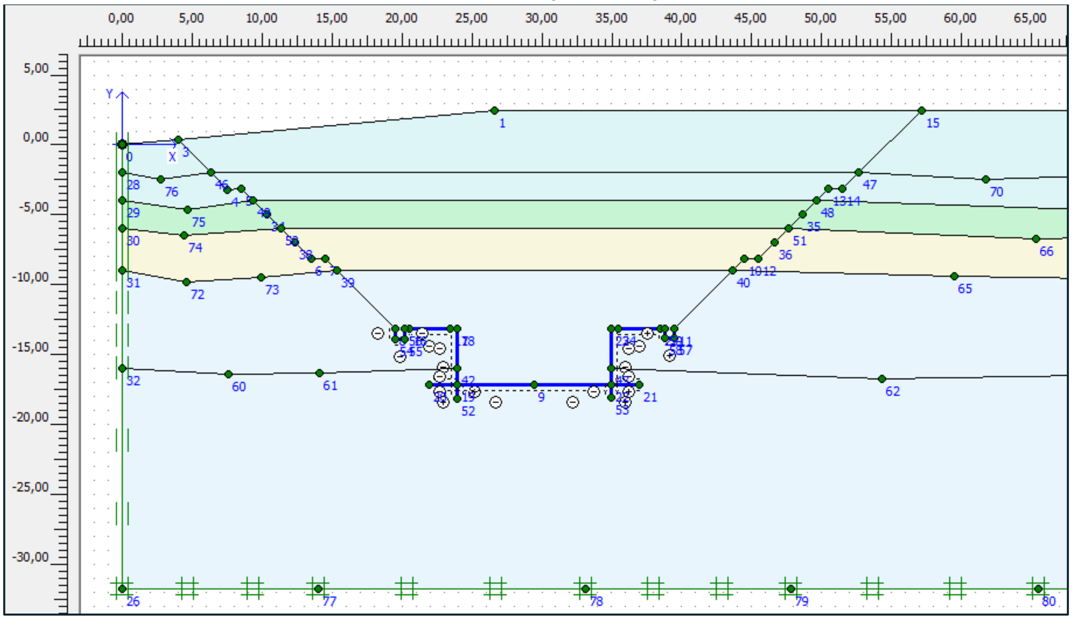
Rekomendasi

Recommendations strengthening the structure and stability is an attempt to prevent the failure of construction and reduce construction failure during a natural disaster area around the Structure.

Cut and Fill

The cut soil in sediment trap Feeder canal area 1 is divided into five stages, including:

FIGURE 5-75 CUT SOIL CONSTRUCTION DESIGN (AREA P7)



Plaxis 2D & PPC Way Sekampung

Quoting from geological report compatriot way, for the area is divided into several lithological soil, the construction phase drains soil layer cut waster done quite a lot because most of the elevation base of the canal was +50 M, so that the construction cut into 5 phases are:

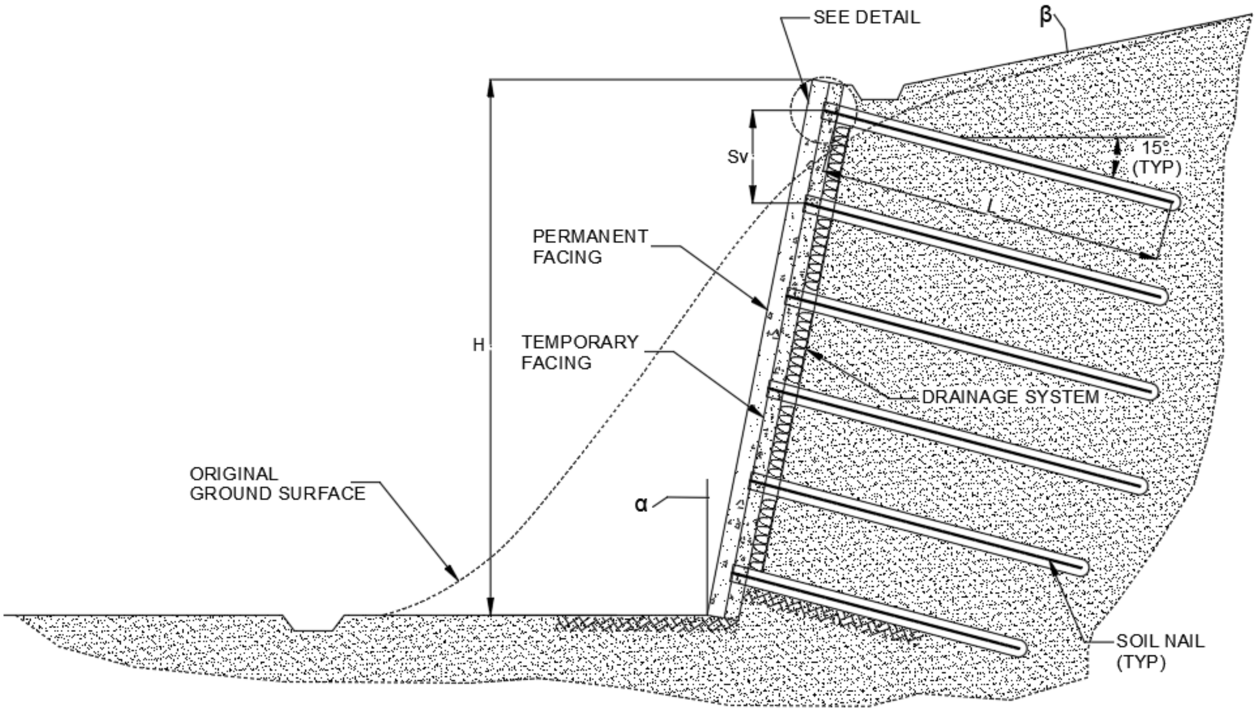
TABLE 5-17 CUT AND FILL PHASE

Phase	Strarting Phase	Item	Lithology
Construction Cut 1	1	Construction Phase	Silt clay
Construction Cut 2	2	Construction Phase	Tuff
Construction Cut 3	3	Construction Phase	Sand Tuff
Construction Cut 4	4	Construction Phase	Sand Tuff
Construction Cut 5	54	Construction Phase	Sand Tuff

Design Of Soil Nail Walls

Soil nail wall consists of put on the passive reinforcement (ie, no post-drag) on the existing soil by installing a rod or steel parts in close proximity (ie, spikes) and place struts of the front face. Soil nail-grout later on if set in the borehole. Soils perforated nail is also possible if a nail (or part of steel) driven into the ground. The image below shows a typical detail soil nail wall, and for more details can be seen in the feeder canal engineering geology reports I and II.

FIGURE 5-76 TYPICAL SOIL NAIL WALL ARRANGEMENT



Pile

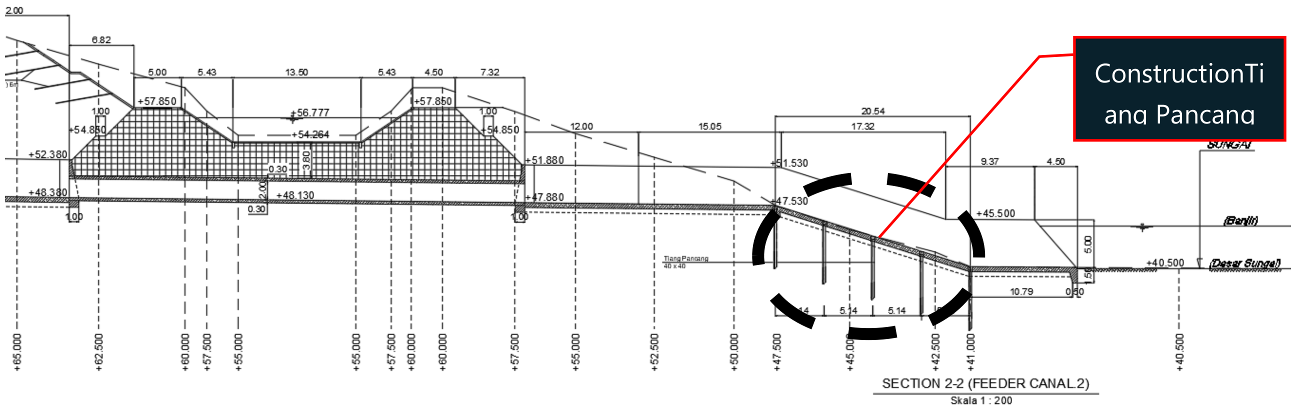
Piles are part of the structure that is used to receive and transfer the load from the superstructure to the supporting soil which is located at a certain depth. The piles in the feeder canal II area are located in the A-A cross section, for more details, see the structure report.

In planning the drainage of sediment trap feeder canal I, the piles have the following dimensions:

- Dimension : 40 X 40 cm^2
- Height : 6 m/ pile

- Contrete Characteristic : K-450

FIGURE 5-77 AREA CROSS SECTION A-A



Sheet Pile

In the construction of sheet piles in the feeder canal, the sediment trap I is located along the feeder canal II area. For sheet pile details as follows:

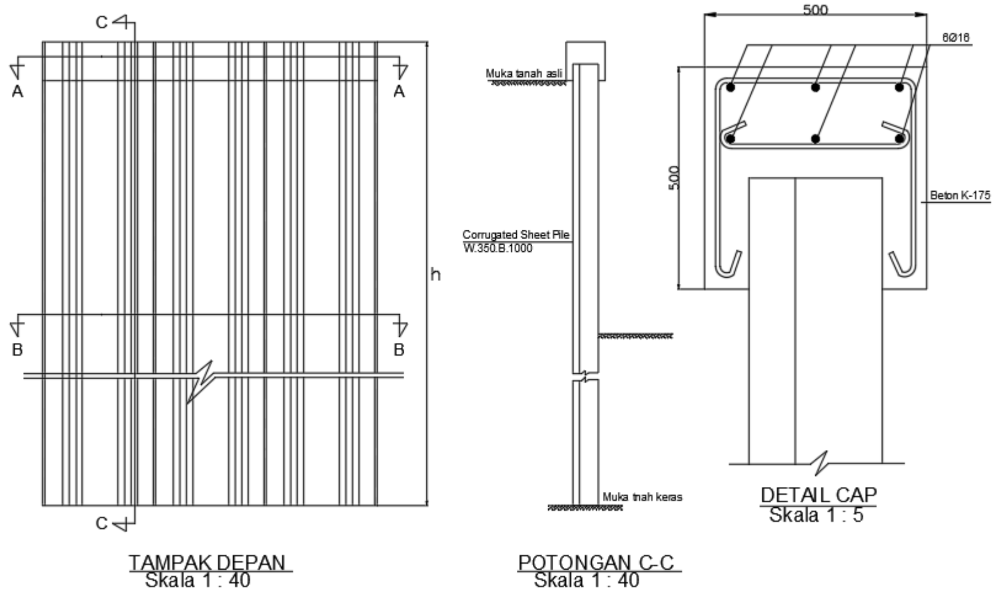
Dimension : - Width 1000 mm

: - Thick 350 mm

: - Height 9-17 m

Conrete Characteristic : Type (A) K-350

FIGURE 5-78 DETAIL SHEET PILE

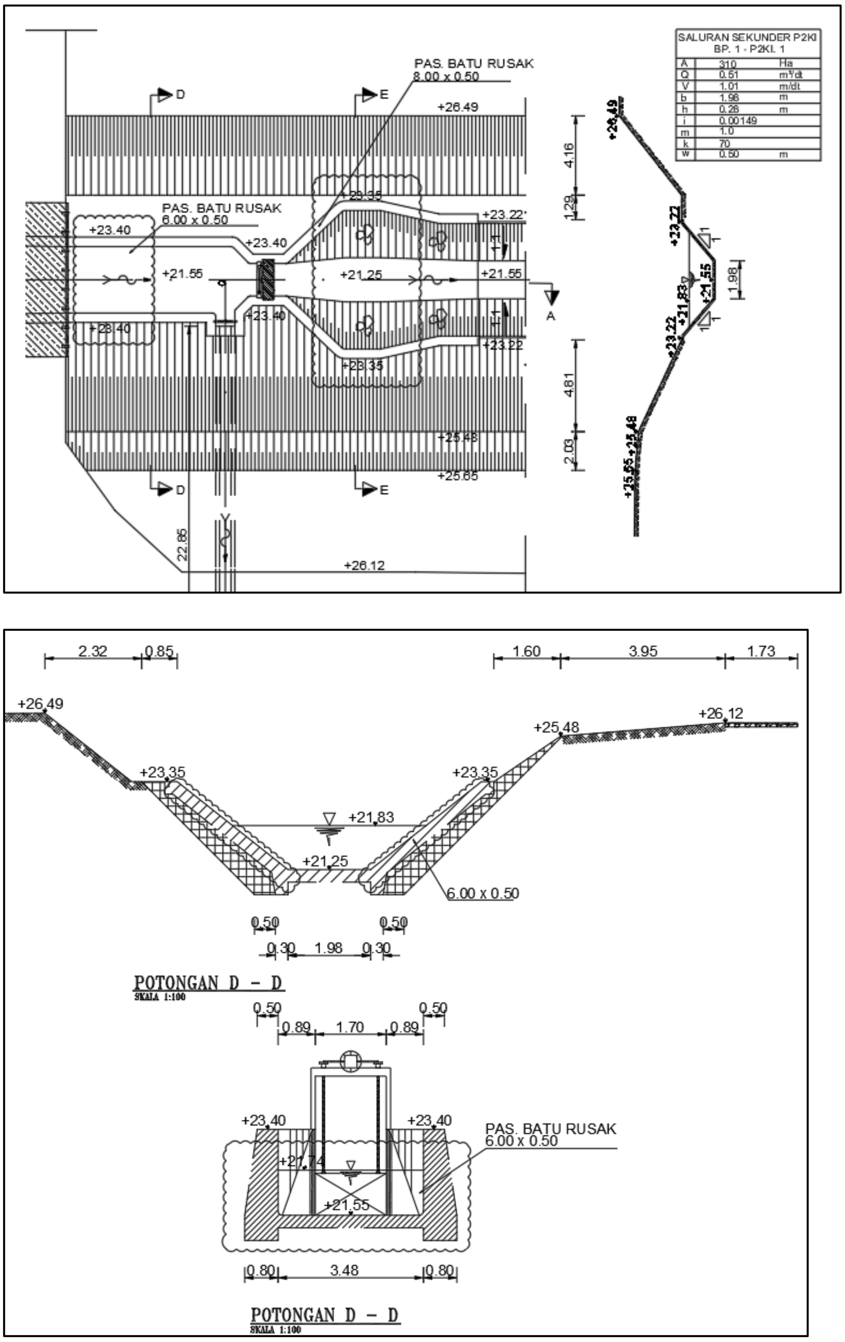


5.2.3.2 - Offtake, Offtake-Intake, and Intake Structure

The structures of offtake, offtake-intake, and intake have different functions but have almost the same Structure structure as using masonry equipped with broadcasts and plaster or plaster.

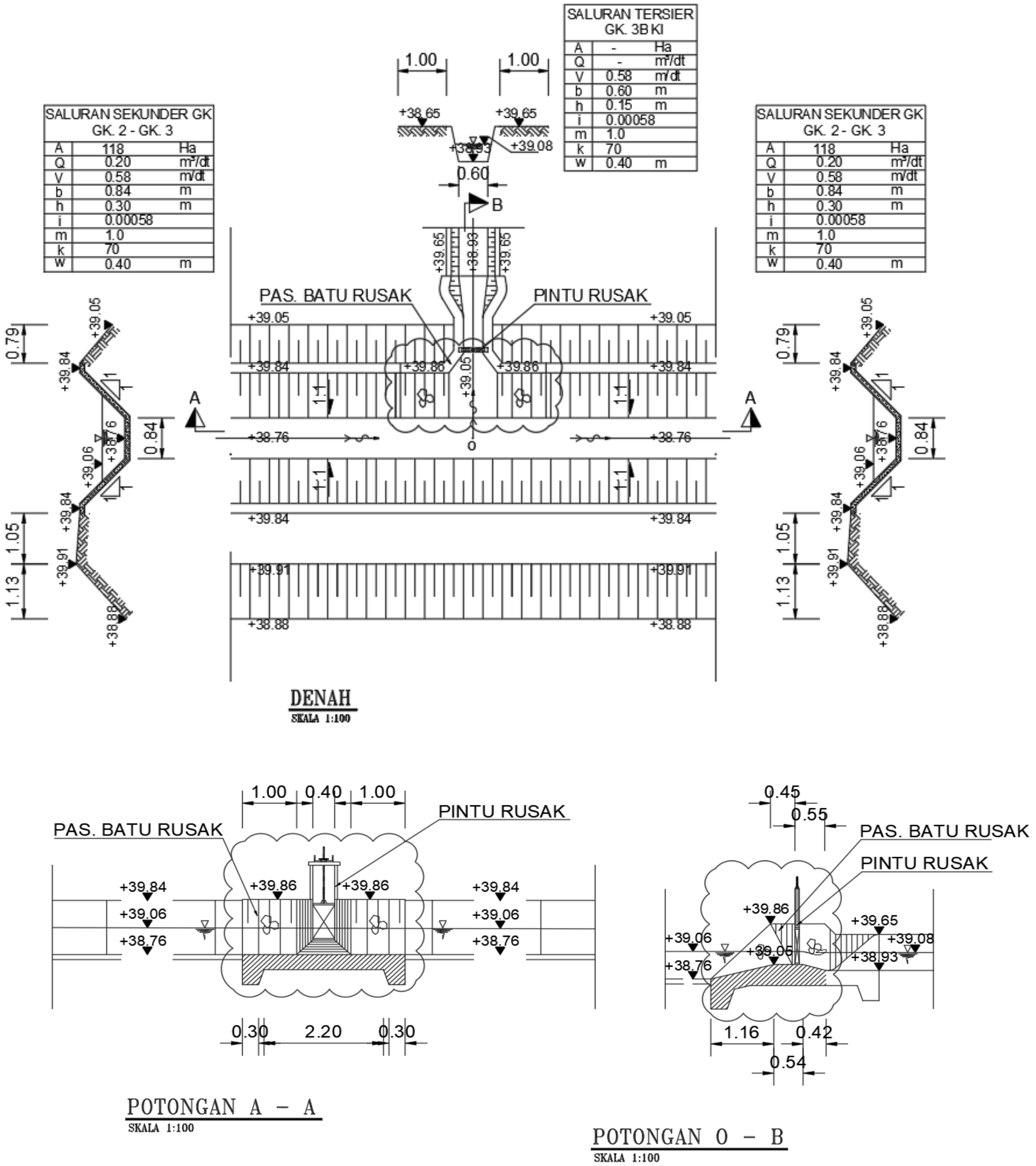
Offtake structure is a structure that functions to divide water from primary or secondary canals into two or more canals, each with a smaller discharge. The offtake structure is located in the primary canal and/or in the secondary canal at a branch point. In Way Sekampung rehabilitation, there are several offtake structures for various canal sections, each Structure has different dimensions with the structures using masonry, detailed images of the rehabilitation of the structures are in the image attachment. The following is an example of a structure for the Batanghari Utara Area of the BPU 1 and P1 and P2 secondary canals for the P1 P2Ki location.

FIGURE 5-79 REHABILITATION OF OFFTAKE STRUCTURE FOR BATANGHARI UTARA



Intake structure serves to intake or take water from the primary canal to the secondary or tertiary canal, the final intake structure is a water divider structure at the end of the secondary canal where the discharge is tapped out by tertiary canals. For intake structure work, there are several stages starting from new demolition, excavation and heap of soil, masonry, and broadcast work, details of the intake structure are in the attached image. An example of a tapping Structure for the Sekampung Batanghari Irrigation Area GK secondary canal is located in GK3b.

FIGURE 5-80 REHABILITATION OF INTAKE STRUCTURE FOR SEKAMPUNG BATANGHARI



Offtake-intake structure is an offtake structure that has an intake gate to tertiary plots, this structure is located in a primary or secondary canal that connects directly to the tertiary plot. With this structure for intaking, the water flow and water discharge from the primary canal can be divided equally or according to the discharge requirements of each branching secondary canal. In the example image below, the BG primary canal at BG9 location in Batanghari Utara has several branches to the tertiary canal directly, and it divides into the PU secondary canal. Details of the structure for intaking in the image attachment.

FIGURE 5-81 REHABILITATION OF OFFTAKE-INTAKE STRUCTURE FOR BATANGHARI UTARA

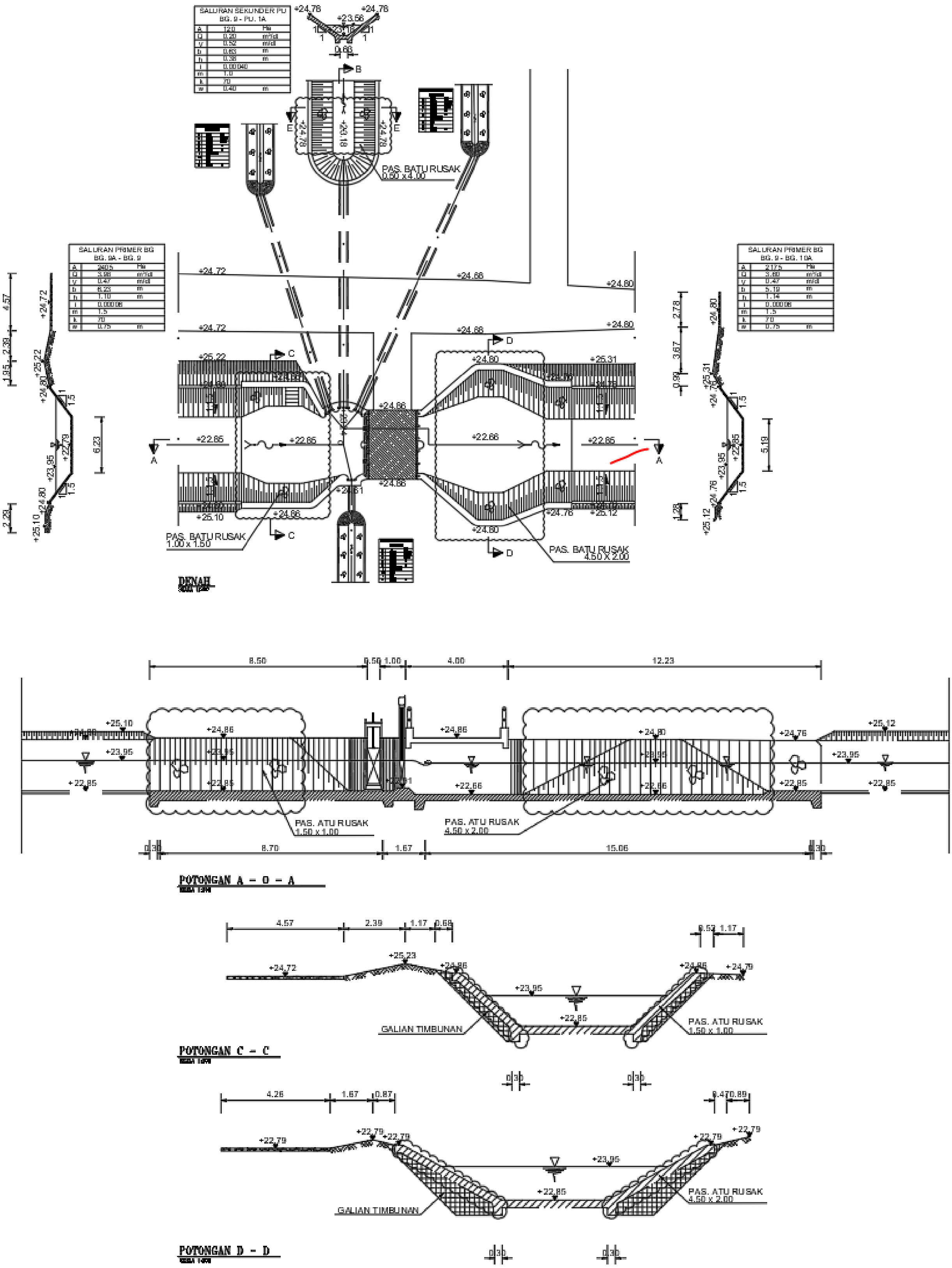


TABLE 5-18 LOCATIONS OF STRUCTURE REHABILITATION FOR OFFTAKE, OFFTAKE-INTAKE, AND INTAKE

No	Irrigation Area	Structure	Canal Name	Location
1	Punggur Utara	Bangunan Sadap	Induk BPU	BPU9Ka2
2	Punggur Utara	Bangunan Sadap	Sekunder BD	BD9Ki
3	Punggur Utara	Bangunan Sadap	Sekunder BE	BE1Ka1
4	Punggur Utara	Bangunan Sadap	Sekunder BE	BE1Ka2
5	Punggur Utara	Bangunan Sadap	Sekunder BE	BE1Ki
6	Punggur Utara	Bangunan Sadap	Sekunder BE	BE2Ki
7	Punggur Utara	Bangunan Sadap	Induk BPU	BPU19Kr2
8	Punggur Utara	Bangunan Sadap	Induk BPU	BPU19kr1
9	Sekampung Batanghari	Bangunan Pengatur	Induk KBH	KBH4
10	Sekampung Batanghari	Bangunan Pengatur	Induk KBH	KBH5
11	Sekampung Batanghari	Bangunan Pengatur	Induk KBH	KBH13
12	Sekampung Batanghari	Bangunan Sadap	Sekunder GK	GK3b
13	Batanghari Utara	Bangunan Pengatur	Induk BG	G8
14	Batanghari Utara	Bangunan Pengatur	Induk BG	G9
15	Batanghari Utara	Bangunan Bagi	Induk BG	G9PU
16	Batanghari Utara	Bangunan Pengatur	Induk BG	G10
17	Batanghari Utara	Bangunan Bagi	Sekunder P2KA	P1 P2Ka
18	Batanghari Utara	Bangunan Bagi	Sekunder P2KI	P1 P2Ki
19	Batanghari Utara	Bangunan Sadap	Induk BG	G9A
20	Batanghari Utara	Bangunan Sadap	Sekunder PU	PU1A
21	Batanghari Utara	Bangunan Sadap	Sekunder PU	PU1
22	Batanghari Utara	Bangunan Sadap	Sekunder PU	PU2
23	Batanghari Utara	Bangunan Sadap	Sekunder P	P2Ki1

5.2.3.3 - *Sanggar Tani* (Saung meeting)

Sanggar tani is used as a means for interaction among farmers, or between farmers and irrigation officers in order to facilitate the resolution of problems that occur in the field. Table 5-19 shows the construction of *Sanggar Tani* in the Way Sekampung Irrigation Area.

TABLE 5-19 LOCATIONS OF *SANGGAR TANI* DEVELOPMENT IN THE WAY SEKAMPUNG IRRIGATION AREA

No	Irrigation Area	Structure Name	Total
1	Punggur Utara 1	Sanggar Tani	3
2	Punggur Utara 2	Sanggar Tani	31
3	Batanghari Utara	Sanggar Tani	16
4	Bekri	Sanggar Tani	25
5	Raman Utara	Sanggar Tani	13
6	Rumbia Barat	Sanggar Tani	26
7	Sekampung Batanghari	Sanggar Tani	24
8	Sekampung Bunut	Sanggar Tani	19

FIGURE 5-82 LOCATIONS OF *SANGGAR TANI* DEVELOPMENT IN THE WAY SEKAMPUNG IRRIGATION AREA

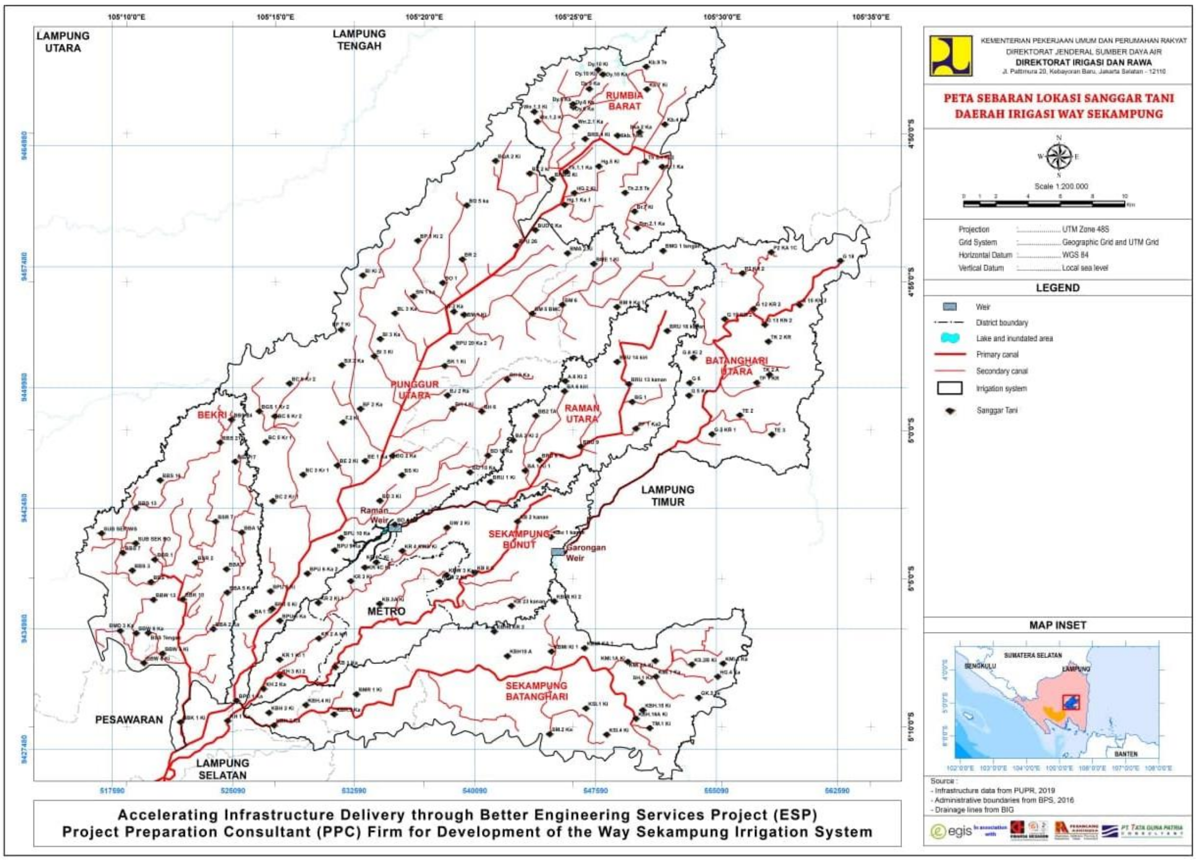
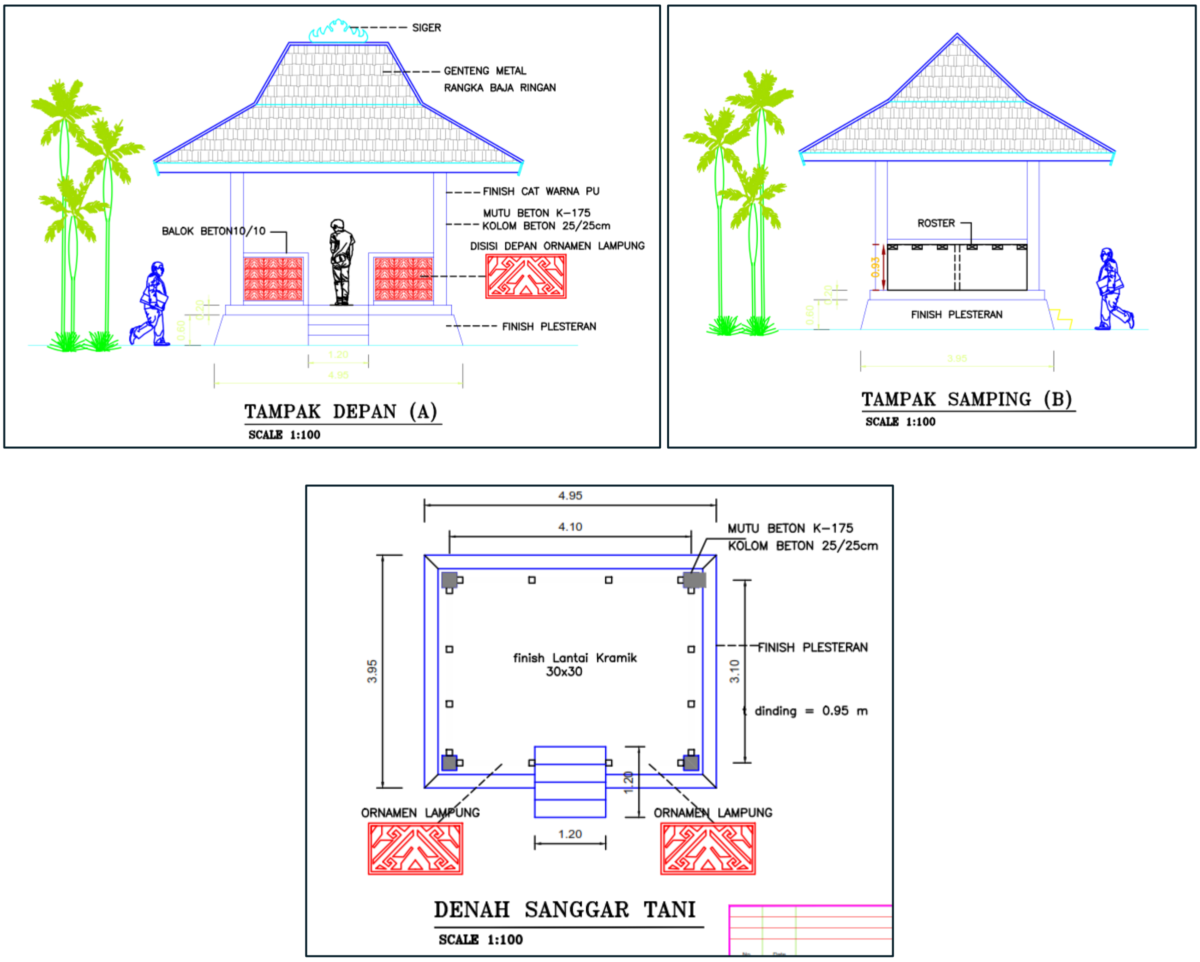


FIGURE 5-83 *SANGGAR TANI* DESIGN



The parts of *Sanggar Tani* that will be built in the Way Sekampung Irrigation Area include,

a. Metal tile with mild steel frame
b. The fence frame uses 10/10 concrete beams with typical Lampung ornaments in the front, while the sides use a roster.
c. The poles use K-175 quality concrete with a column size of 25/25 cm and a typical PU paint color is applied
d. Ceramic floor size of 30 x 30 cm

For detailed calculations and geotechnical analysis, see the attachment of the *Sanggar Tani* design.

5.2.3.4 - Water Gates

Gates in the irrigation canal is generally made of steel. In the modernization of irrigation in Way Sekampung, there are several types of gates, including sliding, crump de gruyter, romijn and automatic gates. The following are the gates and their installation locations.

TABLE 5-20 INSTALLATION AND REHABILITATION OF GATES IN CANAL

No	Sub-Irrigation	UPTD	Crump	Sliding	Romijn	Automatic
1	Punggur Utara	Trimurjo	4	13		
2	Punggur Utara	Punggur	7			
3	Punggur Utara	Kota Gajah	5			
4	Punggur Utara	Rantau Fajar	17	6		
5	Punggur Utara	Seputih Raman	5			1
6	Rumbia Barat	Rumbia Barat	7			
7	Bekri	Bekri	56	143		
8	Sekampung Bunut	Pekalongan	1	3		
9	Sekampung Bunut	Metro		4		
10	Sekampung Bunut	Adipuro		5		
11	Sekampung Batanghari	Sekampung	8		5	
12	Sekampung Batanghari	Adipuro		1		
13	Sekampung Batanghari	Metro		2		
14	Raman Utara	Raman Utara		18		
15	Batanghari Utara	Purbolinggo		9		

FIGURE 5-84 CRUMP DE GRUYTER WITH SINGLE SPINDLE

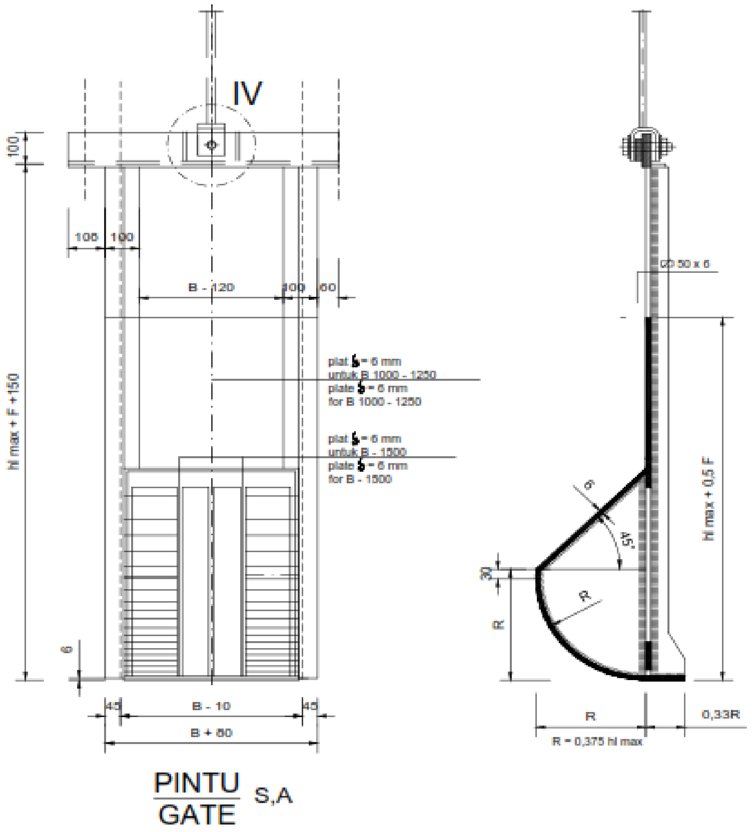


FIGURE 5-85 SLIDE GATE WITH DOUBLE SPINDLE

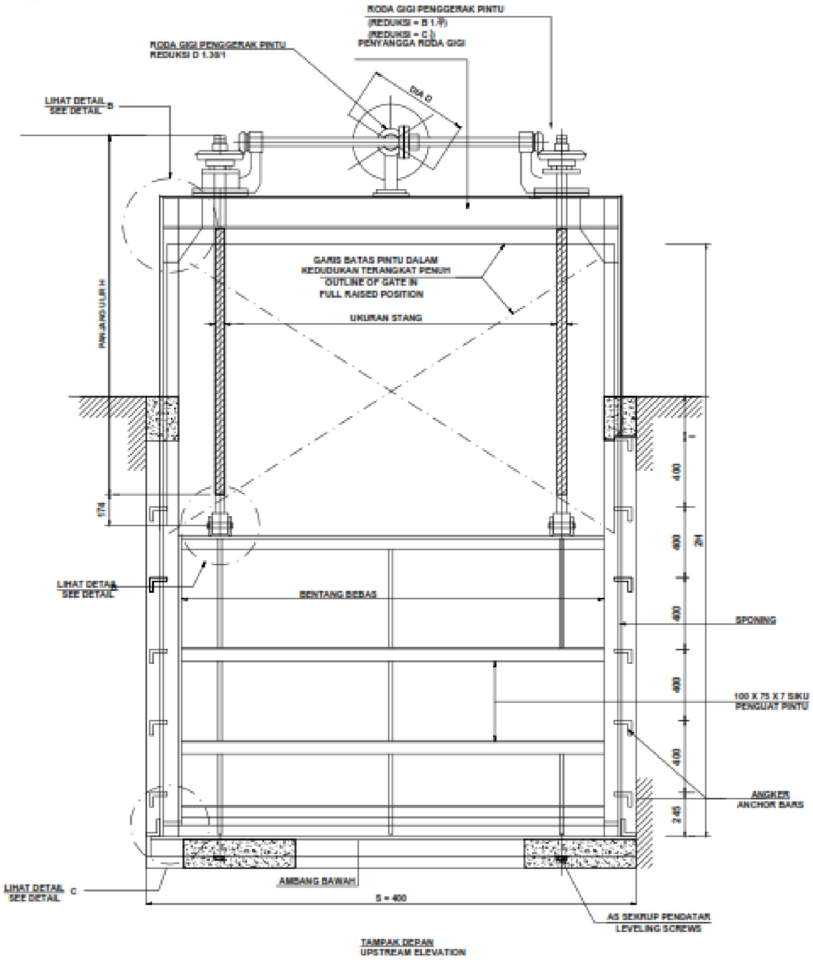


FIGURE 5-86 SLIDE GATE WITH SINGLE SPINDLE

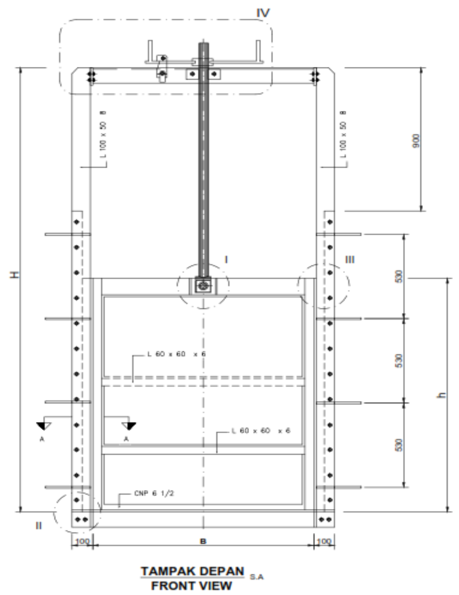
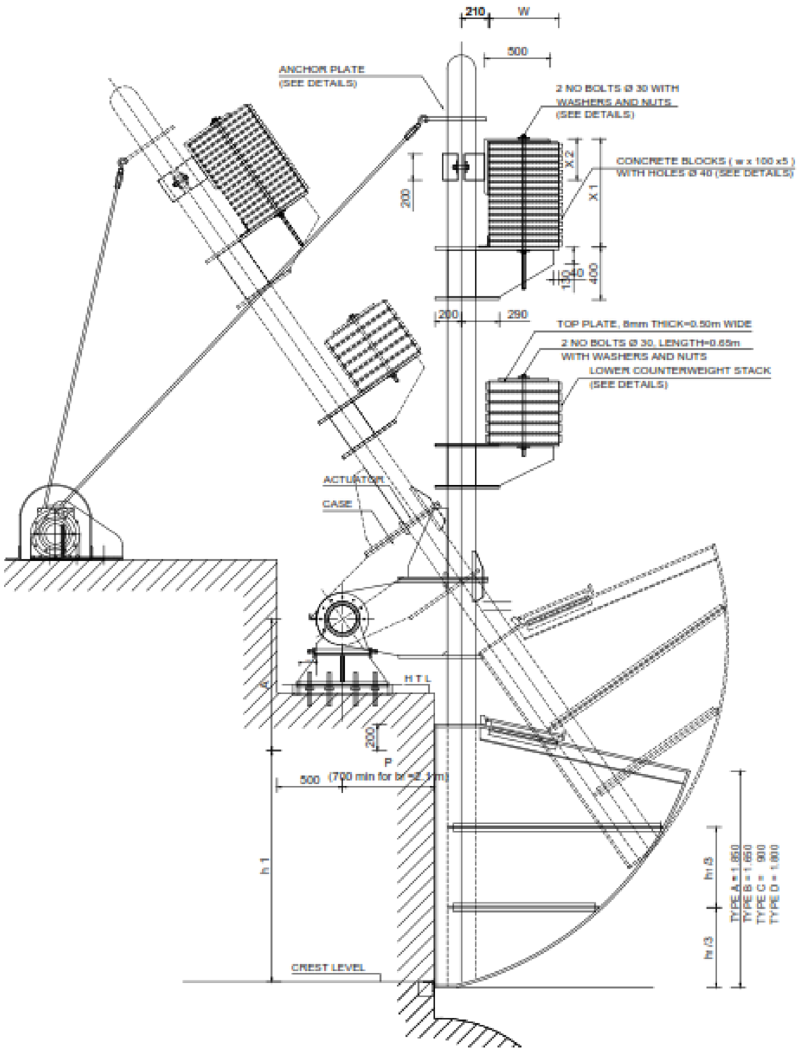


FIGURE 5-87 EXAMPLE OF AUTOMATIC GATES DESIGN

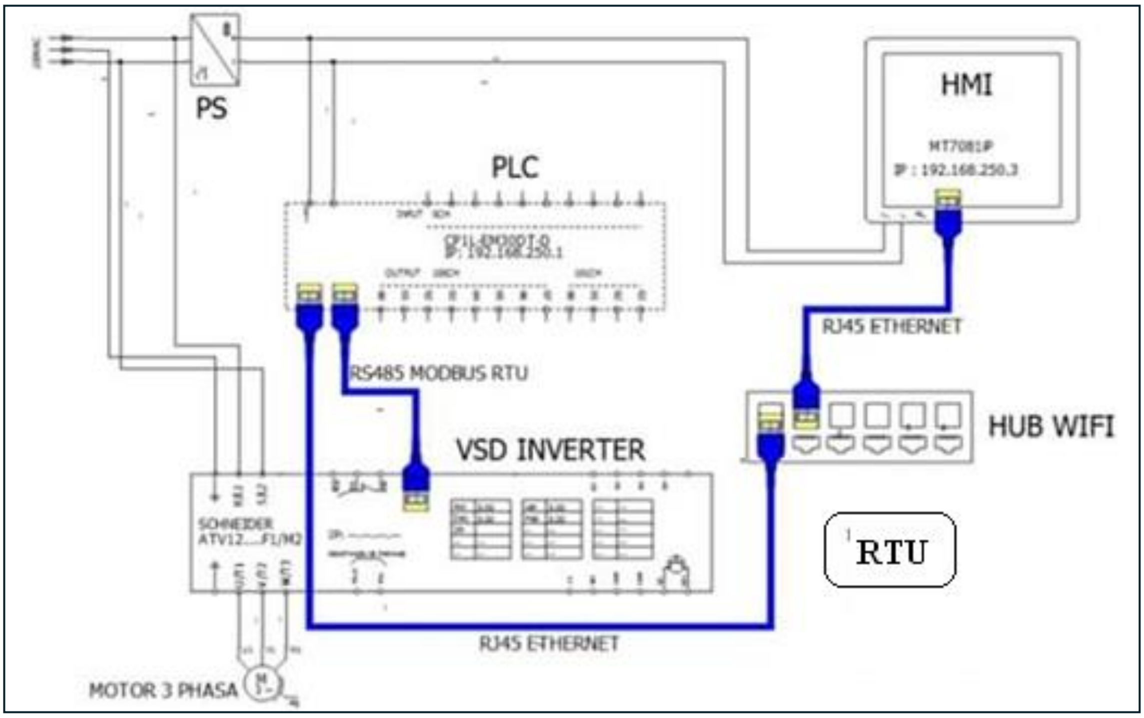


5.2.3.5 - Electromechanical Gates

Modernization of the Way Sekampung irrigation is attempted for gates on large or wide primary and secondary canals, these gates should be replaced with electromechanical drive devices. The electro-mechanical device is a series of regulation systems that were usually manually with a spindle, now the adjustment is carried out by an electric motor. The main problem in realizing the implementation of electromechanical gates lies in the cost of equipment and electric power as the driving force. Many irrigated areas are far from the power grid (20 KVa with a maximum reach of 350 m). According to the irrigation modernization guidelines, all share-tapping structures serving an area of more than 2,000 ha must use electromechanical gates.

Figure 5-88 shows a diagram of the commands in the communication system, the main panel power lines, and the RTU units in communication via the internet to the WOC. Meanwhile, Table 5-21 shows the location of a water control Structure with a service area of more than 2,000 ha which is installed with an electromatic gate in its operation.

FIGURE 5-88 SINGLE WIRING DIAGRAM ELECTRICAL HOIST FOR GATE COMMAND



The practical application of the command to regulate and control irrigation water is:

- Canals are waterways from certain elevations to lower elevations or from water distribution systems such as ditches, canals. Canals operate on open canals.
- Field instruments to control and calibrate discharge. The instrument used in reading the data is the AWLR, the peilschaal in the Structure functions to monitor water level conditions in real-time, monitor, and control water level conditions. Position switch on the gate to monitor the last gate position.

TABLE 5-21 LOCATION OF ELECTROMECHANICAL GATE INSTALLATION

No	Sub-Irrigation	UPTD	Intake Gate	Turnout	Division Structure
1	Batanghari Utara	KPD Purbolinggo	1	8	2
2	Bekri	UPTD Bekri	0	7	7
3	Punggur Utara	UPTD Trimurjo	0	7	3
4	Punggur Utara	UPTD Punggur	0	4	4
5	Punggur Utara	UPTD Kota Gajah	0	1	5
6	Punggur Utara	UPTD Rukti Endah	0	1	5
7	Rumbia Barat	UPTD Rumbia	0	2	5
8	Punggur Utara	KPD Rantau Fajar	0	1	1
9	Punggur Utara	UPTD Seputih Raman	0	1	1
10	Rumbia Barat	UPTD Rumbia	0	2	5
11	Sekampung Bunut	UPTD Adipuro	0	1	3
12	Sekampung Bunut	UPT Metro	0	10	1
13	Raman Utara	KPD Raman Utara	1	11	2
14	Sekampung Batanghari	UPTD Adipuro	0	3	1
15	Sekampung Batanghari	UPT Metro	0	6	1
16	Sekampung Batanghari	KPD Batanghari	0	6	1
17	Sekampung Batanghari	KPD Sekampung	0	0	1

The components related to the installation of electromechanical gates include:

a. Actuator
b. Generator
c. RTU & PLC
d. CCTV
e. Electrification
f. Cable

In the placement of the generator components, the Generator House Structure is used to store the generator so that it is protected from damage and theft. To see the details of the generator house design and analysis, it is included in the attachment of the design note about SCADA HOUSE. The following is an example of an electromechanical gate design that uses an actuator.

FIGURE 5-89 CRUMP DE GRUYTER GATE WITH ACTUATOR

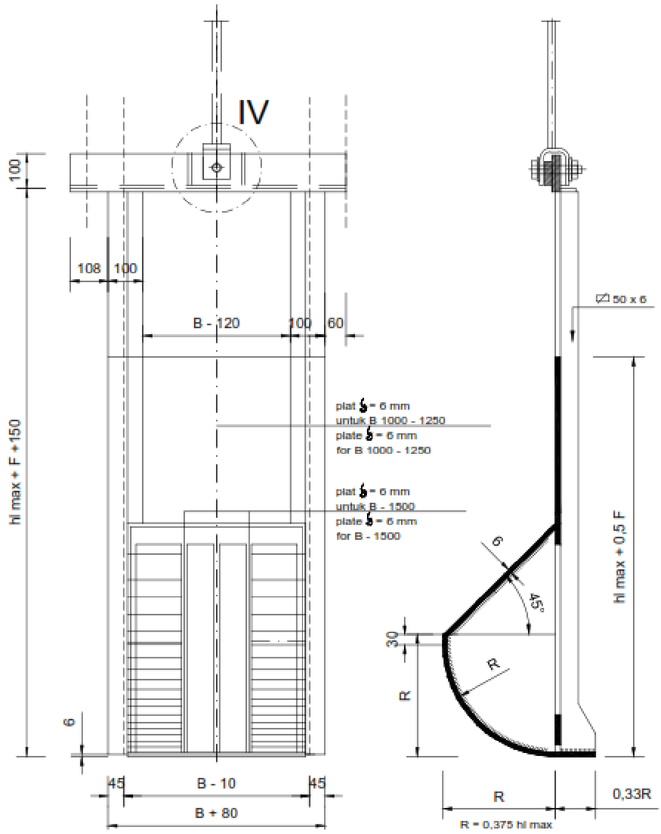


FIGURE 5-90 SLIDE GATE WITH DOUBLE SPINDLE WITH ACTUATOR

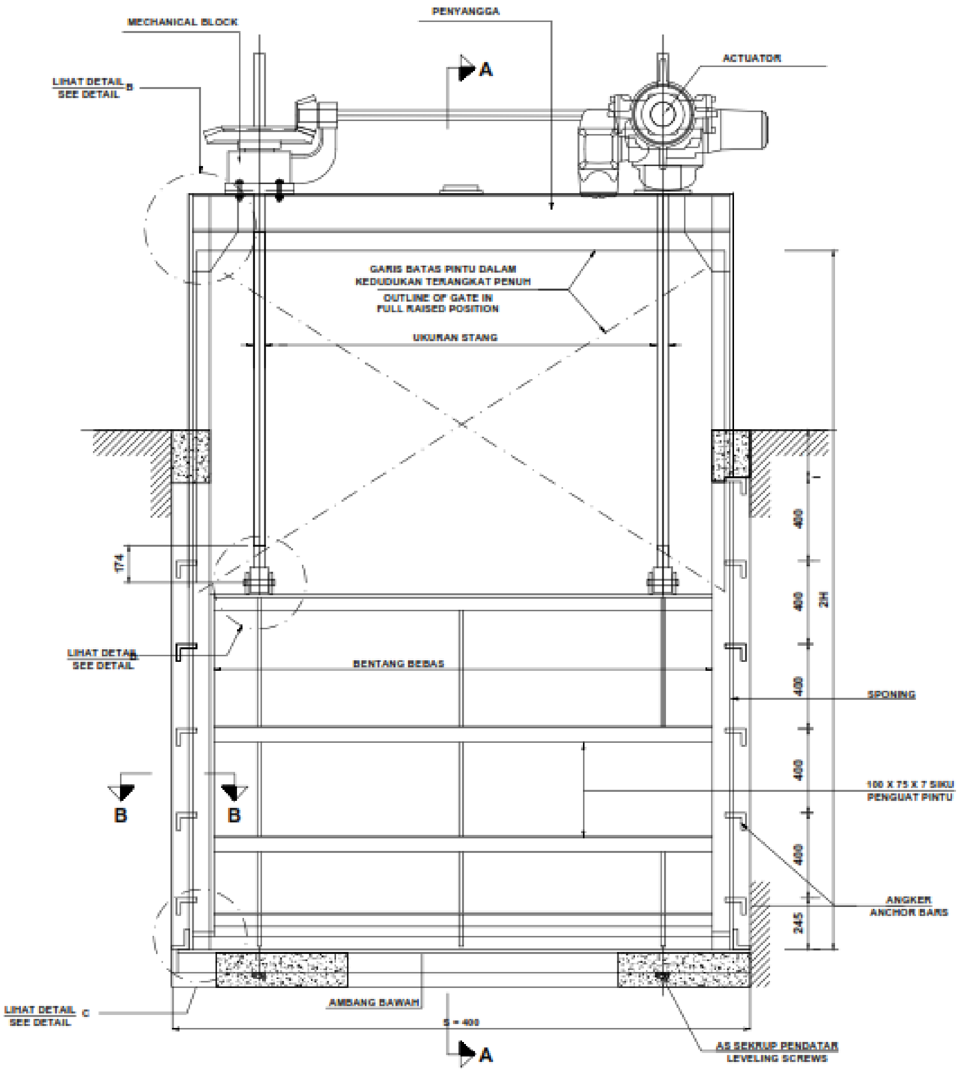


FIGURE 5-91 SLIDING GATES OF INTAKE SANDTRAP FEEDER CANAL 1

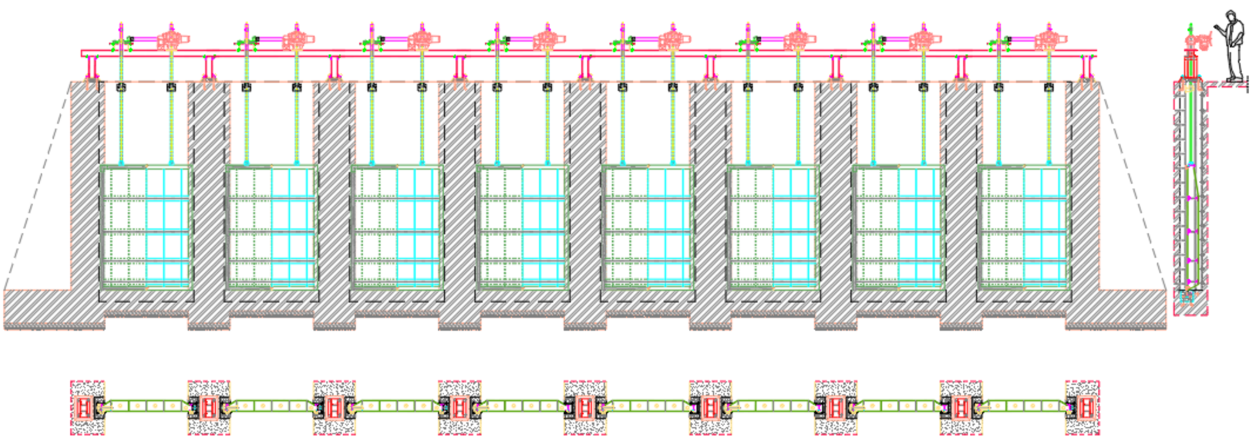


FIGURE 5-92 SLIDING GATES OF ELECTROMECHANICAL FLUSHING FEEDER CANAL 1

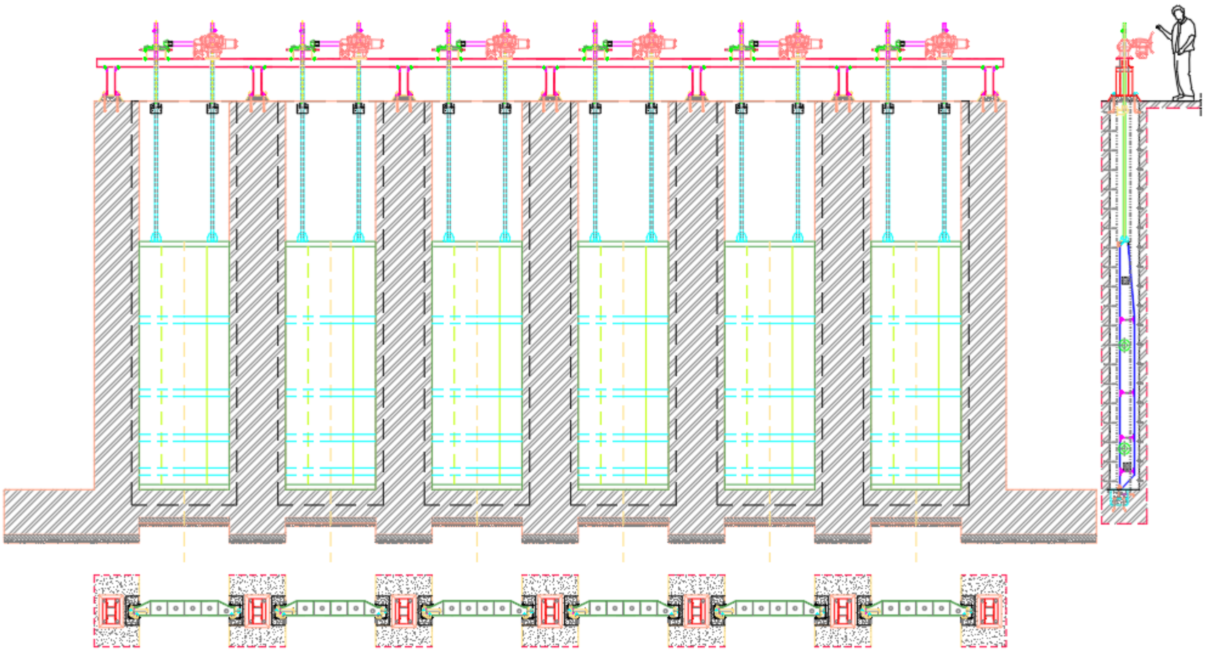


FIGURE 5-93 SLIDING GATES OF INTAKE SANDTRAP FEEDER CANAL 2

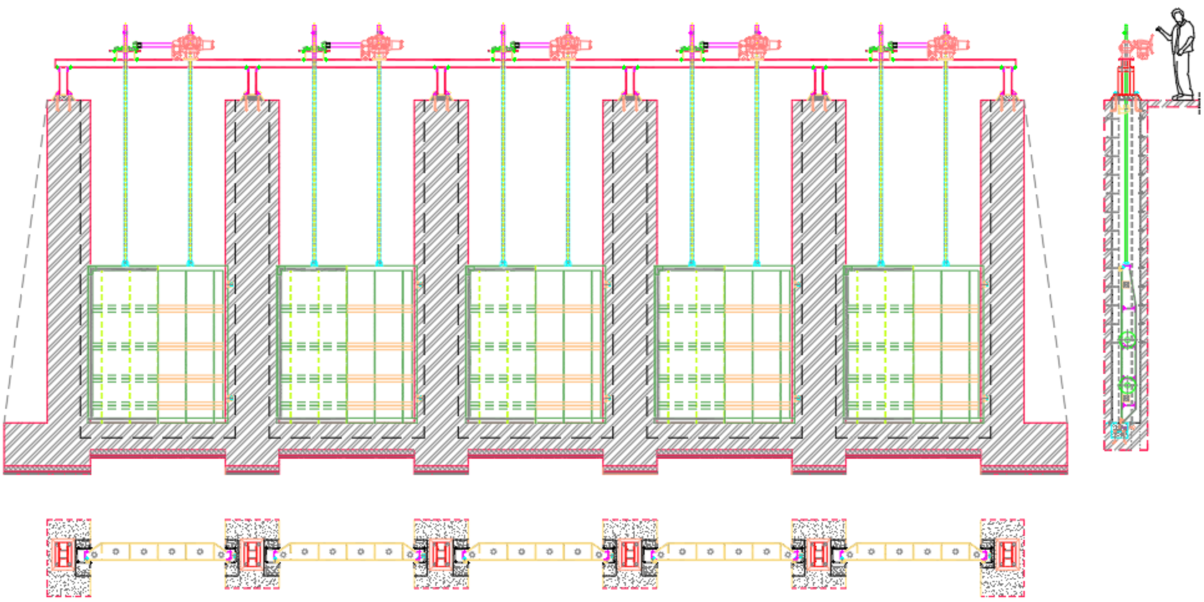
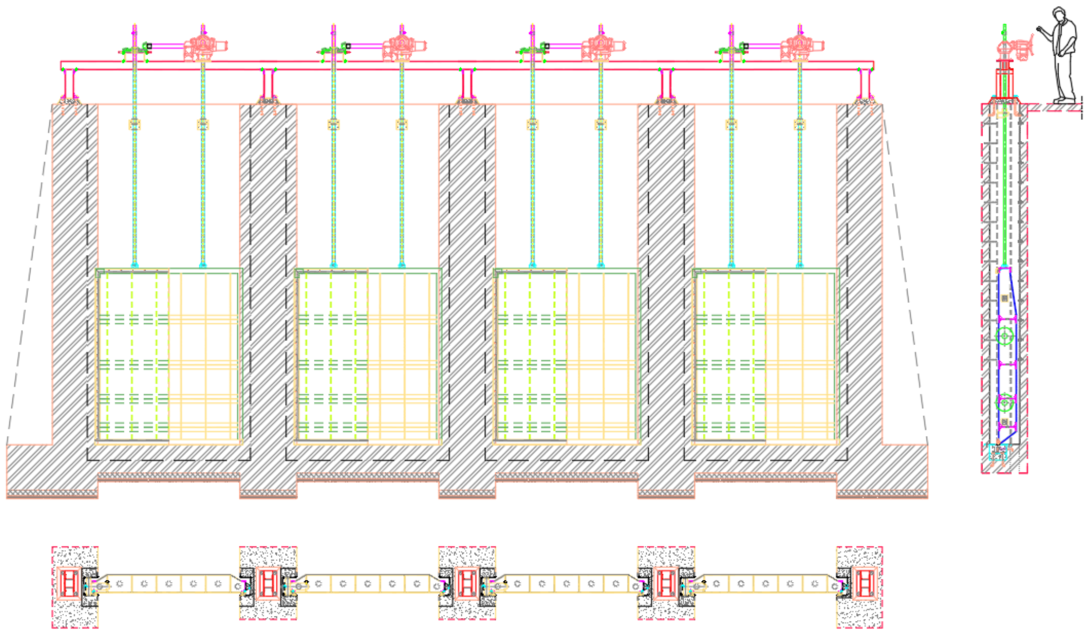


FIGURE 5-94 SLIDING GATES OF ELECTROMECHANICAL FLUSHING FEEDER CANAL 2



5.2.3.6 - Bridge

The structure under the bridge is a foundation, a foundation system must be calculated to ensure the safety, stability of the Structure on it, there should not be a partial or complete decrease in excess of the allowable limits. The following is an example of a design in the planning of the Way Sekampung Punggur Utara bridge which is located at BGS 1a.

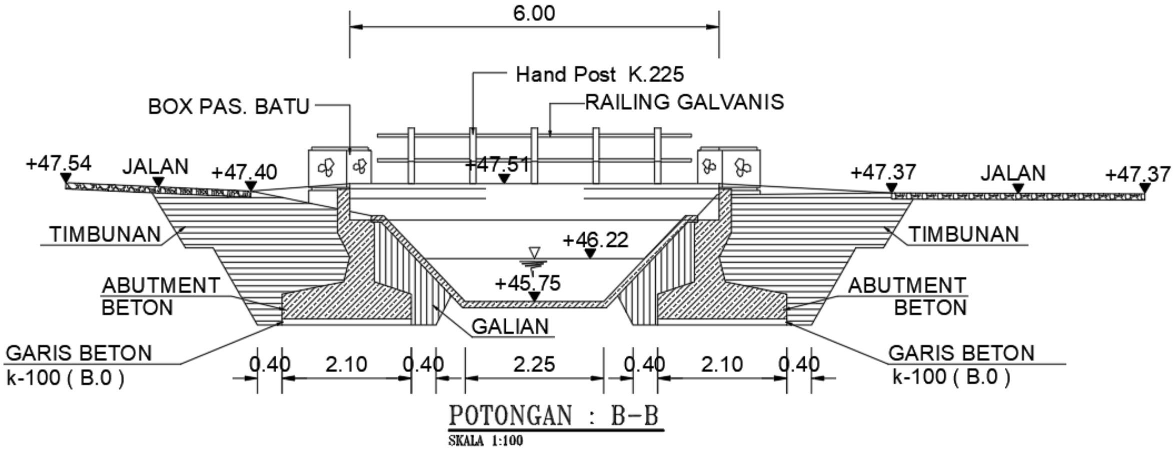
The results of the geometric analysis of homogeneous soil types along the cross-section, the results of geotechnical analysis in normal dry/undrain conditions without earthquake loads, soil stability showed a Safety Factor (SF) value of 2.172. While the results of the geotechnical analysis in dry/normal conditions without earthquake loads, soil stability analysis shows a Safety Factor (SF) value of 2.546.

Calculation of bridge construction using concrete specifications K225. Based on geotechnical calculations, the average slope stability is 1.5 to 2 with a simulation of 2 conditions, namely normal conditions and normal conditions with earthquake loads. Based on the simulation using PLAXIS 2D, the abutment construction can withstand passive earth pressure and vertical earth pressure. For more details, see the attached image.

TABLE 5-22 TOTAL REHABILITATION OF BRIDGES IN WAY SEKAMPUNG

NO	IRRIGATION AREA	STRUCTURES	TOTAL (UNIT)
1	PUNGGUR UTARA 1	JEMBATAN	9
2	PUNGGUR UTARA 2	JEMBATAN	22
3	BATANGHARI UTARA	JEMBATAN	3
4	SEKAMPUNG BATANGHARI	JEMBATAN	27
5	SEKAMPUNG BUNUT	JEMBATAN	9
6	RAMAN UTARA	JEMBATAN	4
8	BEKRI	JEMBATAN	25

FIGURE 5-95 REHABILITATION OF BRIDGE STRUCTURE OF PUNGGUR UTARA 2



5.2.3.7 - Canal Culverts

Canal Culverts are water structures built in places where conveyance canals pass under Structures (roads, railroads, etc.). In the rehabilitation work in the Way Sekampung, the carrying culverts are made of masonry with a broadcast and covered with plaster with the dimensions planned to be able to withstand the load from the top of the culvert such as vehicles or pedestrians.

The results of the analysis show the condition of the box culvert TK0. Under normal conditions, the stage before construction, the value of the safety factor > 3. The stage after construction, the safety factor > 3. The stage after construction with drainage conditions, SF > 3.

Analysis by applying earthquake loads. Under normal conditions, the safety factor is > 3. The total deformation under undrain conditions is 25.18E-03 m. Deviatoric stress with drain condition is 139.80 kN/m2 and normal effective stress is 93.16 kN/m2. For more details, see the attached image. The following is an example of the design of the Batanghari Utara Irrigation Area in the location of TK0'

FIGURE 5-96 EXAMPLE OF BOARD CRESTED WEIR DESIGN IN PUNGGUR UTARA CANAL 2

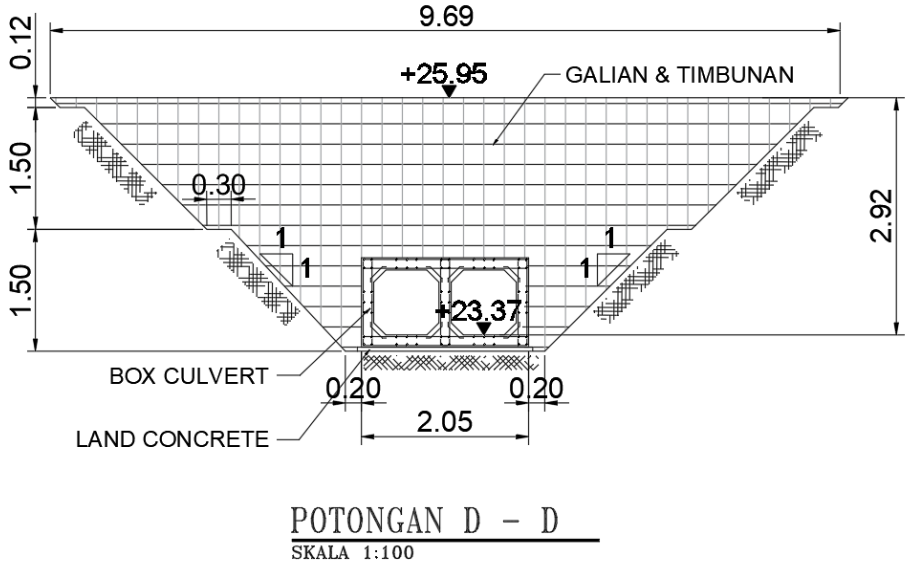


TABLE 5-23 TOTAL REHABILITATION OF CULVERTS IN WAY SEKAMPUNG

NO	IRRIGATION AREA	STRUCTURES	TOTAL (UNIT)
1	PUNGGUR UTARA 1	GORONG-GORONG PEMBAWA	2
2	PUNGGUR UTARA 2	GORONG-GORONG PEMBAWA	1
3	BATANGHARI UTARA	GORONG-GORONG PEMBAWA	2
4	SEKAMPUNG BATANGHARI	GORONG-GORONG PEMBAWA	2
5	SEKAMPUNG BUNUT	GORONG-GORONG PEMBAWA	1
6	RAMAN UTARA	GORONG-GORONG PEMBAWA	3

5.2.3.8 - Drainage culverts

Drainage culverts/sewers are structure used to carry the flow of water in irrigation canals under waterways (irrigation canals), under roads, or railways. Culverts are also used as small bridges, used to drain small rivers or as drainage or ditches. The culverts are made transversely. Several culverts in the rehabilitation of the way Sekampung irrigation canals are at the end of the damaged culverts and function as open canals with free flow. Details of the Structure design are in the attached image, the following is an example of a detailed design of the sewerage culvert for the Irrigation Area of Sekampung Bunut KBM1a.

FIGURE 5-97 EXAMPLE OF SEWER DESIGN IN SEKAMPUNG BUNUT CANAL

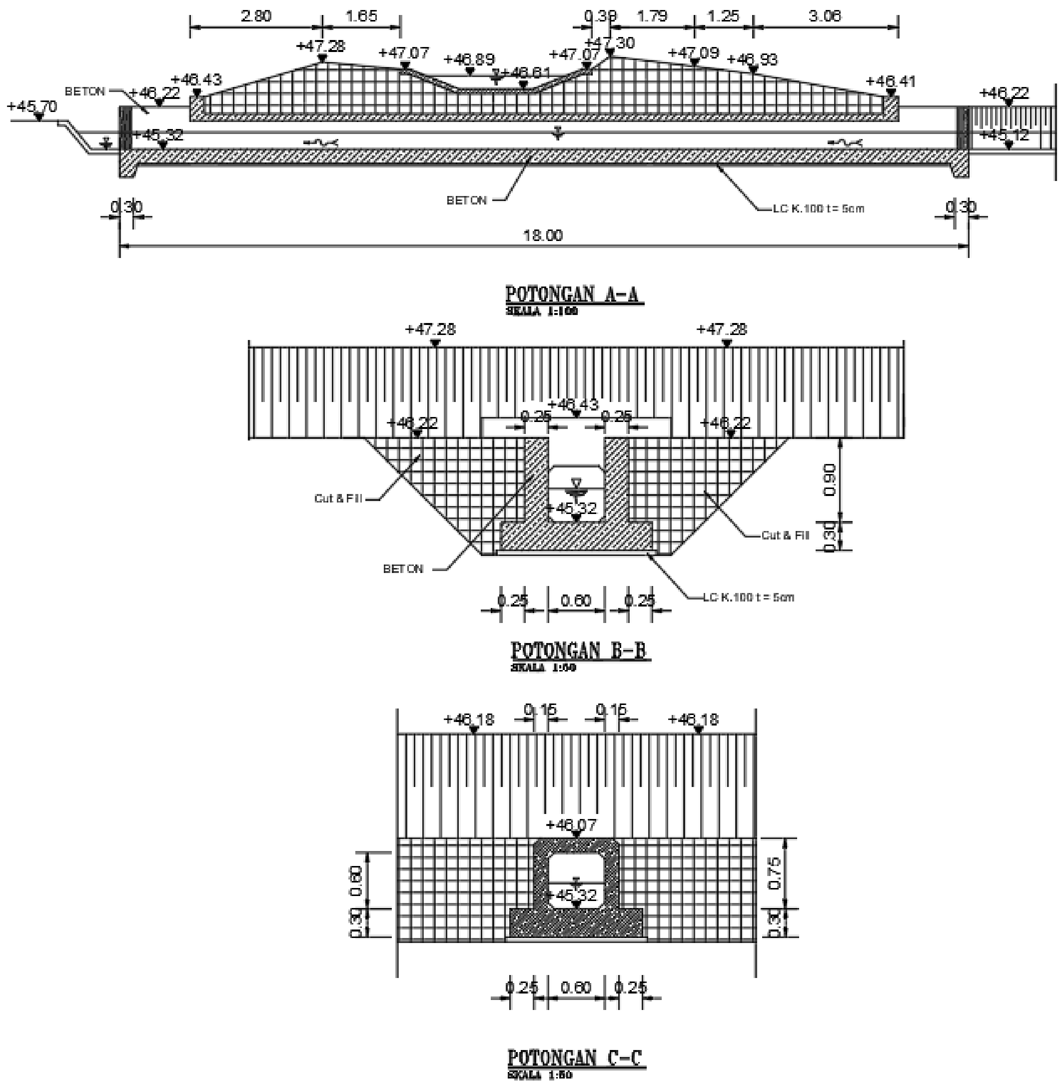


TABLE 5-24 REHABILITATION OF SEWERS IN WAY SEKAMPUNG

NO	IRIGATION AREA	STRUCTURES	UNIT
1	PUNGGUR UTARA 1	GORONG-GORONG PEMBUANG	4
2	SEKAMPUNG BATANGHARI	GORONG-GORONG PEMBUANG	3
3	SEKAMPUNG BUNUT	GORONG-GORONG PEMBUANG	3
4	RAMAN UTARA	GORONG-GORONG PEMBUANG	3
5	BEKRI	GORONG-GORONG PEMBUANG	3

5.2.3.9 - Drop Structures

Drop structures or sloping drains are required if the ground level slope is steeper than the maximum allowable canal slope. Such a Structure has four functional sections, each of which has distinctive planning properties.

1. The upstream part of the controller, that is, the part where the flow becomes supercritical
2. The part where water flows to a lower elevation
3. The part right downstream is the place where the energy is dissipated
4. The canal transition section requires protection to prevent erosion.

The results of geotechnical analysis of the calculation of the BB1d of drop structures have homogeneous soil types along the cross section, for the safety factor from the results of the analysis it shows the condition of the BB1d of drop structures to the work force. Normal drain and undrain conditions have SF > 3. The total displacement in normal undrain conditions is 4.95E-03, while under normal drain conditions it is 1.474E-02 m. Deviatoric stress is 156.80 kN/m^2. The active and passive shear stress on the Structure is 103.46 (effective normal stress) kN/m^2.

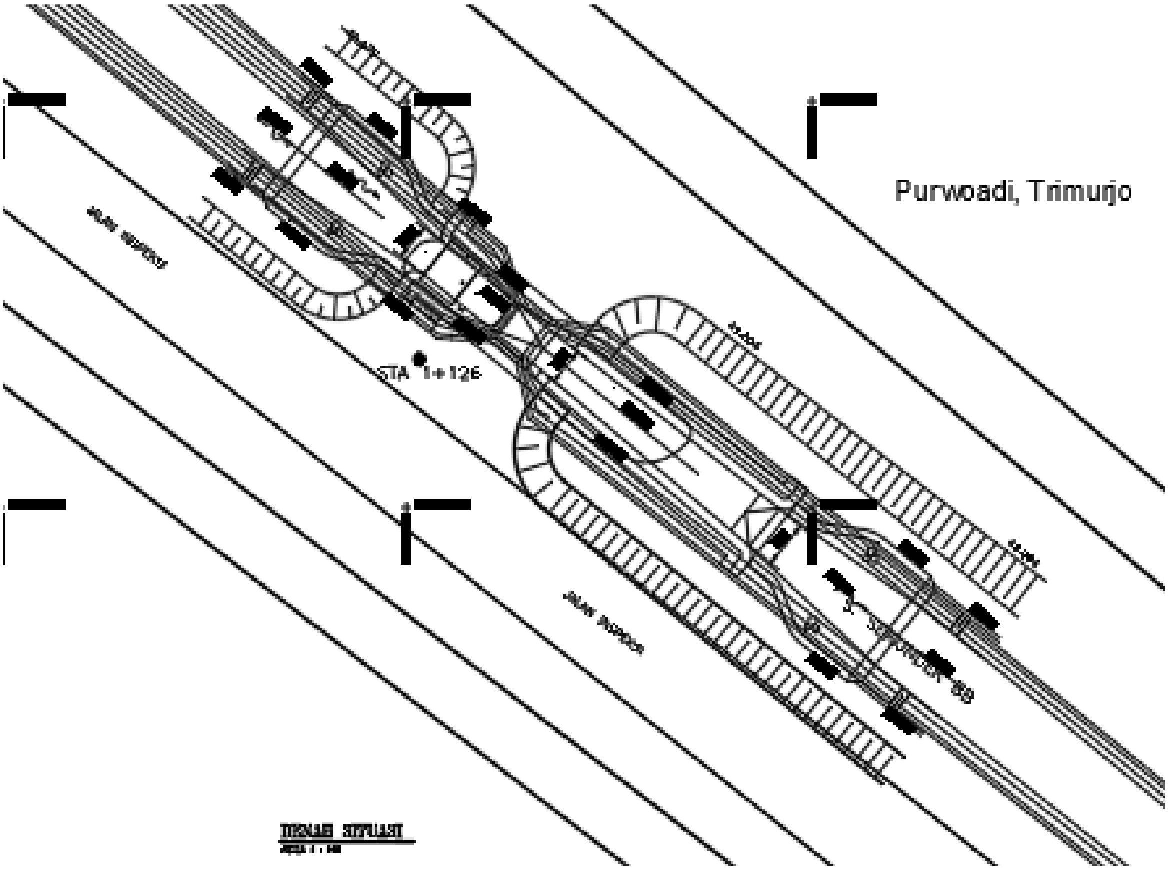
Consideration of analysis with earthquake loads. The condition of the structure has SF > 3 in the drain and undrain conditions. The total deformation in the undrain condition is 0.02036 m, while in the drain condition it is 0.02858 m. Deviatoric stress with drain condition is 260.96 kN/m^2. and the normal effective stress is 103.46 kN/m^2.

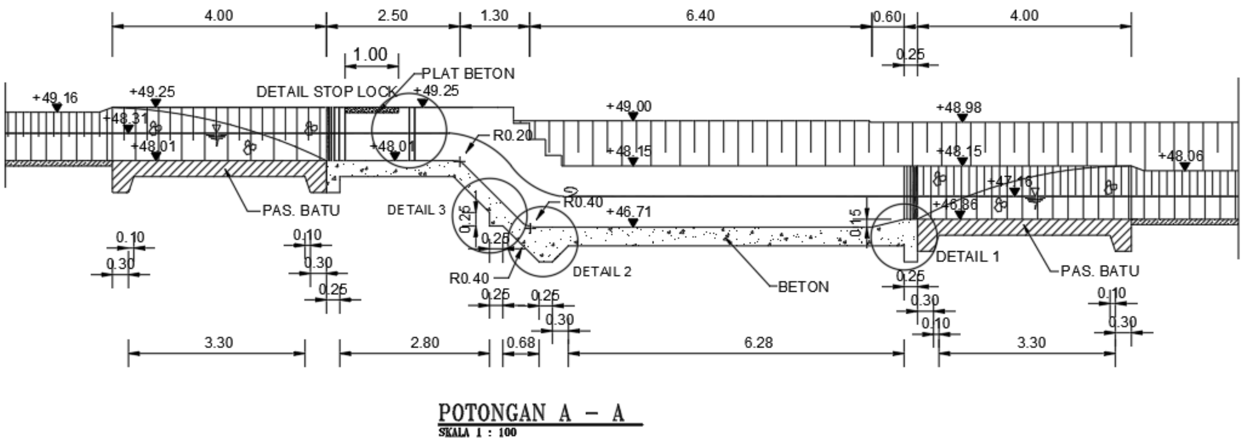
The following is the location of the rehabilitation and design of the drop structures. For detailed analysis, see the attachment of the geotechnical design.

TABLE 5-25 REHABILITATION OF DROP STRUCTURES IN WAY SEKAMPUNG

No	**Irrigation Area**	**Canal Name**	**Location**
1	Punggur Utara	Sekunder BB	BB 1d
2	Sekampung Batanghari	Sekunder KDJ	KDJ 4
3	Sekampung Batanghari	Sekunder KDJ	KDJ 5
4	Sekampung Batanghari	Sekunder KSI	KSI 5
5	Sekampung Batanghari	Sekunder KSI	KSI 5 C
6	Raman Utara	Induk BRU	BRU1g

FIGURE 5-98 EXAMPLE OF DROP STRUCTURE DESIGN IN PUNGGUR UTARA BB 1D





5.2.3.10 - Retaining wall

Retaining wall is one of the Structure structures that serves to maintain the stability of a pile of soil, so that the pile of soil does not experience sliding or landslides. The following is an example of a BRB1ac geotechnical analysis in a Side Canal Spillwayway. the results of the calculation of the stability of the retaining wall based on various conditions, both normal conditions and conditions during an earthquake.

FIGURE 5-99 DEVIATORIC VOLTAGE IN EARTHQUAKE CONDITIONS BRB1AC

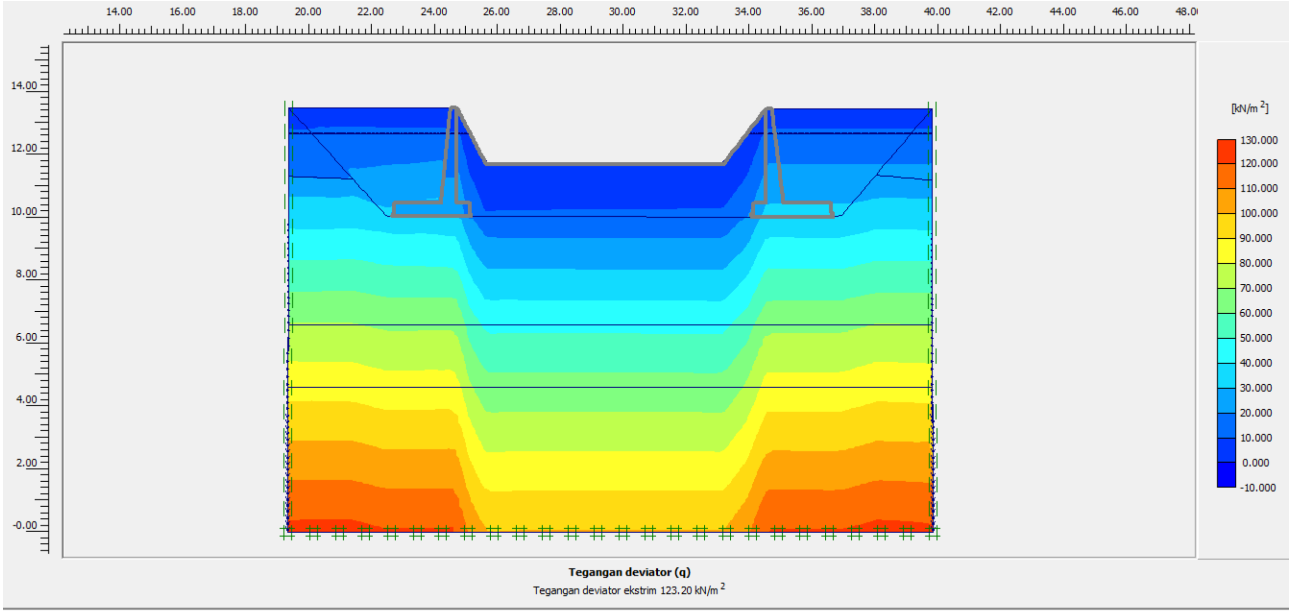


FIGURE 5-100 EFFECTIVE NORMAL STRESS UNDER SEISMIC CONDITION OF BRB1AC

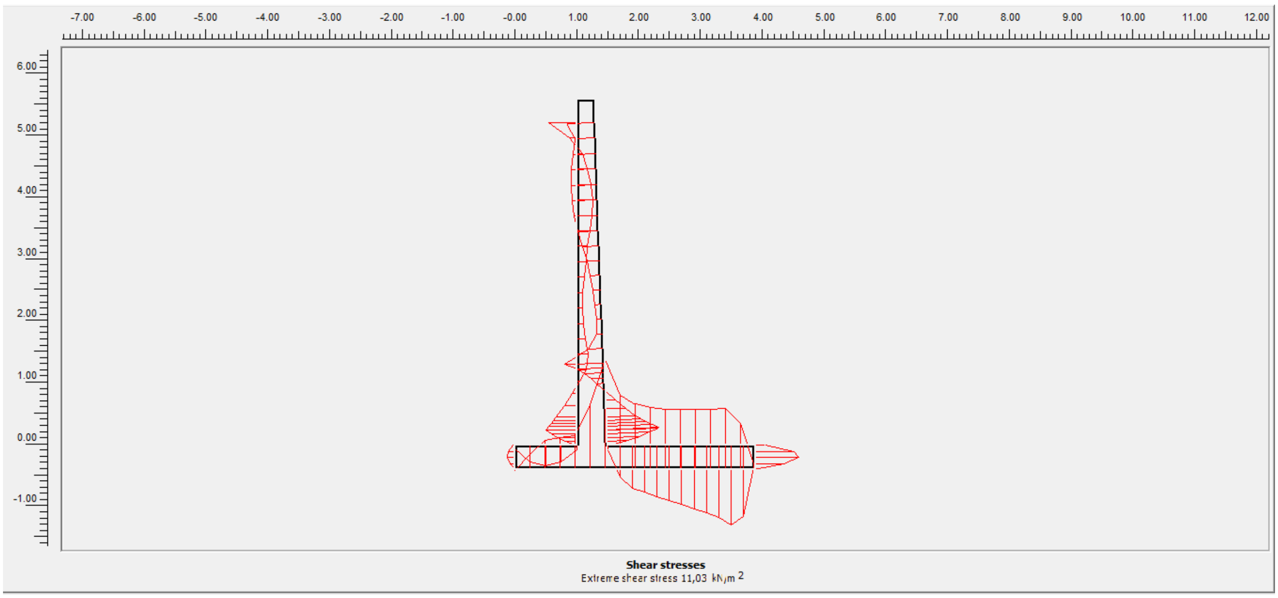


TABLE 5-26 PARAMETER VALUE FOR DESIGN MODEL OF BRB1AC

Case	Test parameters	Value	Unit
Deformation of normal drain conditions	Total displacement (extreme)	1.280E-03	m
	Pore water pressure	-1.289E+02	kN/m2
Deformation of seismic drain conditions	Total displacement (extreme)	1.200E-03	m
	Deviatoric stress (extreme) seismic conditions	123.20	kN/m2
	Shear stress (extreme) seismic conditions	11.03	kN/m2
	Safety Factor	1	

PPC Way Sekampung, January 2021 from PLAXIS 2D Model

TABLE 5-27 CALCULATION UNDER NORMAL CONDITION OF BPS1A

a) Stability against overturning |e| = 0.117 m < B/6 = 0.400 m	OK
b) Stability against sliding SF = 2.094 > 2.00	OK
c) Reaction of foundation soil q_{1} = 6,322 m² < q_a = 108,347 t/m²	OK
q_{2} = 4,106 t/m² < q_a = 108,347 t/m²	OK

PPC Way Sekampung, January 2021 from PLAXIS 2D Model

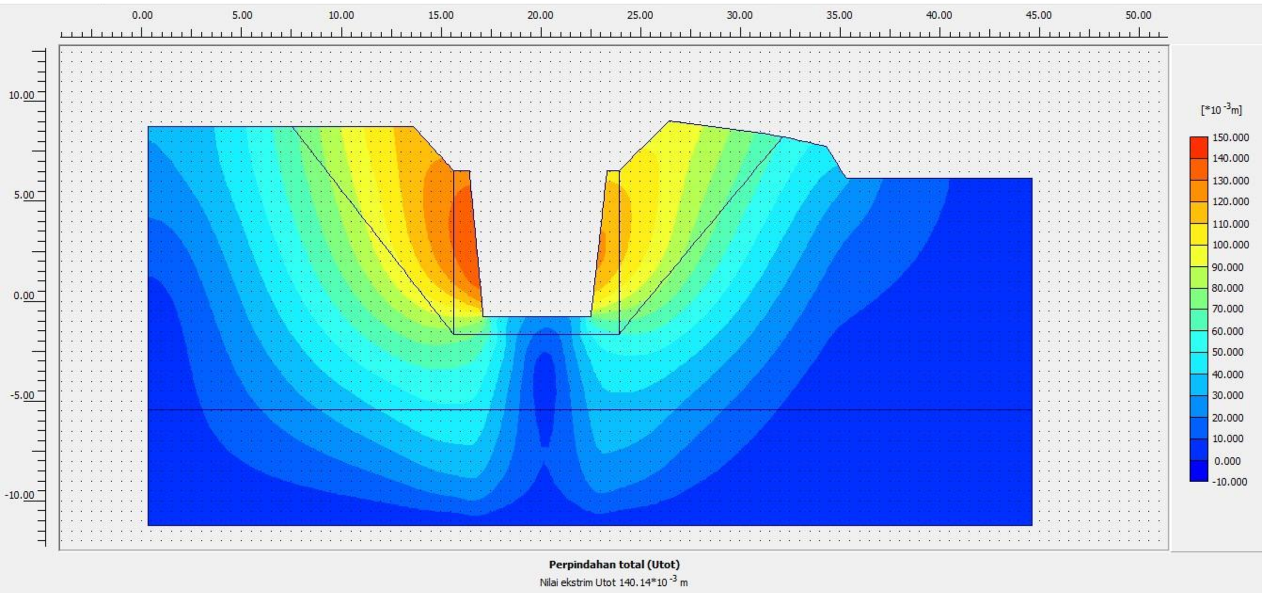
TABLE 5-28 CALCULATION UNDER SEISIMIC CONDITION OF BPS1A

a) Stability against overturning |e| = 0,403 m < B/6 = 0,800 m	OK
b) Stability against sliding SF = 1.542 > 1.25	OK
c) Reaction of foundation soil q_{1} = 8,748 t/m² < q_a = 162,520 t/m²	OK
q_{2} = 0,972 t/m² < q_a = 162,520 t/m²	OK

PPC Way Sekampung, January 2021 from PLAXIS 2D Model

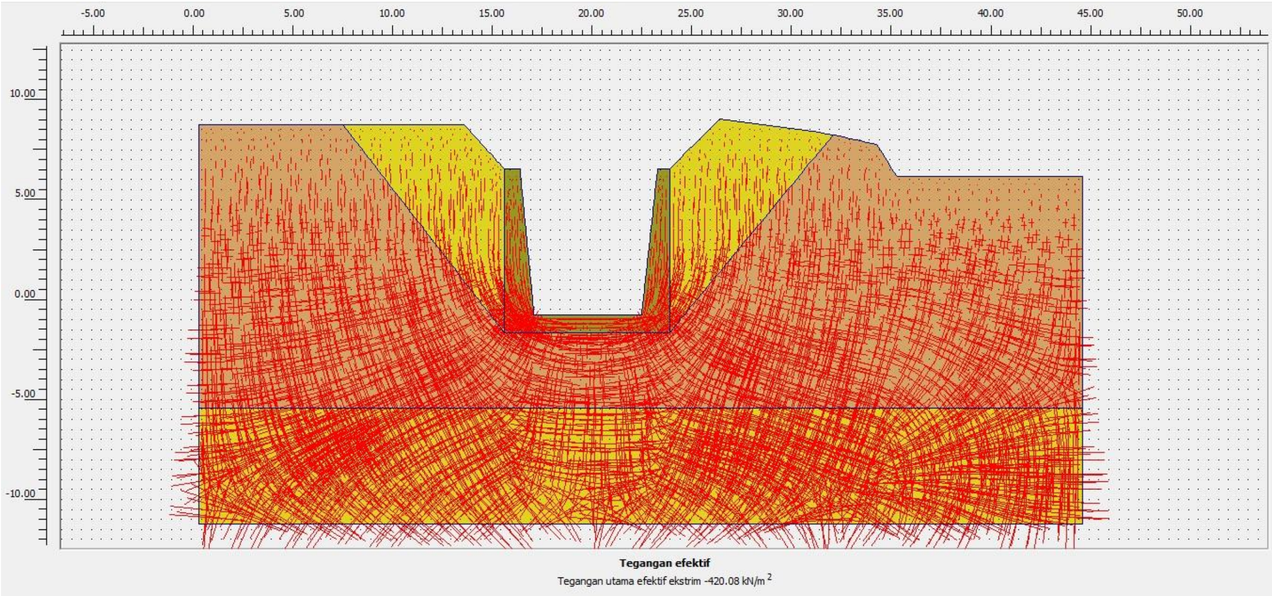
A predetermined safety value is obtained for the calculation of the stability of retaining walls with cohesive embankments. The difference in this value occurs due to the use of different methods. The safety factor value is 8060, greater than equal to three, indicating the value of slope stability and safe bearing capacity. The results of calculations and simulations show the value of the forces acting on the structures. The total displacement in this structure is 112.36E-03 m and the vertical shear stress is -339.77 kN/m^2. The degree of saturation is 127.71%. The safety factor value is 8060, greater than equal to three. Indicates the value of slope stability and safe bearing capacity.

FIGURE 5-101 TOTAL DISPLANCEMENT OF BRB1AC SEDIMENT EXCLUDER AND DRAINAGE SPILLWAY



PPC Way Sekampung, December 2020 from PLAXIS 2D Model

FIGURE 5-102 EFFECTIVE NORMAL VOLTAGE EXCEPTING BRB1AC SEDIMENT AND SPILLWAY DRAINAGE



PPC Way Sekampung, December 2020 from PLAXIS 2D Model

5.2.3.11 - Aqueduct

Irrigation modernization project to rehabilitate Aqueduct in Sub-Systems in Sekampung Batanghari Irrigation Area, KPD Sekampung. The location of the rehabilitation is on the SN secondary canal, more precisely in the SN3B Structure. The following is an example of a Aqueduct design in Sekampung Batanghari and more details are in the design drawing album.

FIGURE 5-103 DESIGN OF AQUEDUCT SN3B

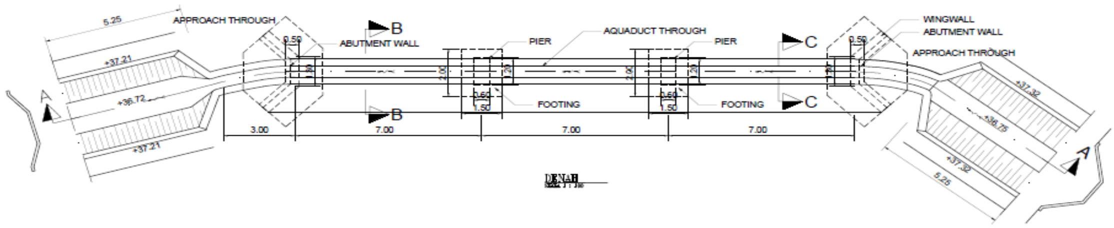
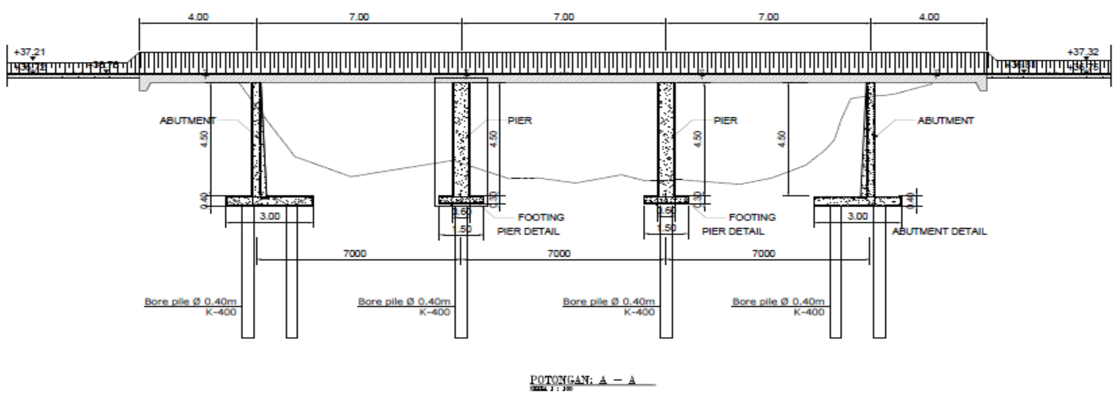


FIGURE 5-104 SECTION OF DESIGN OF AQUEDUCT SN3B



The gabion work uses K-225 concrete for abutments, piers and Aqueduct, while for the foundation, K-400 concrete is used. Aqueduct are made by plastering and equipped with gabions.

5.2.3.12 - Drainage

A drainage structure is a structure with a gate operated by a person, used to empty the entire canal section when needed. The drainage structure was damaged in the masonry and gate replacement. Rehabilitation of drainage structure for irrigation area in Sekampung Bunut, KBZ canal at KBZ 1f location along with location of structures and design example of drainage structure for Sekampung Bunut.

FIGURE 5-105 LOCATION OF DRAINAGE STRUCTURE FOR THE WAY SEKAMPUNG IRRIGATION AREA

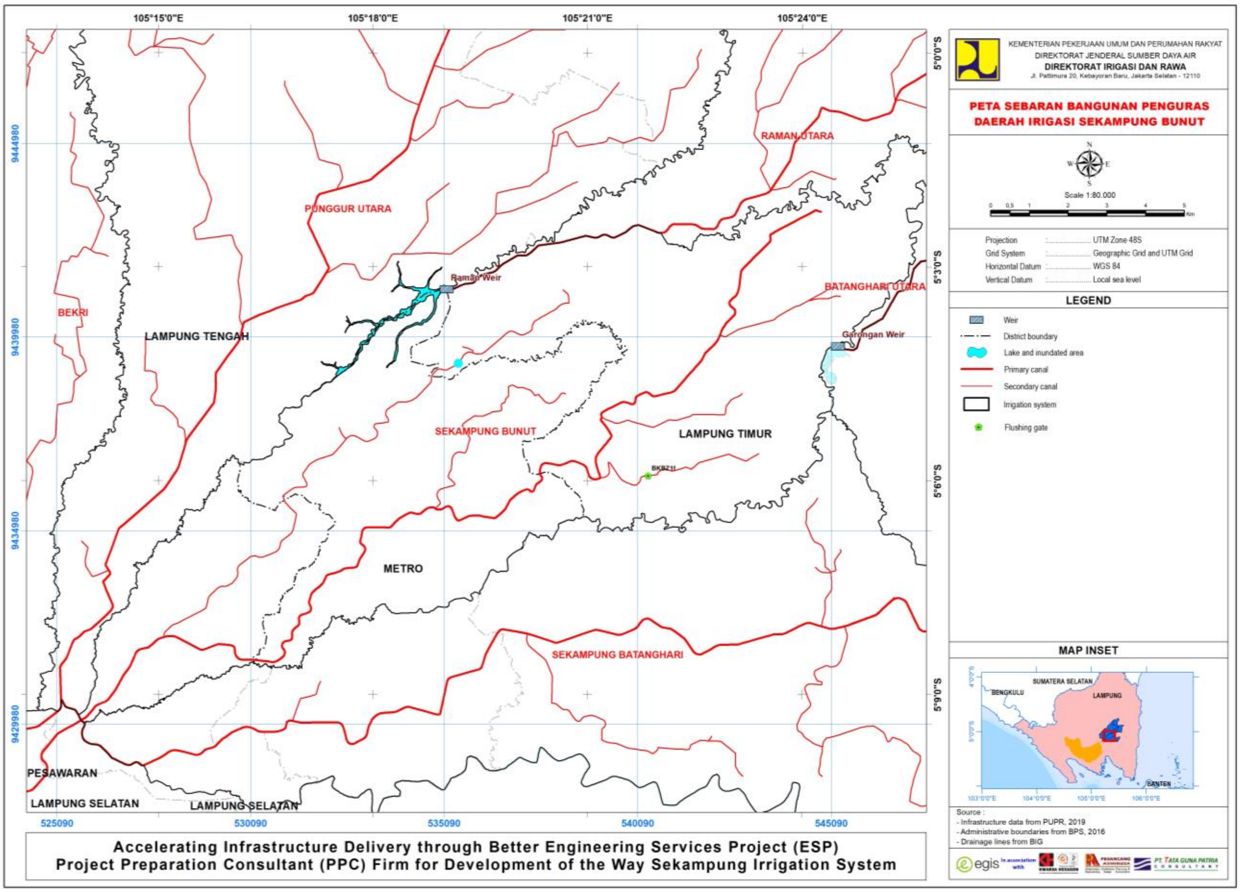
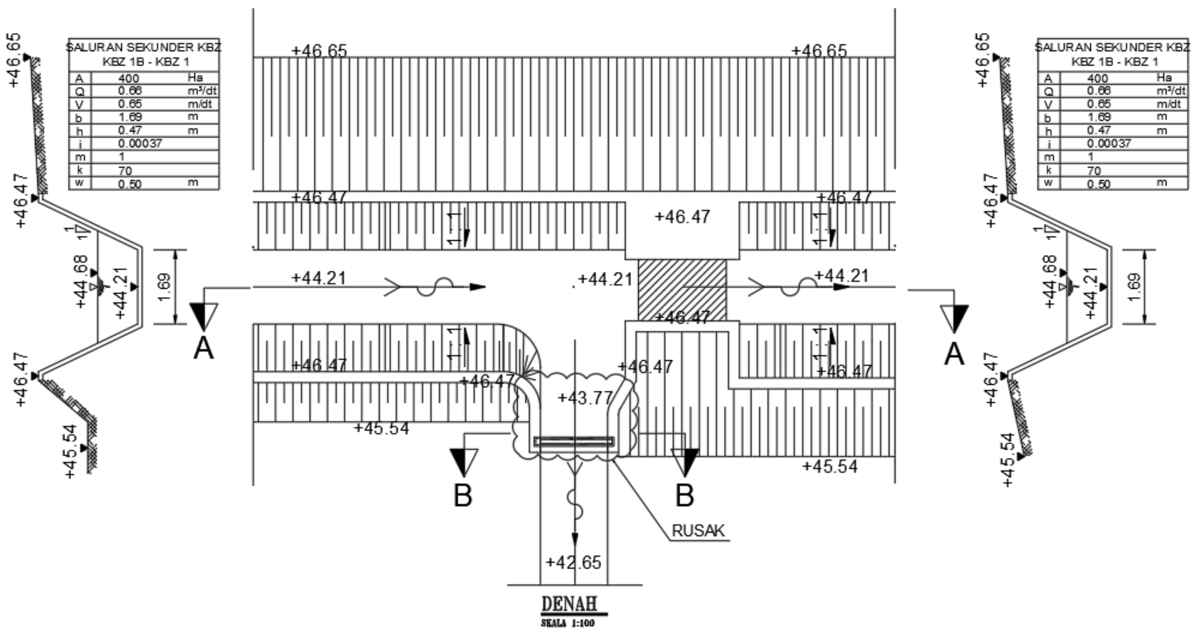
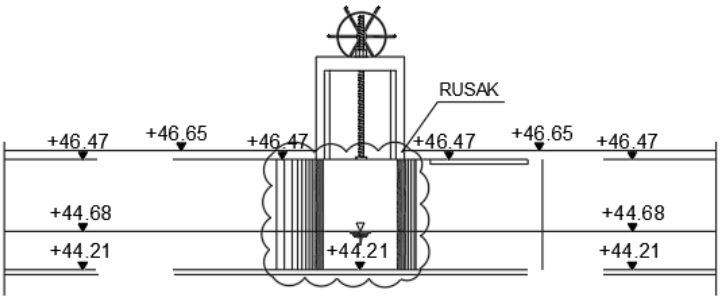
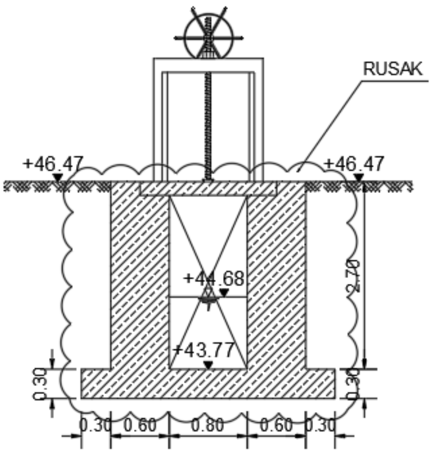


FIGURE 5-106 LOCATION OF DRAINAGE STRUCTURE FOR SEKAMPUNG BUNUT





POTONGAN : A – A
SKALA 1:100

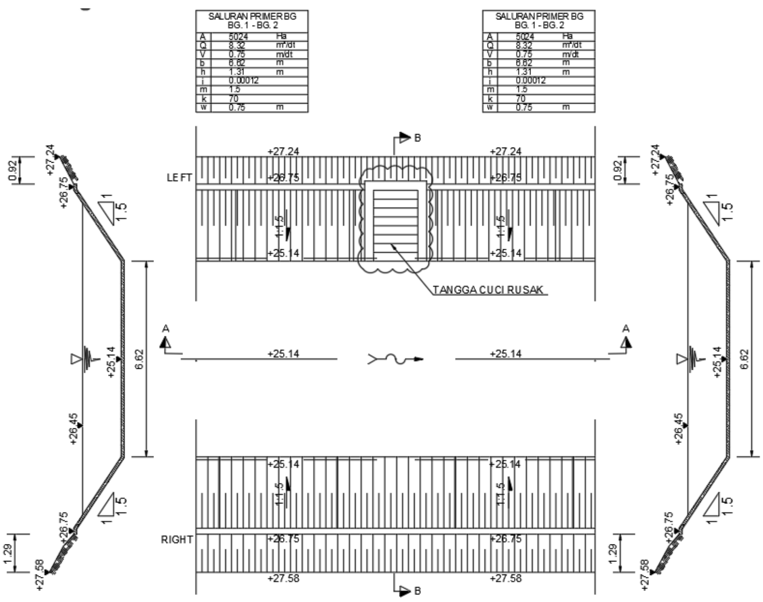


POTONGAN : B – B
SKALA 1:50

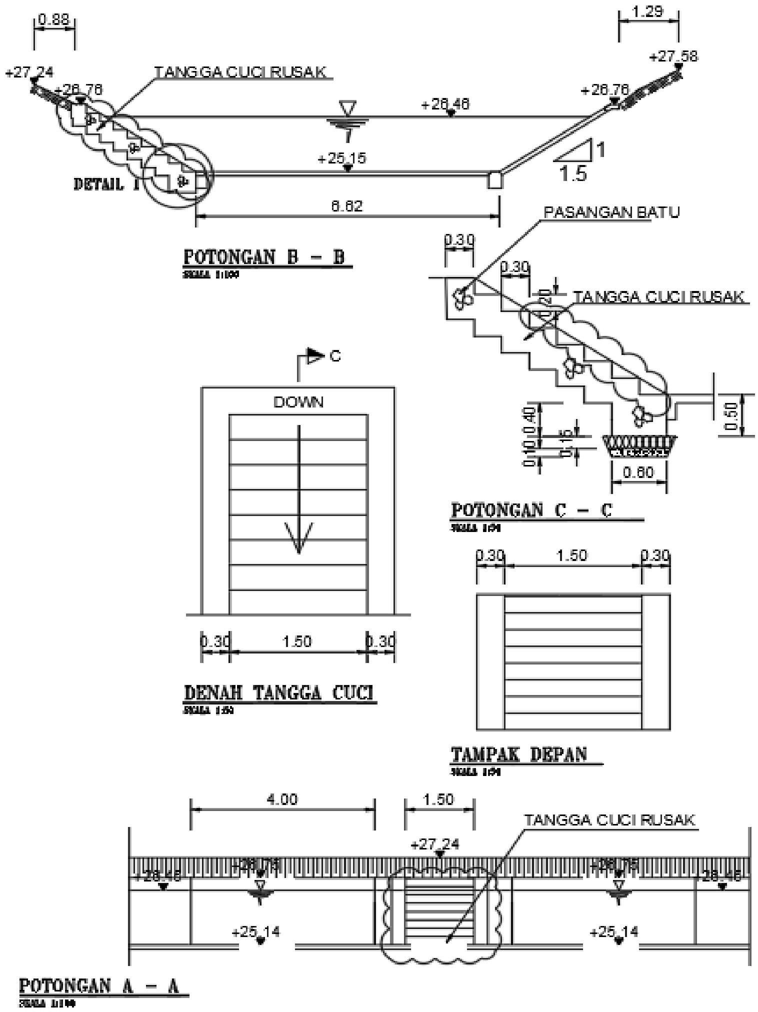
5.2.3.13 - Washing Step

Washing Steps structure is a structure located on the edge of the canal that serves to wash or do other purposes, the form of a ladder that descends towards the flow of water with the lowest ladder reaching the bottom of the canal structure of the Structure using masonry with broadcast and plaster, has a ladder width of 1.5 m tapa katas 0.3 m and the height of the steps is 0.2 m. Generally, local people use the washing steps to wash household items and wash clothes. The following is a detailed example of a washing step structure in the Irrigation Area of Sekampung Bunut, the BG canal, located in G 2a.

FIGURE 5-107 WASHING STEPS



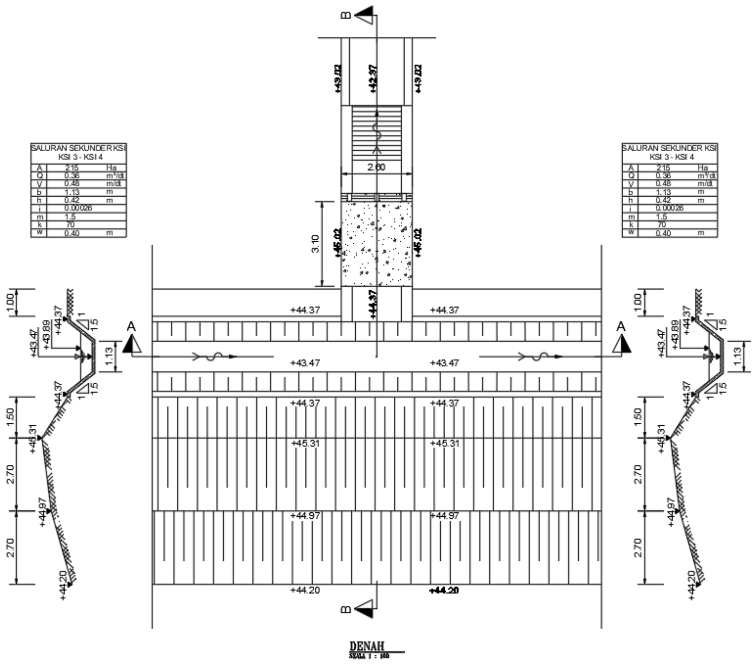
DENAH

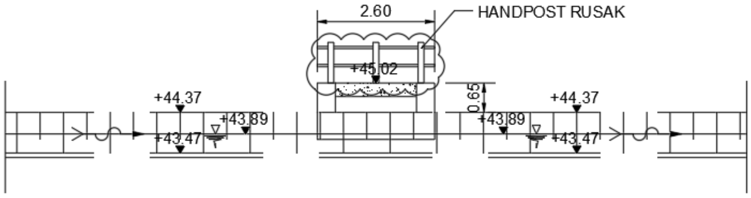


5.2.3.14 - Side Canal Spillway

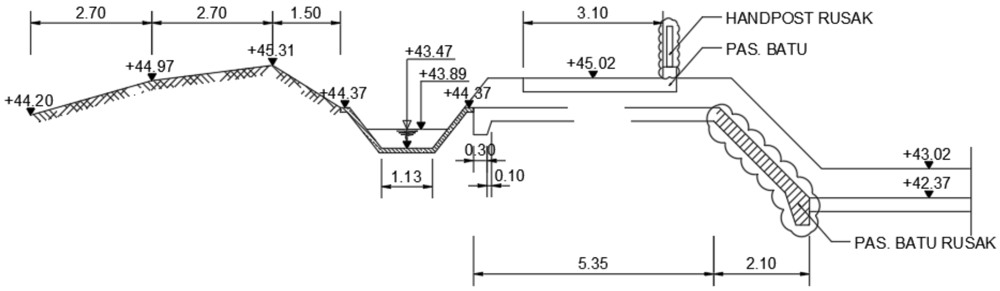
Side Canal Spillway is a Structure to protect the canal from damage caused by an excessive voulme of water, by constructed a side canal spillway the water level in the canal is maintained.

FIGURE 5-108 SIDE CANAL SPILLWAY





POTONGAN: A – A
SKALA 1 : 100



POTONGAN: B – B
SKALA 1 : 100

5.2.4 - Drainage Canals and Structures

5.2.4.1 - Drainage Function

Every irrigation network construction is equipped with drainage canal construction which is an integral part of the irrigation network (PP 20 article 46 paragraph 1). The intended drainage in the irrigation system is the drainage of agricultural land. Agricultural land drainage is an attempt to remove excess water naturally or artificially to reduce the risk of disturbing plant growth. In addition to the risk to plants, drainage canals can be used for erosion control due to surface runoff and flood control on low land.

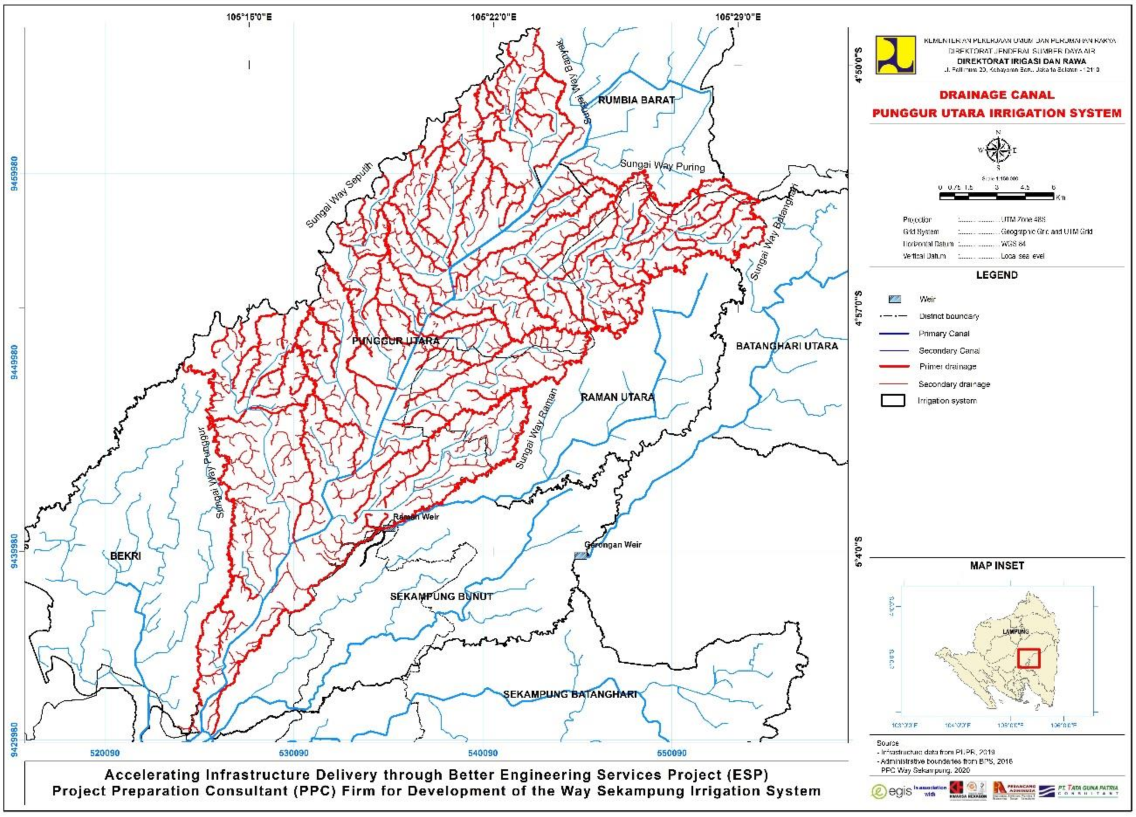
The Way Sekampung drainage canal is a drainage canal located in the Way Sekampung Irrigation Area, which includes 3 regencies/cities, namely Central Lampung Regency, East Lampung Regency and Metro City. The function of the Way Sekampung drainage canal is as follows: a) Dispose of excess water from agricultural activities, b) Flood and erosion control, c) Supply to Raman and Garongan weirs for irrigation, d) Water control in Irrigation Canals. In general, drainage canals are divided into 3 types of canals, namely: Primary drainage canals which are natural rivers that function as the final disposal of excess water. Secondary drainage canals are generally small rivers or smaller tributaries which generally extend from several tertiary plots. Tertiary drainage canal is the smallest category of drainage used as a discharge from tertiary plots.

5.2.4.2 - Identification of Drainage Conditions

The Way Sekampung Irrigation Area consists of 7 sub-irrigation areas, each of which is bordered by large rivers. Large rivers functioned as drainage canals or the last disposal of tertiary plots. Sub-irrigation areas and their boundaries are as follows:

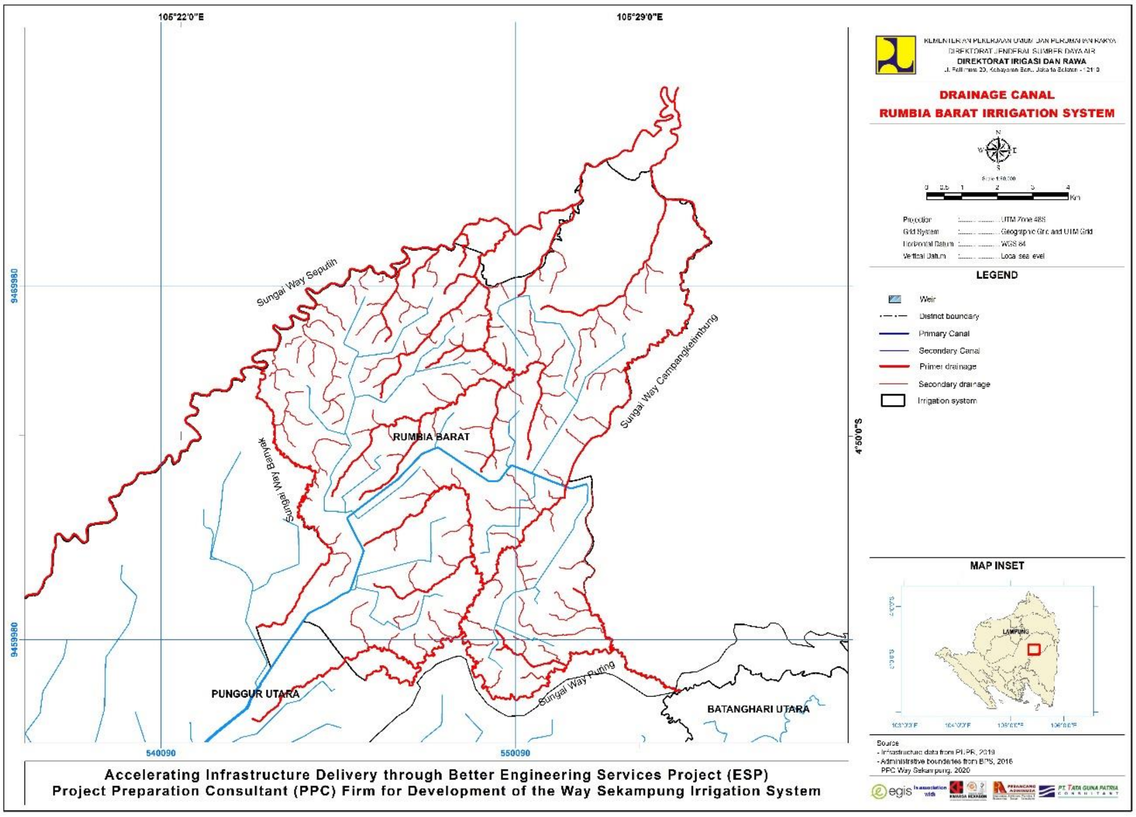
1. Punggur Utara Irrigation Area it is bordered by the Way Seputih, Way Punggur, Way Puring, Way Raman and Way Batanghari rivers;

FIGURE 5-109 IRRIGATION AND DRAINAGE CANALS FOR PUNGGUR UTARA IRRIGATION AREA



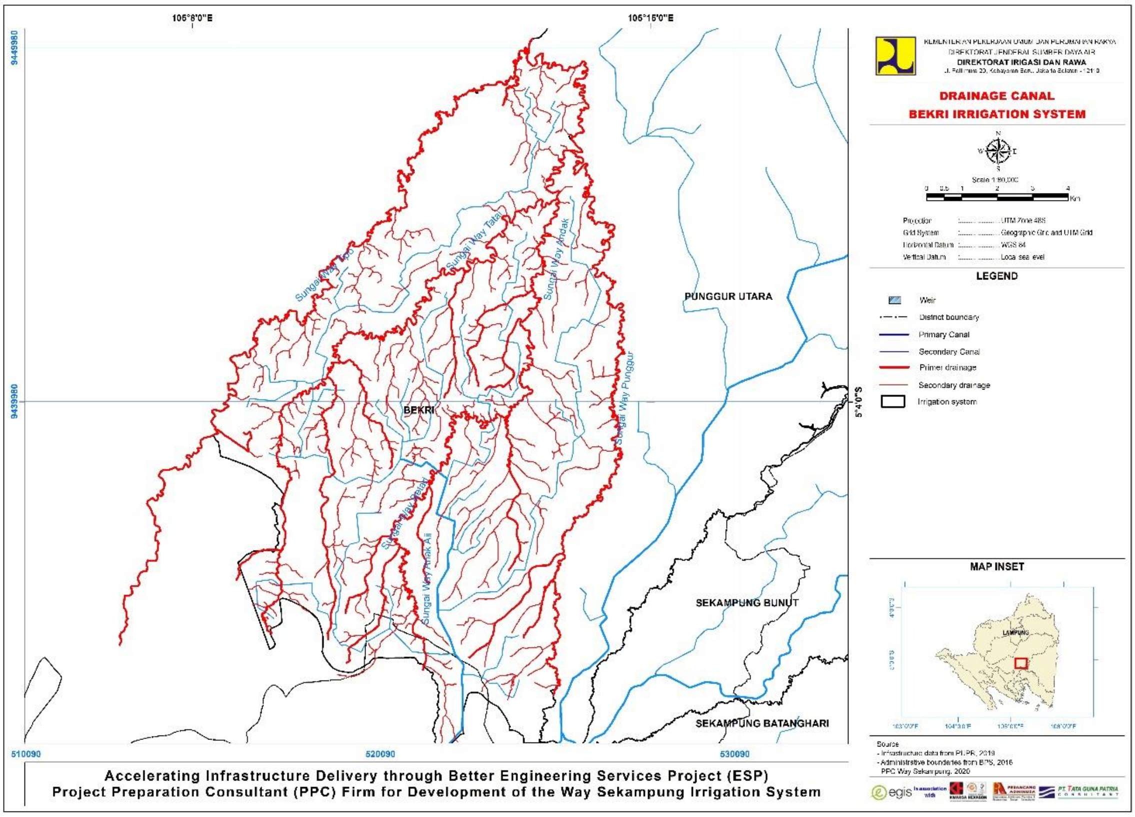
2. Rumbia Barat Irrigation Area is bordered by Way Seputih, Way Banyak, Way Campangketimbung and Way Puring rivers;

FIGURE 5-110 IRRIGATION AND DRAINAGE CANALS FOR RUMBIA BARAT IRRIGATION AREA



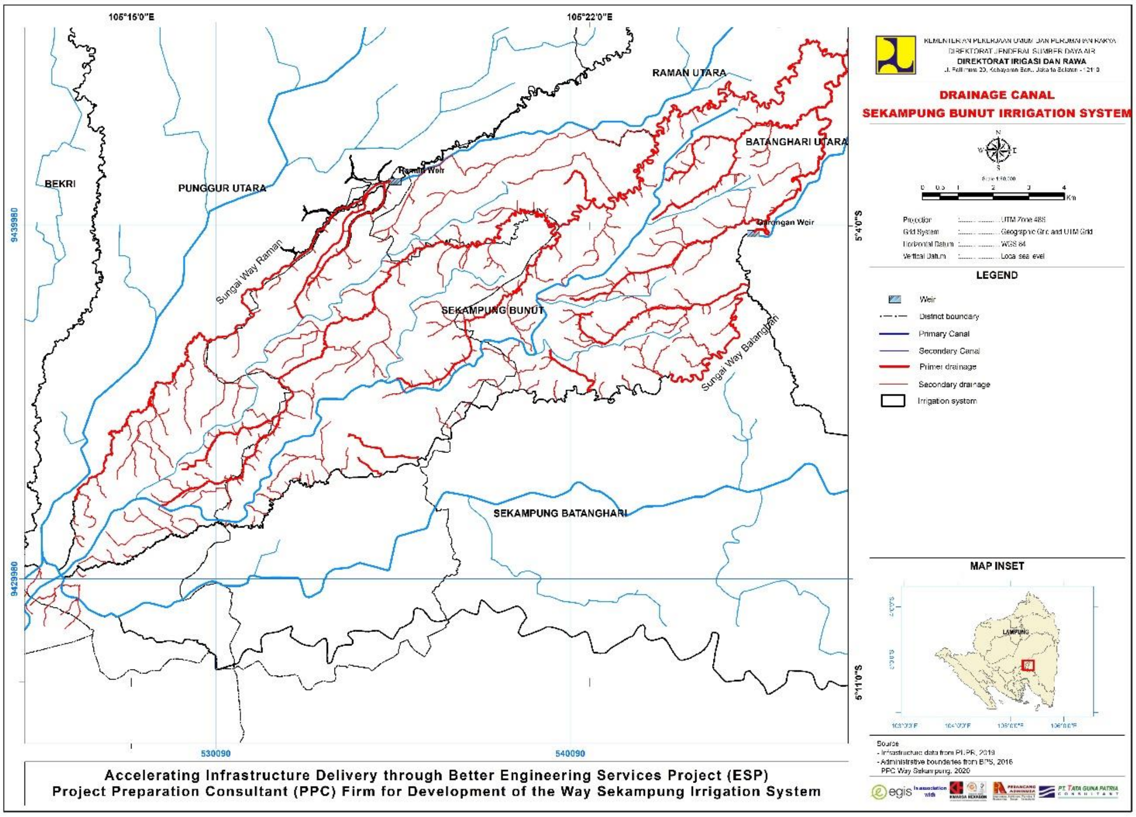
3. Bekri Irrigation Area is bordered by Way Tipo and Way Punggur rivers;

FIGURE 5-111 IRRIGATION AND DRAINAGE CANALS FOR BEKRI IRRIGATION AREA



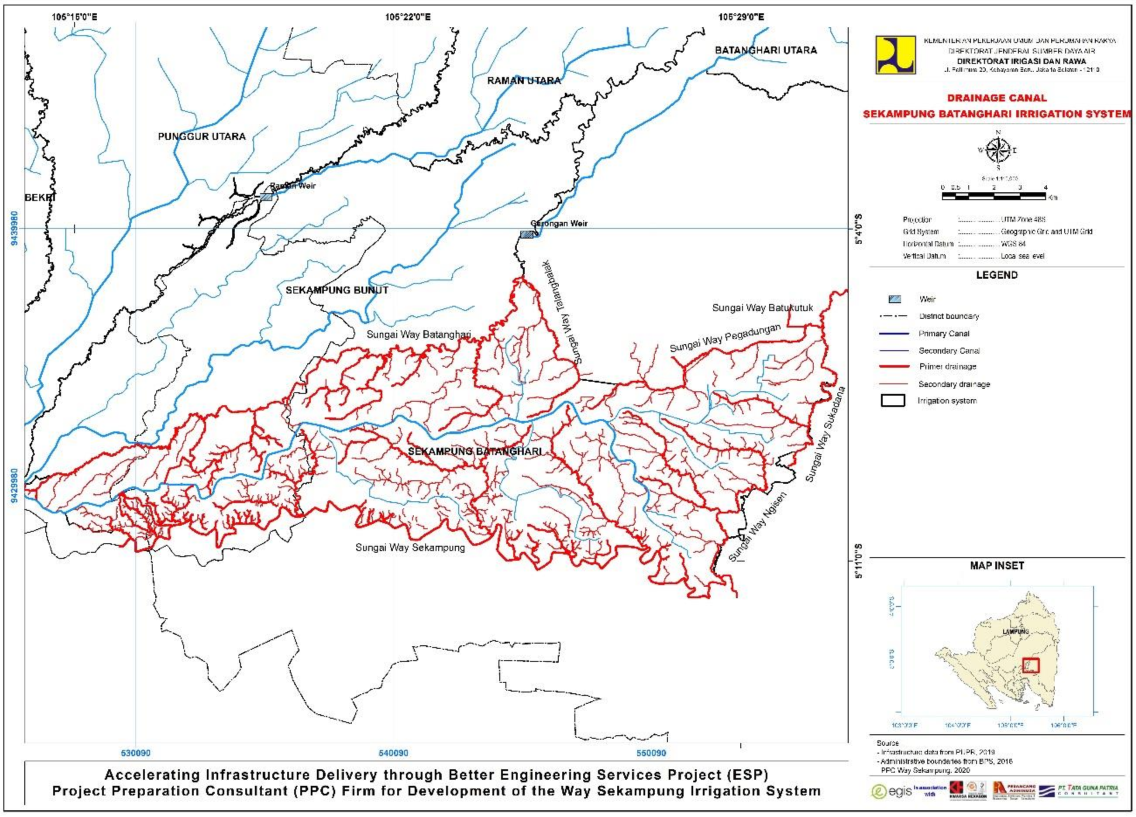
4. Sekampung Bunut Irrigation Area is bordered by Way Raman and Way Batanghari rivers;

FIGURE 5-112 IRRIGATION AND DRAINAGE CANALS FOR SEKAMPUNG BUNUT IRRIGATION AREA



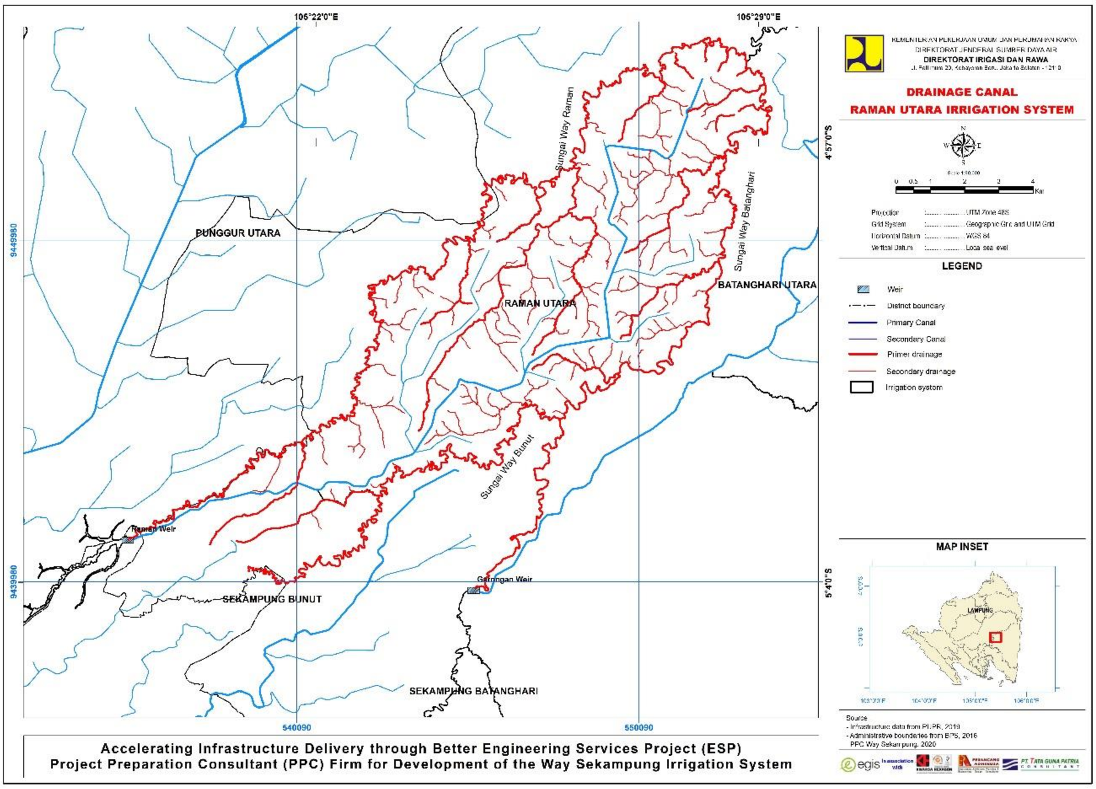
5. Sekampung Batanghari Irrigation Area is bordered by Sungai Way Batanghari, Way Sekampung, Way Ngisen, Way Sukadana and Way Pegadungan rivers;

FIGURE 5-113 IRRIGATION AND DRAINAGE CANALS FOR SEKAMPUNG BATANGHARI IRRIGATION AREA



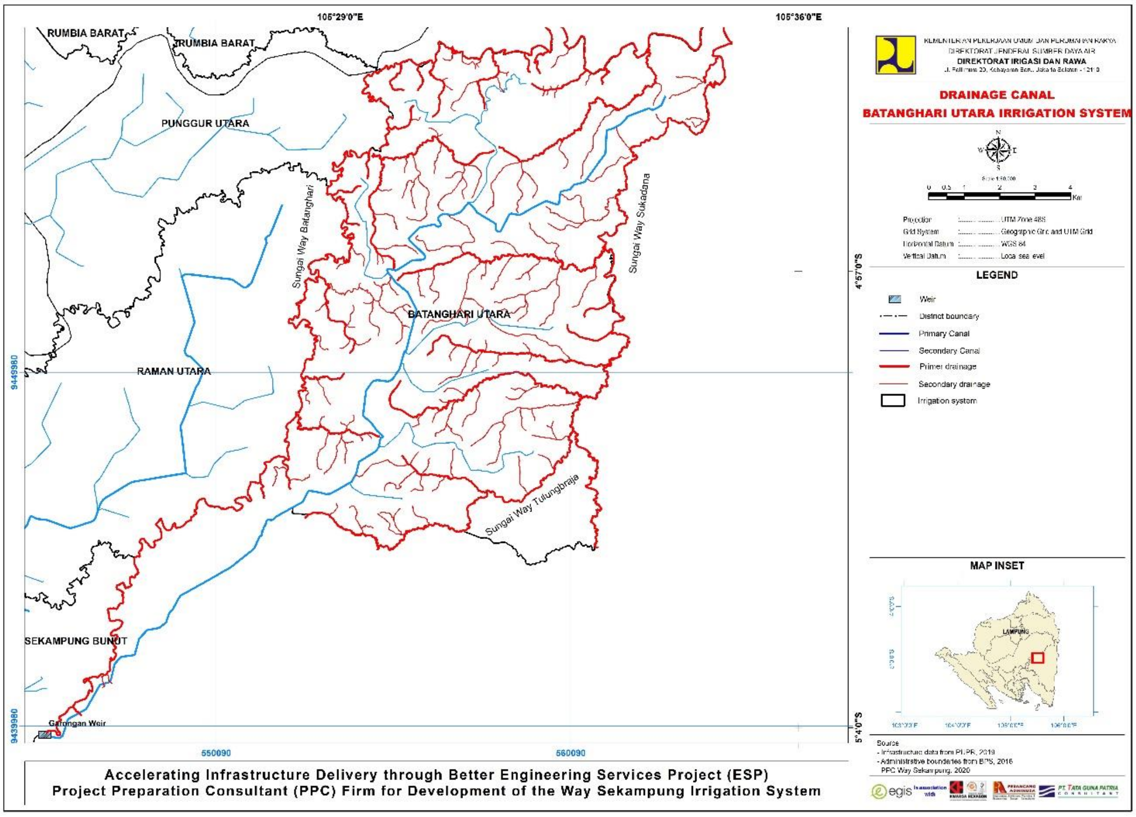
6. Raman Utara Irrigation Area is bordered by Way Raman, Way Bunut and Way Batanghari rivers;

FIGURE 5-114 IRRIGATION AND DRAINAGE CANALS FOR RAMAN UTARA IRRIGATION AREA



7. Batanghari Utara Irrigation Area is bordered by Way Batanghari, Way Tulungbraja and Way Sukadana rivers.

FIGURE 5-115 IRRIGATION AND DRAINAGE CANALS FOR BATANGHARI UTARA IRRIGATION AREA



In addition to being used as a dumping river, big rivers can also be used as a source of irrigation water in the Raman and Garongan weirs. The Raman Weir is used to irrigate the Raman Utara which draws from the Way Raman River, while the Garongan Weir is used to irrigate the Batanghari Utara River which draws water from the Way Batanghari River.

The condition of the existing drainage canal is not yet in perfect managerial planning so it is often neglected. This gives rise to locations of drainage canals that overflow or the water discharge exceeds the capacity of the canal. The following are the results of the analysis of the identification of drainage canals that run over in the Way Sekampung Irrigation Area, namely:

TABLE 5-29 IDENTIFICATION OF DRAINAGE CANAL CONDITIONS OVERFLOWING

No	Irrigation System	Drainage canal	Dimension			Area	Debit flow
			l (m)	b (m)	h (m)	(ha)	(m3/s)
1	Punggur Utara	dAV	2,834.99	1.92	0.43	74.58	0.527
2	Punggur Utara	dDH	673.16	0.41	0.32	25.20	0.178
3	Punggur Utara	dAB	3,144.70	1.71	0.79	226.26	1.534
4	Punggur Utara	dOX	1,075.77	0.90	0.36	87.50	0.622
5	Sekampung Batanghari	dAWC	3,637.79	1.01	0.66	229.87	1.887
6	Sekampung Batanghari	dAWD	2,728.46	2.36	0.52	284.20	2.347
7	Sekampung Batanghari	dBCV	1,365.53	1.24	0.49	273.67	2.415
8	Raman Utara	dCGJ	1,988.75	1.84	0.42	91.83	0.728
9	Raman Utara	dCGX	1,357.94	1.66	0.35	109.80	0.841
10	Batanghari Utara	dCKL	1,942.79	0.57	0.62	88.81	0.632

5.2.4.3 - Determination Method of Drainage Modulus and Canal Capacity Analysis

a. Rainfall Distribution

- Distribution of rainfall using the Thiessen method from 5 rain stations
- The distribution of rainfall is obtained from daily data for the last 8 years by analyzing the probability distribution of 1 year and 5 years

b. Evapotranspiration

- Penman-Monteith method (FAO 1991)

c. Drainage Modulus

- Surface waster for tiles

Where,

= number of consecutive days

= surface discharge runoff for n days, mm

= rainfall in n consecutive days with a return period of T years, mm

= irrigation water supply, mm/day

= evapotranspiration, mm/day

= percolation, mm/day

= additional reservoir, mm

- Waster modulus

Where,

= waster modulus, ltr/dt.ha

= surface discharge runoff for 3 days, mm

1 mm/day = 1/8,64 ltr/dt.ha

- Plan waster debit

Where,

= design discharge, l/s

= waster modulus, ltr/dt.ha

A = area where the water is drained, ha

d. Canal Capacity

- Drainage flow, formula of Strickler (Manning)

Where,

v = flow rate, m/s

k = Stickler roughness coefficient, $m^{1/3}/s$

R = hydraulic radius, m

I = energy slope

- Strickler roughness coefficient (k)

TABLE 5-30 STRICKLER ROUGHNESS COEFFICIENT (K)

Main Disposal Network	$k = m^{1/3}/s$
h > 1.5 m	30
h ≤ 1.5 m	25

5.2.4.4 - Results of Drainage Modulus and Canal Capacity Analysis

Based on the results of the analysis of the drainage modulus and the capacity of the drainage canal, the results of the analysis are as follows:

a. Punggur Utara

TABLE 5-31 DRAINAGE CANAL CAPACITY FOR PUNGGUR UTARA IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channe;}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
1	dFM	29.12	0.204	0.49	0.44	trapezoid	0.00488	1	0.38	0.204	Sufficient
2	dFN	152.88	1.055	1.82	0.65	trapezoid	0.00286	1	0.59	1.055	Sufficient
3	dAC	74.58	0.527	0.87	0.62	trapezoid	0.00407	1	0.51	0.502	Sufficient
4	dAG	96.79	0.686	1.54	0.77	trapezoid	0.00102	1	0.57	0.510	Sufficient
5	dES	161.84	1.150	2.64	0.91	trapezoid	0.00343	1	0.46	1.040	Sufficient
6	dADL	589.20	4.085	2.63	1.56	trapezoid	0.00324	1	1.02	4.085	Sufficient
7	dAV	150.69	1.030	1.87	0.43	trapezoid	0.00306	1	0.57	1.030	Overcoming
8	dIA	19.28	0.139	1.39	0.80	trapezoid	0.00922	1	0.14	0.131	Sufficient
9	dQR	32.49	0.225	1.35	0.60	trapezoid	0.00821	1	0.21	0.226	Sufficient
10	dDK	48.87	0.347	0.86	0.90	trapezoid	0.00877	1	0.33	0.341	Sufficient
11	dDJ	25.20	0.178	0.34	0.33	trapezoid	0.01212	1	0.32	0.179	Sufficient
12	dDI	25.20	0.178	0.84	0.60	trapezoid	0.00838	1	0.24	0.178	Sufficient
13	dDH	25.20	0.178	0.41	0.32	trapezoid	0.00333	1	0.42	0.179	Overcoming
14	dDG	25.20	0.178	0.58	0.59	trapezoid	0.00258	1	0.40	0.183	Sufficient
15	dAA	52.73	0.352	1.29	0.43	trapezoid	0.00904	1	0.27	0.352	Sufficient
16	dAB	226.26	1.534	1.71	0.79	trapezoid	0.00220	1	0.81	1.535	Overcoming
17	dOX	87.50	0.622	0.90	0.36	trapezoid	0.00662	1	0.49	0.623	Overcoming
18	dOV	114.81	0.814	1.75	0.78	trapezoid	0.01000	1	0.36	0.814	Sufficient
19	dYO	43.73	0.322	0.88	0.36	trapezoid	0.00658	1	0.35	0.322	Sufficient
20	dYR	77.76	0.571	1.01	0.60	trapezoid	0.00889	1	0.41	0.571	Sufficient
21	dPF	13.66	0.102	0.79	0.69	trapezoid	0.00462	1	0.21	0.102	Sufficient
22	dPM	38.57	0.264	1.50	0.80	trapezoid	0.00473	1	0.26	0.264	Sufficient
23	dPQ	15.63	0.121	1.41	0.75	trapezoid	0.00656	1	0.15	0.122	Sufficient
24	dPV	8.74	0.067	1.20	1.00	trapezoid	0.00910	1	0.11	0.068	Sufficient
25	dPW	8.74	0.067	0.96	0.62	trapezoid	0.01656	1	0.10	0.067	Sufficient
26	dPZ	42.21	0.299	0.91	1.11	trapezoid	0.01599	1	0.25	0.299	Sufficient
27	dAAD	85.19	0.574	1.52	0.44	trapezoid	0.00560	1	0.39	0.611	Sufficient
28	dPY	16.05	0.118	0.54	0.70	trapezoid	0.00805	1	0.24	0.118	Sufficient
29	dOB	30.15	0.210	0.47	0.69	trapezoid	0.00558	1	0.38	0.211	Sufficient
30	dOC	102.75	0.686	1.44	0.86	trapezoid	0.00387	1	0.48	0.686	Sufficient
31	dYC	31.48	0.219	0.71	0.53	trapezoid	0.00481	1	0.34	0.220	Sufficient
32	dYD	20.62	0.148	0.32	0.82	trapezoid	0.01905	1	0.26	0.148	Sufficient
33	dXK	37.28	0.264	0.56	0.77	trapezoid	0.00777	1	0.36	0.264	Sufficient
34	dYE	20.62	0.148	0.85	0.76	trapezoid	0.00852	1	0.21	0.148	Sufficient
35	dYF	35.79	0.260	1.14	1.20	trapezoid	0.00562	1	0.28	0.261	Sufficient
36	dYJ	26.06	0.184	0.68	0.61	trapezoid	0.00989	1	0.26	0.184	Sufficient
37	dJX	26.64	0.188	0.77	0.67	trapezoid	0.00896	1	0.25	0.188	Sufficient

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channel}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
38	dJW	79.63	0.561	0.71	0.84	trapezoid	0.00657	1	0.51	0.562	Sufficient
39	dKF	21.87	0.157	0.62	1.02	trapezoid	0.01572	1	0.22	0.157	Sufficient
40	dJU	100.15	0.730	1.45	0.86	trapezoid	0.00416	1	0.49	0.730	Sufficient
41	dKE	29.03	0.203	0.59	0.65	trapezoid	0.01750	1	0.25	0.203	Sufficient
42	dKD	72.22	0.510	0.75	0.51	trapezoid	0.01614	1	0.38	0.510	Sufficient
43	dBR	34.54	0.270	0.81	0.73	trapezoid	0.00157	1	0.52	0.305	Sufficient
44	dMA	39.28	0.268	1.26	0.96	trapezoid	0.00481	1	0.28	0.269	Sufficient
45	dME	37.57	0.258	0.72	0.79	trapezoid	0.01268	1	0.28	0.259	Sufficient
46	dprimer25a	298.23	2.123	5.25	1.52	trapezoid	0.00449	1	0.43	2.123	Sufficient
47	dJZ	40.97	0.295	0.87	0.76	trapezoid	0.00654	1	0.31	0.259	Sufficient
48	dKB	53.30	0.368	1.02	1.01	trapezoid	0.00923	1	0.31	0.368	Sufficient
49	dKC	108.45	0.766	1.09	0.93	trapezoid	0.00697	1	0.50	0.767	Sufficient
50	dWA	24.73	0.183	3.55	0.52	trapezoid	0.01036	1	0.10	0.184	Sufficient
51	dWC	43.28	0.318	1.80	0.50	trapezoid	0.00764	1	0.22	0.318	Sufficient
52	dNK	174.83	1.284	1.70	0.75	trapezoid	0.00382	1	0.68	1.467	Sufficient
53	dWF	54.62	0.384	1.50	0.79	trapezoid	0.01420	1	0.23	0.384	Sufficient
54	dKH	49.37	0.360	1.93	0.81	trapezoid	0.01123	1	0.20	0.360	Sufficient
55	dKJ	47.79	0.321	0.75	0.94	trapezoid	0.01033	1	0.33	0.322	Sufficient

b. Rumbia Barat

TABLE 5-32 DRAINAGE CANAL CAPACITY FOR RUMBIA BARAT IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channel}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
1	dCAD	32.14	0.24	1.87	0.59	trapezoid	0.00458	1	0.213	0.239	Sufficient
2	dCBS	39.20	0.30	0.77	0.95	trapezoid	0.00574	1	0.371	0.303	Sufficient
3	dCCE	57.71	0.43	1.88	0.34	trapezoid	0.00423	1	0.309	0.432	Sufficient
4	dCCK	49.14	0.37	1.12	0.85	trapezoid	0.00394	1	0.384	0.373	Sufficient
5	dCDV	27.00	0.22	0.78	1.15	trapezoid	0.01232	1	0.246	0.215	Sufficient
6	dCCY	83.00	0.64	1.67	1.04	trapezoid	0.00473	1	0.402	0.636	Sufficient
7	dCDQ	49.58	0.36	1.77	1.34	trapezoid	0.00378	1	0.295	0.357	Sufficient
8	dCDR	75.71	0.55	0.90	1.31	trapezoid	0.01043	1	0.407	0.554	Sufficient
9	dCDV	27.00	0.22	0.78	1.15	trapezoid	0.01232	1	0.246	0.215	Sufficient
10	dCDW	23.14	0.19	0.71	0.88	trapezoid	0.00774	1	0.271	0.187	Sufficient
11	dCEC	23.80	0.20	0.80	1.03	trapezoid	0.00722	1	0.267	0.196	Sufficient
12	dCED	18.63	0.15	2.31	0.90	trapezoid	0.00624	1	0.131	0.152	Sufficient
13	dCEF	50.41	0.38	0.79	0.48	trapezoid	0.00627	1	0.407	0.383	Sufficient
14	dCEG	62.76	0.47	1.05	1.30	trapezoid	0.01001	1	0.347	0.468	Sufficient
15	dCEI	37.36	0.29	2.74	1.65	trapezoid	0.00887	1	0.156	0.291	Sufficient
16	dCEK	39.79	0.31	0.97	1.01	trapezoid	0.00554	1	0.338	0.308	Sufficient
17	dCBN	98.47	0.73	1.39	1.17	trapezoid	0.00430	1	0.491	0.728	Sufficient
18	dCEJ	136.73	1.05	0.83	0.92	trapezoid	0.00699	1	0.660	1.054	Sufficient

c. Bekri

TABLE 5-33 DRAINAGE CANAL CAPACITY FOR BEKRI IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channel}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
1	dCUT	14.35	0.1292	0.72	0.96	trapezoid	0.008758	1	0.21	0.1297	Sufficient
2	dCUS	43.89	0.4002	1.11	0.88	trapezoid	0.006616	1	0.35	0.4002	Sufficient
3	dDAP	9.55	0.0964	1.00	0.79	trapezoid	0.005589	1	0.17	0.0965	Sufficient

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channe;}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
4	dCVD	9.54	0.0950	1.00	0.61	trapezoid	0.006204	1	0.16	0.0951	Sufficient
5	dCVL	51.32	0.4914	1.01	1.63	trapezoid	0.006861	1	0.41	0.4920	Sufficient
6	dCXV	25.04	0.2354	2.77	0.89	trapezoid	0.005673	1	0.16	0.2354	Sufficient
7	dCXS	19.12	0.1752	1.43	1.07	trapezoid	0.009534	1	0.17	0.1757	Sufficient
8	dCSL	86.91	0.1044	0.95	1.92	trapezoid	0.006109	1	0.18	0.1045	Sufficient
9	dCSK	163.37	0.7996	2.69	1.66	trapezoid	0.004399	1	0.36	0.7997	Sufficient
10	dCYI	6.16	0.0593	1.56	1.42	trapezoid	0.006632	1	0.09	0.0596	Sufficient
11	dCYM	20.66	0.1807	1.43	0.54	trapezoid	0.006567	1	0.19	0.1810	Sufficient
12	dCYF	81.00	0.7345	1.48	1.39	trapezoid	0.005321	1	0.45	0.7345	Sufficient
13	dCPO	81.38	0.7040	2.82	2.18	trapezoid	0.006954	1	0.28	0.7041	Sufficient
14	dCPP	159.37	1.4000	2.57	1.42	trapezoid	0.005751	1	0.47	1.4001	Sufficient
15	dDAN	40.68	0.3684	2.29	1.39	trapezoid	0.005138	1	0.24	0.3690	Sufficient
16	dCPK	63.38	0.5885	2.53	1.75	trapezoid	0.005734	1	0.29	0.5894	Sufficient
17	dCQZ	19.82	0.1924	0.96	0.54	trapezoid	0.013964	1	0.20	0.1924	Sufficient
18	dCQU	94.89	0.8610	1.20	1.77	trapezoid	0.006871	1	0.51	0.8610	Sufficient
19	dCPY	11.58	0.1061	0.88	1.22	trapezoid	0.011444	1	0.16	0.1068	Sufficient
20	dCPU	56.60	0.5093	1.59	0.95	trapezoid	0.005549	1	0.35	0.5091	Sufficient
21	dCPX	117.26	1.0679	1.91	0.94	trapezoid	0.005883	1	0.47	1.0681	Sufficient
22	dCVY	8.43	0.0803	0.68	0.41	trapezoid	0.00458	1	0.20	0.0805	Sufficient
23	dPrimer179-2	125.19	1.1773	1.34	0.63	trapezoid	0.005145	1	0.62	1.1771	Sufficient

d. Sekampung Bunut

TABLE 5-34 DRAINAGE CANAL CAPACITY FOR SEKAMPUNG BUNUT IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channe;}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
1	dAHJ	26.81	0.223	1.08	0.71	trapezoid	0.0031	1	0.31	0.223	Sufficient
2	dAHK	15.23	0.139	1.22	0.59	trapezoid	0.0029	1	0.23	0.140	Sufficient
3	dAOR	8.33	0.007	1.00	0.66	trapezoid	0.0193	1	0.02	0.007	Sufficient
4	dAOM	27.58	0.186	1.46	0.75	trapezoid	0.0084	1	0.18	0.186	Sufficient
5	dAKA	8.62	0.078	0.95	0.68	trapezoid	0.0044	1	0.17	0.078	Sufficient
6	dAKB	41.42	0.351	0.99	1.06	trapezoid	0.0056	1	0.36	0.351	Sufficient
7	dAKD	30.30	0.018	1.06	0.88	trapezoid	0.0065	1	0.06	0.019	Sufficient
8	dAKC	109.44	0.457	1.50	0.92	trapezoid	0.0031	1	0.40	0.457	Sufficient
9	dAKX	33.84	0.287	1.00	0.48	trapezoid	0.0109	1	0.26	0.287	Sufficient
10	dAKY	66.15	0.565	1.66	0.97	trapezoid	0.0076	1	0.33	0.565	Sufficient
11	dAHP	54.40	0.427	1.26	1.08	trapezoid	0.0068	1	0.34	0.427	Sufficient
12	dAHO	187.10	1.545	4.66	1.37	trapezoid	0.0040	1	0.39	1.545	Sufficient
13	dALQ	41.84	0.354	1.79	1.25	trapezoid	0.0045	1	0.28	0.354	Sufficient
14	dAKT	247.96	1.180	2.56	0.70	trapezoid	0.0056	1	0.43	1.180	Sufficient

e. Sekampung Batanghari

TABLE 5-35 DRAINAGE CANAL CAPACITY FOR SEKAMPUNG BATANGHARI IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channe;}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
1	dASW	15.126	0.134	0.80	0.43	trapezoid	0.0233	1.00	0.15	0.135	Sufficient
2	dASY	46.627	0.433	1.45	0.73	trapezoid	0.0165	1.00	0.24	0.433	Sufficient
3	dATM	18.708	0.172	1.01	0.58	trapezoid	0.0130	1.00	0.18	0.173	Sufficient
4	dAUF	34.572	0.304	1.45	0.60	trapezoid	0.0354	1.00	0.16	0.304	Sufficient
5	dAUN	11.064	0.101	0.96	0.61	trapezoid	0.0225	1.00	0.12	0.101	Sufficient

No.	Drainage Canal	A (Ha)	Q(d) (m³/s)	Drainage Canal Capacity							
				B (m)	Hchanne; (m)	Form of Canal	Slope (i)	Tilt	Hwater (m)	Qcount (m³/s)	Canal Control
6	dAUR	74.181	0.658	1.56	1.49	trapezoid	0.0171	1.00	0.29	0.659	Sufficient
7	dAVN	29.211	0.261	0.94	0.80	trapezoid	0.0088	1.00	0.27	0.261	Sufficient
8	dAVO	31.671	0.296	1.75	0.55	trapezoid	0.0153	1.00	0.18	0.296	Sufficient
9	dAVS	21.922	0.189	1.44	0.59	trapezoid	0.0123	1.00	0.16	0.189	Sufficient
10	dAWI	27.037	0.229	1.33	0.66	trapezoid	0.0044	1.00	0.26	0.230	Sufficient
11	dAWJ	70.511	0.585	1.21	0.43	trapezoid	0.0069	1.00	0.41	0.585	Sufficient
12	dAWC	229.865	1.887	1.01	0.66	trapezoid	0.0035	1.00	0.99	1.887	Overcoming
13	dAWD	284.197	2.347	2.36	0.52	trapezoid	0.0044	1.00	0.73	2.347	Overcoming
14	dAYH	48.181	0.409	1.15	0.85	trapezoid	0.0061	1.00	0.35	0.409	Sufficient
15	dAYG	103.003	0.888	2.25	1.03	trapezoid	0.0073	1.00	0.36	0.888	Sufficient
16	dAYK	133.353	1.157	1.50	0.64	trapezoid	0.0076	1.00	0.52	1.157	Sufficient
17	dBAI	173.167	1.507	2.12	1.19	trapezoid	0.0057	1.00	0.55	1.507	Sufficient
18	dBCH	40.476	0.368	1.38	0.82	trapezoid	0.0051	1.00	0.32	0.368	Sufficient
19	dBCJ	13.547	0.121	0.96	1.33	trapezoid	0.0100	1.00	0.17	0.121	Sufficient
20	dBCK	20.353	0.177	1.30	0.76	trapezoid	0.0176	1.00	0.15	0.177	Sufficient
21	dBCP	240.409	2.107	3.26	1.40	trapezoid	0.0045	1.00	0.56	2.107	Sufficient
22	dBCR	32.332	0.286	1.40	0.47	trapezoid	0.0058	1.00	0.26	0.286	Sufficient
23	dBCU	29.937	0.252	0.84	0.67	trapezoid	0.0103	1.00	0.27	0.252	Sufficient
24	dBCV	273.864	2.415	1.24	0.49	trapezoid	0.0113	1.00	0.77	2.415	Overcoming
25	dBDN	12.926	0.116	0.90	0.67	trapezoid	0.0106	1.00	0.17	0.117	Sufficient
26	dBDO	23.267	0.200	1.06	0.63	trapezoid	0.0110	1.00	0.21	0.200	Sufficient
27	dBDP	23.670	0.203	1.66	0.74	trapezoid	0.0091	1.00	0.17	0.203	Sufficient
28	dBEP	167.147	1.457	1.71	0.76	trapezoid	0.0040	1.00	0.67	1.457	Sufficient
29	dBEQ	24.602	0.217	1.05	0.47	trapezoid	0.0040	1.00	0.29	0.217	Sufficient
30	dBFA	38.902	0.321	0.91	0.60	trapezoid	0.0075	1.00	0.33	0.321	Sufficient
31	dBFQ	97.406	0.857	1.06	1.06	trapezoid	0.0041	1.00	0.62	0.857	Sufficient
32	dBGQ	11.129	0.107	1.12	0.80	trapezoid	0.0203	1.00	0.11	0.107	Sufficient
33	dBGR	65.926	0.625	1.21	0.70	trapezoid	0.0153	1.00	0.34	0.625	Sufficient

f. Raman Utara

TABLE 5-36 DRAINAGE CANAL CAPACITY FOR RAMAN UTARA IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m³/s)	Drainage Canal Capacity							
				B (m)	Hchanne; (m)	Form of Canal	Slope (i)	Tilt	Hwater (m)	Qcount (m³/s)	Canal Control
1	dCFY	33.99	0.2516	1.19	0.85	trapezoid	0.00675	1	0.2546	0.2523	Sufficient
2	dCFZ	36.44	0.2822	1.23	1.37	trapezoid	0.00474	1	0.2960	0.2827	Sufficient
3	dCGT	48.07	0.3658	0.92	0.66	trapezoid	0.00460	1	0.4027	0.3660	Sufficient
4	dCGZ	46.56	0.3490	1.89	0.93	trapezoid	0.00406	1	0.2753	0.3498	Sufficient
5	dCHH	79.94	0.6137	1.57	1.13	trapezoid	0.00586	1	0.3822	0.6143	Sufficient
6	dCHL	20.55	0.1584	1.44	0.92	trapezoid	0.01640	1	0.1332	0.1593	Sufficient
7	dCHM	10.28	0.0837	1.11	0.35	trapezoid	0.00548	1	0.1471	0.0838	Sufficient
8	dCIF	50.42	0.3998	1.40	0.69	trapezoid	0.00612	1	0.3137	0.3998	Sufficient
9	dCIG	15.79	0.1306	1.15	0.79	trapezoid	0.01293	1	0.1452	0.1307	Sufficient
10	dCIO	3.75	0.0331	0.85	0.68	trapezoid	0.00518	1	0.1017	0.0338	Sufficient
11	dCIP	14.25	0.1193	1.23	0.81	trapezoid	0.00296	1	0.2056	0.1201	Sufficient
12	dCIR	27.94	0.2101	1.05	1.20	trapezoid	0.00499	1	0.2685	0.2109	Sufficient
13	dCIS	27.94	0.2101	0.89	0.85	trapezoid	0.00785	1	0.2576	0.2103	Sufficient
14	dCJL3	163.84	1.3223	2.02	1.48	trapezoid	0.00590	1	0.5196	1.3223	Sufficient
15	dCJM	8.67	0.0716	1.67	2.07	trapezoid	0.00951	1	0.0895	0.0722	Sufficient
16	dCJN	31.32	0.2453	1.02	1.07	trapezoid	0.01465	1	0.2184	0.2455	Sufficient
17	dCFX	116.25	0.8808	2.11	1.19	trapezoid	0.00503	1	0.4190	0.8810	Sufficient

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channe;}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
18	dCHN	34.03	0.2747	2.15	0.77	trapezoid	0.00476	1	0.2109	0.2748	Sufficient
19	dCHU	50.08	0.3899	1.27	1.37	trapezoid	0.00764	1	0.3055	0.3899	Sufficient
20	dCGJ	91.83	0.7279	1.84	0.42	trapezoid	0.00420	1	0.4264	0.7279	Overcoming
21	dCGX	109.80	0.8412	1.66	0.35	trapezoid	0.00667	1	0.4295	0.8419	Overcoming
22	dCIQ	40.56	0.3406	1.50	0.77	trapezoid	0.00334	1	0.3280	0.3412	Sufficient

g. Batanghari Utara

TABLE 5-37 DRAINAGE CANAL CAPACITY FOR BATANGHARI UTARA IRRIGATION AREA

No.	Drainage Canal	A (Ha)	Q(d) (m^3/s)	Drainage Canal Capacity							
				B (m)	$H_{channe;}$ (m)	Form of Canal	Slope (i)	Tilt	H_{water} (m)	Q_{count} (m^3/s)	Canal Control
1	dCKB	23.14	0.1706	0.46	0.48	Trapesium	0.0027	1	0.41	0.1713	Sufficient
2	dCKE	29.76	0.2150	0.43	0.47	Trapesium	0.0074	1	0.37	0.2157	Sufficient
3	dCKF	38.98	0.2882	0.81	1.04	Trapesium	0.0088	1	0.31	0.2882	Sufficient
4	dCKL	88.81	0.6322	0.57	0.62	Trapesium	0.0042	1	0.66	0.6321	Overcoming
5	dCKP	23.78	0.1849	1.28	0.74	Trapesium	0.0083	1	0.19	0.1852	Sufficient
6	dCKQ	9.22	0.0732	1.29	0.80	Trapesium	0.0060	1	0.12	0.0732	Sufficient
7	dCKR	57.42	0.4345	0.77	1.10	Trapesium	0.0133	1	0.36	0.4348	Sufficient
8	dCKV	15.80	0.1201	1.56	1.88	Trapesium	0.0081	1	0.13	0.1204	Sufficient
9	dCMD	31.68	0.2277	1.86	0.77	Trapesium	0.0078	1	0.18	0.2278	Sufficient
10	dCME	95.15	0.6970	0.48	0.68	Trapesium	0.0075	1	0.63	0.6975	Sufficient
11	dCMF	31.79	0.2415	0.62	0.43	Trapesium	0.0113	1	0.30	0.2415	Sufficient
12	dCMH	33.30	0.2520	1.32	0.64	Trapesium	0.0100	1	0.21	0.2520	Sufficient
13	dCMO	51.46	0.3757	1.23	0.64	Trapesium	0.0060	1	0.33	0.3758	Sufficient
14	dCMP	70.10	0.4970	0.87	0.82	Trapesium	0.0071	1	0.43	0.4979	Sufficient
15	dCMR	79.68	0.5735	1.42	1.32	Trapesium	0.0050	1	0.41	0.5737	Sufficient
16	dCNB	17.15	0.1295	0.82	0.62	Trapesium	0.0083	1	0.20	0.1295	Sufficient
17	dCNC	17.15	0.1295	0.82	0.90	Trapesium	0.0076	1	0.21	0.1303	Sufficient
18	dCNK	11.34	0.0885	1.13	0.71	Trapesium	0.0041	1	0.16	0.0885	Sufficient
19	dCNL2	43.62	0.3416	2.12	0.76	Trapesium	0.0039	1	0.26	0.3419	Sufficient
20	dCNM	18.67	0.1444	1.44	0.95	Trapesium	0.0078	1	0.16	0.1445	Sufficient
21	dCNP	89.28	0.6429	1.33	1.10	Trapesium	0.0041	1	0.47	0.6430	Sufficient

5.2.4.5 - Improved drainage function

The amount of flow in the drainage canal is planned at the peak of the flow, when the flow exceeds the plan, the drainage canal will overflow. Based on the data in Table 5-31 to Table 5-37, the drainage canal experienced runoff due to the capacity of the canal not being able to accommodate the water discharge that entered the drainage canal. The result of the runoff from the drainage canal is that it interferes with agricultural activities, which is even worse when the runoff causes inundation which results in crop failure. Therefore, to overcome the overflowing discharge, it is necessary to raise the embankment as follows

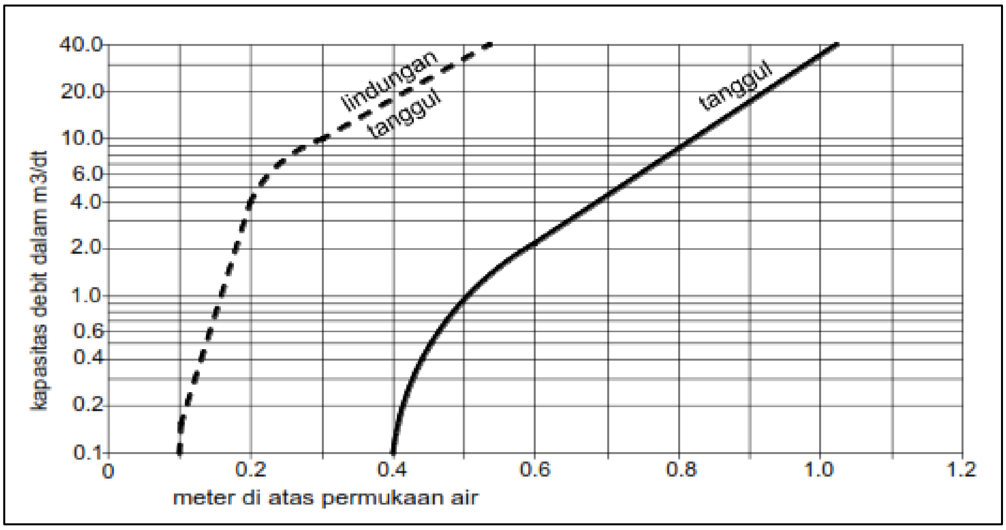
TABLE 5-38 OVERFLOWING CONDITION OF WAY SEKAMPUNG DRAINAGE CANAL

No	Irrigation System	Drainage canal	l (m)	Dimension Existing		Dimension Planning		Enhancement	Debit flow
				b (m)	h (m)	b (m)	h (m)	h (m)	(m3/s)
1	Punggur Utara	dAV	2,834	1.92	0.43	1.92	0.70	0.27	0.527
2	Punggur Utara	dDH	673	0.41	0.32	0.41	0.55	0.23	0.178
3	Punggur Utara	dAB	3,144	1.71	0.79	1.71	0.98	0.19	1.534

No	Irrigation System	Drainage canal	l (m)	Dimension Existing		Dimension Planning		Enhancement	Debit flow
				b (m)	h (m)	b (m)	h (m)	h (m)	(m3/s)
4	Punggur Utara	dOX	1,075	0.90	0.36	0.90	0.63	0.27	0.622
5	Sekampung Batanghari	dAWC	3,637	1.01	0.66	1.01	1.17	0.51	1.887
6	Sekampung Batanghari	dAWD	2,728	2.36	0.52	2.36	0.88	0.36	2.347
7	Sekampung Batanghari	dBCV	1,365	1.24	0.49	1.24	0.92	0.43	2.415
8	Raman Utara	dCGJ	1,988	1.84	0.42	1.84	0.56	0.14	0.728
9	Raman Utara	dCGX	1,357	1.66	0.35	1.66	0.57	0.22	0.841
10	Batanghari Utara	dCKL	1,942	0.57	0.62	0.57	0.81	0.19	0.632

The increase in embankment height is based on Figure 5—41.

FIGURE 5-116 GUARD HEIGHT FOR EXHAUST LINE



5.2.4.6 - Drainage inspection road

■ Definition

Drainage inspection road is built along a drainage canal that is intended for inspection activities. Inspection is a direct observation activity to visually determine the condition of the drainage canal. Inspection activities are the first step taken to identify problems with drainage. Inspection activities are divided into 3 types, namely, routine inspections (minimum 2 times a week), periodic inspections (minimum 2 times every year) and special inspections, carried out when floods, erosion or reports from the surrounding community occur.

After the identification of the problem is complete, maintenance of the drainage canal is carried out. Maintenance is a handling activity, in the form of preventive maintenance and repairs needed to maintain the condition of the slurry to function optimally. Based on the type of inspection results, maintenance activities are divided into several types, namely,

1. Routine maintenance, without changing Structure parts such as cleaning garbage and vegetation
2. Periodic maintenance, such as dredging sediment and gravel
3. Rehabilitation maintenance, such as repair of damage to drains
4. Improved maintenance, replacing existing designs due to design errors or climatic and weather conditions
5. Special maintenance, emergency repairs, examples of broken drains

■ Typical drainage inspection road

The drainage inspection road is located on the edge of the drainage canal which is connected to the inspection line for the conveyance and the main line. The width of the drainage inspection road is 1 meter with a slope of 1:20 and there are roadsides on the side of the road each with a width of 0.5 meters. Construction of drainage roads using K-225 concrete with a pavement thickness of 15 cm (subgrade CBR 6%). Details of typical drainage canal inspection road can be seen in, Figure 5-118, Figure 5-119, Figure 5-120 and Figure 5-121.

FIGURE 5-117 TYPICAL ROAD OF CONDITION I

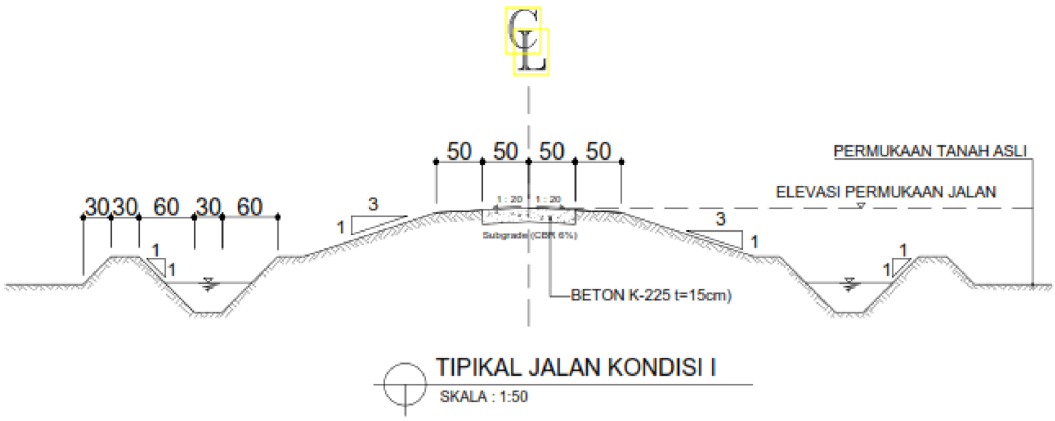


FIGURE 5-118 TYPICAL ROAD OF CONDITION II

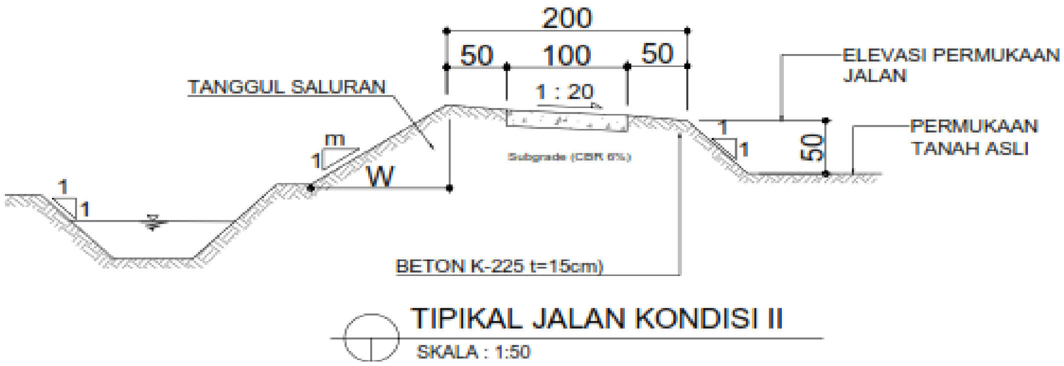


FIGURE 5-119 TYPICAL ROAD OF CONDITION III

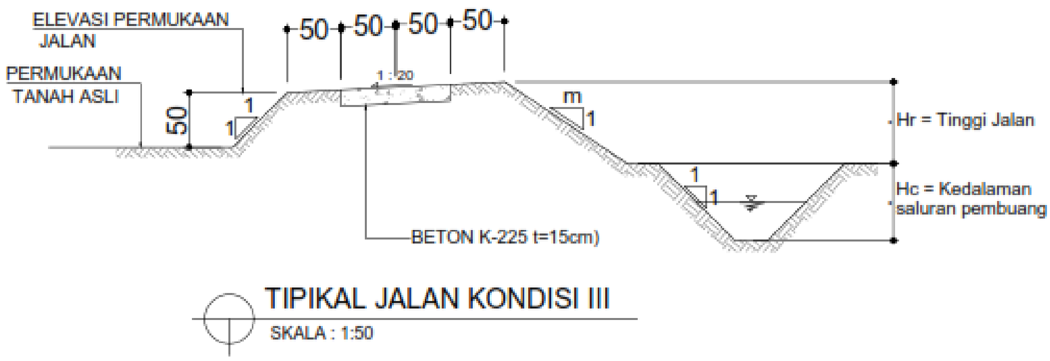


FIGURE 5-120 TYPICAL ROAD OF CONDITION IV

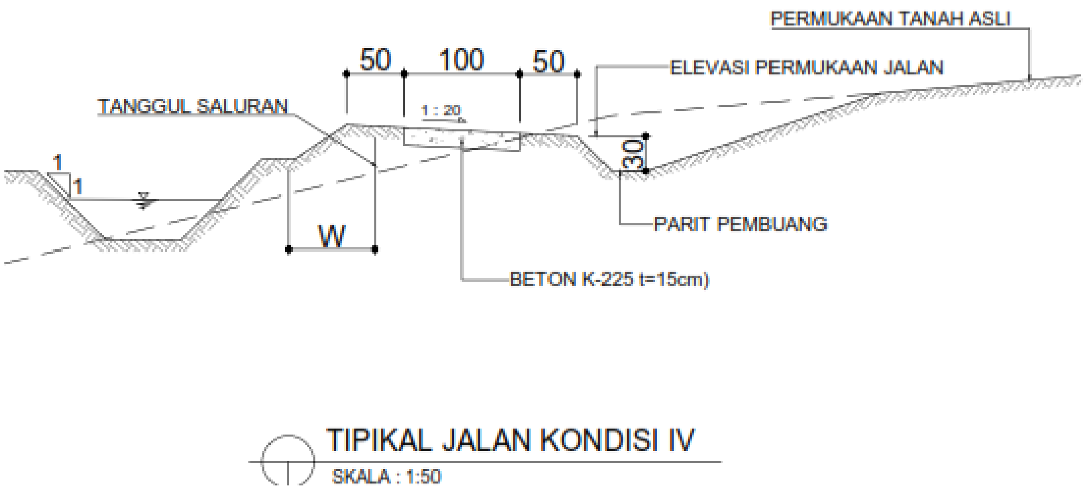
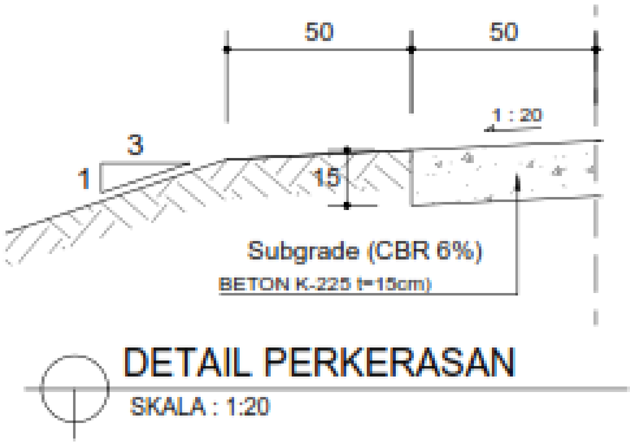


FIGURE 5-121 TYPICAL ROAD OF CONDITION V



5.2.5 - Complementary Structures

5.2.5.1 - Inspection roads

Inspection roads are needed in the inspection, operation and maintenance of irrigation and drainage networks, namely canals and their Structures which are then planned, built and maintained by the Irrigation Service. The construction of the inspection road is intended to facilitate the exploitation and maintenance of existing irrigation canals and structures.

Canals that are built parallel to nearby public roads do not require inspection roads along these canal sections. Usually the inspection road is located along the outer side of the irrigation canal. However, in most rural areas this road also functions as the main road because it is also passed by commercial vehicles with heavier axles than the existing inspection vehicles.

5.2.5.1.1 - Inspection Road Location

Inspection roads on the irrigation canal are planned to be spread over 6 (six) Sub-Systems in Punggur Utara Irrigation Area, Sub-Systems in Rumbia Barat Irrigation Area, Sub-Systems in Sekampung Bunut Irrigation Area, Sub-Systems in Sekampung Batanghari Irrigation Area, Sub-Systems in Raman Utara and Sub-Systems in Bekri. The following are the locations of each inspection road section as shown in the following figures.

FIGURE 5-122 LOCATION OF IRRIGATION CANAL INSPECTION ROAD (PUNGGUR UTARA)

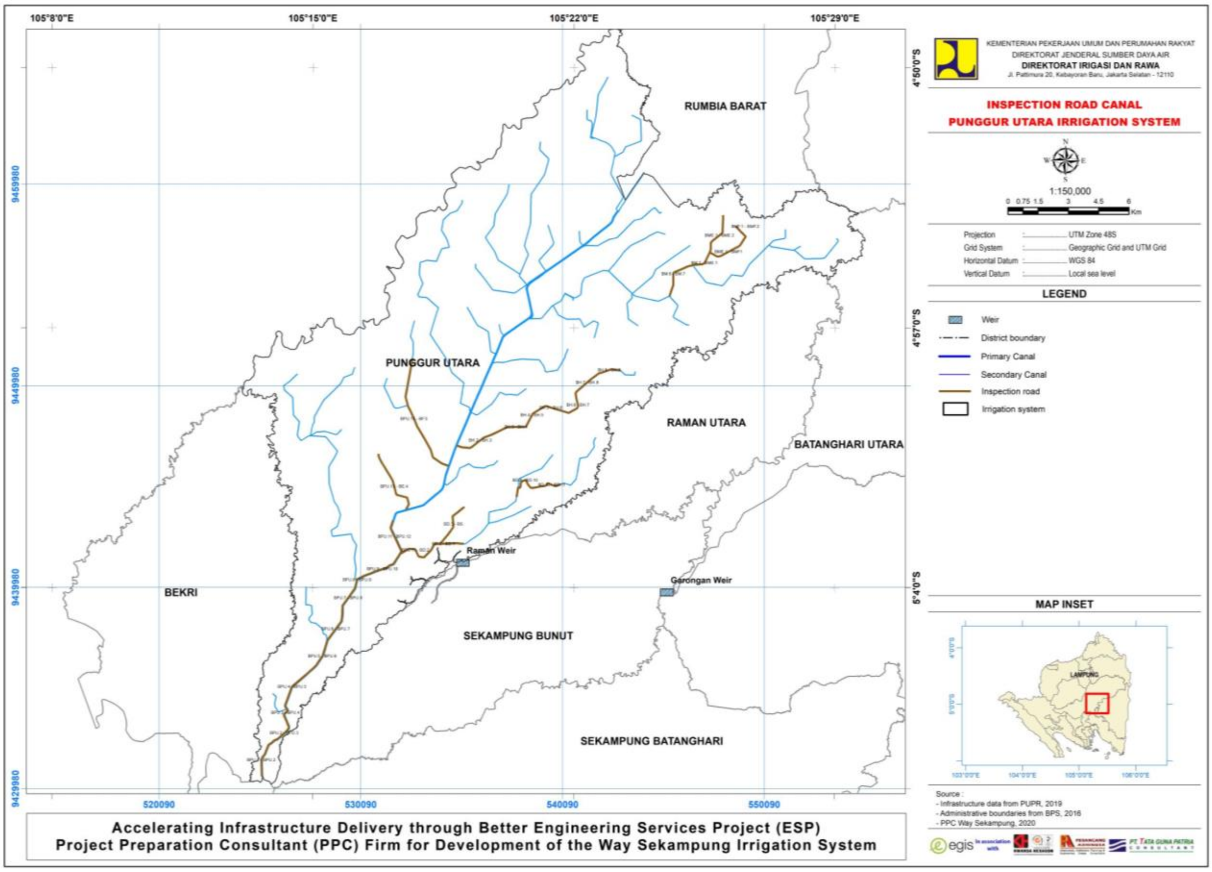


FIGURE 5-123 LOCATION OF IRRIGATION CANAL INSPECTION ROAD (RUMBIA BARAT)

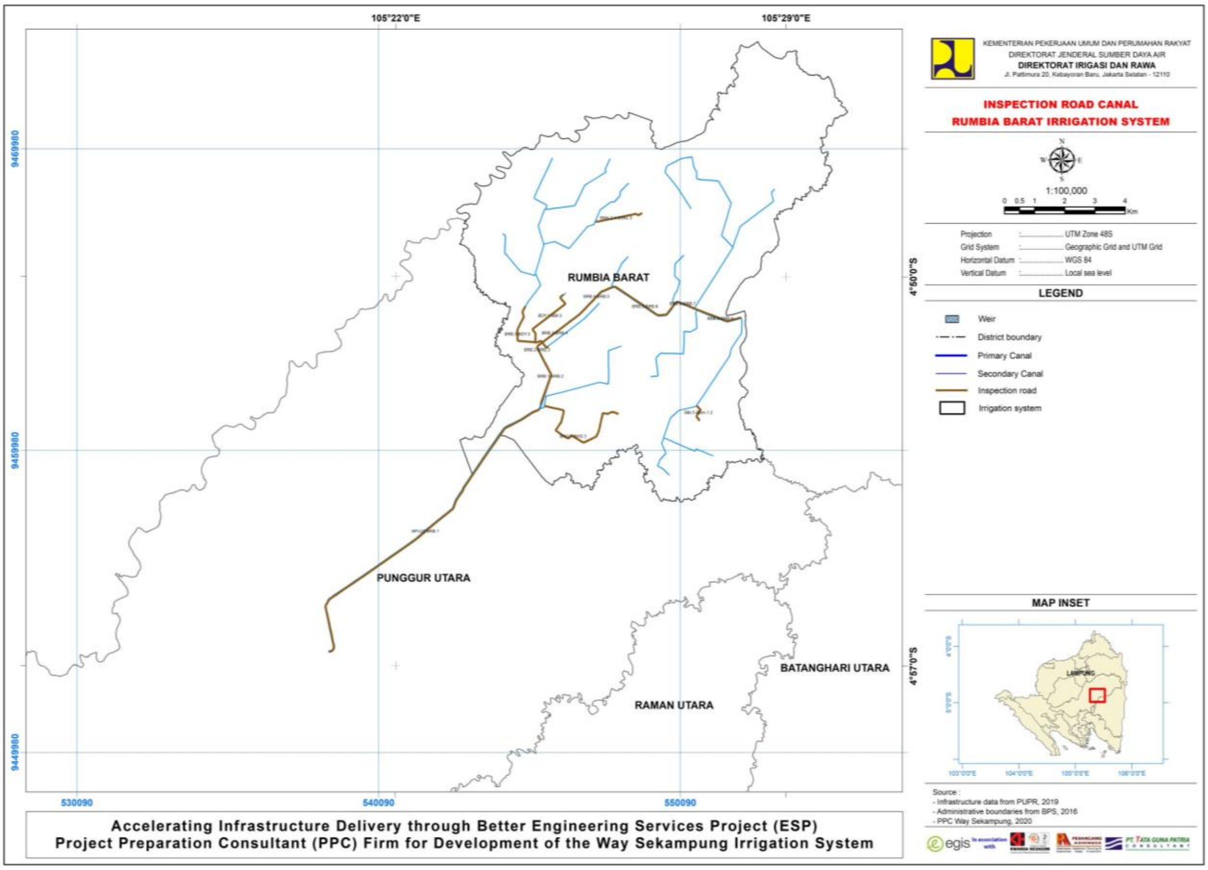


FIGURE 5-124 LOCATION OF IRRIGATION CANAL INSPECTION ROAD (SEKAMPUNG BUNUT)

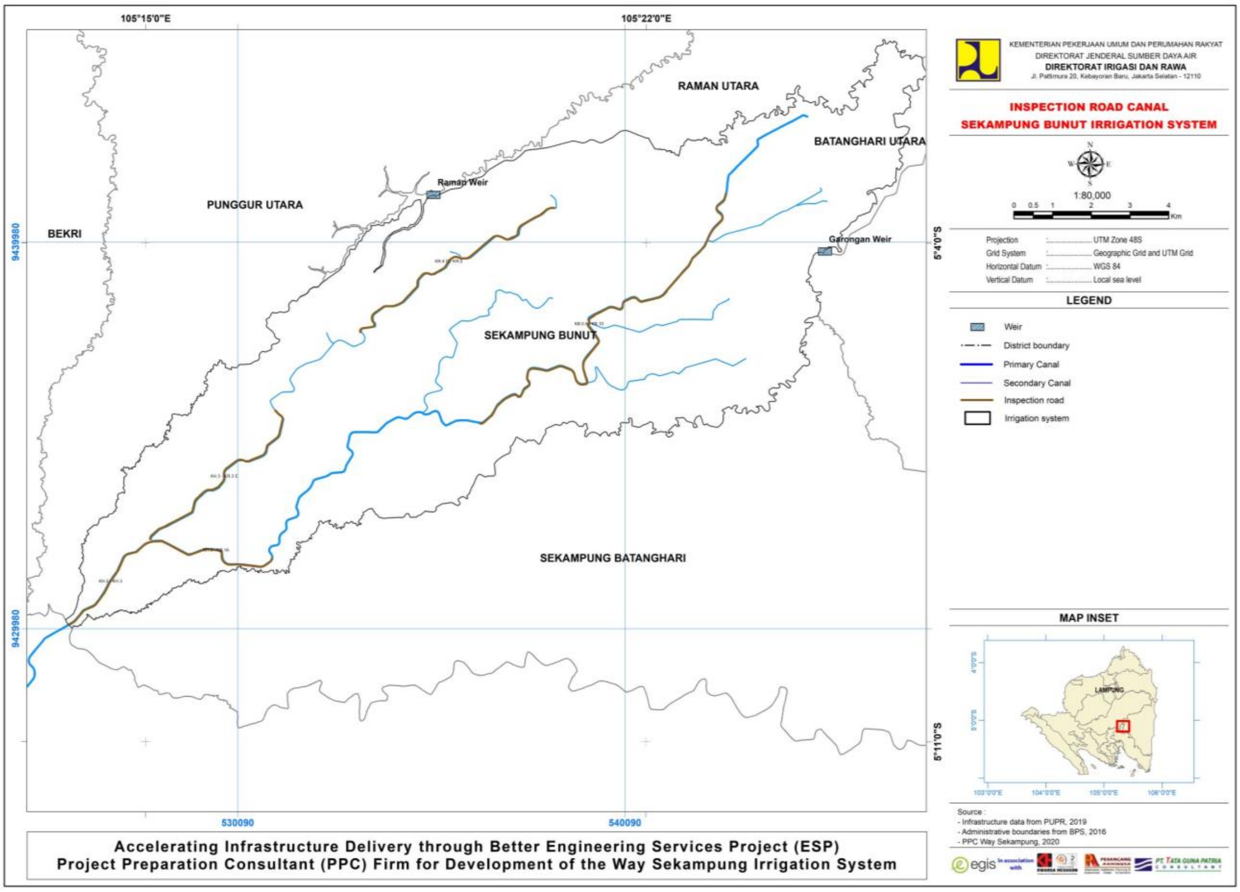


FIGURE 5-125 LOCATION OF IRRIGATION CANAL INSPECTION ROAD (SEKAMPUNG BATANGHARI)

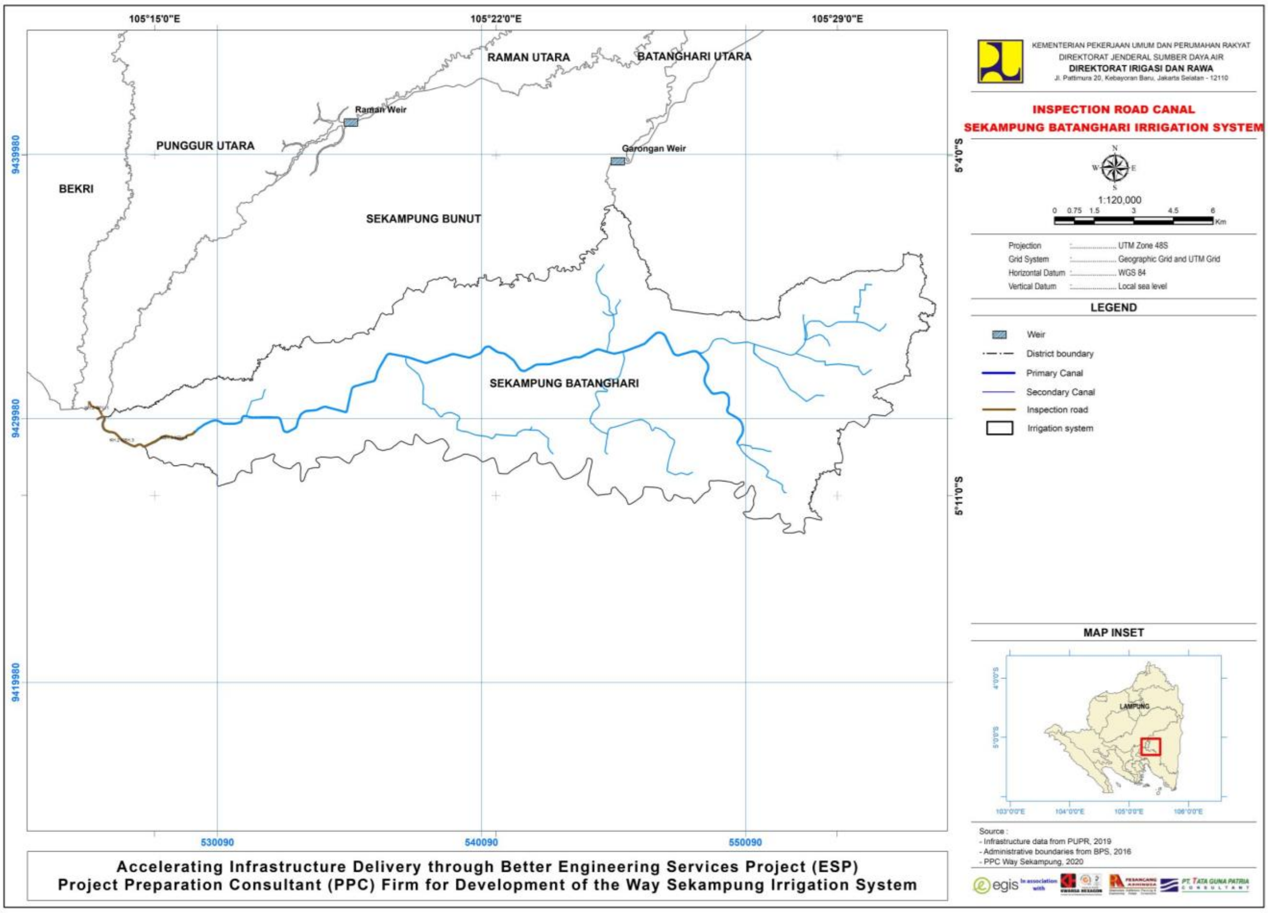


FIGURE 5-126 LOCATION OF IRRIGATION CANAL INSPECTION ROAD (RAMAN UTARA)

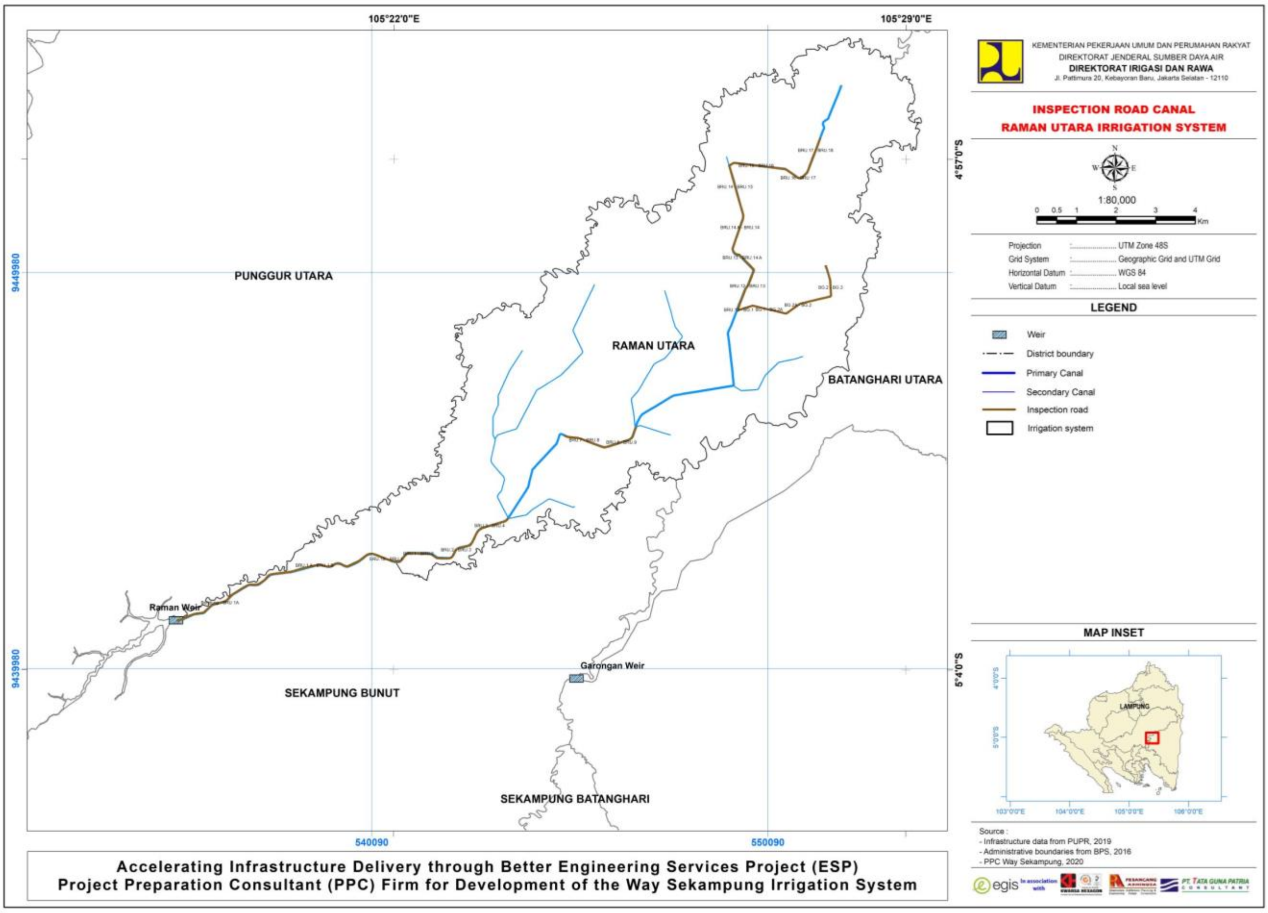
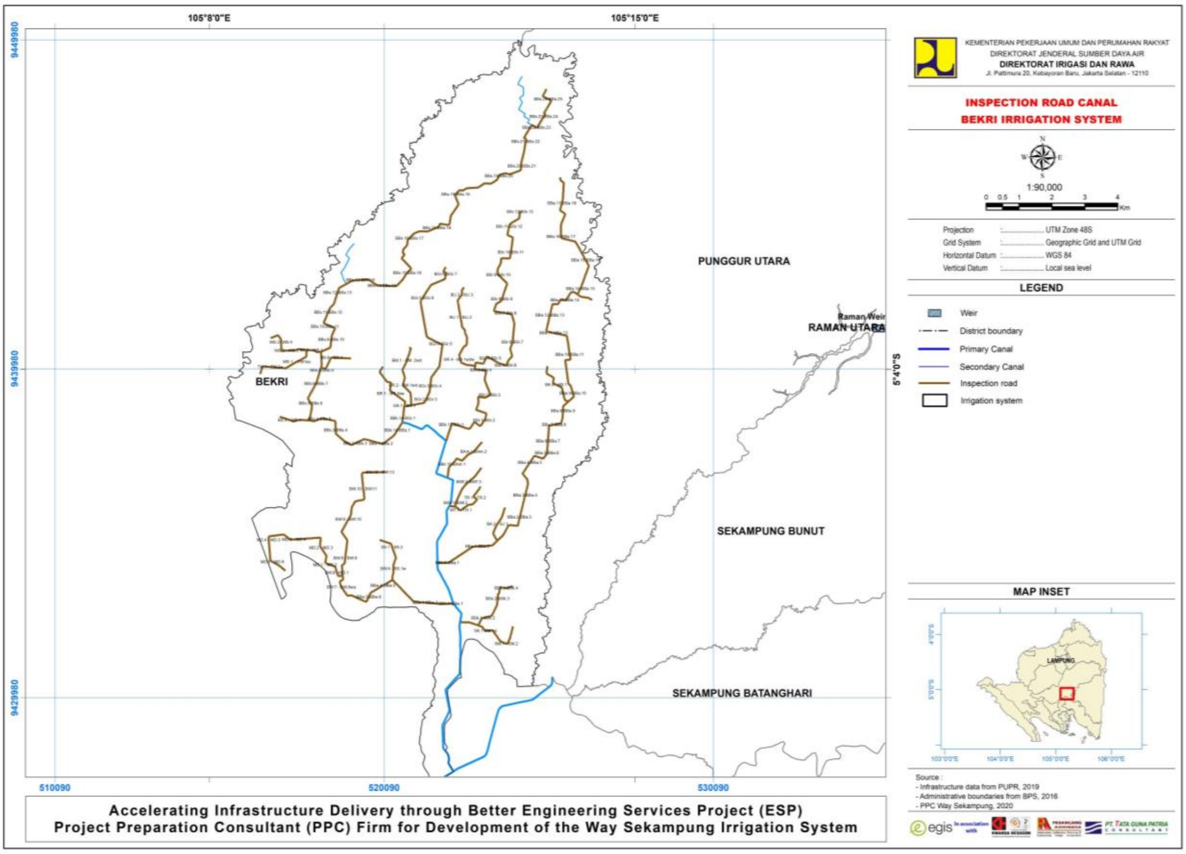


FIGURE 5-127 LOCATION OF IRRIGATION CANAL INSPECTION ROAD (BEKRI)



Inspection roads on the irrigation canal are planned to be spread over 7 (seven) Sub-Systems in Punggur Utara, Rumbia Barat, Sekampung Bunut, Sekampung Batanghari, Batanghari Utara, Raman Utara and Bekri Irrigation Areas. The following are the locations of each inspection road section as shown in the image below.

FIGURE 5-128 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (PUNGGUR UTARA)

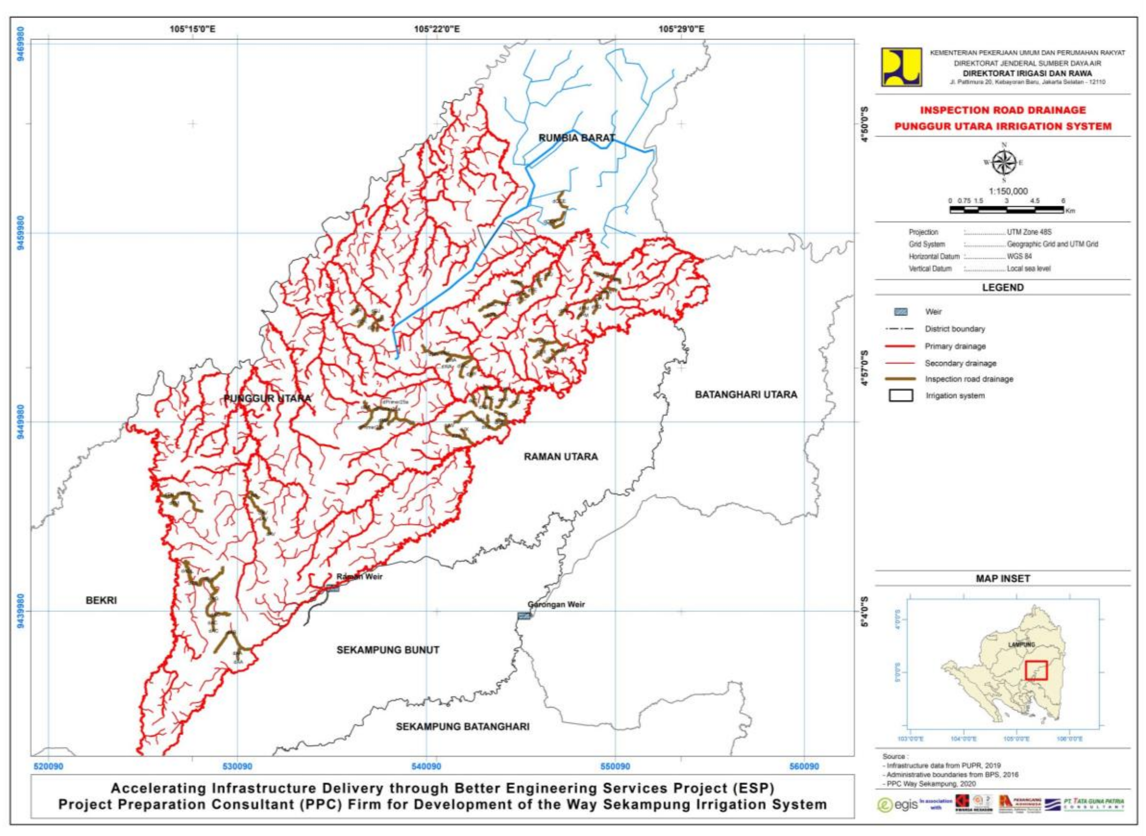


FIGURE 5-129 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (RUMBIA BARAT)

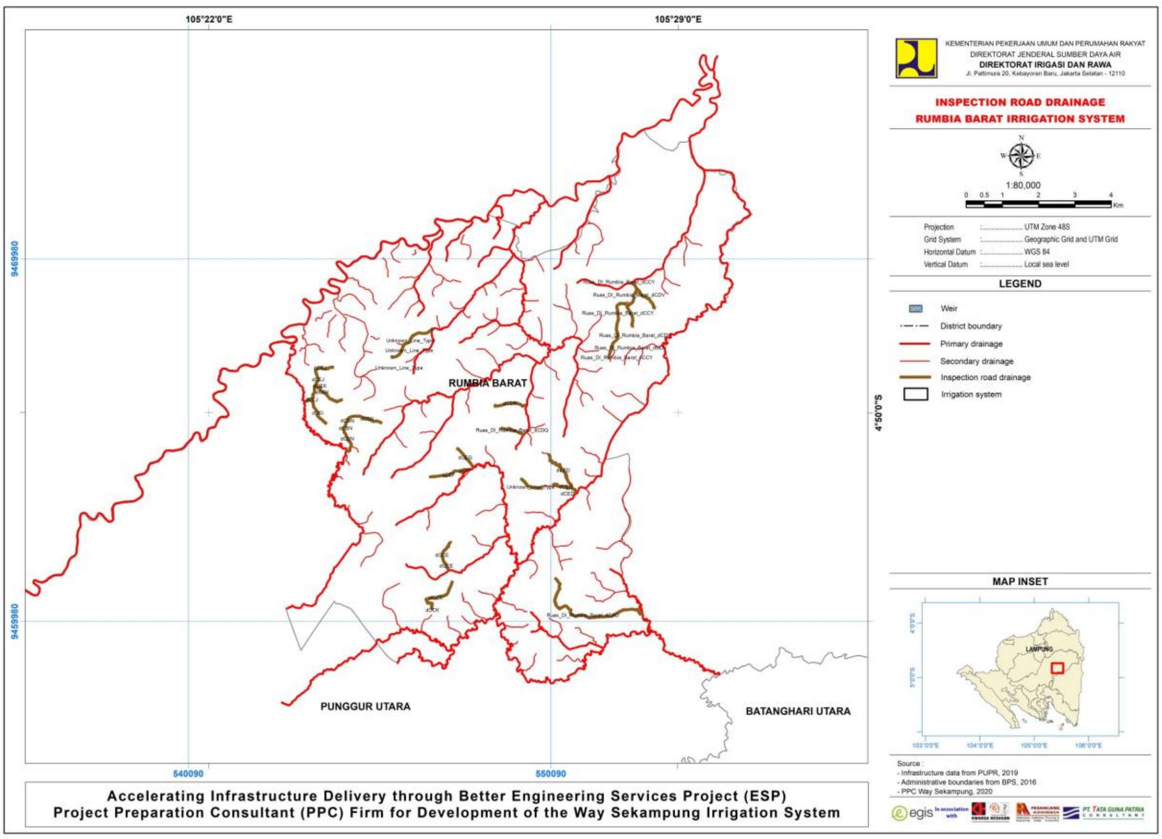


FIGURE 5-130 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (SEKAMPUNG BUNUT)

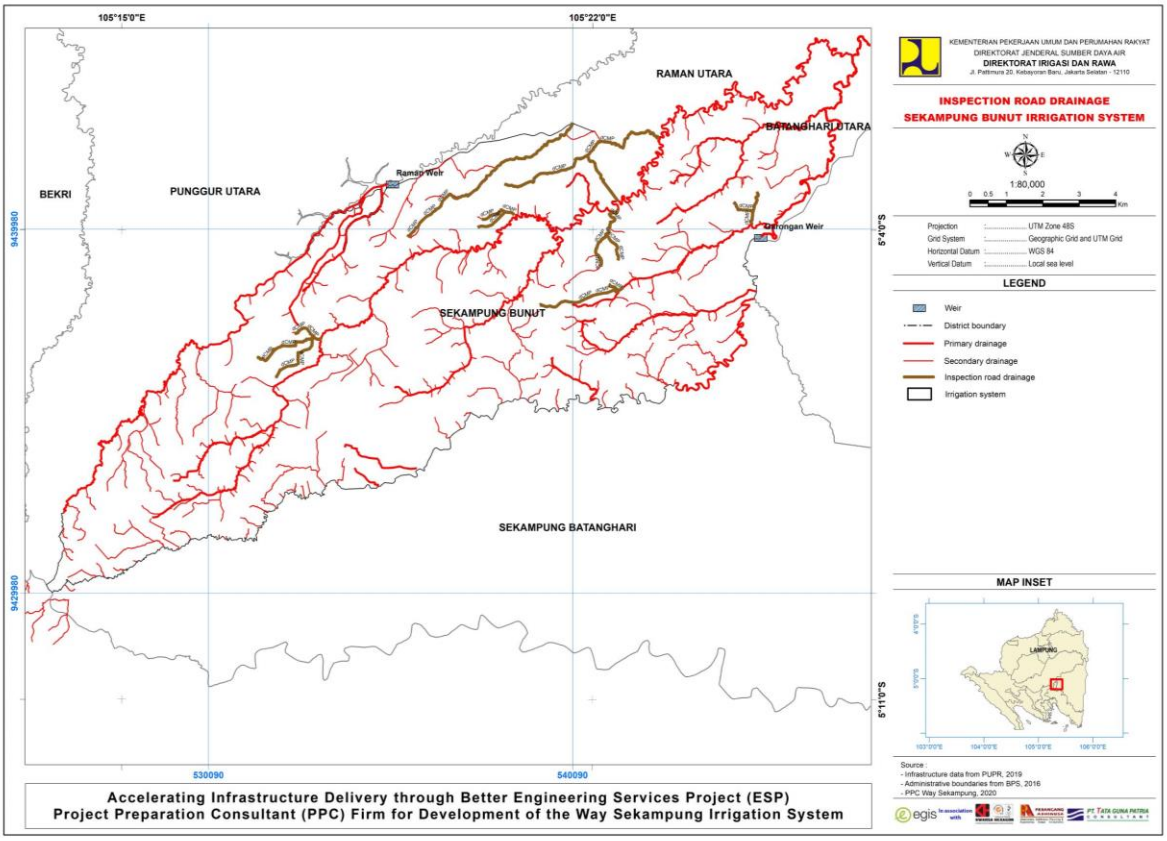


FIGURE 5-131 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (SEKAMPUNG BATANGHARI)

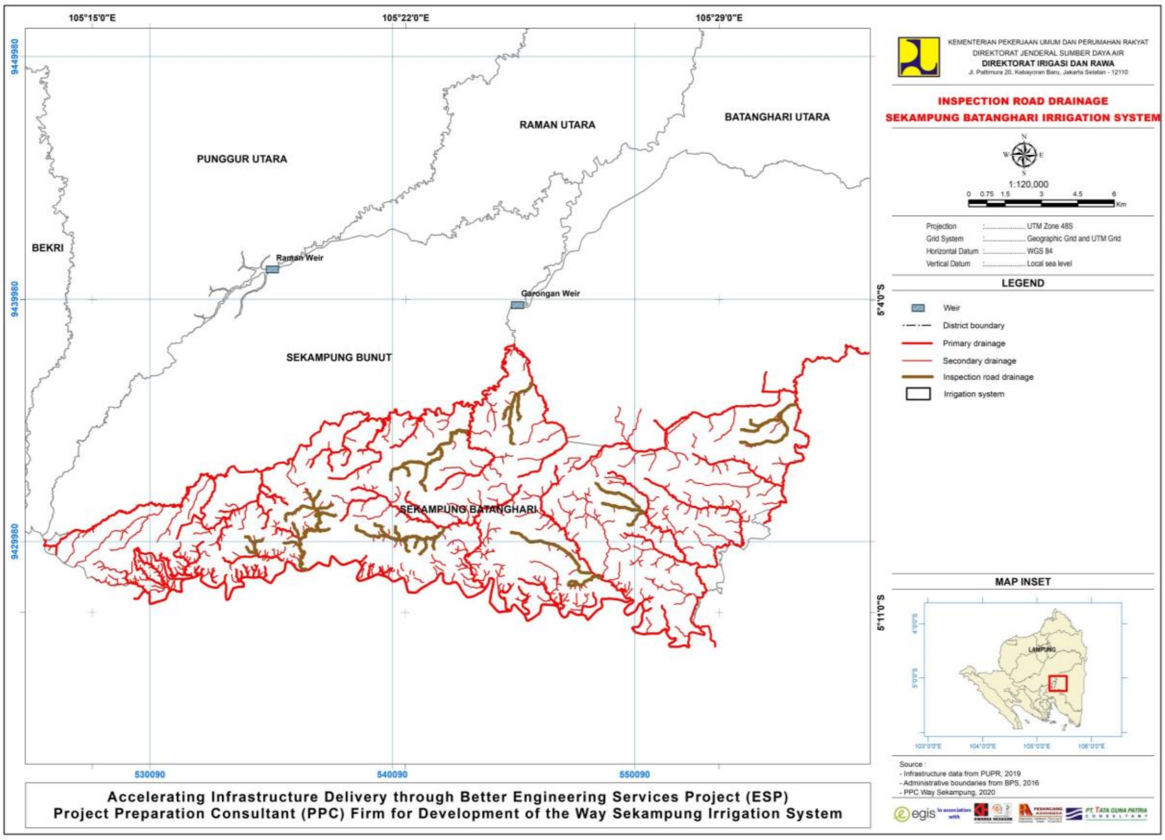


FIGURE 5-132 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (RAMAN UTARA)

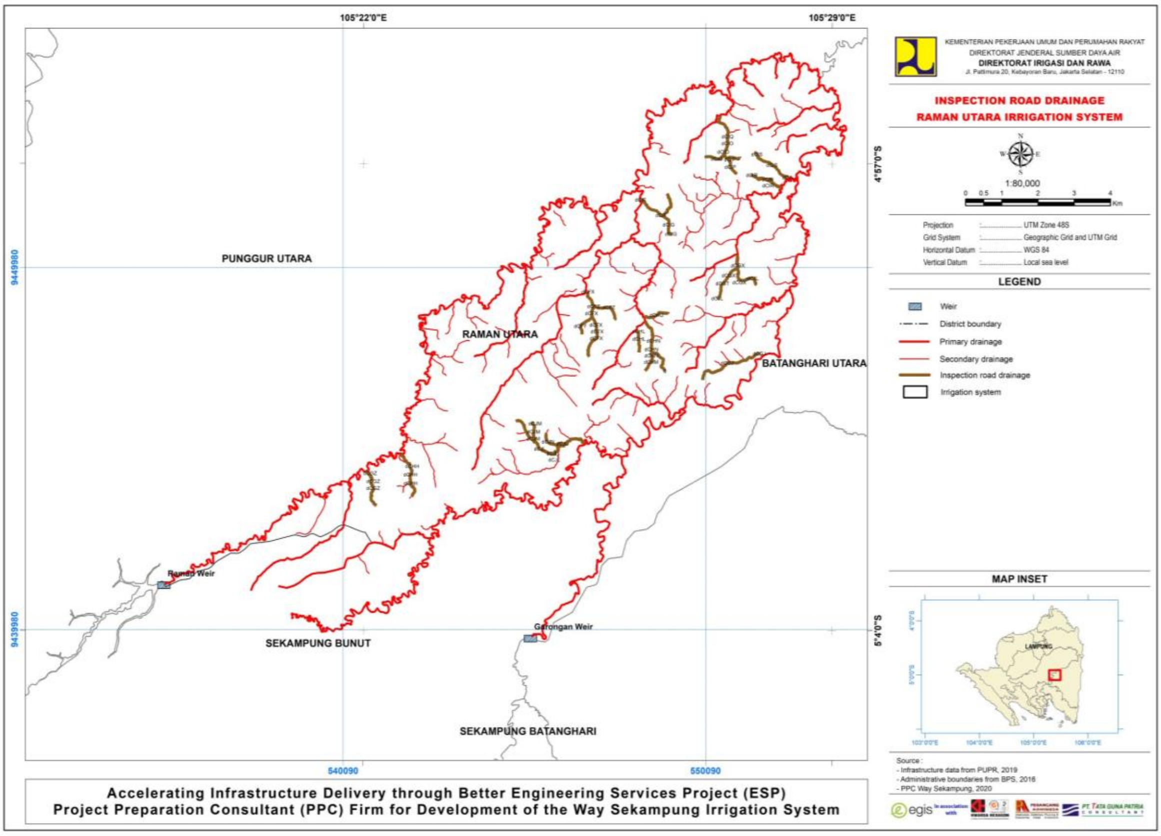


FIGURE 5-133 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (BEKRI)

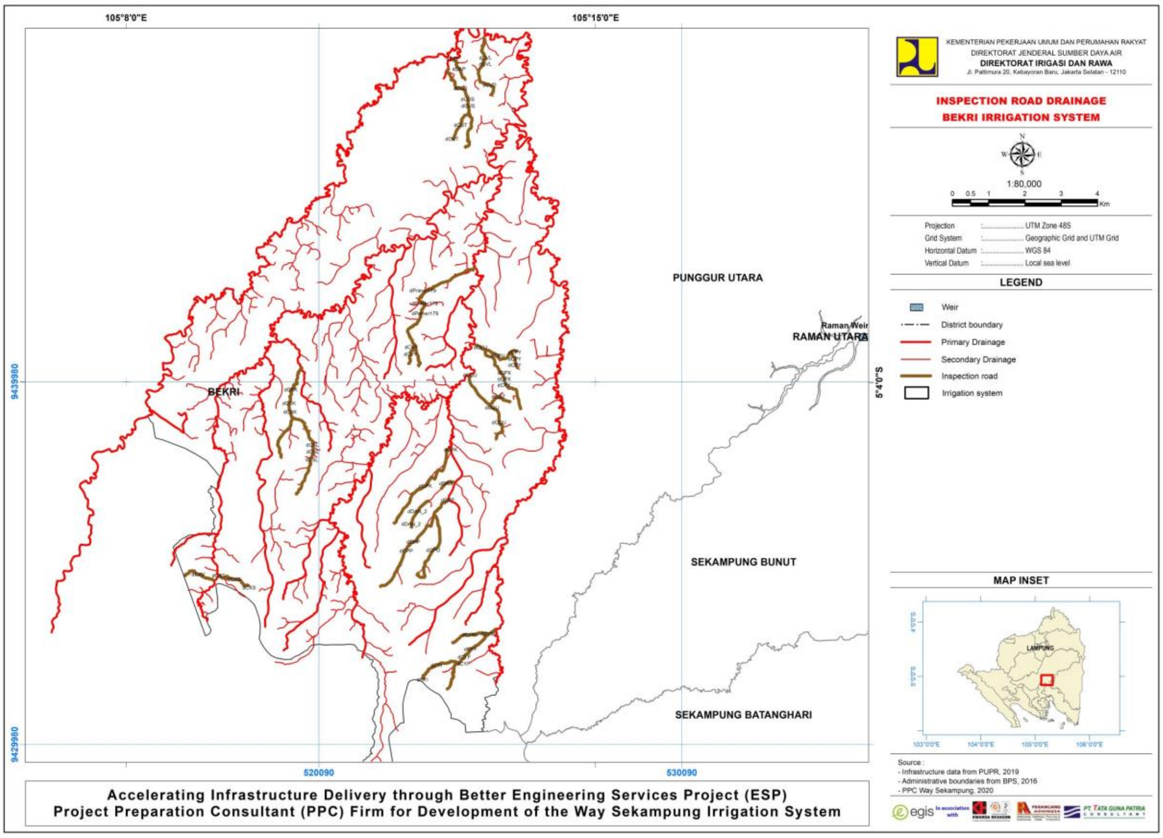
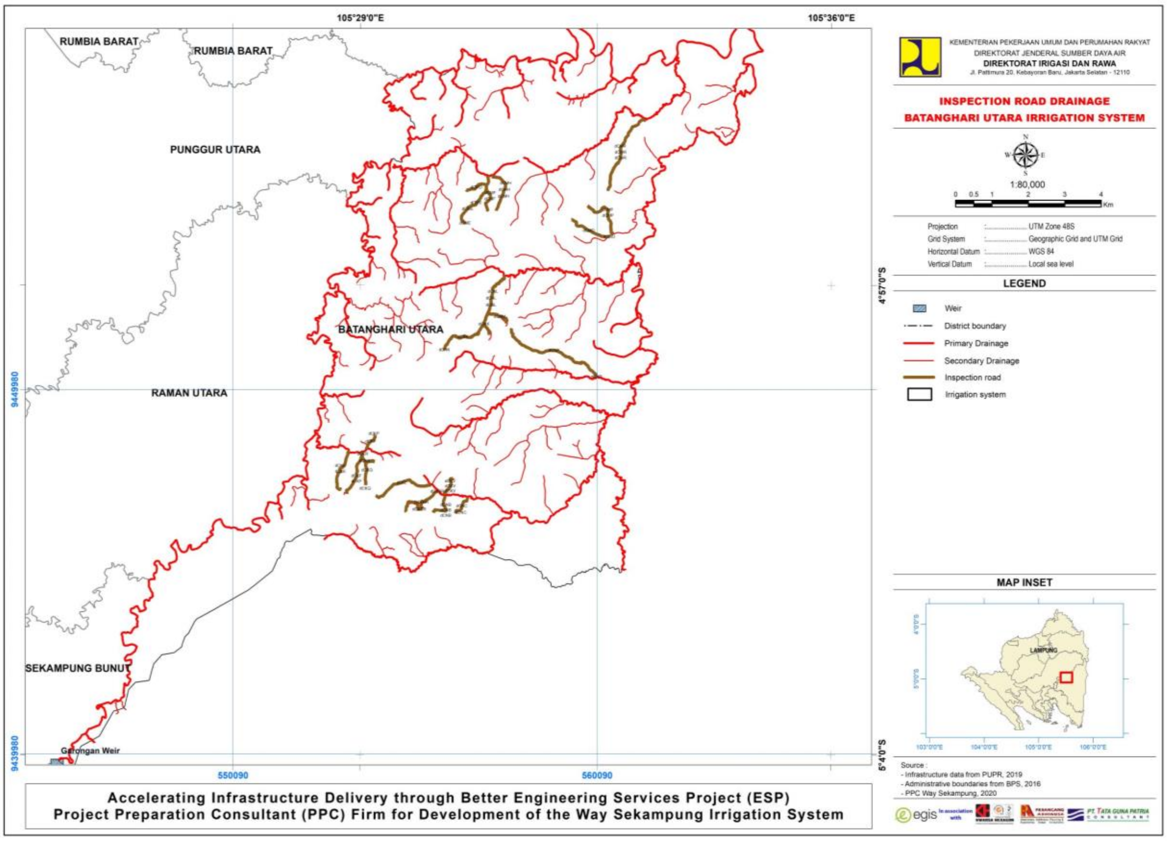


FIGURE 5-134 LOCATION OF DRAINAGE CANAL INSPECTION ROAD (BATANGHARI UTARA)



5.2.5.1.2 - Scope of Inspection Road Works

The Canal Embankment will be used as an Inspection road. Benefits of improving inspection roads is to be access roads and infrastructure to support inspection, operation and maintenance activities of irrigation networks. As part of the planning, the function of the embankment as an inspection and maintenance road is that the surface of the embankment must be passable during the dry season and rainy season. To increase the bearing capacity of the wheel load and road protection on the surface of the embankment, it is necessary to have pavement on the inspection road surface using 2 types of pavement, namely Onderlag and K-225 Concrete. The specifications for inspection road pavement materials in the Irrigation canal and Way Sekampung Drainage Canal are as follows:

- Materials for the inspection road of the Irrigation canal with Onderlag pavement, namely Aggregate (5/7), Split Stone (25 cm), Split Stone (20 cm) and Sand Landslides. The material is compacted using a Vibro Roller. For Concrete pavement, the inspection road material uses Ready Mix Concrete with K-225 Concrete quality, Wiremesh M8 - 8 mm reinforcement and the distance between reinforcement is 15 cm, and Dowel reinforcement D13 - 13 mm.
- Materials for the drainage canal inspection road use unreinforced concrete pavement using Ready Mix Concrete with K-225 Concrete quality.

5.2.5.1.3 - Irrigation canal Inspection Road Design

The design of the Way Sekampung Irrigation Inspection Road is planned to follow the inspection road along the irrigation canal and drainage canal through one of the canal embankments which also acts as a canal protection against existing river/rice/settlement cliffs. The dimensions of the inspection road are adjusted to the needs and refer to the Irrigation Planning Standards/Irrigation Planning Criteria (KP 01 – 09).

Irrigation canal Inspection Road with width : 2.00 – 3.50 m (Primary Irrigation canal) and width : 1.00 – 4.00 m (Secondary Irrigation canal), left and right shoulder @ 1.00 m. The planned pavement is using Onderlag pavement (thickness: 15 cm) and Concrete pavement with Wiremesh M8 - 8mm 1 layer (thickness: 15 cm).

TABLE 5-39 IDENTIFICATION OF ROAD EXISTING IRRIGATION CANALS INSPECTION CONDITIONS AND IMPROVEMENTS

No.	Location	Dimension			Existing Status	Pavement Type Inspection
		Length (m)	Width (m)	Thickness (m)		
RUMBIA BARAT						
1	BPU.22 - BRB.1	11,523	1.50	0.15	Tanah	Onderlag
2	BRB.1 - BRB.2	1,834	1.50	1.15	Tanah - Sub Base	Onderlag
3	BRB.2 - BRB.3	465	1.50	2.15	Tanah	Onderlag
4	BRB.3 - BRB.4	1,812	1.50	3.15	Tanah	Onderlag
5	BRB.4 - BRB.5	1,182	1.50	4.15	Tanah	Onderlag
6	BRB.5 - BRB.6	2,531	1.50	5.15	Tanah	Onderlag
7	BRB.6 - BRB.7	700	1.50	6.15	Tanah - Sub Base	Onderlag
8	BRB.7 - BRB.8	105	1.50	7.15	Tanah - Sub Base	Onderlag
9	BRB.8 - BRB.9	1,543	1.50	8.15	Tanah - Sub Base	Onderlag
10	BHG.1 - BHS.3	4,289	1.00	0.15	Tanah - Sub Base	Onderlag
11	BRB.3 - BDY.3	2,042	1.00	0.15	Tanah - Sub Base	Onderlag
12	BDY.1 - BBT.2	2,320	1.50	0.15	Tanah - Sub Base	Onderlag
13	BRB.3 - BTH.1.1	247	1.50	0.15	Tanah	Onderlag
14	BWN.2.3 - BSKC.3	2,019	1.50	0.15	Tanah - Sub Base	Onderlag
15	BBR.5 - BBM.1.2	621	1.50	0.15	Sub Base	Beton
SEKAMPUNG BATANGHARI						
1	KH.1 - KH.2	1,278	2.00	0.15	Sub Base	Beton
2	KH.2 - BPU.1	748	2.00	0.15	Sub Base	Beton
3	KH.2 - KBH.3	2,580	2.50	0.15	Tanah	Onderlag
4	KBH.3 - KBH.4	2,325	2.00	0.15	Tanah	Onderlag
SEKAMPUNG BUNUT						
1	KH.2 - KH.3	3,157	3.00	0.15	Aspal (Rusak Sedang)	Beton
2	KH.3 - KB.1A	3,568	2.00	0.15	Aspal (Rusak Berat)	Beton
3	KR.4 D - KR.5	6,729	4.00	0.15	Aspal (Rusak Berat)	Beton
4	KB.5 A - KB.10	11,498	3.00	0.15	Aspal (Rusak Berat)	Beton
5	KH.3 - KR.2 E	5,407	3.00	0.15	Sub Base	Beton
RAMAN UTARA						
1	Bendung - BRU 1A	2,453	3.00	0.15	Tanah	Onderlag
2	BRU.1 A - BRU.1 B	2,828	3.00	0.15	Sub Base	Beton
3	BRU.1B - BRU.1	1,119	3.00	0.15	Sub Base	Beton
4	BRU.1 - BRU.2	729	3.00	0.15	Sub Base	Beton
5	BRU.2 - BRU.3	1,431	3.50	0.15	Sub Base	Beton
6	BRU.3 - BRU.4	957	3.50	0.15	Sub Base	Beton
7	BRU.7 - BRU.8	970	3.00	0.15	Sub Base	Beton
8	BRU.8 - BRU.9	1,140	3.00	0.15	Sub Base	Beton
9	BRU.12 - BRU.13	1,315	2.50	0.15	Tanah - Sub Base	Onderlag
10	BRU.13 - BRU.14 A	487	2.50	0.15	Tanah - Sub Base	Onderlag
11	BRU.14 A - BRU.14	1,260	2.50	0.15	Tanah - Sub Base	Onderlag
12	BRU.14 - BRU.15	1,021	2.50	0.15	Tanah - Sub Base	Onderlag
13	BRU.15 - BRU.16	1,298	2.00	0.15	Tanah	Onderlag
14	BRU.16 - BRU.17	1,036	2.50	0.15	Tanah - Sub Base	Onderlag
15	BRU.17 - BRU.18	715	2.00	0.15	Tanah - Sub Base	Onderlag
16	BG.1 - BG.2A	510	3.00	0.15	Tanah - Sub Base	Onderlag
17	BG.2A - BG.2	1,082	3.00	0.15	Tanah - Sub Base	Onderlag
18	BG.2 - BG.3	1,157	3.00	0.15	Tanah - Sub Base	Onderlag
19	BRU.12 - BG.1	563	3.00	0.15	Tanah - Sub Base	Onderlag
PUNGGUR UTARA						
1	BPU.1 - BPU.2	1,520	3.50	0.15	Tanah - Sub Base	Onderlag
2	BPU.2 - BPU.3	2,019	3.50	0.15	Tanah - Sub Base	Onderlag
3	BPU.3 - BPU.4	514	3.50	0.15	Sub Base	Beton

No.	Location	Dimension			Existing Status	Pavement Type Inspection
		Length (m)	Width (m)	Thickness (m)		
4	BPU.4 - BPU.5	2,559	3.50	0.15	Sub Base	Beton
5	BPU.5 - BPU.6	1,496	3.00	0.15	Sub Base	Beton
6	BPU.6 - BPU.7	1,385	3.00	0.15	Sub Base	Beton
7	BPU.7 - BPU.8	2,068	3.00	0.15	Sub Base	Beton
8	BPU.8 - BPU.9	844	3.00	0.15	Tanah - Sub Base	Onderlag
9	BPU.9 - BPU.10	1,076	3.00	0.15	Sub Base	Beton
10	BPU.10 - BPU.11	771	3.00	0.15	Sub Base	Beton
11	BPU.11 - BPU.12	1,780	3.00	0.15	Sub Base	Beton
12	BPU.11 - BD.2	1,598	2.50	0.15	Sub Base	Beton
13	BPU.13 - BE.4	3,417	2.50	0.15	Sub Base	Beton
14	BPU.15 - BF.5	6,068	2.50	0.15	Tanah	Onderlag
15	BD.2 - BD.4	2,122	2.50	0.15	Tanah - Sub Base	Onderlag
16	BD.3 - BS	2,343	2.00	0.15	Tanah	Onderlag
17	BD.8 - BD.10	2,149	2.50	0.15	Tanah - Sub Base	Onderlag
18	BD.10 - BD.11	1,035	2.50	0.15	Sub Base	Beton
19	BH.2 - BH.3	2,495	2.50	0.15	Sub Base	Beton
20	BH.3 - BH.4	1,654	2.50	0.15	Sub Base	Beton
21	BH.4 - BH.5	673	2.50	0.15	Tanah	Onderlag
22	BH.5 - BH.6	1,414	2.50	0.15	Sub Base	Beton
23	BH.6 - BH.7	1,605	2.50	0.15	Tanah	Onderlag
24	BH.7 - BH.8	1,231	2.50	0.15	Sub Base - Tanah	Beton
25	BH.8 - BH.9	1,164	2.00	0.15	Tanah - Sub Base	Onderlag
26	BM.6 - BM.7	2,241	3.50	0.15	Aspal (Rusak Sedang)	Beton
27	BM.7 - BME.1	1,192	2.50	0.15	Tanah - Sub Base	Onderlag
28	BME.1 - BME.2	2,107	3.50	0.15	Sub Base	Beton
29	BME.1 - BMF1	1,936	3.00	0.15	Sub Base	Beton
30	BMF.1 - BMF.2	976	3.00	0.15	Sub Base	Beton
BEKRI						
1	BBK.3 - SK.1	560	2.00	0.15	Tanah	Onderlag
2	SK.1 - SK.2	655	2.00	0.15	Tanah	Onderlag
3	SK.2 - SK.3	870	2.00	0.15	Tanah	Onderlag
4	SK.3 - SK.4	308	2.00	0.15	Tanah	Onderlag
5	BK.4 - BW.1	358	2.50	0.15	Tanah - Sub Base	Onderlag
6	BW.1 - BW.2	609	3.00	0.15	Tanah - Sub Base	Onderlag
7	BW.4 - BW.5	573	3.00	0.15	Tanah	Onderlag
8	BW.5 - BW.6	559	3.00	0.15	Tanah	Onderlag
9	BBK.6 - BA.1	622	3.00	0.15	Tanah - Sub Base	Onderlag
10	BA.1 - BA.2	1,388	3.00	0.15	Tanah - Sub Base	Onderlag
11	BA.2 - BA.3	951	3.00	0.15	Tanah	Onderlag
12	BA.3 - BA.4	1,659	3.50	0.15	Tanah - Sub Base	Onderlag
13	BA.4 - BA.5	644	3.00	0.15	Tanah - Sub Base	Onderlag
14	BA.5 - BA.6	450	3.00	0.15	Tanah	Onderlag
15	BA.6 - BA.7	692	3.00	0.15	Tanah	Onderlag
16	BA.7 - BA.8	549	3.00	0.15	Tanah	Onderlag
17	BA.8 - BA.9	634	3.00	0.15	Tanah	Onderlag
18	BA.9 - BA.10	1,165	1.50	0.15	Tanah - Sub Base	Onderlag
19	BA.10 - BA.11	1,053	1.50	0.15	Tanah - Sub Base	Onderlag
20	BA.11 - BA.12	874	1.50	0.15	Tanah	Onderlag
21	BA.12 - BA.13	553	1.50	0.15	Tanah - Sub Base	Onderlag
22	BA.13 - BA.14	1,051	1.50	0.15	Tanah - Sub Base	Onderlag
23	BA.14 - BA.15	313	2.50	0.15	Tanah - Sub Base	Onderlag
24	BA.15 - BA.16	1,630	2.50	0.15	Tanah	Onderlag
25	BA.16 - BA.17	596	2.50	0.15	Tanah	Onderlag
26	BA.17- BA.18	1,662	3.00	0.15	Tanah	Onderlag
27	BK.8 - WT.1	178	2.50	0.15	Tanah - Sub Base	Onderlag
28	WT.1-WT.2	275	2.50	0.15	Tanah	Onderlag
29	WT.2-WT.3	1,184	2.50	0.15	Tanah	Onderlag
30	BK.10 - AM.1	883	2.00	0.15	Tanah	Onderlag
31	AM.1 - AM.2	798	2.00	0.15	Tanah	Onderlag
32	BK.12 - SR.1	1,054	2.50	0.15	Tanah - Sub Base	Onderlag
33	SR.1 - SR.2	1,375	2.50	0.15	Tanah	Onderlag

No.	Location	Dimension			Existing Status	Pavement Type Inspection
		Length (m)	Width (m)	Thickness (m)		
34	SR.2 - SR.3	1,296	2.50	0.15	Tanah	Onderlag
35	SR.3 - SR.4	570	2.50	0.15	Onderlag	Beton
36	SR.4 - SR.5	682	2.50	0.15	Tanah - Sub Base	Onderlag
37	SR.5 - SR.6	643	2.50	0.15	Tanah - Sub Base	Onderlag
38	SR.6 - SR.7	1,275	2.50	0.15	Tanah	Onderlag
39	SR.7 - SR.8	835	2.50	0.15	Tanah - Sub Base	Onderlag
40	SR.8 - SR.9	843	2.50	0.15	Tanah - Sub Base	Onderlag
41	SR.9 - SR.10	862	2.50	0.15	Tanah - Sub Base	Onderlag
42	SR.10 - SR.11	1,095	2.50	0.15	Tanah - Sub Base	Onderlag
43	SR.11 - SR.12	687	2.50	0.15	Tanah	Onderlag
44	SR.12 - SR.13	281	2.50	0.15	Tanah	Onderlag
45	BK.14 -GR.1	495	2.00	0.15	Tanah - Sub Base	Onderlag
46	GR.1 - GR.2	221	2.00	0.15	Tanah	Onderlag
47	GR.2 - GR.3	449	2.00	0.15	Tanah	Onderlag
48	GR.3 - GR.4	938	2.00	0.15	Tanah - Sub Base	Onderlag
49	GR.4 - GR.5	1,893	2.00	0.15	Tanah - Sub Base	Onderlag
50	GR.5 - GR.6	1,542	2.00	0.15	Tanah - Sub Base	Onderlag
51	GR.6 - GR.7	534	2.00	0.15	Tanah	Onderlag
52	BK.14 - BS.1	702	2.50	0.15	Tanah - Sub Base	Onderlag
53	BS.1 - BS.2	724	2.50	0.15	Tanah - Sub Base	Onderlag
54	BS.2 - BS.3	745	2.50	0.15	Tanah - Sub Base	Onderlag
55	BS.3 - BS.4	944	2.50	0.15	Tanah	Onderlag
56	BS.4 - BS.5	564	2.00	0.15	Tanah - Sub Base	Onderlag
57	BS.5 - BS.6	1,077	2.50	0.15	Tanah - Sub Base	Onderlag
58	BS.6 - BS.7	401	3.00	0.15	Tanah - Sub Base	Onderlag
59	BS.7 - BS.8	245	3.00	0.15	Tanah - Sub Base	Onderlag
60	BS.8 - BS.9	484	3.00	0.15	Tanah - Sub Base	Onderlag
61	BS.9 - BS.10	994	3.00	0.15	Tanah - Sub Base	Onderlag
62	BS.10 - BS.11	422	2.00	0.15	Tanah	Onderlag
63	BS.11 - BS.12	506	2.00	0.15	Tanah - Sub Base	Onderlag
64	BS.12 - BS.13	778	2.00	0.15	Tanah - Sub Base	Onderlag
65	BS.13 - BS.14	895	2.00	0.15	Tanah - Sub Base	Onderlag
66	BS.14 - BS.15	423	2.00	0.15	Tanah - Sub Base	Onderlag
67	BS.15 - BS.16	1,640	2.00	0.15	Tanah - Sub Base	Onderlag
68	BS.16 - BS.17	928	2.00	0.15	Tanah - Sub Base	Onderlag
69	BS.17 - BS.18	829	2.00	0.15	Tanah - Sub Base	Onderlag
70	BS.18 - BS.19	2,201	2.50	0.15	Tanah - Sub Base	Onderlag
71	BS.19 - BS.20	802	2.50	0.15	Tanah - Sub Base	Onderlag
72	BS.20 - BS.21	663	2.00	0.15	Tanah - Sub Base	Onderlag
73	BS.21 - BS.22	1,148	2.50	0.15	Tanah - Sub Base	Onderlag
74	BS.22 - BS.23	385	3.00	0.15	Tanah - Sub Base	Onderlag
75	BS.23 - BS.24	447	3.00	0.15	Tanah - Sub Base	Onderlag
76	BS.24 - BS.25	827	3.00	0.15	Tanah	Onderlag
77	BA.14 - SW.1	473	1.50	0.15	Tanah	Onderlag
78	WT.1 - TR.1	465	2.00	0.15	Tanah	Onderlag
79	TR.1 - TR.2	822	2.00	0.15	Tanah	Onderlag
80	SR.4 - BU.1	1,446	2.00	0.15	Tanah	Onderlag
81	BU.1 - BU.2	932	2.00	0.15	Tanah - Sub Base	Onderlag
82	BU.2 - BU.3	531	1.50	0.15	Tanah	Onderlag
83	GR.1 - BR.1	648	1.50	0.15	Tanah - Sub Base	Onderlag
84	BR.1 - BR.2	965	1.50	0.15	Tanah	Onderlag
85	GR.2 - BM.1	1,149	1.50	0.15	Tanah	Onderlag
86	BM.1 - BM .2	793	1.50	0.15	Tanah	Onderlag
87	BS.5 - WR.1	359	2.00	0.15	Tanah	Onderlag
88	WR.1 - WR.2	559	2.00	0.15	Tanah - Sub Base	Onderlag
89	BS.8 - BO.1	1,123	2.00	0.15	Tanah	Onderlag
90	BS.9 - WS.1	445	2.00	0.15	Tanah	Onderlag
91	WS.1 - WS.2	458	2.00	0.15	Tanah	Onderlag
92	WS.2 - WS.3	338	2.00	0.15	Tanah	Onderlag
93	WS.3- WS.4	508	2.00	0.15	Tanah	Onderlag
94	WS.4- WS.5	183	2.00	0.15	Tanah	Onderlag
95	WS.1 - TM1	972	2.00	0.15	Tanah	Onderlag

No.	Location	Dimension			Existing Status	Pavement Type Inspection
		Length (m)	Width (m)	Thickness (m)		
96	TM.1 - TM.2	898	2.00	0.15	Tanah	Onderlag
97	SK.1 SM.1	455	2.00	0.15	Tanah	Onderlag
98	SM.1 - SM.2	1,233	2.00	0.15	Tanah	Onderlag
99	BW.4 - SS.1	634	2.00	0.15	Tanah	Onderlag
100	SS.1 - SS.2	880	2.00	0.15	Tanah	Onderlag
101	BW.6 - BW.7	374	2.50	0.15	Tanah	Onderlag
102	BW.7 - BW.8	880	2.50	0.15	Tanah	Onderlag
103	BW.8 - BW.9	1,146	2.50	0.15	Tanah	Onderlag
104	BW.9 - BW.10	1,427	2.50	0.15	Tanah	Onderlag
105	BW.10 - BW.11	1,015	2.50	0.15	Tanah	Onderlag
106	BW.11 - BW.12	280	2.50	0.15	Tanah	Onderlag
107	BW.12 - BW.13	367	2.50	0.15	Tanah	Onderlag
108	BW.8 - MD.1	504	2.00	0.15	Tanah	Onderlag
109	MD.1 - MD.2	389	2.00	0.15	Tanah	Onderlag
110	MD.2 - MD.3	710	2.00	0.15	Tanah	Onderlag
111	MD.3 - MD.4	1,473	2.00	0.15	Tanah	Onderlag
112	MD.4 - MD.5	402	2.00	0.15	Tanah	Onderlag
113	MD.5 - MD.6	984	2.00	0.15	Tanah	Onderlag
114	BA.2 - SJ.1	1,126	2.00	0.15	Tanah	Onderlag
115	BA.9 - KB.1	1,421	2.00	0.15	Tanah	Onderlag
	TOTAL	**237,453**	**m**			

The Inspection Road is located on the edge of the secondary and primary irrigation canals which are connected to the inspection road of the canal and the main road. The width of the irrigation canal inspection road is as shown in Table 5-39 with a slope of 1:20 and there is a side road shoulder of 1.0 meter wide. Construction of drainage roads using Onderlag pavement and K-225 Concrete. Typical details of a canal line inspection path can be seen in Figure 5-135, Figure 5-136, Figure 5-137, Figure 5-138, Figure 5-139 and Figure 5-140.

FIGURE 5-135 TYPICAL INSPECTION ROAD OF IRRIGATION CANAL OF CONDITION I

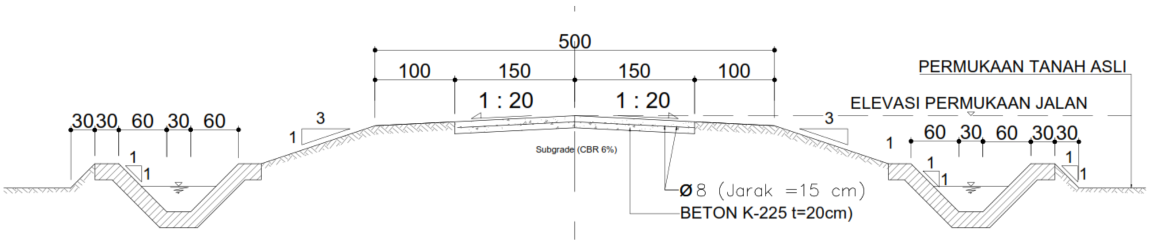


FIGURE 5-136 TYPICAL INSPECTION ROAD OF IRRIGATION CANAL OF CONDITION II

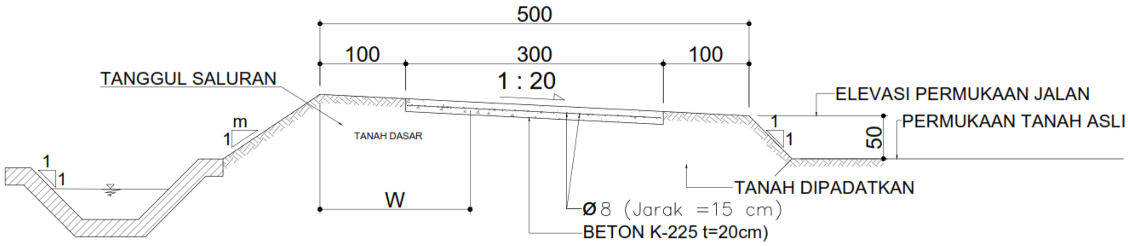


FIGURE 5-137 TYPICAL INSPECTION ROAD OF IRRIGATION CANAL OF CONDITION III

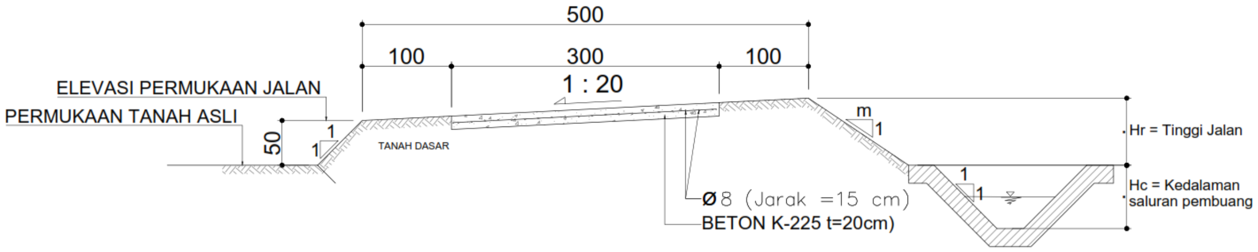


FIGURE 5-138 TYPICAL INSPECTION ROAD OF IRRIGATION CANAL OF CONDITION IV

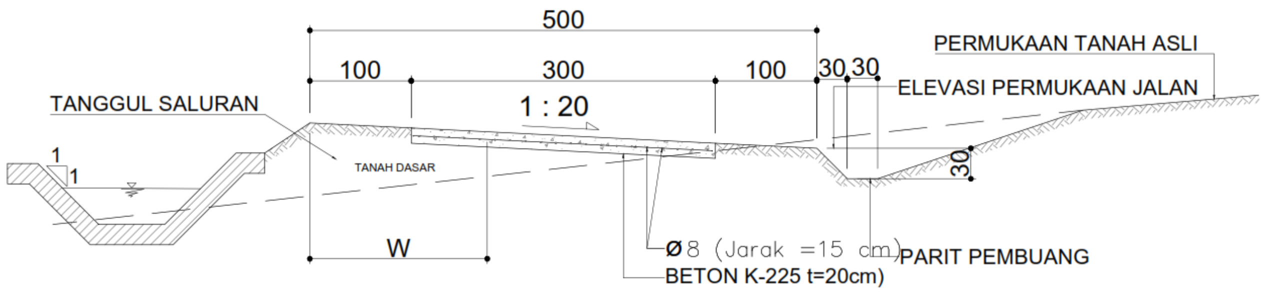


FIGURE 5-139 TYPICAL INSPECTION ROAD OF IRRIGATION CANAL OF CONCRETE K-225

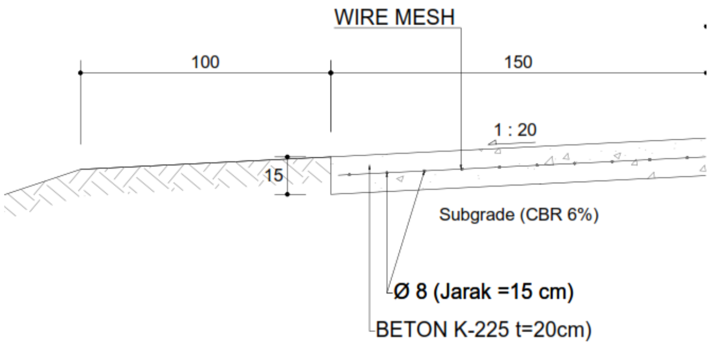
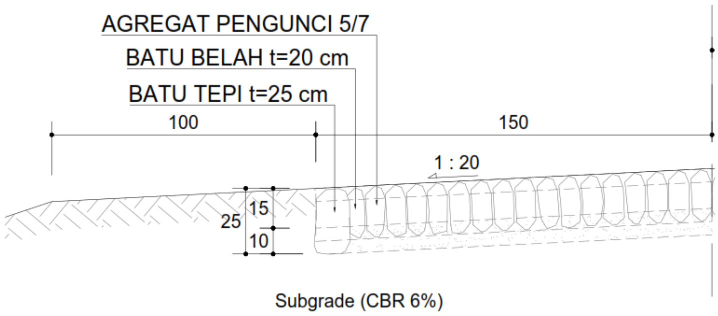


FIGURE 5-140 TYPICAL INSPECTION ROAD OF IRRIGATION CANAL OF ONDERLAG



5.2.5.2 - Shelter Gates

Shelter gate is used to protect the gate from rain so as to reduce the level of corrosion. Shelter gates are construct on the gates of the offtake and intake structures in order to complete the function of the gates. The following is a shelter gate that was built in the Way Sekampung irrigation area.

TABLE 5-40 LOCATION OF SHELTER GATE CONSTRUCTION IN WAY SEKAMPUNG

No	Irrigation Area	Canal Name	Location
1	Batanghari Utara	Saluran induk BG	G10
2	Batanghari Utara	Saluran induk BG	G8
3	Batanghari Utara	Saluran induk BG	G9
4	Batanghari Utara	Saluran sekunder TK	TK1
5	Batanghari Utara	Saluran induk BG	G1
6	Batanghari Utara	Saluran induk BG	G5
7	Sekampung Bunut	Saluran induk KH	KH3KB1A
8	Sekampung Bunut	Saluran induk KB	KB1
9	Sekampung Bunut	Saluran induk KB	KB3
10	Sekampung Bunut	Saluran induk KB	KB5
11	Sekampung Bunut	Saluran induk KB	KB6
12	Sekampung Batanghari	Saluran induk KBH	KBH12
13	Punggur Utara	Saluran sekunder BC	BC7BGS
14	Punggur Utara	Saluran induk BPU	BPU8BC
15	Punggur Utara	Saluran induk BPU	BPU 26 BQ
16	Punggur Utara	Saluran induk BPU	BPU 22 BM

FIGURE 5-141 LOCATION OF SHELTER GATES OF THE WAY SEKAMPUNG IRRIGATION AREA

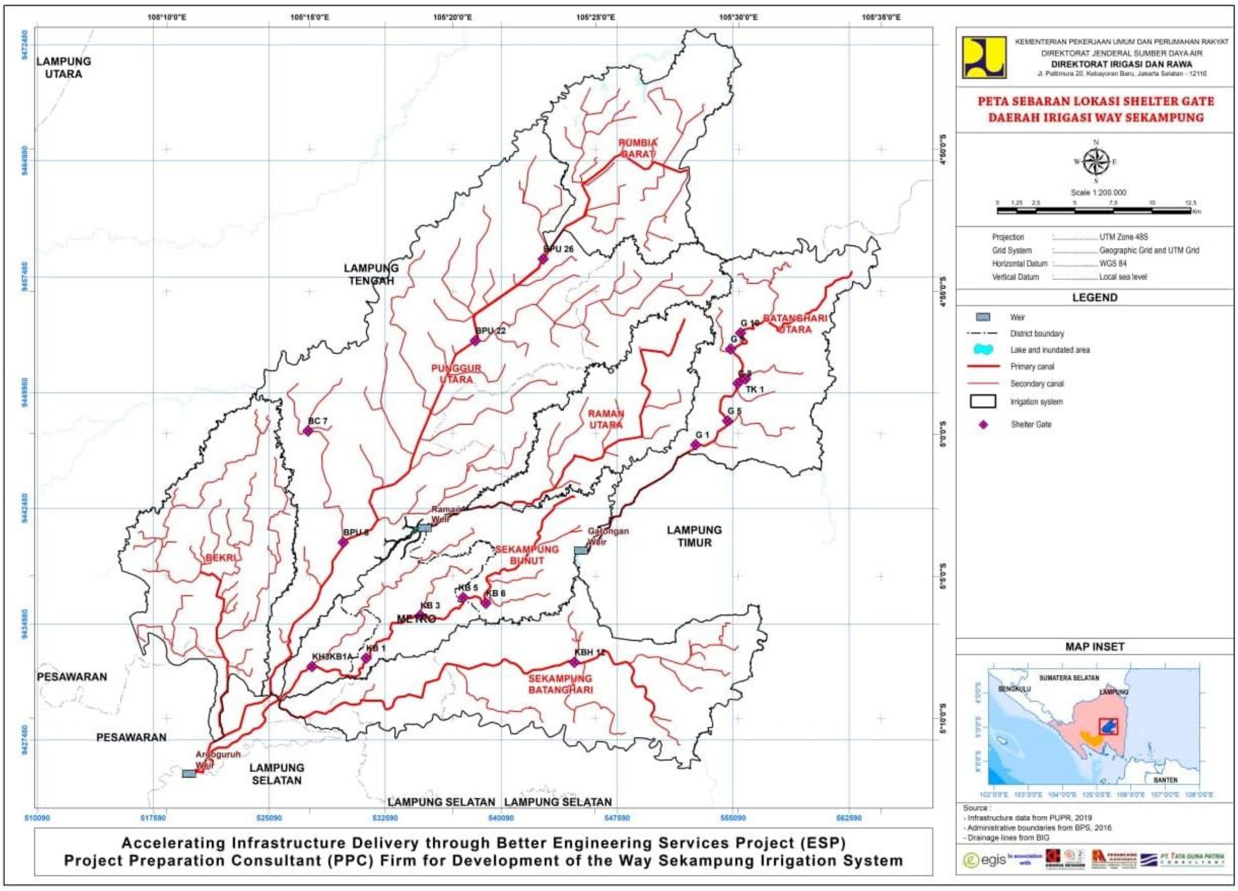
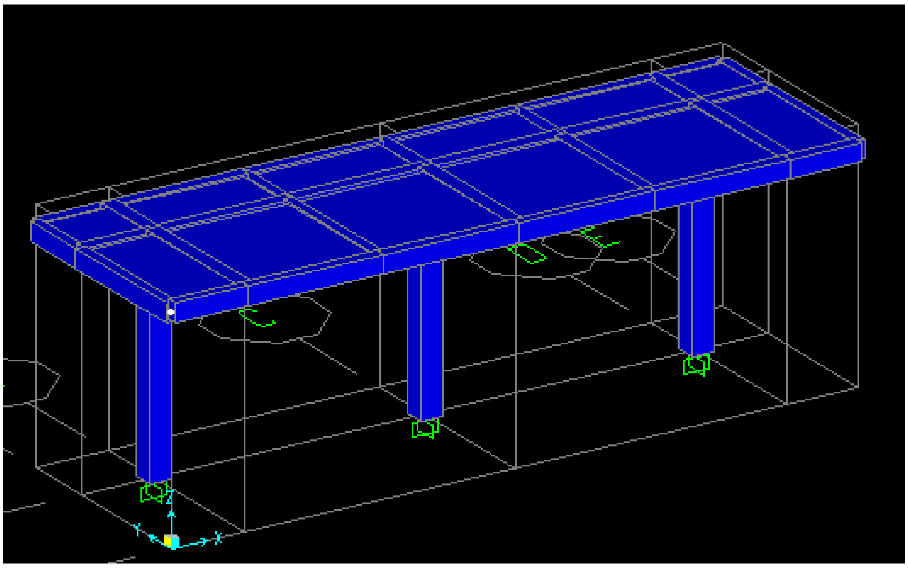
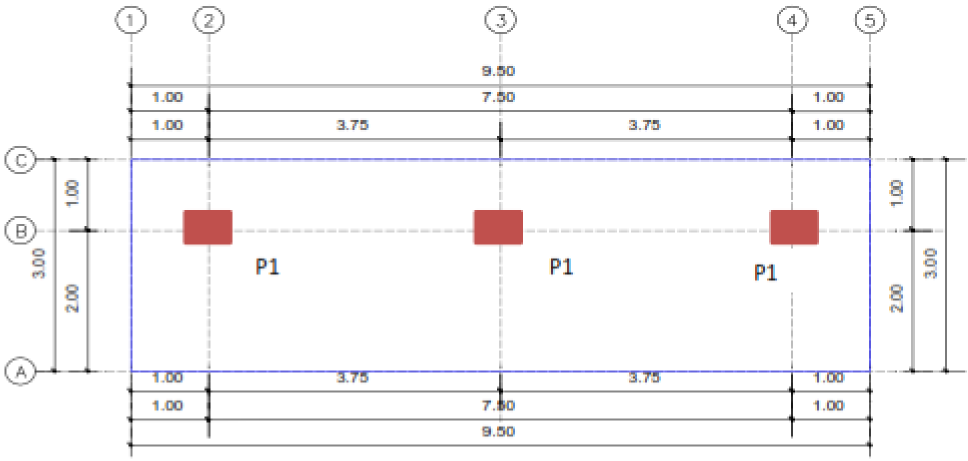


FIGURE 5-142 SHELTER GATE MODEL



The shelter gate structure uses K-175 concrete casting with 25 cm long padestal anchor iron to stick the structure. Frame and roof work uses K-225 concrete with iron. The sluice gates shelter is equipped with a typical siger ornament from Lampung. The following is the foundation plan of the Way Sekampung floodgate shelter. Details of analysis and design can be seen in

FIGURE 5-143 PLAN OF SHELTER GATE FOUNDATION



5.2.5.3 - Trashrack

Trashrack serves as a garbage filter so that garbage that enters the canal can be collected in 1 place. The entry of garbage and floating objects is due to clogged sluice gates in the irrigation canal so that the construction of a trashrack can reduce incoming garbage. There are 16 Trashracks built in Way Sekampung which are divided into 5 in Punggur Utara, 3 in Sekampung Bunut, 3 in Sekampung Batanghari, 2 in Batanghari Utara and 2 units in Raman Utara. The following are the details of the Trashrack Installation in the Way Sekampung Irrigation Area.

TABLE 5-41 TRASHRACK INSTALLATION

No	Irrigation Area	Canal Name	Location
1	Punggur Utara	Saluran sekunder BQA	BQA.1a
2	Punggur Utara	Saluran sekunder BUF	BUF.1a

No	Irrigation Area	Canal Name	Location
3	Punggur Utara	Saluran induk BPU	BPU.8
4	Punggur Utara	Saluran induk BPU	BPU.15
5	Punggur Utara	Saluran sekunder BC	BC.7
6	Punggur Utara	Saluran sekunder BE	BE.1
7	Sekampung Bunut	Saluran induk BKB	BKB.2
8	Sekampung Bunut	Saluran induk BKB	BKB.11
9	Sekampung Bunut	Saluran sekunder KR	KR.4
10	Sekampung Batanghari	Saluran induk KBH	KBH.13
11	Sekampung Batanghari	Saluran sekunder KMI	KMI.4
12	Sekampung Batanghari	Saluran sekunder KDJ	KDJ.2
13	Batanghari Utara	Saluran induk BG	BG.5
14	Batanghari Utara	Saluran induk BG	BG.12
15	Raman Utara	Saluran induk BRU	BRU.7
16	Raman Utara	Saluran induk BRU	BRU.17

FIGURE 5-144 TRASHRACK LOCATION OF WAY SEKAMPUNG IRRIGATION AREA

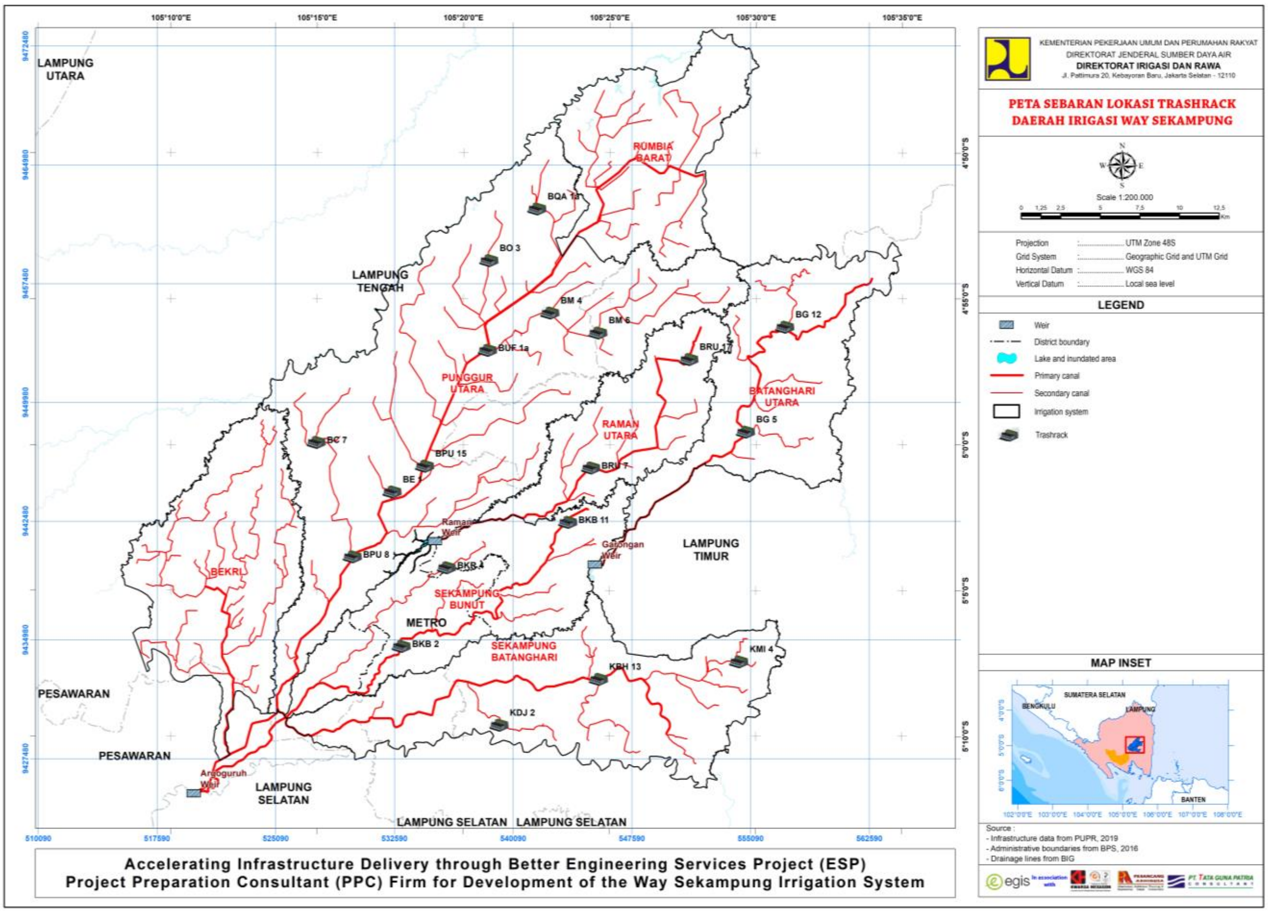


FIGURE 5-145 TRASHRACK DESIGN EXAMPLE ON BUF.1A

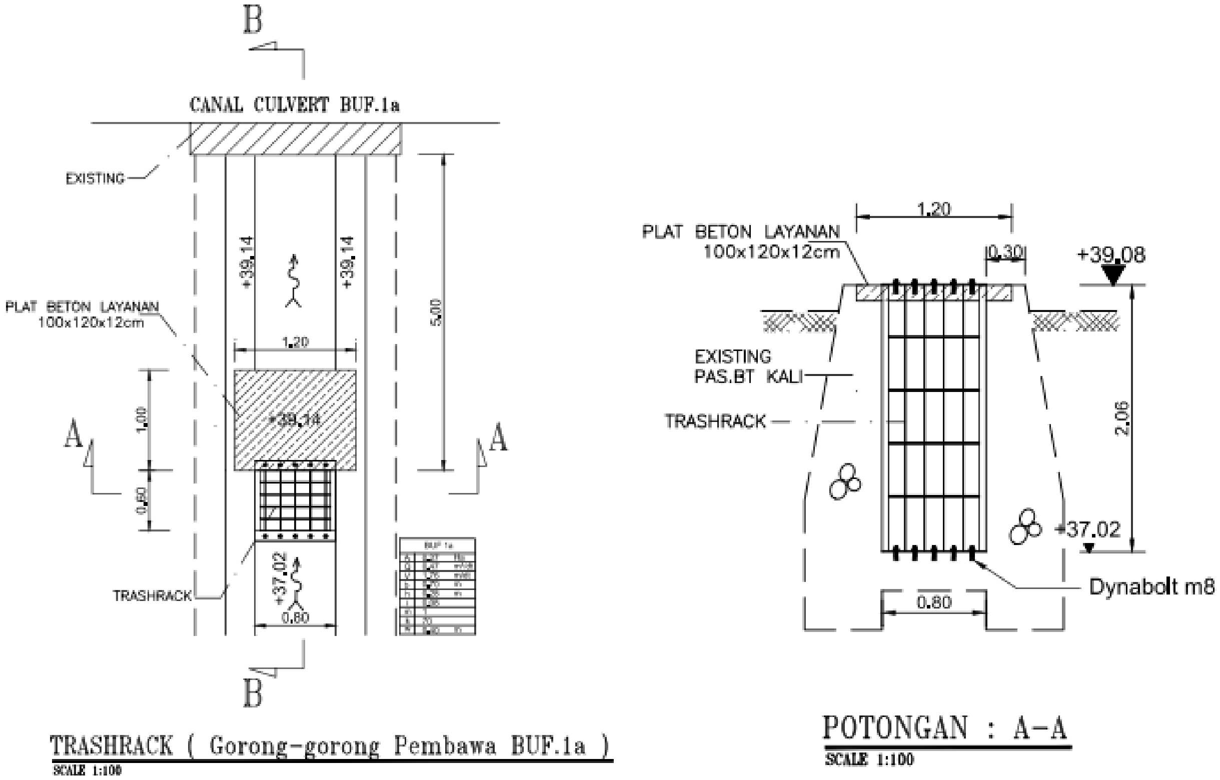
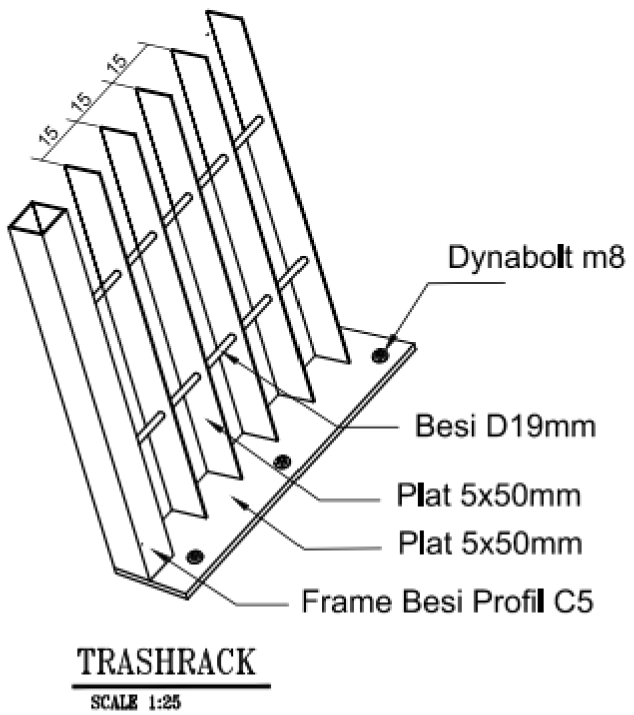


FIGURE 5-146 TRASHRACK DETAILS



The Trashrack design uses a 5 x 50 mm iron plate with a C5 profile iron frame. The horizontal section of iron uses iron with a diameter of 19 mm as a liaison between the frames. Trashracks are attached to Structures such as Canal Culverts using dynabolt m8 bolts by means of grouting. The complete design can be seen in the A3 design drawing album.

5.2.5.4 - Exploitation Board

The exploitation board is used to record information in the tertiary plot such as service area, debit and others. Exploitation boards are installed in offtake, offtake-intake and intake structures. The installation of exploitation boards is divided into 3 size types, namely type 1 (0.8 x 1) for tertiary intake structure 1, type 2 (1.5 x 1) for tertiary 2/3 intake structure and type 3 (1.7 x 1) for offtake-intake and intake structures. The following is the number of exploitation boards installed based on the type in the Way Sekampung Irrigation Area.

TABLE 5-42 TOTAL OF EXPLOITATION BOARD INSTALLATIONS

No	Irrigation Area	Unit/Total		
		0.8 x 1 m	1.5 x 1 m	1.7 x 1 m
1	Punggur Utara	194	65	31
2	Rumbia Barat	67	21	18
3	Bekri	162	14	27
4	Sekampung Bunut	75	8	13
5	Sekampung Batanghari	106	22	17
6	Raman Utara	51	9	14
7	Batanghari Utara	42	18	7

FIGURE 5-147 TYPE 1 EXPLOITATION BOARD DESIGN

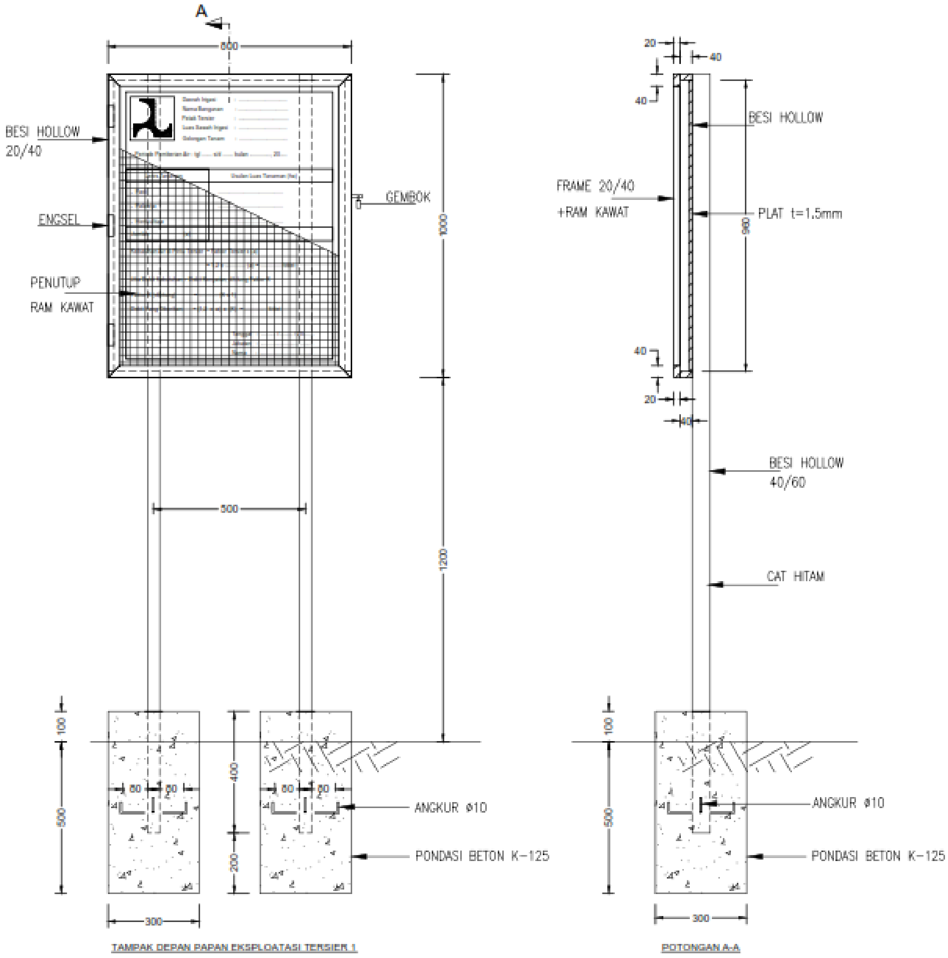


FIGURE 5-148 TYPE 1 EXPLOITATION BOARD INFORMATION

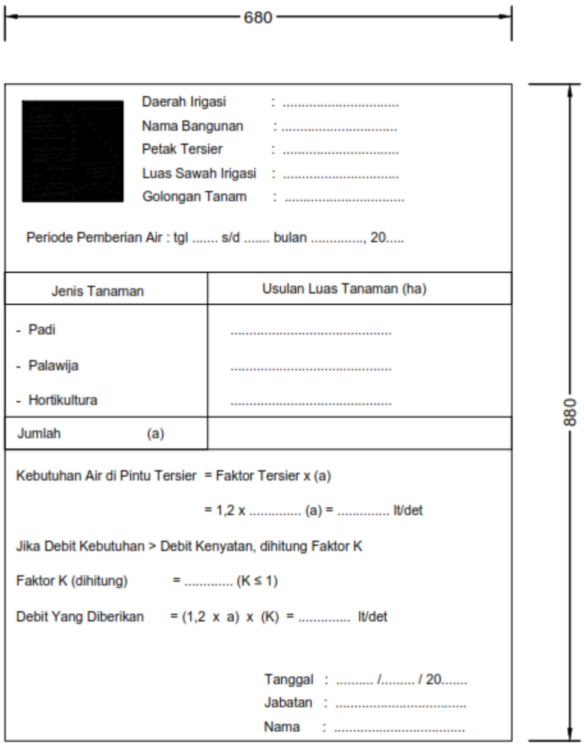


FIGURE 5-149 TYPE 2 EXPLOITATION BOARD DESIGN

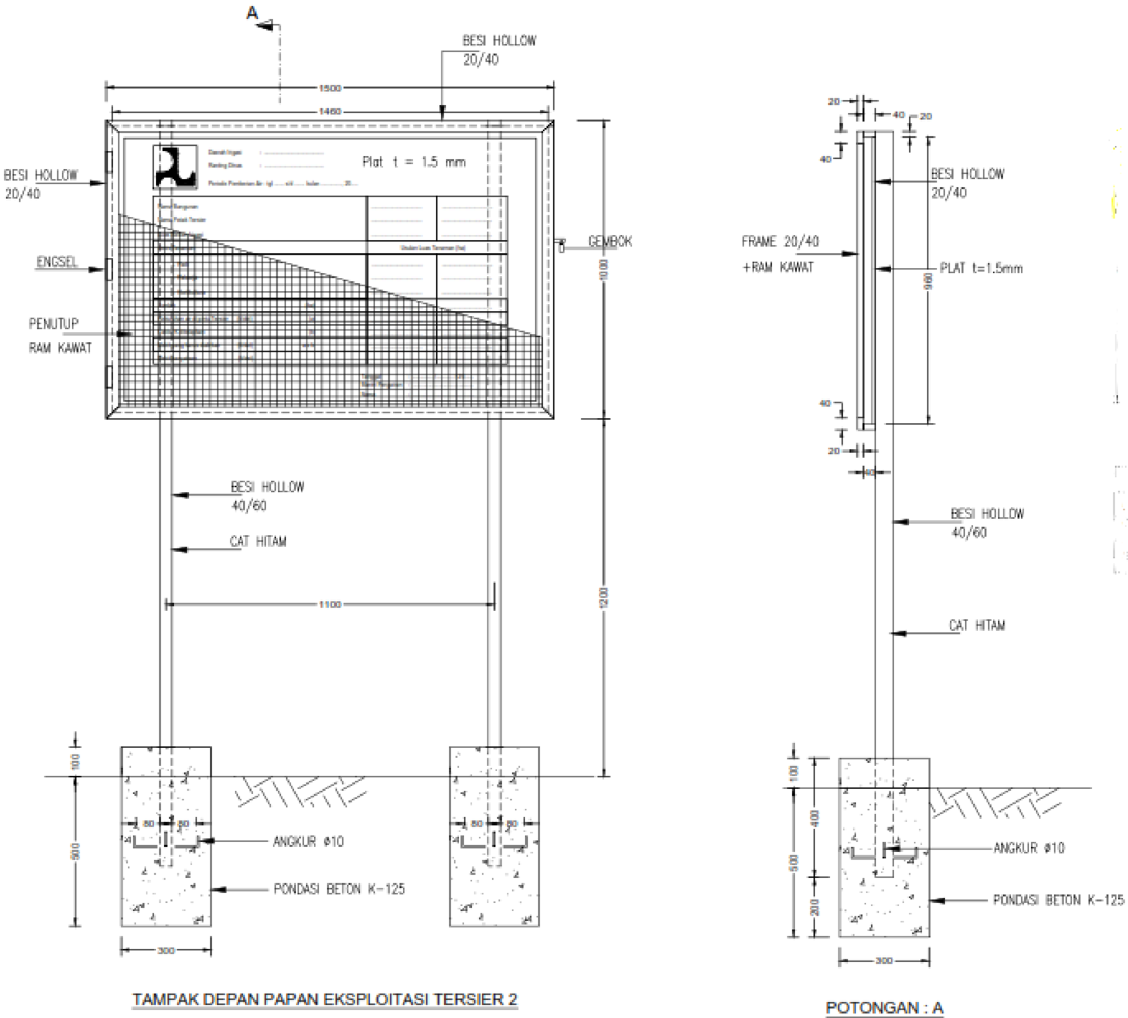


FIGURE 5-150 EXPLOITATION BOARD INFORMATION

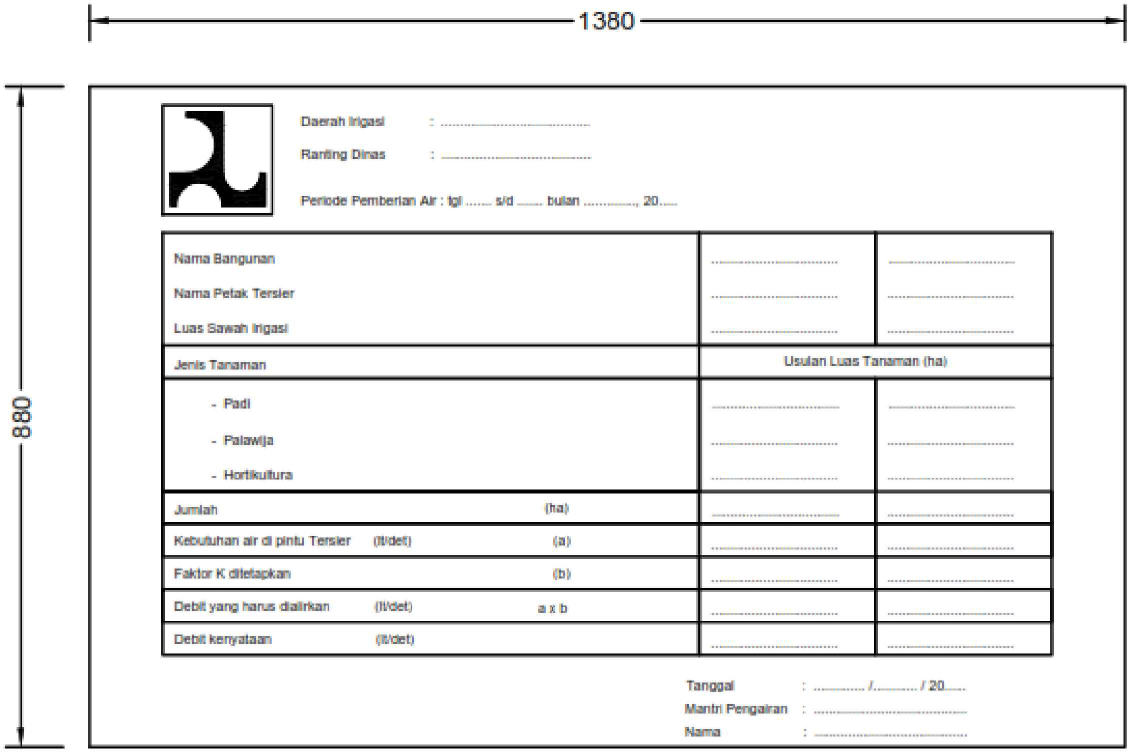


FIGURE 5-151 TYPE 3 EXPLOITATION BOARD INFORMATION

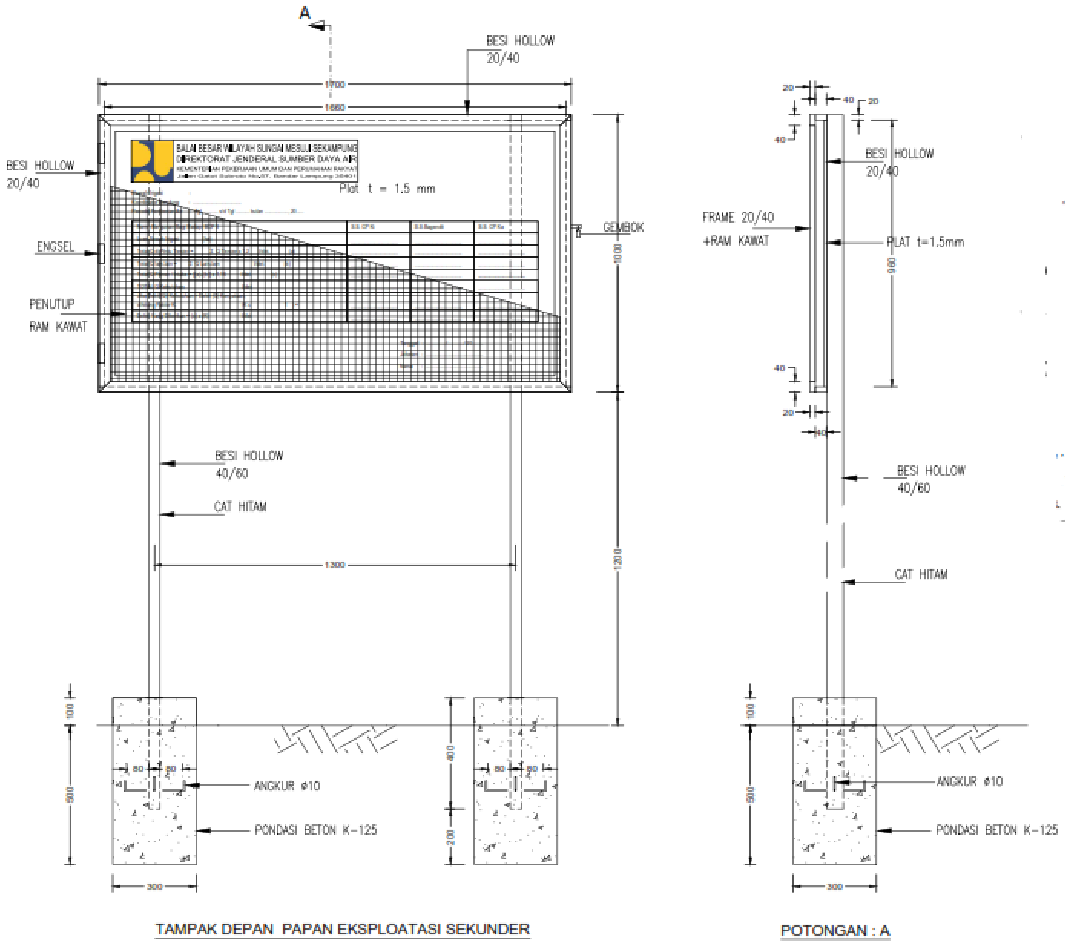
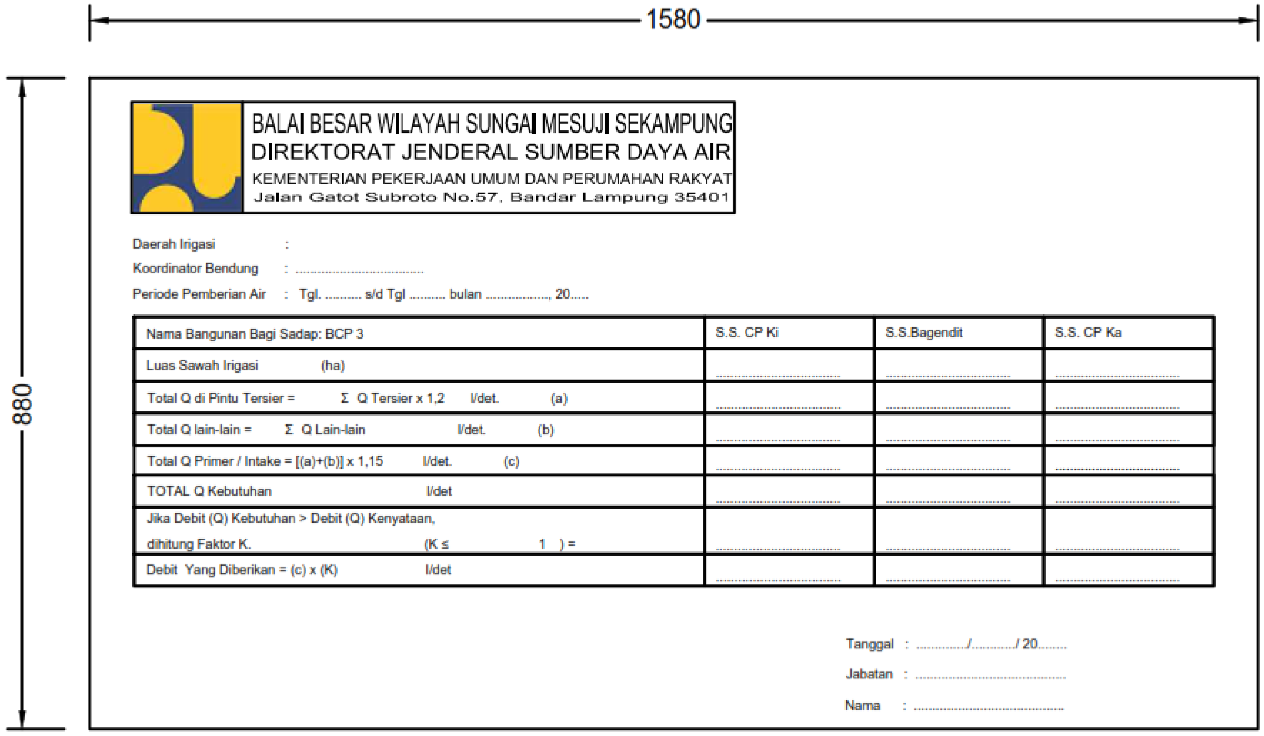


FIGURE 5-152 TYPE 3 EXPLOITATION BOARD INFORMATION



Exploitation board design is installed with materials:

a. Poles and boards are made of hollow iron
b. The paint of the poles and boards is black
c. Paint white letters
d. Exploitation board with additional gate with wire gauze/chicken
e. The foundation uses K-125 concrete with an anchor diameter of 10 mm

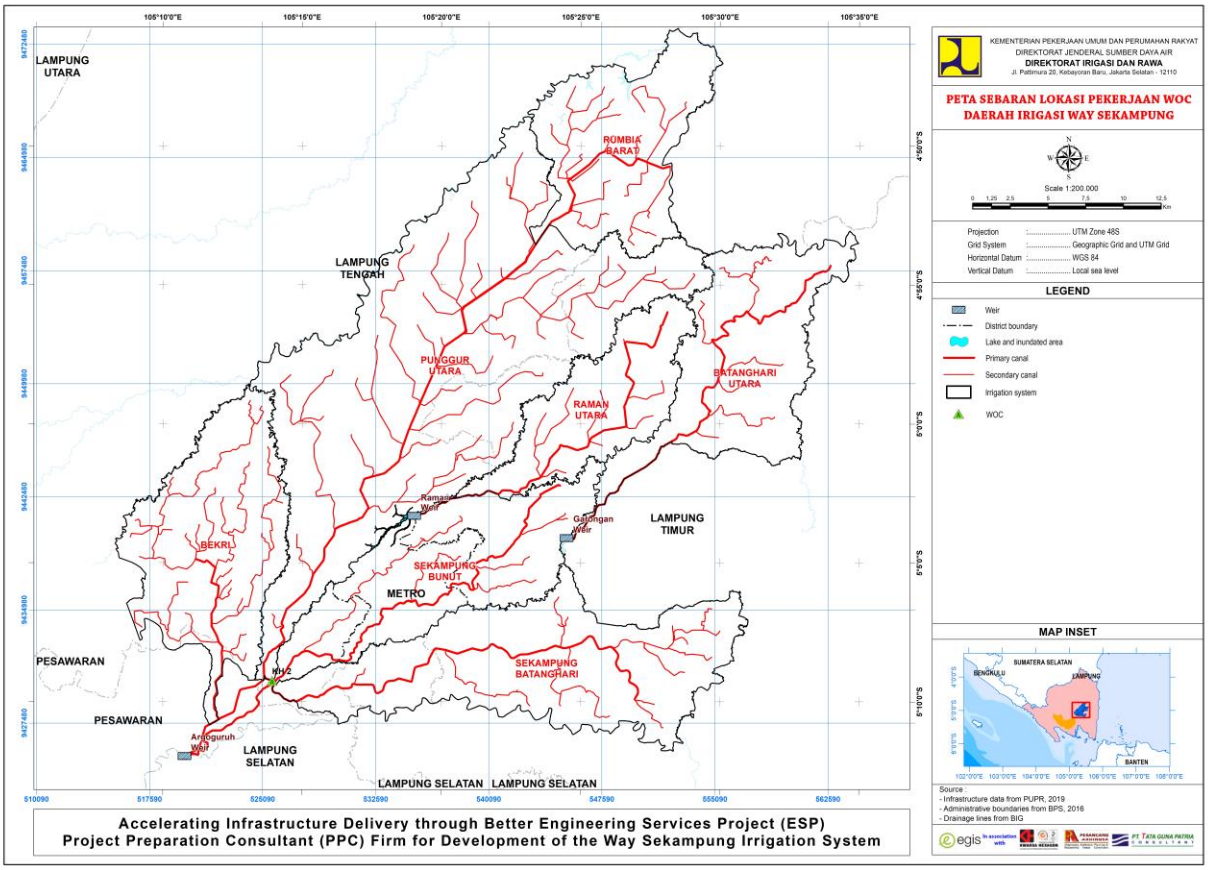
5.2.6 - Offices, Houses, and Warehouses (UPIM)

- **Office (Water Operation Center), (Modern Irrigation Management Unit)**

The Modern Irrigation Management Unit (UPIM, *Unit Pengelola Irigasi Modern*) is a work unit that is responsible for the operation and maintenance of irrigation in an irrigation area with the principles of participatory, needs-based, effective, efficient, and sustainable which ensures a better level of service to farmers using water.

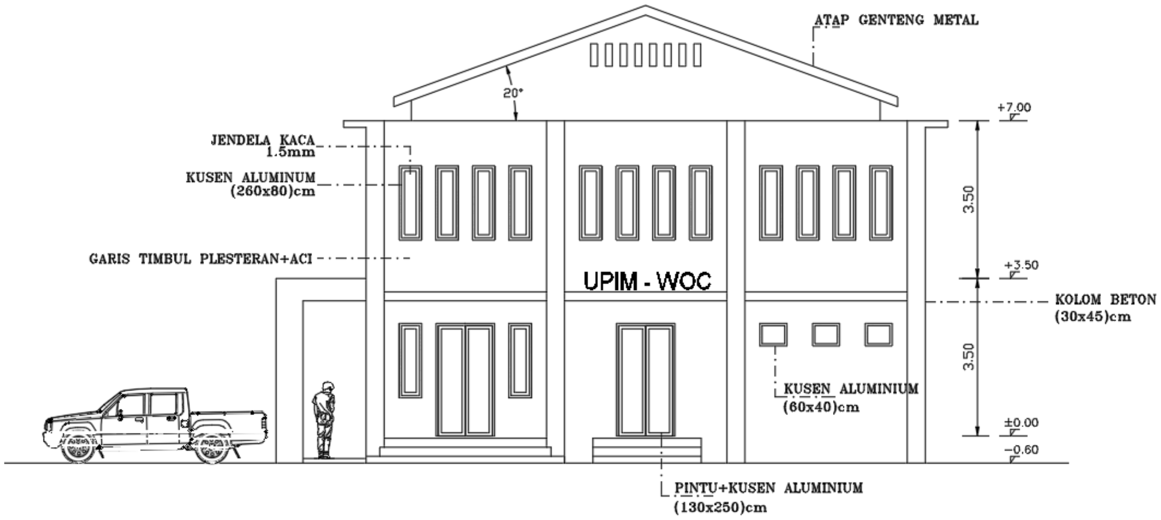
The Water Management Center (WOC) is an institution that principally regulates water and connects several automatic and telemetry inputs with inputs that are fully under human control even though assistive devices are used. WOC in work is directly connected to telemetry devices that record and measure water level and discharge (AWLR), temperature and rainfall recorder (AWS) and is also equipped with a system that must be controlled by admins and operators. The WOC is also directly connected to the planners and implementers of water distribution in the field and is mainly carried out by the waterworkers. This WOC is supported by Sipasi Version-01 and SCADA software.

FIGURE 5-153 LOCATION OF WOC-UPIM STRUCTURE FOR WAY SEKAMPUNG IRRIGATION PROJECT



The WOC-UPIM Structure will be built with an area of + 565 m2, in which there are 2 floors with the 1st floor having several rooms in between, namely warehouse, meeting, archive, panel, exhibition, and toilet rooms. While on the 2nd floor there are work offices, heads, archives, controls and toilets. This Structure is designed for irrigation management facilities in the Lampung area divided into 7 irrigation areas.

FIGURE 5-154 WOC-UPIM STRUCTURE



TAMPAK DEPAN WOC
SCALE 1:100

- **Houses (Operating House of Waterworkers)**

The waterworkers house is intended for someone who maintains the irrigation canal, the waterworkers operator's house has 1 floor with a Structure area of + 58 m2, built with masonry and inside there are several rooms, namely living room, dining, kitchen, sleeping, and toilet.

FIGURE 5-155 OPERATING HOUSE OF WATERWORKERS

TAMPAK DEPAN 2
SKALA A

- **Warehouse (Generator House)**

Generators have a very important role when there is a sudden power outage. With a generator, you don't have to worry about work being hampered and keep working optimally using electricity. There are several important things about generator sets, from operation, maintenance, to placement. The selection of the correct generator house design will provide security and avoid work accidents or create uncomfortable conditions for the surrounding environment.

The gen-set house has a size of 4m x 4m with a Structure structure using a foundation and walls using red brick, and for a special foundation for a generator using reinforced concrete in order to dampen the vibrations caused by the 20kVA generator.

FIGURE 5-156 LOCATION OF GENERATORS OF THE WAY SEKAMPUNG IRRIGATION AREA

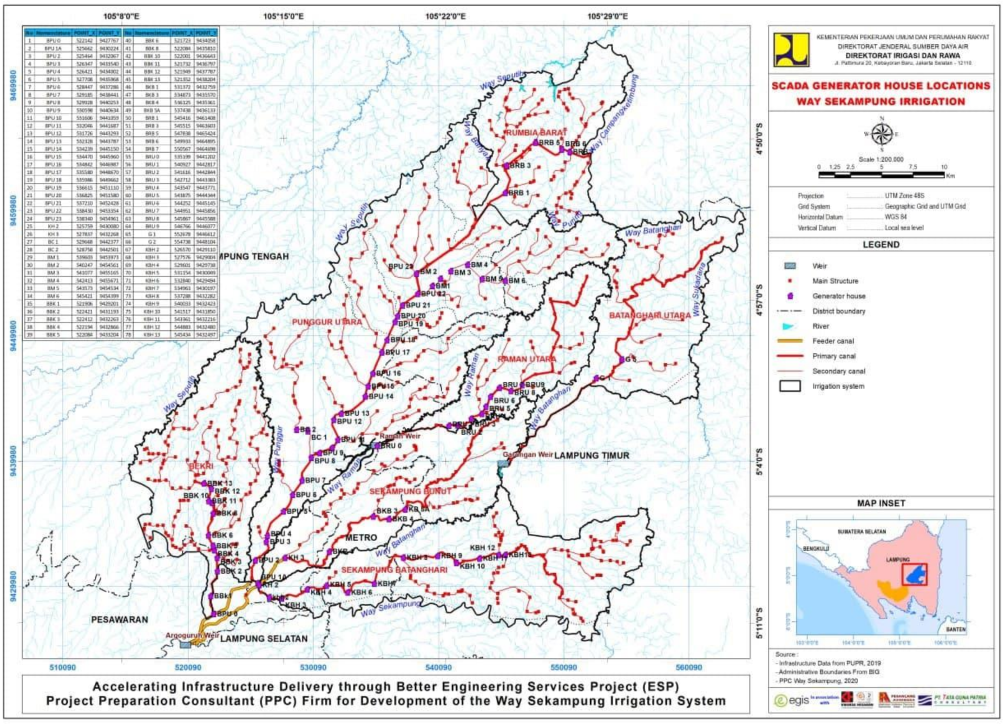
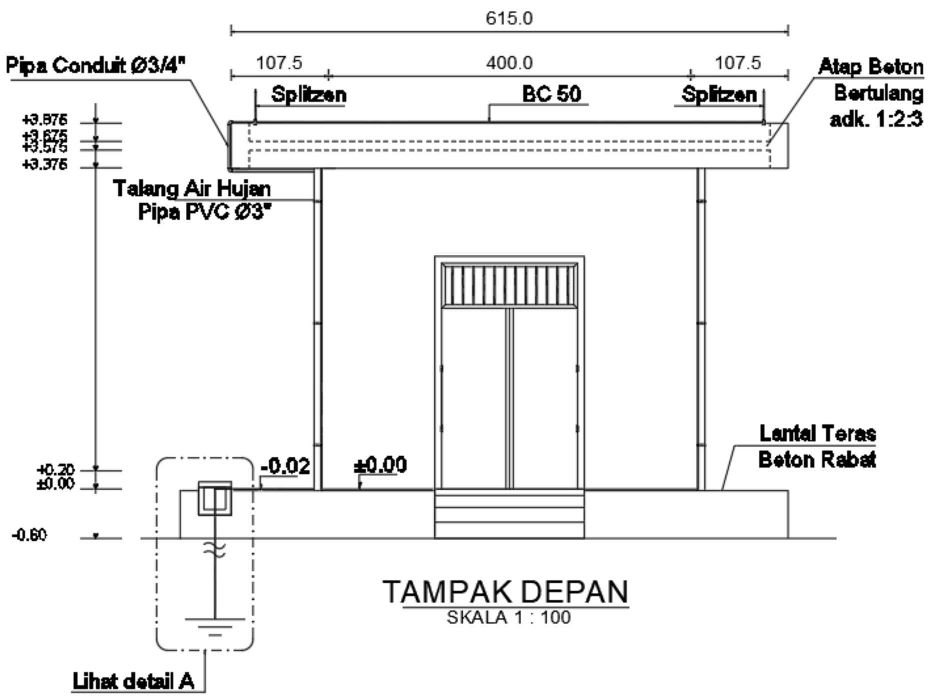
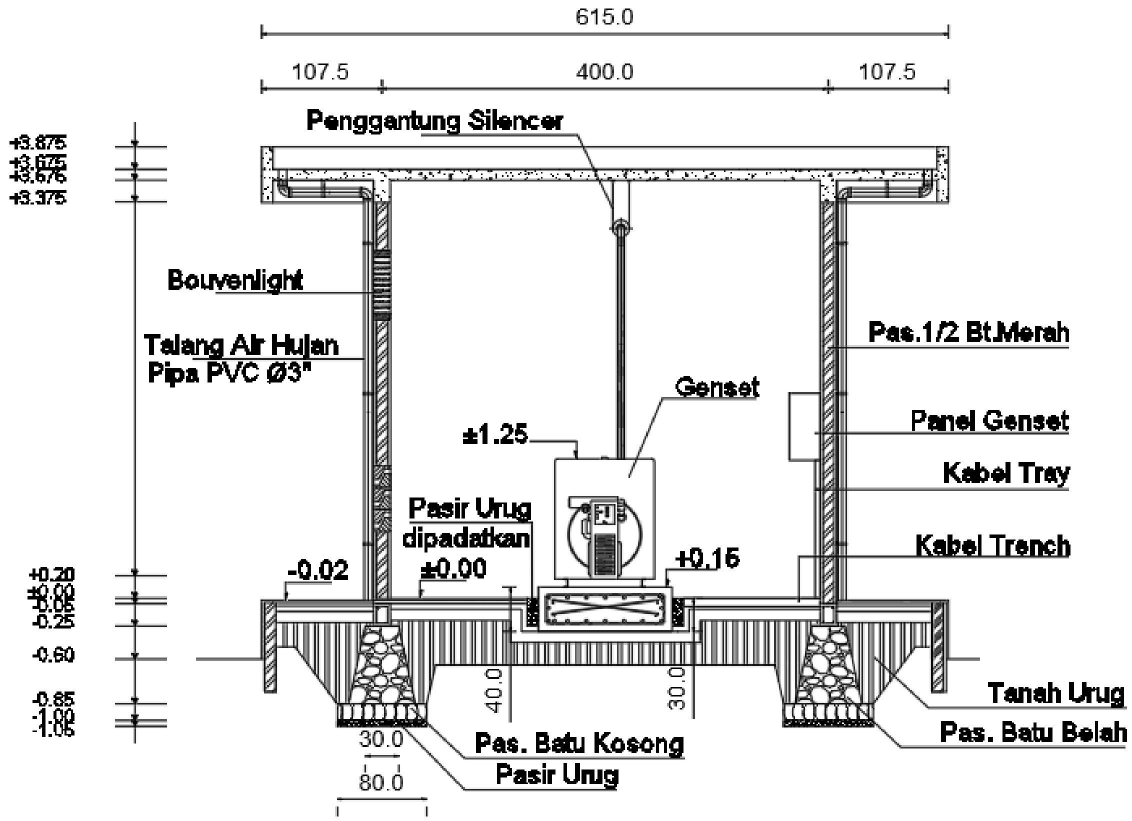


FIGURE 5-157 GENERATOR HOUSE





POTONGAN A-A

SKALA 1 : 100

5.2.7 - Tertiary

5.2.7.1 - Tertiary plot of BG.2 Ka

TABLE 5-43 HYDRAULIC ANALYSIS OF TERTIARY CANAL BG.2 KA

Canal Section	A (ha)	Q (liter/s)	v (m/s)	b (m)	h (m)	Length (m)	I (slope)	m
BG.2 ka-T.1	52.35	86.73	0.58	0.54	0.20	35.90	0.00066	1
T.1-T.2	13.53	22.42	0.24	1.00	0.09	214.10	0.00018	1
T.2-K.1	6.63	10.98	0.20	0.72	0.07	53.15	0.00021	1
T.1-T.3	38.82	64.31	0.48	0.84	0.14	114.10	0.00057	1
T.3-T.4	34.42	57.02	0.42	0.63	0.17	100.00	0.00052	1
T.4-K.2	30.43	50.41	0.39	0.60	0.17	195.80	0.00044	1

Information: A = service area; Q = the flowed debit; v = flow rate; b = canal width; h = water level height; I = canal slope; m = canal shape (1=trapezoid, 0=square)

TABLE 5-44 ANALYSIS OF QUATERNARY CANAL BG.2 KA

Quarter	b (m)	Aperture (m)	A (Ha)	Q (lt/s)
T.2-A1Ki	0.2	0.04	6.9	11.43
K.1-A3Ka	0.2	0.02	2.81	4.66
K.1-A2Ki	0.2	0.03	3.82	6.33
T.3-B1Ka	0.2	0.02	4.4	7.29

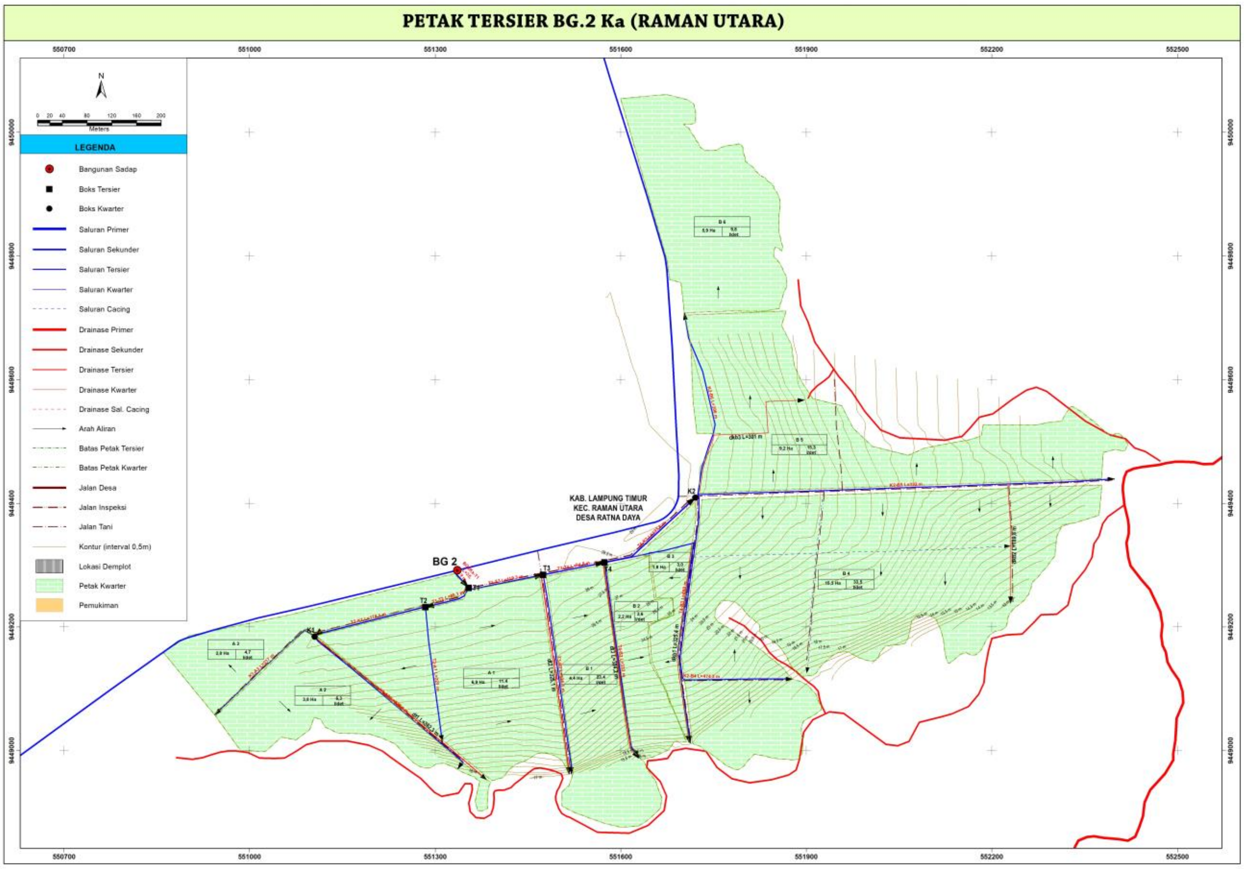
Quarter	b (m)	Aperture (m)	A (Ha)	Q (lt/s)
T.4-B2Ka	0.2	0.01	2.19	3.63
T.4-B3Te	0.2	0.01	1.8	2.98
K.2-B4Ka	0.2	0.13	15.3	25.35
K.2-B5Te	0.2	0.08	9.23	15.29
K.2-B6Ki	0.2	0.05	5.9	9.77

Information: b = canal width; Aperture = Gate opening in the tertiary box (quarter); A = service area; Q = debit

The tertiary plot of G.2 Ka is a tertiary plot that obtain its supply from the BG.2 Ka intake gate of the BG secondary canal, and it is part of the Raman Utara Irrigation Area. the BG.2 Ka intake gate has a service area of 52.35 ha with a discharge requirement of 86.73 liters/second. The BG.2 ka tertiary canal has 1 tertiary offtake box, 3 tertiary intake boxes and 2 quaternary boxes.

The BG.2 Ka tertiary canal is in the form of a trapezoid with 6 mm K-225 wiremesh concrete. The walls of the canal has a thickness of 7 cm, the floor is 8 cm, and the hat is 7 cm thick. Meanwhile, the tertiary and quaternary box structures use a pair of adk 1:4 split stones with 1:3 plaster and thickness of 15 mm. The following is a tertiary map of BG.2 Ka Raman Utara.

FIGURE 5-158 TERTIARY TILE MAP BG.2 KA



5.2.7.2 - Tertiary plot of BRB.2 Ki

TABLE 5-45 HYDRAULIC ANALYSIS OF TERTIARY CANAL BRB.2 KI

Canal Section	A (ha)	Q (liter/second)	v (m/s)	b (m)	h (m)	Length (m)	I (slope)	m
BRB.2 Ki-T.1	79.35	131.46	0.72	0.50	0.37	153.77	0.00103	0
T.1-T.6	37.25	27.58	0.32	0.40	0.49	344.43	0.00017	0
T.7-K.2	20.60	34.13	0.33	0.40	0.26	411.20	0.00034	0
T.1-T.2	42.10	69.75	0.07	0.40	0.47	100.82	0.00031	0
T.2-T.3	37.50	62.13	0.06	0.30	0.46	199.10	0.00040	0
T.3-T.4	26.50	43.90	0.04	0.30	0.22	101.60	0.00256	0
T.4-T.5	19.60	32.47	0.03	0.30	0.16	296.00	0.00361	0
T.5-K.1	14.20	23.53	0.02	0.30	0.09	150.70	0.01095	0

Information: A = service area; Q = the flowed debit; v = flow rate; b = canal width; h = water level height; I = canal slope; m = canal shape (1=trapezoid, 0=square)

TABLE 5-46 ANALYSIS OF QUATERNARY CANAL BRB.2 KI

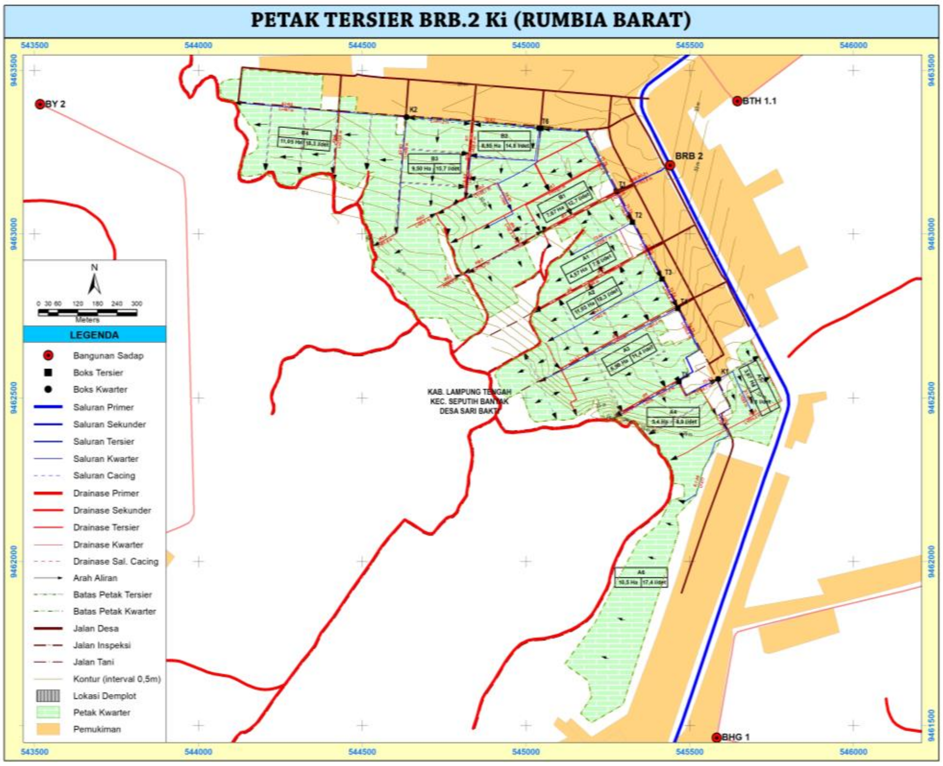
Quarter	b (m)	Aperture (m)	A (Ha)	Q (lt/s)
T.6-B1Ki1	0.2	0.06	7.7	12.76
T.6-B2Ki2	0.2	0.07	8.95	14.83
K.2-B3Ki	0.2	0.07	9.5	15.74
K.2-B4Ka	0.2	0.08	11.1	18.39
T.2-A1Ka	0.2	0.04	4.6	7.62
T.3-A2Ka	0.2	0.04	11	18.22
T.4-A3Ka	0.2	0.04	6.9	11.43
T.5-A4Ka	0.2	0.03	5.4	8.95
K.1-A5Te	0.2	0.02	3.7	6.13
K.1-A6Ka	0.2	0.06	10.5	17.40

Information: b = canal width; Apperture = Gate opening in the tertiary box (quarter); A = service area; Q = debit

The tertiary plot of BRB.2 Ki is a tertiary plot that obtain its supply from the BRB.2 Ki intake gate of the BG secondary canal, and it is part of Rumbia Barat Irrigation Area. the BRB.2 Ki intake gate has a service area of 79.35 ha with a discharge requirement of 131.46 liters/second. The BRB.2 Ki tertiary canal has 1 tertiary offtake box, 5 tertiary intake boxes and 2 quaternary boxes.

The BG.2 Ka tertiary canal is in the form of a rectangle with U Ditch concrete material. Meanwhile, the tertiary and quaternary box structures use a pair of adk 1:4 split stones with 1:3 plaster and thickness of 15 mm. The following is a tertiary map of BRB.2 Ki Rumbia Barat.

FIGURE 5-159 TERTIARY TILE MAP BRB.2 KI



5.2.7.3 - Tertiary Plot of KR.4A Ka

TABLE 5-47 HYDRAULIC ANALYSIS OF TERTIARY CANAL KR.4A KA

Canal Section	A (ha)	Q (liter/s)	v (m/s)	b (m)	h (m)	Length (m)	I (slope)	m
KR.4A Ka-T.1	5.45	9.03	0.25	0.50	0.07	6.42	0.00113	0
T.1-K.1	2.25	3.73	0.25	0.30	0.03	39.13	0.00169	0
T.1-K.2	1.70	2.82	0.09	0.30	0.06	93.50	0.00011	0

Information: A = service area; Q = the flowed debit; v = flow rate; b = canal width; h = water level height; I = canal slope; m = canal shape (1=trapezoid, 0=square)

TABLE 5-48 ANALYSIS OF QUATERNARY CANAL KR.4A KA

Quarter	b (m)	Aperture (m)	A (Ha)	Q (lt/s)
T.1-B1Te	0.2	0.04	1.5	2.49
K.1-B2Te	0.2	0.02	2.25	3.73
K.1-B3Ka	0.2	0.00	0.016	0.03
K.2-A1Ka	0.2	0.02	1.1	1.82
K.2-A2Te	0.2	0.01	0.6	0.99

Information: b = canal width; Aperture = Gate opening in the tertiary box (quarter); A = service area; Q = debit

The tertiary plot of KR.4A Ka is a tertiary plot that obtain its supply from the KR.4A Ka intake gate of the KR secondary canal, and it is part of Sekampung Bunut Irrigation Area. The KR.4A Ka intake gate has a service area of 5.45 ha with a discharge requirement of 9.03 liters/second. The KR.4A Ka tertiary canal has 1 tertiary offtake box and 2 quarter boxes.

Tertiary canal KR.4A Ka Square is in the form of a rectangle with U Ditch concrete material. Meanwhile, the tertiary and quaternary box Structures use a pair of 1:4 adk split stones with 1:3 plaster and 15 mm thick. The following is a KR.4A Ka tertiary map.

FIGURE 5-160 TERTIARY TILE MAP KR.4A KA

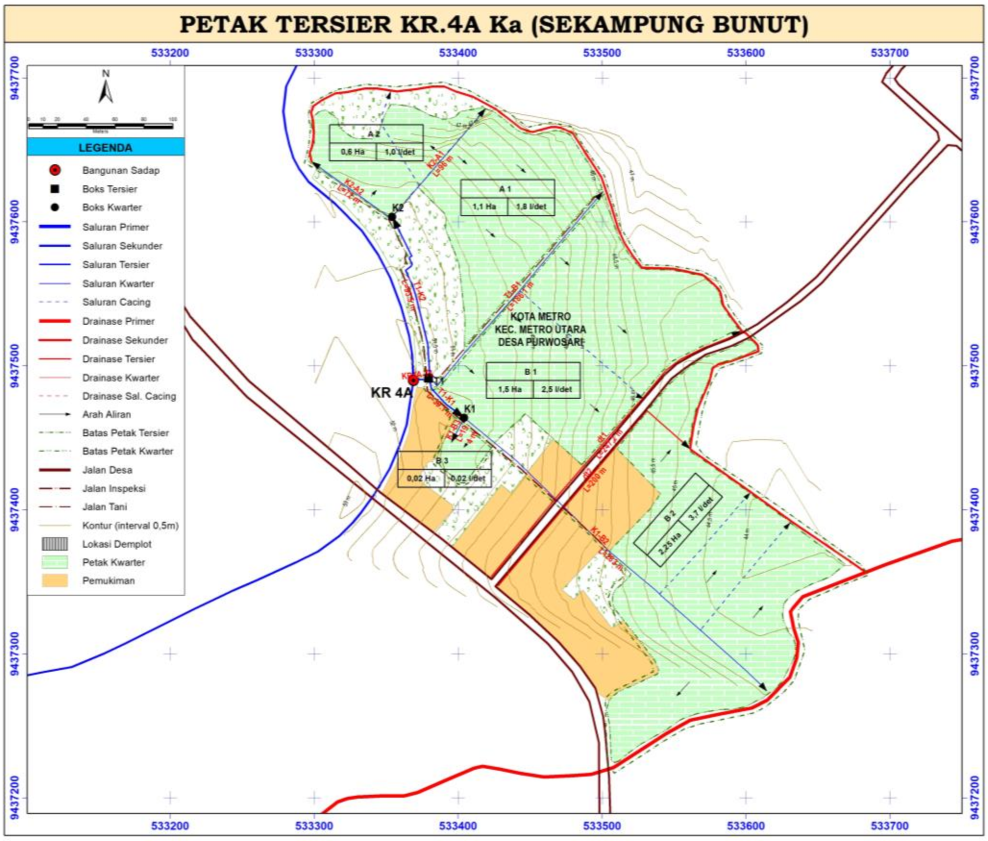


Figure 5-161, Figure 5-162 and Figure 5-163 show depictions of tertiary canal design, and tertiary and quaternary box design. More detailed designs can be found in the appendix to the tertiary plot design. To build a tertiary canal, a design analysis and cost budget are needed, which can be seen in Table 5-49.

FIGURE 5-161 TERTIARY CANAL DESIGN

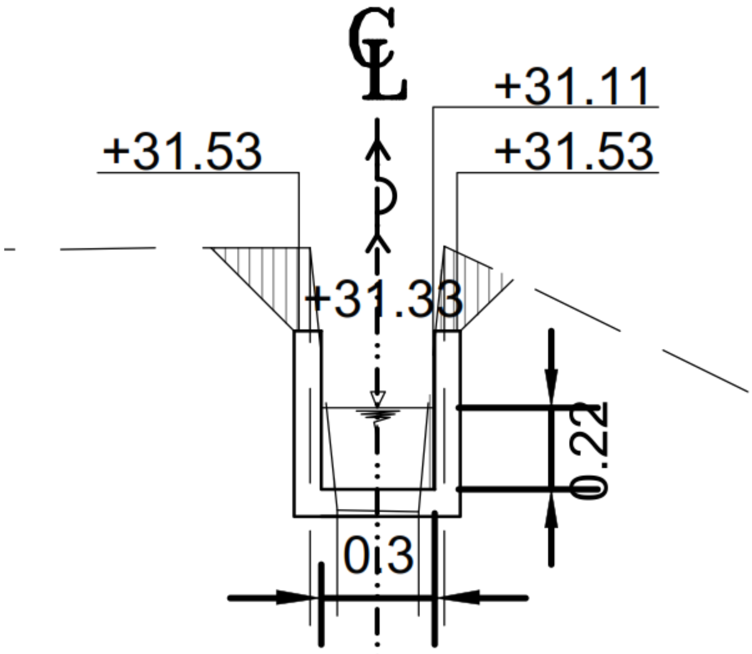


FIGURE 5-162 TERTIARY BOX DESIGN FOR OFFTAKE

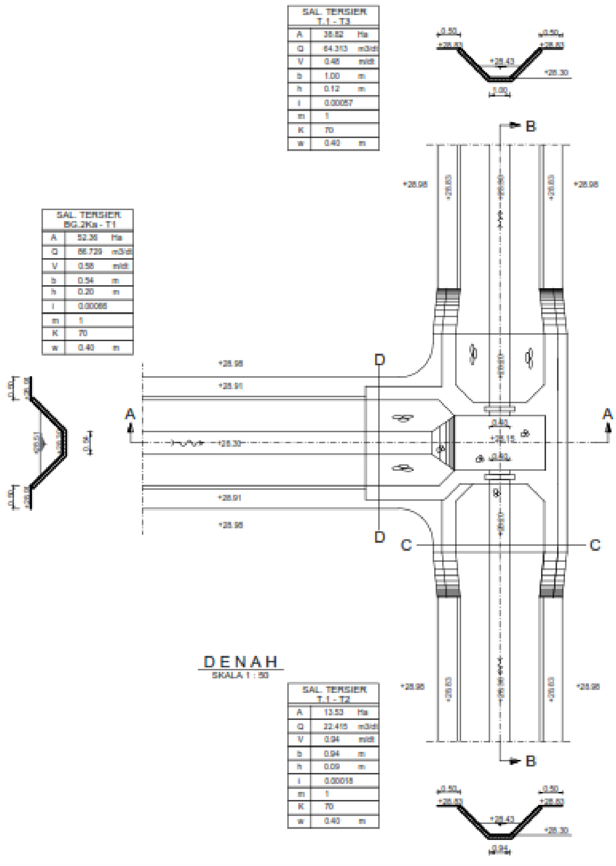


FIGURE 5-163 TERTIARY BOX DESIGN FOR INTAKE

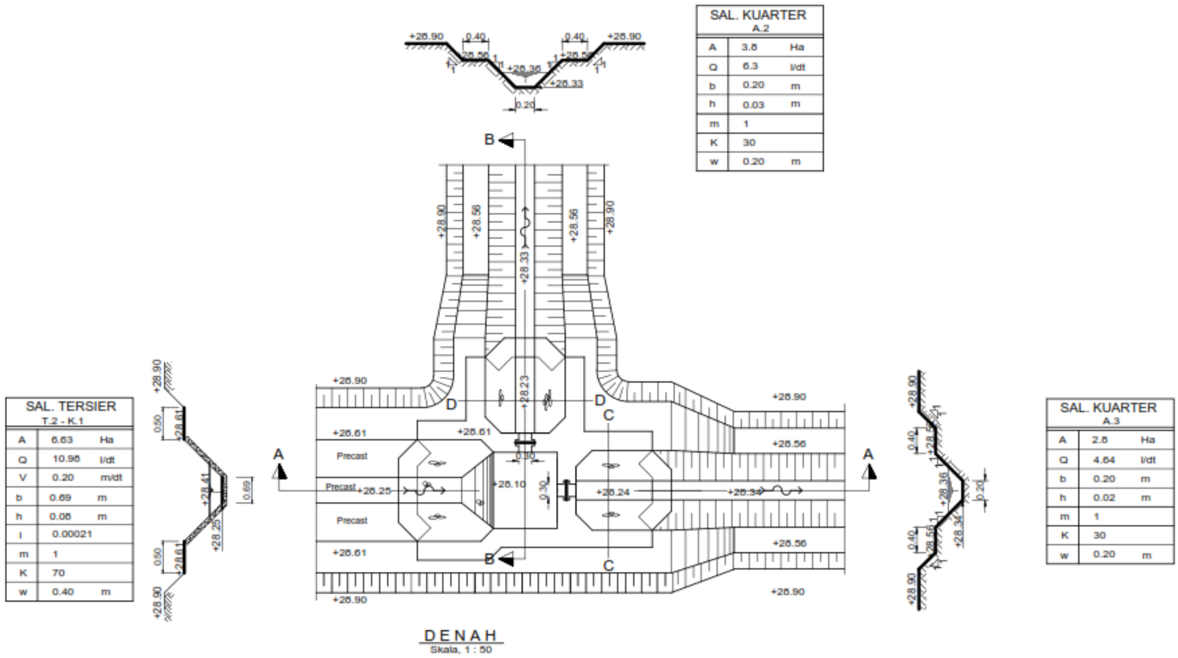


TABLE 5-49 WORK BUDGET PLAN FOR TERTIARY CANAL 3

No.	JOB DESCRIPTION	UNIT	QUANTITY	TOTAL PRICE (Rp.)
I	**PREPARATION**			
1	Mobilization and demobilization	LS	1	11.110.000
2	Photos and videos documenting activities using drone cameras	LS	1	44.495.000
3	Drawing and printing of Structure construction drawings (5 Sets)	LS	1	4.472.000
4	Measurement/setting out	LS	1	7.829.000
5	Occupational Health and Safety (K3)	LS	1	302.334.200
				370.240.200
II	**WORK ON TERTIER CANALS**			
2	**Earthwork**			
2.1	Regular excavation work up to 1 m (man power)	m^3	658.0	42.112.316
2.2	Dumping work and leveling of excavations as far as 20 km	m^3	262.6	32.641.344
2.3	Disposal work and leveling of excavations as far as 5 km	m^3	262.6	9.637.469
2.4	Backfill compacted with stemper	m^3	132.8	20.079.707
2.5	Grass planting	m^2	2.609.7	193.898.481
3	**Precast Concrete U-Ditch Work**			
3.1	Masonry demolition work	m^3	528.0	85.267.030
3.2	Concrete U-Ditch Installation Work with size of 30x30x120	m'	150.7	46.279.970
3.3	Concrete U-Ditch Installation Work with size of 30x40x120	m'	296.0	98.272.000
3.4	Concrete U-Ditch Installation Work with size of 30x50x120	m'	101.6	35.031.680
3.5	Concrete U-Ditch Installation Work with size of 30x70x120	m'	199.1	76.175.660
3.6	Concrete U-Ditch Installation Work with size of 40x50x120	m'	411.2	196.882.560
3.7	Concrete U-Ditch Installation Work with size of 40x70x120	m'	445.3	251.432.675
3.8	Concrete U-Ditch Installation Work with size of 50x30x120	m'	139.1	71.527.320
3.9	Concrete U-Ditch Installation Work with size of 50x60x120	m'	153.8	86.757.034

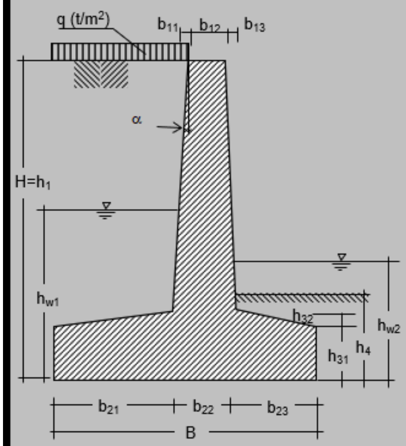
3.1	Formwork work	m^2	673.1	99.347.314
3.11	K-225 concrete wall work, wiremesh M6 - 6mm, thickness of 7 cm (ready mix)	m^3	47.1	84.714.450
3.12	K-225 concrete floor work, wiremesh M6 - 6mm, thickness of 8 cm (ready mix)	m^3	41.1	71.501.644
3.13	K-225 cap work, wiremesh M6 - 6mm, 7 cm thick (ready mix)	m^3	8.5	15.345.229
3.14	Dumping work and leveling of excavations as far as 20 km	m^3	264.0	32.813.287
3.15	Disposal work and leveling of excavations as far as 5 km	m^3	264.0	9.688.235
				1.559.405.405
III	**STRUCTURE WORK ON TERTIER CANAL**			
1	**Rehabilitation of Quarter of Box Structure**			
1.1	Masonry demolition work	m^3	85.38	13.789.513
1.2	Ordinary Earthworks up to 1 m (Man Power)	m^3	44.46	2.845.407
1.3	Backfill compacted with Stemper	m^3	44.46	6.722.273
1.4	Pair of adk split stone 1:4	m^3	85.38	89.738.564
1.5	Broadcast with type-M mortar	m^3	-	-
1.6	Plaster 1 : 3, thickness of 15 mm	m^2	156.49	12.942.082
1.7	Dumping work and leveling of excavations as far as 20 km	m^3	42.69	5.306.614
1.8	Disposal work and leveling of excavations as far as 5 km	m^3	42.69	1.566.796
				132.911.249
3	**Rehabilitation of Tertiary Box Structure**			
3.1	Masonry demolition work	m^3	142.86	23.072.654
3.2	Ordinary Earthworks up to 1 m (Man Power)	m^3	71.76	4.592.536
3.3	Backfill compacted with Stemper	m^3	71.76	10.849.865
3.4	pair of adk split stone 1:4	m^3	142.86	150.150.829
3.5	Broadcast with type-M mortar	m^3	-	-

3.6	Plaster 1 : 3, thickness of 15 mm	m^2	253.11	20.932.199
3.7	Dumping work and leveling of excavations as far as 20 km	m^3	71.43	8.879.043
3.8	Disposal work and leveling of excavations as far as 5 km	m^3	71.43	2.621.568
				221.098.693
				354.009.942
VII	**IRRIGATION GATE WORK ON BEKRI CANALS**			
A	**Tertiary box gate repair and replacement**			
1	Installation of tertiary box gates, b=0.3 , h=0.4	unit	15.00	32.223.000
2	Installation of tertiary box gates, b=0.2 , h=0.4	unit	23.00	46.117.300
				78.340.300
	Total Tertiary Expenditure Budget			**2.361.995.847**

The design details at this stage are divided based on the Road Map plan for the physical improvement of the irrigation network in Way Sekampung. Design drawings are presented in the attachment of design drawings in A3 format with the following calculations (example):

5.3 - Retaining Wall

FIGURE 5-164 DESIGN CALCULATIONS FOR RETAINING WALLS



Section of Retaining wall

Name of Structure	:	Inverted T-shape Type Retaining Wall (H=5.0m)
Location	:	Bbo1b

MENU

Dimension (unit length)

H =	5.00	m	B =	3.60	m	L =	1.00	m
b_{11} =	0.20	m	b_{12} =	0.30	m	b_{13} =	0.10	m
b_{21} =	2.00	m	b_{22} =	0.60	m	b_{23} =	1.00	m
h_1 =	5.00	m	h_{31} =	0.40	m	h_{32} =	0.20	m
h_4 =	1.00	m	h_{w1} =	1.00	m	h_{w2} =	2.00	m

Basically passive earth pressure are not considered.
Therefore h_4 = 0

q =	0.50	t/m²	Kh =	0.16	
γ_c =	2.40	t/m³	γ_w =	1.00	t/m³

Backfill soil

γ_{soil} =	1.80	t/m³				
γ_{sat} =	2.00	t/m³	α =	0.000	°	(for stability analysis)
φ =	30.0	°	α =	2.603	°	(for structural analysis)
c =	0.00	t/m²	β =	0.000	°	

Foundation soil

γ_s' =	1.00	t/m³
ϕ_B =	30.0	°
c_B =	0.00	t/m²

Friction coefficient

μ = 0.50

Uplift coefficient

Uμ = 1.00

Cover of bar

Wall

d_{back} =	7	cm
d_{front} =	10	cm

Footing

d_{upper} =	10	cm
d_{lower} =	10	cm

Safety factor

			(normal)	(seismic)
Overturning	|e|	≤	B/6=0.83	B/3=1.20
Sliding	fs	≥	2.00	1.25

Reaction of foundation soil

qmax	≥	qa=qu/3	qae=qu/2

Allowable stress

Compressive	σ_{ca} =	60	90	kg/cm²
Tensile	σ_{sa} =	1400	2100	kg/cm²
Shear	τ_a =	5.5	8.25	kg/cm²

Young's modulus ratio

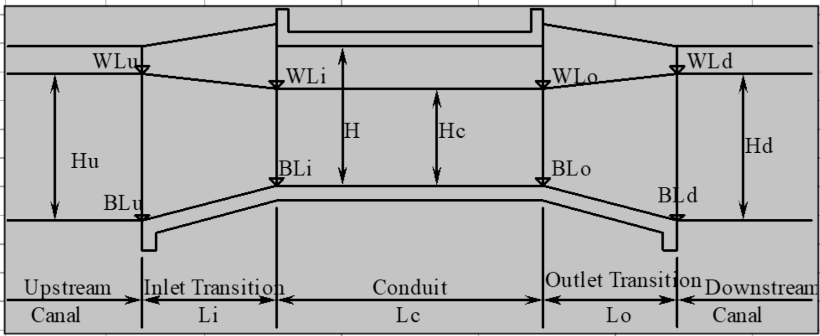
24	16

5.4 - Culverts

FIGURE 5-165 DESIGN CALCULATIONS FOR CULVERTS

Hydraulic Calculation of Box Culvert

Canal Name:	Ps	Chainage	
Structure No.	BPs1b	Type	Box Single



Dimension and Hydraulic Conditions

Conduit width Bc=	0.90	m	Design Discharge Q=	0.136	m3/sec
Nos. of Conduit N =	1	nos	Conduit length Lc =	18.00	m

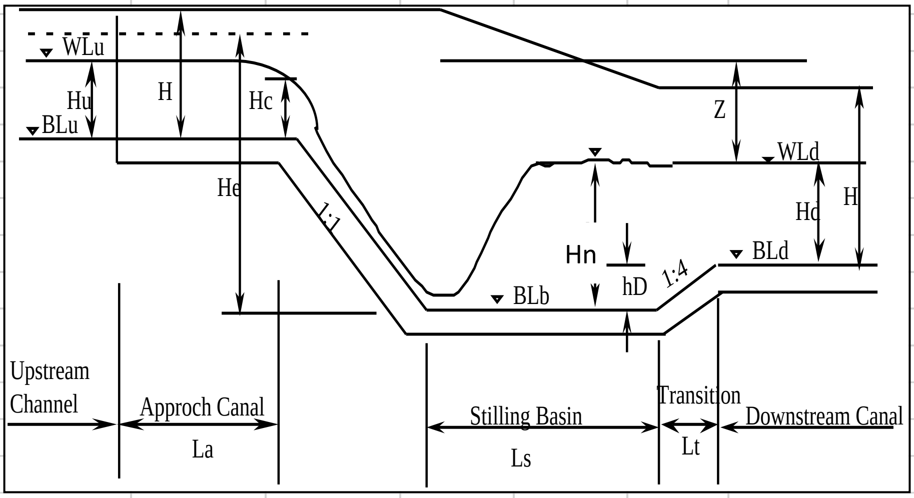
	Upstream Canal		Conduit		Downstream Canal	
			Qi=Q/N =	0.136		
Bottom Width	Bu =	0.90	Bc =	0.90	Bd =	0.90
Side Slope 1:m	m=	1	m=	0	m=	1
Water Depth	Hu =	0.600	Hc =	0.5973	Hd=	0.600
Water Surface Width	Wu =	2.1	Wc =	0.900	Wd =	2.1
Flow Area	Au =	0.9	Ac =	0.53757	Ad=	0.9
Velocity	Vu =	0.15111111	Vc =	0.25299031	Vd=	0.15111111
Velocity Head	hvu =	0.00116503	hvc =	0.00326552	hvd=	0.00116503
Energy Head	Eu =	0.60116503	Ec =	0.60056552	Ed =	0.60116503
Inlet loss in the transition (hi)			hi =	0.00051933		
dE = Eu - (Ei + hi)				8.0184E-05	ok	
Wetted Perimeter P = B + 2H(m^2+1)^0	Pu =	2.59705627	Pc =	2.0946	Pd =	2.59705627
Hydraulic Radius R = A/P	Ru =	0.34654621	Rc =	0.25664566	dd =	0.34654621
Roughness Coefficient	n=	0.01428571	n=	0.01428571	n=	0.01428571
Roughness Coefficient K	K=	70		70		70
Hydraulic Gradient I =[n V/R ^(2/3)]^2	Iu =	1.9145E-05	Ic =	8.0088E-05	Id =	1.9145E-05

Transition = 1.92098 (Wu-Wc)/2		1.152588	Transition =2.41421 (Wu-Wc)/2	1.448526	
Length of Transition	say Li =	2.00	m	say Lo =	2.00 m
	designed	2.00	m		2.00 m

5.5 - Drop Structure

FIGURE 5-166 DESIGN CALCULATIONS FOR TILTED DROP STRUCTURES

Project :	Rehabilitation and Modernization Way Sekampung Irrigation System		
Location :	Punggur Utara		
Canal Name	Secondary Canal BB		
Structure N	**BB1D**	Type	**Inclined Drop**



Demension and Hydraulic Conditions

Design Discharge Q=	0.409	m3/sec
Required Drop Height Z =	1.10	m

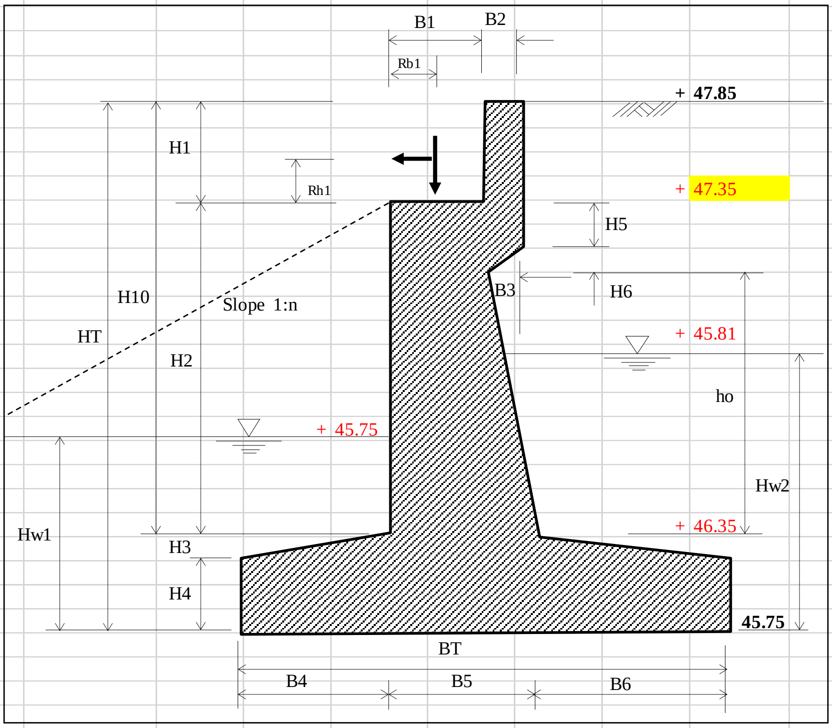
	Upstream Canal		Downstream Canal	
Bottom Width	Bu =	1.40	Bd =	1.40
Side Slope 1:m	m=	1.5	m=	1.50
Water Depth	Hu =	0.6	Hd =	0.6
Water Surface Width	Wu =	3.2	Wd =	3.200
Flow Area	Au =	1.38	Ad =	1.38
Velocity	Vu =	0.29638	Vd =	0.296376812
Velocity Head	hvu =	0.00448	hvd =	0.004481593
Energy Head	Eu =	0.60448	Ed =	0.604481593
Wetted Perimeter P = B + 2H(m^2+1	Pu =	3.56333	Pd =	3.563330765
Hydraulic Radius R = A/P	Ru =	0.38728	Rd =	0.387278109
Roughness Coefficient (n=1/K)	n=	0.01429	n=	0.014285714
Roughness Coefficient K	K=	70	K=	70
Hydraulic Gradient I =[n V/R ^(2/3)]	Iu =	6.4E-05	Id =	6.35031E-05

5.6 - Bridge

FIGURE 5-167 DESIGN CALCULATIONS FOR BRIDGES

ABUTMENT : BGS1a

1. Input

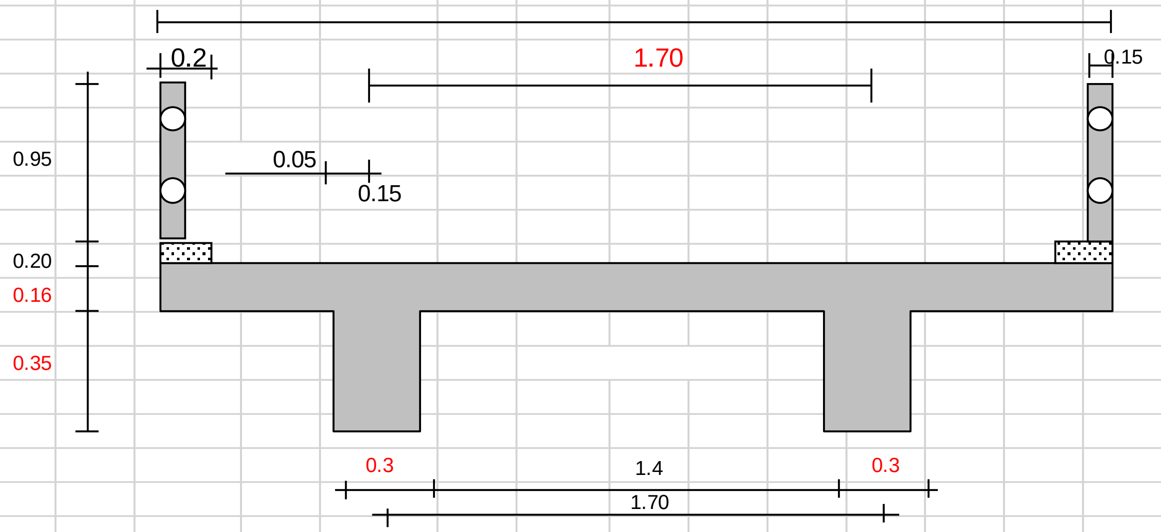


Dimension			
HT	=	**2.10**	m
B1	=	0.40	m
B2	=	0.20	m
B3	=	0.20	m
B4	=	0.60	m
B5	=	0.50	m
B6	=	1.00	m
BT	=	2.10	m
H1	=	0.50	m
H1 max	=	0.50	m
H2	=	1.00	m
H3	=	0.20	m
H4	=	0.40	m
H5	=	0.20	m
H6	=	0.40	m
H10	=	1.50	m
ho	=	0.40	m
Abutment width BL =		2.50	m
Support from Parapet =		0.20	m
Rh1	=	0.73	m
Rb1	=	0.20	m
Hw1	=	0.00	m
Hw2	=	0.06	m
Slope	=	1.0	slope 1:n
(in case no soil on toe side, input "0")			

Unit Weight			
Soil		1.80	t/m3
Soil (saturated)		2.00	t/m3
Concrete		2.40	t/m3
Reaction of superstructure			
Normal	Vn=Rd+Rl	23.44	ton
Seismic	Ve=Rd	0.00	
	He=	0.00	0 (He=2 kh Rd, for fixed bearing)
Type of bearing		Fixed	(He=kh Rd, for movable bearing)
	(Input **Fixed** or **Movable**)		
Surcharge Load		0.70	t/m2

Design Load for Parapet			
Wheel load of T-Load			
T	=	8.0	ton
Contact width of T-load			
a	=	0.20	m
Effective width of road =		2.50	m
Thickness of pavement =		0.05	m
With Impact Plate?		No	
(Input **Yes** or **No**)			
Width of Corbel Lp=		0.25	m
Thickness of Impact Plate =		0.25	m
Length of Impact plate		2.00	m
Soil depth above plate		0.30	m

JEMBATAN KELAS : III



DESIGN OF CONCRETE BRIDGE ("T" Beam Type)

1.	**DESIGN DATA**										
	1.	Code				=	BGS1a				
	2.	Construction type				=	Reinforcement Concrete "T Beam"				
	3.	Bridge length				=		5.80	m		
	4.	Beam length				=		5.70	m		
	5.	Span bridge				=		5.00	m		
	6.	Width of bridge				=		2.50	m		
	7.	Class of bridge				=		III			
	8.	Width of side walk				=		0.00	m		
	9.	Thick of asphalt pavement				=		0.06	m		
	10.	Thick of concrete slab				=		0.16	m		
	11.	Material strength and allowable stress				=					
		a. Super structure									
		- Concrete compressive strength σ'bk				=		225.00	kg/cm²	(K 225)	
		- Allowable bending stress σ'b				=		85.00	kg/cm²	8.4	Mpa
		- Reinforcing bar allowable stress σa				=		1400.00	kg/cm²	(U 24)	
		a. Sub structure									
		- Concrete compressive strength σ'bk				=		225.00	kg/cm²	(K 225)	
		- Allowable bending stress σ'b				=		85.00	kg/cm²		
		- Reinforcing bar allowable stress σa				=		1400.00	kg/cm²	(U 24)	
2.	**CALCULATION OF CARRIAGE FLOOR**										
2.1	LIVE LOAD										
	a. Impact coefficient (K)										
		K = 1 + (20/(50+L))				=	1.364				
	where :	L = length of span				=	1.70	m			
	b. Effective width of slab (Le)										
		Le = 0.72 L' + g				=	1.06	m			
	where :	L' = span of load between support				=	1.19	m			
		g = width of wheel				=	0.20	m			
	c. Moveable load (with impact)										
		P1 = P/Le * K				=	5.16	ton			
	where :	P = moveable load				=	4.00	ton			
2.2	DEAD LOAD										
	- Slab floor		=	0.16	1.00	2.40		=	0.384	t/m	
	- Pavement		=	0.06	1.00	2.20		=	0.132	t/m	
	- Water		=	0.05	1.00	1.00		=	0.050	t/m	
							q1	=	0.566	t/m	
	- Hand rail		(P2) =					=	0.067	t	
	- Side walk load		(q2) =	0.20	1.00	2.20		=	0.440	t/m	

5.7 - Calculation of Work Volume and Construction Costs

The calculation of the Budget Plan (RAB) for the Modernization of the Way Sekampung irrigation area is as follows.

5.7.1 - Unit Price

a. Basic Unit Price of Construction

TABLE 5-50 BASIC UNIT PRICE OF CONSTRUCTION

No	URAIAN	SATUAN	HARGA	KETERANGAN
1	2	3	4	5
I	**UPAH**			
1	Pekerja	O/H	80,000	
2	Mandor Lapangan	O/H	125,000	
3	Operator	O/H	125,000	
4	Pembantu Operator	O/H	80,000	
5	Supir/Driver	O/H	100,000	
6	Pembantu Supir/Kenek	O/H	80,000	
7	Mekanik	O/H	125,000	
8	Pembantu Mekanik	O/H	100,000	
9	Tukang	O/H	100,000	
10	Kepala Tukang	O/H	115,000	
11	Tukang Las	O/H	100,000	
12	Tukang Besi	O/H	100,000	
13	Tukang Batu	O/H	100,000	
14	Penjaga Malam	O/H	85,000	
15	Ahli Bor	O/H	115,000	
II	**BAHAN**			
II.1	**BATU**			
1	Abu batu	M^3	404,191	
2	Batu Kali/Gunung (Bulat)	M3	320,000	
3	Batu Kali/Gunung (Belah)	M3	340,000	
II.2	**BATU PECAH MESIN**			
1	Batu pecah 3-5	M3	360,000	
2	Batu pecah 2-3	M3	375,000	
3	Batu pecah 1-2	M3	385,000	
4	Batu pecah ½ -1	M3	321,257	
II.3	**KERIKIL**			
1	Batu jagung (Gravel) dia. 5 s/d7 mm	kg	233	
2	Kerikil timbun/Kerikil kali disaring	M3	155,686	
II.4	**PASIR DAN TANAH TIMBUNAN**			

No	URAIAN	SATUAN	HARGA	KETERANGAN
1	Pasir pasang	M3	130,000	
2	Pasir beton	M3	130,000	
3	Pasir urug	M3	110,000	
4	Tanah timbunan biasa	M3	110,000	
5	Tanah timbunan pilihan	M3	110,000	
6	Tanah Liat	M3	144,136	
7	Sirtu	M3	385,000	
II.5	**BETON READYMIX**			
1	Beton Readymix B 0 (Termasuk ppn 10%)	M3	780,000	
2	Beton Readymix K 125 (Termasuk ppn 10%)	M3	805,000	
3	Beton Readymix K 175 (Termasuk ppn 10%)	M3	830,000	
4	Beton Readymix K 225 (Termasuk ppn 10%)	M3	1,051,050	
5	Beton Readymix K 250 (Termasuk ppn 10%)	M3	905,000	
6	Beton Readymix K 275 (Termasuk ppn 10%)	M3	955,000	
7	Beton Readymix K 300 (Termasuk ppn 10%)	M3	1,035,000	
II.6	**BAHAN BAKAR MINYAK, PENCAMPUR/OLI**			
1	Premium	Liter	6,450	
2	Solar non subsidi	Liter	12,950	
3	Solar subsidi	Liter	5,150	
4	Minyal Pelumas (Oli)	Liter	40,000	
5	Minyak Bekisting	Liter	6,500	
6	Minyak Tanah/Korosin	Liter	13,000	
7	Aspal (Pertamina)	Kg	15,100	
8	Hotmix	Kg	1,848	
II.7	**BATA DAN KERAMIK**			
1	Batu bata	Bh	500	
2	Bata Ringan Hebel 7,5x20x60 cm	Bh	8,896	
3	Bata Ringan Hebel 10x20x60 cm	Bh	10,269	
4	Paving block tebal 8 cm	Bh	3,190	
5	Kansteen	bh	29,910	
II.8	**Beton precast**			
22	Semen PC (Portland Cement)	kg	1,265	
23	Semen putih	kg	1,950	
24	Semen grout	kg	10,750	
25	Batu andesit hitam POLOS	m2	148,273	
26	Palimanan	m2	300,000	
27	Granit homogenus tille 600x600mm	bh	105,600	
28	Keramik 400x400mm	bh	17,500	
29	Keramik 300x300mm	bh	8,182	

No	URAIAN	SATUAN	HARGA	KETERANGAN
30	Keramik 200x200mm lantai	bh	3,400	
31	Keramik 200x200mm dinding	bh	3,200	
32	Plint / border keramik 10 x 2 cm	bh	3,700	
33	Plastik cor	M2	5,000	
II.9	**BAHAN KAYU**			
1	Kayu Borneo balok klas I	M3	8,500,000	
2	Kayu Borneo papan klas I	M3	10,000,000	
3	Kayu papan klas II	M3	4,500,000	
4	Kayu balok klas II	M3	4,250,000	
5	Kayu Meranti balok klas III	M3	3,250,000	
6	Kayu Meranti papan klas III	M3	3,500,000	
7	Kayu Perancah	M3	2,000,000	
8	Kayu Balok 6 x 12 x 400 cm	btg	185,000	
9	Triplek 4 mm (Kw-1)	Lembar	62,500	
10	Multiplek 5 mm (Kw-1)	Lembar	136,500	
11	Multiplek 9 mm (Kw-1)	Lembar	101,500	
12	Multiplek 12 mm	Lembar	169,493	
13	Multiplek 18 mm	Lembar	227,500	
14	Phenol film 12 mm	Lembar	252,000	
15	GRC Board 5 mm	Lembar	67,500	
16	Gypsumboard 9 mm	Lembar	72,500	
17	Casting kompon 20 kg	sak	36,000	
18	List Gypsum polos 7x7 cm	m'	9,885	
19	Lisplank GRC 0,30 x 4 m	m'	88,964	
20	Kain kompon	roll	6,500	
21	Kayu Dolken	Btg	27,500	
22	Bambu dia. 15 cm	Btg	132,000	
23	Ijuk	Kg	27,500	
24	Lem kayu	Kg	35,000	
24	Kaso 5/7	M3	1,550,000	
II.10	**BAHAN BESI DAN KAWAT**			
1	Kawat beton	Kg	20,000	
2	Besi beton polos	Kg	13,000	
3	Besi beton ulir U 32 / U 39	Kg	15,000	
4	Kawat Bronjong	Kg	35,000	
5	Wiremesh M5	kg	9,000	
6	Wiremesh M6 (6 mm)	kg	9,700	
7	Wiremesh M7 (7 mm)	kg	9,000	
8	Wiremesh M8 (8 mm)	kg	10,300	
9	Seng gelombang BJLS 0,25 mm	Lbr	60,000	
10	Paku 2 - 15 cm	Kg	18,000	

No	URAIAN	SATUAN	HARGA	KETERANGAN
11	Paku Seng/Beton	Kg	35,000	
12	Paku triplek	Kg	12,000	
13	Paku skrup	dos	40,000	
14	Skrup Fischer	bh	27,500	
15	Besi angkur dia.16 mm	bh	37,538	
16	Besi siku L.100.100.10 L = 6 m	Kg	6,606	
	Besi siku L.100.100.8 L = 6 m	kg	6,613	
17	Besi siku L.50.50.5 L = 6 m	Kg	6,656	
18	Besi siku L.60.60.6 L = 6 m	Kg	6,640	
19	Baja struktur titik leleh 2600 kg/cm2	Kg	44,328	
20	Besi plat 2 mm	Kg	12,500	
21	Besi Profil reng 5,8 m	Kg	18,000	
22	Besi Profil reng 5,8 m	Kg	18,000	
23	Besi Hollow (40 x 40 x 2) mm	m	16,000	
24	Besi Hollow (40 x 40 x 2) mm	Kg	19,500	
25	Besi Hollow (50 x 50 x 3) mm	m	22,333	
26	Besi Hollow (50 x 50 x 3) mm	Kg	6,000	
27	Besi Hollow (40 x 60 x 2) mm	m	26,000	
28	Besi Hollow (40 x 60 x 2) mm	Kg	8,000	
29	Pagar BRC H: 1200mm hot dip galvanized	Lbr	239,700	
30	Pagar BRC H: 1750 mm hot dip galvanized	Lbr	380,800	
31	Besi Galvanized 1,5" Tinggi 150 cm	bh	114,250	
32	Besi Galvanized 1,5" Tinggi 200 cm	bh	152,333	
33	Besi Galvanized 2"	m	76,167	
34	Kawat las RB	kg	25,400	
35	Penjaga jarak Bekisting/Spacer	Bh	600	
36	Dynabolt 12 (10 s.d. 15) cm	bh	2,500	
37	Genteng metal polos (Zincalume)	m2	47,500	
38	Nok/bubungan metal	bh	35,000	
39	Nok/bubungan beton	bh	8,402	
40	Aluminium Profil	m1	74,136	
41	Sealant	tube	35,000	
42	Aluminium Strip	m1	48,930	
II.11	**BAHAN LAIN**			
1	Cat dasar	kg	23,000	
2	Meni Besi	kg	27,500	
3	Plamuur kayu/besi	kg	25,000	
4	Plamuur tembok	kg	22,500	
5	Cat Weathershield (Eksterior)	kg	130,500	
6	Cat Emulsion (Interior)	kg	112,500	
7	Cat Besi/Kayu	kg	75,000	
8	Cat Waterproofing	kg	75,000	

No	URAIAN	SATUAN	HARGA	KETERANGAN
9	Kuas cat 8"	bh	17,500	
10	Pengencer/Thiner	ltr	25,000	
11	Cuka bibit	ltr	65,000	
12	Amplas	lbr	7,500	
13	Palu/godam (baja keras)	bh	101,600	
14	Gergaji besi	bh	42,000	
15	Pahat beton (baja keras)	bh	17,000	
16	Linggis (baja keras)	bh	45,000	
17	Pipa PVC dia. 2"	m	28,250	
18	Water Stop 25 cm	m'	140,000	
19	Geotextile	m2	11,000	
20	Lempengan Rumput Lokal	m2	30,000	
21	Rumput gajah mini	m2	49,424	
22	Air bersih	ltr	350	
23	Karung bagor	unit	7,500	
24	Kawat nyamuk	m2	25,000	
25	Rangka Atap Baja + pasang	m2	120,000	
26	Engsel Pintu	Set	50,000	
27	Gembok	bh	72,000	
28	Harddisk External 2 TB	bh	1,200,000	
29	Cetak Foto	lembar	2,500	
30	Foto Album	bh	110,000	
31	Pipa PVC dia. 1/2" AW	btg	27,000	
III.1	**BAHAN ELEKTRIKAL**			
1	Kabel NYM (SNI) 2 x 1,5 mm2	m'	8,000	
2	Kabel NYM (SNI) 2 x 2,5 mm2	m'	9,500	
3	Kabel NYM (SNI) 3 x 1,5 mm2	m'	11,000	
4	Kabel NYM (SNI) 3 x 2,5 mm2	m'	15,800	
5	Saklar Tunggal	bh	25,000	
6	Saklar ganda	bh	36,000	
7	Stopkontak	bh	17,500	
8	Lampu SL 18 watt	bh	35,000	
9	Lampu SL 11 watt	bh	25,000	
10	Lampu Sorot LED 23 Watt	unit	276,775	
11	T dos	bh	5,000	
12	Klem	lot	8,750	
13	Inbow Dos	bh	1,500	
14	Isolasi	bh	8,500	
15	Fitting Ulir	bh	10,000	
16	Pipa Pralon uk. 5/8"	btg	12,500	
17	Pipa PVC d 3/4''	btg	33,000	
18	Lampu solar sel tiang PJU tunggal (Lengkap)	unit	4,950,000	

No	URAIAN	SATUAN	HARGA	KETERANGAN
19	Tali rafia	m'	16,300	
IV.1	**SEWA ALAT BERAT**			
1	Excavator Long Arm	Jam	165,000	
2	Excavator Standar	Jam	165,000	
3	Compactor	Jam	350,000	
4	Dozer 140 HP	Jam	350,000	
5	Crane Kap 10 - 15 ton	Jam	500,000	
6	Vibro roller 8 - 10 Ton	hari	1,200,000	
7	Tandem Roler 8 - 10 Ton	hari	4,420,000	
8	Jack hammer	hari	348,800	
9	Concreate Pump long boom	Jam	437,500	
10	Concreate Vibrator	hari	400,000	
11	Stamper,Vibrator Plate	Jam	245,000	
12	Dump Truk 4 Ton	hari	3,169,600	
13	Bulldozer 215 HP	Jam	876,200	
14	Mesin Pompa air 3 "	hari	350,000	
15	Asphal Spayer 800 lt	4 jam	318,800	
16	Wheel loader 1,5 m3	Jam	741,700	
17	Compressor	4 jam	1,116,000	
18	Compressor	hari	2,232,000	
19	Water Tank Truk	6 jam	2,394,000	
20	Motor Grader 100 HP	hari	7,749,600	
21	Concrete Mixer 0,3-0,6 m3	hari	1,010,400	
22	Genset 100 KVA	4 jam	625,000	
23	Mesin las	hari	5,742,400	
24	Mesin Bubut	hari	185,500	
25	Peralatan Sandblast	hari	1	
26	Mesin Bor Radial	jam	589,700	
27	Molen Kapasitas 0.3 m3	hari	896,000	
28	Bor Listrik	jam	1,300	
29	Gergaji Listrik	jam	2,100	
30	Gerindra	jam	2,100	
31	Generator set 5 kW	jam	18,300	
32	Mesin Jahit Terpal	jam	2,900	
33	Pompa Air 5 kW	jam	17,800	
34	Dump Truck	jam	434,000	
35	Bulldozer	jam	876,200	
36	Roller Vibro	jam	630,700	
37	Water Truck	jam	320,600	
38	Truck Crane	jam	831,000	
39	Takel (Katrol)	hari	345,000	

No	URAIAN	SATUAN	HARGA	KETERANGAN
V.1	**PINTU AIR**			
1	CDC, B = 0.3 m; H = 1.2 m	bh	8,500,000	
2	CDC, B = 0.5 m; H = 1.6 m	bh	9,000,000	
3	CDC, B = 0.5 m; H = 1.2 m	bh	9,250,000	
4	CDC, B = 0.7 m; H = 1.6 m	bh	10,000,000	
5	Sorong, B = 0.5 m; H = 1.2 m	bh	9,500,000	
6	Sorong, B = 0.7 m; H = 1.7 m	bh	11,800,000	
7	Daun Pintu 8 mm, B = 0.3 m; H = 0.6 m	bh	350,000	
8	Daun Pintu 8 mm, B = 0.5 m; H = 0.9 m	bh	700,000	
9	Pintu Air, B = 0.75 m; H = 1.2 m	bh	9,500,000	
10	Ulir 63	m	1,800,000	
11	Bushing Kuningan	bh	1,700,000	
12	Jasa Pengiriman Surabaya - Metro, Lampung	Kg	7,000	

b. SCADA Unit Price

No	DESCRIPTION	UNIT	PRICE
I	**Sluice Work Area >2000 ha**	Unit	23,400,000
1	2.5 Kwatt Actuator	Unit	42,800,000
2	15 Kwatt Actuator	Unit	241,725,000
3	Generator	Unit	842,000
4	CCTV	Unit	22,257,160
5	Electrification		
II	**Remote Instrument Work**	Unit	259,500,000
1	Automatic Weather Station (AWS)	Unit	61,700,000
2	Automatic Rainfall Recorder (ARR)	Unit	29,500,000
3	Automatic Water Level Record (AWLR)	Unit	55,000,000
4	Remote Terminal Unit (RTU)		
III	**MTU Jobs**	Unit	40,000,000
1	Desktop Computer	Unit	62,000,000
2	Network Server	Unit	7,300,000
3	UPS	Unit	2,400,000
4	ADC	Unit	3,200,000
5	Power Supply	Unit	27,000,000
6	Large Screen 70"	Unit	330,000,000
7	Scada Software	Unit	98,000,000
8	DSS software	Unit	4,700,000
9	AC 1.5 pk	Unit	6,800,000
10	OS software	Unit	732,000

No	DESCRIPTION	UNIT	PRICE
11	CCTV/Gate access	Unit	8,300,000
12	VMS/Access software	Unit	4,100,000
13	RAM 4 Terabytes	Unit	1,350,000
14	4G/5G Antenna	Unit	13,420,000
15	Installation materials		
IV	**Water Operation Center (WOC) Work**		
1	WOC Argoguruh Weir	Unit	52,382,000
1.1	Server PC	Unit	26,202,000
1.2	34 inch LED	Unit	153,232,200
1.3	WinCC system software V7.4 SP1 RC 2048	Unit	33,817,300
1.4	SIMANTIC telecontrol, basic engineering software V7.0	Unit	66,382,800
1.5	SIMANTIC telecontrol, server software runtime 12ST V7.4		
2	Monitoring Unit (BBWS Mesuji Sekampung)	Unit	69,843,400
2.1	PC client	Unit	52,382,000
2.2	34 inch LED	Unit	132,058,300
2.3	SIMANTIC WinCC/Web navigator, 3 client licenses		
3	SCADA SYSTEM	Unit	123,970,000
3.1	Developed PLC programming	Unit	123,970,000
3.2	Developed HMI & SCADA programming	Unit	24,794,000
3.3	Assembly panels	Unit	24,794,000
3.4	System integration test (Site Acceptance Test)	Unit	148,764,000
3.5	On-site installation, testing & commissioning	Unit	24,794,000
3.6	On-site training	Unit	24,794,000
3.7	Project scheduling, documentation, administration, reporting		
		Unit	1,870,000,000
4	Connection between SIPASI and SCADA		

c. Basic Unit Price of Operation

TABLE 5-51 BASIC UNIT PRICE OF OPERATION

NO	DESCRIPTION	UNIT	PRICE
I	**Salaries/Wages/Fees for UPIM and UPTD Personnel**		
A	UPIM personnel		
1	Manager	OB	10,000,000
2	Administration & Finance Staff	OB	5,000,000
3	Technical Staff	OB	3,000,000
4	WOC Coordinator	OB	7,500,000

NO	DESCRIPTION	UNIT	PRICE
5	WOC Staff	OB	7,000,000
6	KMC Coordinator	OB	6,000,000
7	KMC Staff	OB	5,000,000
8	Irrigation Extension Coordinator	OB	5,000,000
9	Irrigation Extension Staff	OB	4,500,000
10	SPKM Coordinator	OB	6,000,000
11	SPKM Technician	OB	5,000,000
12	Workshop Coordinator	OB	6,000,000
13	Workshop Technician	OB	5,000,000
14	SPI Commander	OB	4,500,000
15	SPI	OB	4,000,000
B	UPTD personnel		
1	UPT/Regional Coordinator	OB	1,200,000
2	Waterworker	OB	750,000
3	Sluice Guard (Civil Servant)	OB	500,000
4	Sluice Guard (Honorary)	OH	100,000
5	Administrative staff	OH	150,000
6	Performance incentives (paid based on group)	OH	150,000
II	**Office stationery**		
A	Paper, Stationery	Ls	750,000
B	Report generation costs	Ls	750,000
C	WiFi Subscription		
1	UPT/Regional Coordinator	Ls	750,000
2	For UPIM	Ls	900,000
3	For WOC	Ls	700,000
4	Generator House	Ls	300,000
5	Measuring station	Ls	90,000
D	PLN Electricity		
1	UPT/Regional Coordinator	Ls	1,000,000
2	For UPIM	Ls	5,000,000
III	**Equipment Operation**		
1	Fuel Oil (Cars, motorbikes, generators and lawn mowers)	OB	9,125
IV	**Equipment Procurement**		
1	Current meter procurement	Set	15,000,000

d. Basic Unit Price of Maintenance

TABLE 5-52 BASIC UNIT PRICE OF MAINTENANCE

No	DESCRIPTION	UNIT	PRICE
I	**Salary and Wages**		
1	Freelance Daily Worker	OH	100,000
2	Coordination Resource	OJ	1,000,000
3	Coordination Participants	OJ	750,000
4	BBWS Monitoring Resource	OJ	1,000,000
5	Resource Person for Monitoring PSDA/BPSDA	OJ	500,000
II	**Consumables**		
A	Maintenance of the canal structures (Brush/paint roller material and others)	Ls	300,000
B	Grass shears	Ls	250
C	Gate routing maintenance (oil)	Ls	125,000
D	Inspection road maintenance	Ls	250
E	Communication fee		
1	Balance package for waterworkers	Ls	100,000
2	Balance package for PPA	Ls	50,000
F	Equipment used		
1	Topographical Measuring Tool	Ls	300,000
2	Peil schal (broken replacement)	Ls	500,000
3	Raincoat	Ls	100,000
4	Flashlight	Ls	100,000
5	Safety equipment	Ls	100,000
6	Equipment for irrigation/security officers (uniforms, flashlights, boat shoes, keys, batons, handcuffs, etc.)	Ls	300,000
III	**Coordination and Monitoring (BBWS, BPSDA and Provincial Office)**		
1	Meal and Snack	LS	50,000
2	Transport participants (UPTD, Waterworkers, PPA, UPIM)	LS	50,000
3	Transport Monitoring by BBWS	LS	150,000
4	Honorarium Fee	OH	3,000,000

e. Basic Price of UPIM and Institutional Training

TABLE 5-53 BASIC PRICE OF UPIM AND INSTITUTIONAL TRAINING

No	ACTIVITIES	UNIT	UNIT PRICE (Rp.)
I	**Construction of Working Facilities for UPIM & WOC**		
1	Work office construction	LS	3,000,000,000
2	4-wheeled vehicle (MPV car) for UPIM operations	LS	250,000,000

No	ACTIVITIES	UNIT	UNIT PRICE (Rp.)
3	4-wheeled vehicle (MPV car) for UPIM operations	LS	170,000,000
4	2-wheeled vehicle (Operational Motorcycle for SPKM members)	LS	35,000,000
5	2-Wheeled Vehicle (Operational Motorcycle for SPI members)	LS	35,000,000
II	**UPIM Preparation (Modernization)**		
A	Modernization Socialization (UPIM and SIPASI) to provincial level stakeholders		
1	Province	OH	2,250,000
2	Metro City	OH	2,000,000
3	East Lampung Regency	OH	2,000,000
4	Central Lampung Regency	OH	2,000,000
B	Modernization Socialization (UPIM and SIPASI) Irrigation Commission Towards Modern Irrigation Commission		
1	Province	OH	4,000,000
2	Metro City	OH	3,000,000
3	East Lampung Regency	OH	3,000,000
4	Central Lampung Regency	OH	3,000,000
C	Distribution Socialization in the Pilot Tertiary Plot	Tersier	5,000,000
D	UPIM Staff Training		
1	WOC Training	O/P	10,000,000
2	Training for UPIM Managers (KMC, Irrigation Extension Officer)	O/P	5,000,000
3	SPKM Training	O/P	7,500,000
4	SPI HR Training	O/H	200,000
5	Modernization Training for Irrigation Manager		
6	TOT training (preparation of trainers)	O/P	1,000,000
7	Modernization Training for UPTD-Irrigation Commission-UPT	O/P	500,000
8	Modernization for Waterworkers in 7 Sub-Systems in Irrigation Area	O/P	500,000
9	Modernization for PPA	O/P	500,000
10	Introductory Training on Modernization of Irrigation Management for WUA/GP3A/IP3A	O/P	1,000,000
11	Irrigation Security Training and Socialization for PPA/GP3A/IP3A	O/P	1,000,000
12	Training on Procedures for Providing Water to Tertiary Plots with SIPASI	O/P	500,000
13	Training for the Preparation of the Modernization Irrigation Aknop for UPTD-Irrigation Commission-UPT	O/P	750,000
III	**Trial and Maturation of UPIM, WOC and Sipasi Concepts**		
1	Periodic Field Monitoring	LS	25,000,000
2	Discussion and Improvement of the UPIM & Sipasi Concept	LS	55,000,000
3	SIPASI Fixes (Ver 2)	LS	300,000,000
IV	**Strengthening Institutional and Legality of WUA/GP3A/IP3A and Irrigation Commission**		
1	Formation of WUA (new) and Legal Entities	LS	2,000,000

No	ACTIVITIES	UNIT	UNIT PRICE (Rp.)
2	Facilitation of NOTARY CERTIFICATE for P3A	LS	2,000,000
3	Establishment of GP3A (new) and Legal Entity	LS	5,000,000
4	Establishment of IP3A (new) and Legal Entities	LS	4,000,000
5	Communication & Leadership Training for WUAs	Ls	1,500,000
6	Hydrology Training for P3A	Ls	1,000,000
7	Business Development Training for GP3A	Ls	2,000,000
8	GP3A Business Capital Assistance	LS	20,000,000
9	Organizational Management Strengthening/Training/Secretariat of Irrigation Commission	LS	1,500,000
10	Provision of Annual Facilities for the Secretariat of the Irrigation Commission	OB	3,500,000
V	**Community Development Activities**		
1	Punggur, Rumbia Barat & Bekri	LS	500,000,000
2	Sekampung Bunut & Sekampung Batanghari	LS	400,000,000
3	Sekampung Batanghari & Batanghari & Raman Utara	LS	400,000,000
4	Training on Irrigation Management, Water Efficiency and Smart Farming (Farmer to Farmer training)	L/H	150,000
VI	**Strengthening of Irrigation Human Resources**		
1	Professional certification training for personnel for irrigation management implementers (expertise and management)	O/P	15,000,000
2	Recruitment/Test of Freelance Daily Workers (PTHL) to become PPPK or PNS	O/P	10,000,000
3	Orientation for the placement of non-PNS PPA workers (annual routine activities AND 30% CONTRIBUTION)	O/P	3,000,000
4	Development of guidelines for the system of incentives and allowances for the translation of ASN rules	O/P	100,000,000
VII	**Infrastructure Investment**		
1	Installation of AWLR in 1,269 intake structures and 136 offtake structures	O/P	30,000,000

5.7.2 - Budget Plan for Punggur Utara I

TABLE 5-54 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF PUNGGUR UTARA I

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	79,970,000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162,507,200

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44,495,000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	15,632,000
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5,684,000
6	Pengukuran /setting out	LS	1	71,311,200
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	321,620,200
				701,219,600
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	40,254	527,327,400
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	1,578.50	116,809,000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	38,906.1	361,826,777
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	19,544.6	1,117,953,871
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	19,453.1	2,464,701,753
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	19,453.1	994,050,983
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	19,544.6	2,837,882,904
2.6	Penanaman gebalan rumput	m^2	41,554.2	2,904,637,625
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	9,494.9	1,151,727,243
3.2	Pekerjaan lantai kerja K-100	m^3	4,893.2	6,032,351,119
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	50.4	153,732,614
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	3,324.3	9,909,653,308
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	33.1	128,883,928

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	6,501.5	10,937,389,728
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
a.	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	148.9	372,106,431
b.	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	114.0	277,995,090
c.	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	290.3	712,034,858
d.	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	163.5	398,998,325
e.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	322.4	784,790,818
f.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	796.8	1,945,249,272
g.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	472.9	1,149,563,897
h.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1,238.8	3,015,048,229
i.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	2,909.5	7,112,864,906
j.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	366.9	899,089,033
k.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	908.9	2,240,491,020
l.	Pekerjaan linning beton precast K-225 (uk. 1 x 2.0 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	607.9	1,503,343,484
m.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.2 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	105.1	254,253,571
n.	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	113.9	274,792,387
3.8	Pekerjaan joint filler 1 cm	m^2	-	-
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	35.8	83,552,414
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	2,620.4	6,616,896,598
				67,279,998,587
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**			
1	**Rehab Bangunan Bagi Sadap (5 Unit)**			

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	402.48	23,021,695
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	210.60	30,578,772
1.3	Pekerjaan bongkaran pasangan batu	m^3	187.16	27,044,684
1.4	Pasangan batu belah adk 1: 4	m^3	187.16	202,488,880
1.5	Siaran dengan mortar tipe M	m^2	464.82	27,610,225
1.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	189.52	24,012,185
1.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	189.52	9,684,473
				344,440,912
2	**Rehab Bangunan Bagi (2 Unit)**			
2.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	1.62	92,664
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	1.62	235,224
2.3	Pekerjaan bongkaran pasangan batu	m^3	37.35	5,396,670
2.4	Pasangan batu belah adk 1: 4	m^3	37.35	40,405,936
2.5	Siaran dengan mortar tipe M	m^2	57.42	3,411,033
2.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	18.67	2,365,945
2.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	18.67	954,221
				52,861,693
3	**Rehab Bangunan Sadap (7 Unit)**			
3.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	36.50	2,087,708
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	36.50	5,299,566
3.3	Pekerjaan bongkaran pasangan batu	m^3	26.81	3,873,558
3.4	Pasangan batu belah adk 1: 4	m^3	28.20	30,510,693

No .	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3. 5	Siaran dengan mortar tipe M	m^2	75.18	4,465,550
3. 6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	13.40	1,698,200
3. 7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	13.40	684,909
				48,620,184
4	**Rehab Bangunan Jembatan (9 Unit)**			
4. 1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	4.90	280,303
4. 2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	3.95	573,540
4. 3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	3.06	733,751
4. 4	Pekerjaan bongkaran pasangan batu	m^3	1.90	273,972
4. 5	Pasangan batu belah adk 1: 4	m^3	2.85	3,079,520
4. 6	Plester 1:3 tebal 15 mm	m^2	89.77	6,732,825
4. 7	Pekerjaan beton K-225 (Ready Mix)	m^3	3.10	3,256,889
4. 8	Pembesian	kg	129.24	2,184,135
4. 9	Bekisting	m^2	79.92	6,976,580
4. 10	Siaran dengan mortar tipe M	m^2	16.68	990,792
4. 11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	2.95	374,322
4. 12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	2.95	150,970
4. 13	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	20.60	8,262,660
4. 14	Pekerjaan Pengelasan	titik	32.00	105,920
				33,976,179
5	**Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)**			
5. 1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	290.34	16,607,437

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
5.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	52.53	7,627,371
5.3	Pekerjaan bongkaran pasangan batu	m^3	135.77	19,619,421
5.4	Pasangan batu belah adk 1: 4	m^3	118.43	128,133,095
5.5	Plester 1:3 tebal 15 mm	m^2	225.85	16,938,750
5.6	Siaran dengan mortar tipe M	m^2	971.53	57,708,820
5.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	186.79	23,666,562
5.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	186.79	9,545,077
				279,846,532
6	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**			
6.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	22.09	1,263,810
6.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	12.75	1,851,267
6.3	Pekerjaan bongkaran pasangan batu	m^3	7.26	1,048,348
6.4	Pasangan batu belah adk 1: 4	m^3	8.90	9,623,501
6.5	Plester 1:3 tebal 15 mm	m^2	17.10	1,282,605
6.6	Siaran dengan mortar tipe M	m2	17.10	1,015,823
6.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	8.30	1,051,597
6.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	8.30	424,125
				17,561,075
7	**Pembuatan Bangunan Terjun (5 Unit)**			
7.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	326.92	18,699,951
7.2	Timbunan & pemadatan dengan alat berat (tanah dari luar)	m^3	210.24	41,964,235
7.3	Pekerjaan pemasangan bowplank	m'	67.92	5,243,424

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
7.4	Pekerjaan bongkaran pasangan batu	m^3	29.21	4,221,423
7.5	Pasangan batu belah adk 1: 4	m^3	163.09	176,449,251
7.6	Plester 1:3 tebal 15 mm	m^2	334.05	25,053,728
7.7	Beton lantai kerja K-100	m^3	17.01	20,973,654
7.8	Pekerjaan beton K-225	m^3	1.12	1,180,539
7.9	Pembesian	kg	375.14	6,339,857
7.10	Bekisting	m^2	1.80	157,140
7.11	Siaran dengan mortar tipe M	m^2	36.00	2,138,400
7.12	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	72.95	9,242,421
7.13	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	72.95	3,727,606
				315,391,630
				1,092,698,205
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	30,543.00	186,312,300
1.2	Pekerjaan Jalan Onderlag	m^2	30,543.00	5,033,486,400
				5,219,798,700
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	12,650.00	77,165,000
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	3,383.70	6,258,829,890
	- Pekerjaan Bekisting	m^2	6,767.40	791,109,060

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
				7,127,103,950
				12,346,902,650
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**			
1	Pekerjaan pemasangan patok Kilometer	patok	283	43,978,200
2	Pekerjaan pemasangan patok Hektometer	patok	2,281	332,569,800
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	5,068	1,209,731,600
				1,586,279,600
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PUNGGUR UTARA**			
1	Pembangunan sanggar P3A	unit	3.00	72,702,900
2	Pembangunan shelter pintu air	unit	2.00	17,330,800
3	Pembangunan trashrack	unit	2.00	6,332,040
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1	unit	56.00	322,599,200
	- Papan eksploitasi tipe 2	unit	31.00	142,135,000
	- Papan eksploitasi tipe 3	unit	15.00	49,896,000
				610,995,940
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PUNGGUR UTARA**			
A	Perbaikan dan penggantian pintu air di KPD Rantau Fajar			
1	Pemasangan pintu crump baja Lengkap, b= 0,3, h= 1.2	Unit	1.00	11,483,100
2	Pemasangan pintu crump baja Lengkap, b= 0,5, h= 1.6	Unit	3.00	35,039,400
3	Pemasangan pintu crump baja Lengkap, b= 0,5, h= 1.2	Unit	5.00	87,034,000
4	Pemasangan pintu crump baja Lengkap, b= 0,7, h= 1.6	Unit	1.00	16,379,000

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
5	Pemasangan pintu Sorong baja Lengkap, b= 0,5, h= 1.7	Unit	1.00	18,319,600
6	Pemasangan pintu Sorong baja Lengkap, b= 0,7, h= 1.2	Unit	1.00	20,678,300
7	Pemasangan Frame Pintu, b= 0,75, h= 1.2	Unit	1.00	15,789,600
8	Pemasangan spindel pintu air mekanik tunggal lengkap	Unit	9.00	93,199,500
9	Pemasangan spindel pintu air mekanik ganda lengkap	Unit	1.00	14,205,500
B	Perbaikan dan penggantian pintu air di UPTD Seputih Raman			
1	Pemasangan Skin Plate pintu crump baja, b= 0,3, h= 0.6	Unit	1.00	1,477,700
2	Pemasangan Skin Plate pintu crump baja, b= 0,5, h= 0.9	Unit	1.00	4,931,100
3	Pemasangan spindel pintu air mekanik tunggal lengkap	Unit	3.00	31,066,500
4	Pemasangan spindel pintu air mekanik ganda lengkap	Unit	1.00	14,205,500
				363,808,800
				83,981,903,000

5.7.3 - Budget Plan for Punggur Utara II

TABLE 5-55 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF PUNGGUR UTARA II

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	212.850.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	13.970.400
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	71.311.200
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	722.431.800
				1.233.249.600
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	43.412	568.697.200
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	661.50	48.951.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	3.747.5	34.852.122
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	7.883.6	450.943.188
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	7.883.6	1.144.701.938
2.6	Penanaman gebalan rumput	m^2	22.235.9	1.554.288.711
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	4.025.9	488.336.643
3.2	Pekerjaan lantai kerja K-100	m^3	3.180.6	3.921.088.344

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	24.7	75.325.373
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	1.543.0	4.599.549.585
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	4.0	15.393.435
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	4.301.6	7.236.617.627
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	213.0	583.747.174
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.440.8	3.760.581.966
3.7.3	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.440.4	3.653.817.222
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.217.8	3.034.657.920
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.742.1	4.249.560.341
3.7.6	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	394.0	963.409.075
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	646.5	1.573.428.730
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.045.0	2.543.530.779
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	718.6	1.743.822.737
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	31.2	75.123.360
3.7.11	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	31.2	75.304.320
3.7.12	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	31.2	75.791.040
3.7.13	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	267.3	656.787.144
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	50.7	112.321.455
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	2.884.9	6.951.355.938
				50.191.984.369

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**			
1	**Rehab Bangunan Bagi Sadap (8 Unit)**			
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	127.90	7.315.685
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	124.61	18.093.493
1.3	Pekerjaan bongkaran pasangan batu	m^3	113.22	16.360.388
1.4	Pasangan batu belah adk 1: 4	m^3	113.22	122.493.450
1.5	Siaran dengan mortar tipe M	m^2	112.20	6.664.975
1.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	59.90	7.588.835
1.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	59.90	3.060.690
				181.577.517
2	**Rehab Bangunan Ukur (7 Unit)**			
2.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	57.66	3.298.203
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	51.02	7.408.813
2.3	Pekerjaan bongkaran pasangan batu	m^3	198.12	28.627.834
2.4	Pasangan batu belah adk 1: 4	m^3	209.02	226.137.942
2.5	Siaran dengan mortar tipe M	m^2	338.87	20.128.723
2.6	Linning Beton Precast K-225 (Uk. 1 x 1,0 x 0,08 m), Wiremesh M8-8 mm (ready mix)	m^3	0.51	2.520.871
2.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	105.69	13.391.463
2.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	105.69	5.400.977
				306.914.827
3	**Rehab Bangunan Jembatan, 3 unit buat baru (22 Unit)**			
3.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	119.79	6.852.194
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	119.79	17.394.031

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	3.41	817.084
3.4	Pekerjaan bongkaran pasangan batu	m^3	16.27	2.351.605
3.5	Pasangan batu belah adk 1: 4	m^3	17.94	19.407.209
3.6	Plester 1:3 tebal 15 mm	m^2	446.85	33.513.885
3.7	Pekerjaan beton K-225 (Ready Mix)	m^3	161.97	187.247.737
3.8	Pembesian	kg	12.371.25	209.074.197
3.9	Pekerjaan lantai kerja K-100	m^3	438.99	541.189.091
3.10	Bekisting	m^2	5.04	439.992
3.11	Siaran dengan mortar tipe M	m^2	158.04	9.387.391
3.12	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	9.84	1.246.999
3.13	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	9.84	502.933
3.14	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	624.84	250.623.324
3.15	Pekerjaan Pengelasan	titik	936.00	3.098.160
				1.283.145.831
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**			
6.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	6.62	378.479
6.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	6.62	960.754
6.3	Pekerjaan bongkaran pasangan batu	m^3	2.00	289.000
6.4	Pasangan batu belah adk 1: 4	m^3	2.00	2.163.800
6.5	Plester 1:3 tebal 15 mm	m^2	4.00	300.000
6.6	Siaran dengan mortar tipe M	m2	10.00	594.000
6.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	1.00	126.700

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
6.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	1.00	51.100
				4.863.833
5	**Pembuatan Bangunan Terjun (1 Unit)**			
5.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	18.01	1.030.273
5.2	Timbunan & pemadatan dengan alat berat (tanah dari luar)	m^3	22.06	4.402.489
5.3	Pekerjaan pemasangan bowplank	m'	25.95	
5.4	Pekerjaan bongkaran pasangan batu	m^3	12.26	1.771.454
5.5	Pasangan batu belah adk 1: 4	m^3	12.26	13.263.228
5.6	Plester 1:3 tebal 15 mm	m^2	25.99	1.949.250
5.7	Pekerjaan beton K-225	m^3	49.35	57.048.593
5.8	Pembesian	kg	268.53	4.538.111
5.9	Bekisting	m^2	25.99	2.268.927
5.10	Siaran dengan mortar tipe M	m^2	35.42	2.104.019
5.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	15.14	1.917.665
5.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	15.14	773.423
				91.067.433
				1.867.569.441
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-
				-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	106.904.00	652.114.400
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	22.526.10	41.666.527.170
	- Pekerjaan Bekisting	m^2	45.052.20	5.266.602.180
				47.585.243.750
				47.585.243.750
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**			
1	Pekerjaan pemasangan patok Kilometer	patok	-	-
2	Pekerjaan pemasangan patok Hektometer	patok	-	-
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	-	-
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PUNGGUR UTARA**			
1	Pembangunan sanggar P3A	unit	31.00	751.263.300
2	Pembangunan shelter pintu air	unit	2.00	17.330.800
3	Pembangunan trashrack	unit	4.00	12.664.080
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1	unit	158.00	910.190.600
	- Papan eksploitasi tipe 2	unit	34.00	155.890.000
	- Papan eksploitasi tipe 3	unit	16.00	53.222.400
				1.900.561.180
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PUNGGUR UTARA**			
A	Perbaikan dan penggantian pintu air di UPTD Trimurjo			
1	Pemasangan skin plate pintu crump baja, b = 0.6, h = 1.6	Unit	1.00	5.352.000
2	Pemasangan skin plate pintu crump baja, b = 0.8, h = 0.7	Unit	1.00	3.978.400
3	Pemasangan skin plate pintu crump baja, b = 1, h = 1	Unit	1.00	5.494.800

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
4	Pemasangan skin plate pintu sorong baja, b = 0.3, h = 1.55	Unit	1.00	3.714.700
5	Pemasangan skin plate pintu sorong baja, b = 0.8, h = 0.8	Unit	1.00	4.253.100
6	Pemasangan skin plate pintu sorong baja, b = 0.75, h = 1.4	Unit	1.00	5.667.900
7	Pemasangan skin plate pintu sorong baja, b = 0.8, h = 1.1	Unit	1.00	5.077.300
8	Pemasangan skin plate pintu sorong baja, b = 1.3, h = 0.9	Unit	2.00	12.215.000
9	Pemasangan skin plate pintu sorong baja, b = 2.45, h = 1.4	Unit	1.00	27.326.400
10	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	7.00	71.371.300
B	Perbaikan dan penggantian pintu air di UPTD Punggur			
1	Pemasangan skin plate pintu crump baja, = 0.35, h = 1.2	Unit	1.00	3.500.400
2	Pemasangan skin plate pintu crump baja, = 0.5, h = 1.0	Unit	1.00	3.874.100
3	Pemasangan skin plate pintu crump baja, b = 0.5, h = 1.9	Unit	1.00	5.448.300
4	Pemasangan skin plate pintu crump baja, b = 0.6, h = 1.0	Unit	1.00	4.187.400
5	Pemasangan skin plate pintu crump baja, b = 0.75, h = 1.0	Unit	1.00	4.635.000
6	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap,	Unit	6.00	61.175.400
C	Perbaikan dan penggantian pintu air di UPTD Kota Gajah			
1	Pemasangan spindel pintu air mekanik tunggal lengkap	Unit	1.00	10.195.900
				237.467.400
	Total RAB Punggur Utara II			**103.016.075.000**

5.7.4 - Budget Plan for Raman Utara

TABLE 5-56 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF RAMAN UTARA

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	132.055.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	15.632.000
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	71.311.200
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	561.234.700
			TOTAL I	**992.919.100**
II	**PEKERJAAN PADA SALURAN RAMAN UTARA**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	38.215	500.616.500
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	1.382.50	102.305.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	-	-
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	11.977.8	685.127.306
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	11.977.8	1.739.169.316
2.6	Penanaman gebalan rumput	m^2	25.088.4	1.753.677.063
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	8.983.3	1.089.675.816
3.2	Pekerjaan lantai kerja K-100	m^3	4.537.8	5.594.248.807

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	393.3	1.200.630.482
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	1.375.4	4.100.153.596
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	1.6	6.419.125
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	7.214.0	12.136.039.848
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	591.1	1.620.126.435
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	501.3	1.308.390.928
3.7.3	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	2.226.1	5.647.030.262
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.771.1	4.413.475.539
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	790.0	1.927.007.971
3.7.6	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	881.6	2.145.713.778
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	376.9	917.364.864
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	559.5	1.347.212.256
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.907.9	4.634.622.096
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	675.9	1.660.953.943
3.7.11	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	455.2	1.141.285.463
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	96.0	223.971.175
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	2.090.6	5.279.014.522
			TOTAL II	**61.174.232.091**
III	**PEKERJAAN BANGUNAN PADA SALURAN RAMAN UTARA**			
1	**Rehab Bangunan Jembatan (4 Unit)**			
1.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-
1.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	1.92	459.313
1.4	Pekerjaan bongkaran pasangan batu	m^3	2.11	304.946
1.5	Pasangan batu belah adk 1: 4	m^3	2.11	2.283.190
1.6	Plester 1:3 tebal 15 mm	m^2	46.57	3.492.420
1.7	Pekerjaan beton K-225 (Ready Mix)	m^3	1.92	2.216.244
1.8	Pembesian	kg	954.95	16.138.695
1.9	Bekisting	m^2	43.99	3.840.502
1.1	Siaran dengan mortar tipe M	m^2	14.54	863.771
1.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	2.01	255.133
1.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	2.01	102.899
1.13	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	191.20	76.690.320
1.14	Pekerjaan Pengelasan	titik	376.00	1.244.560
				107.891.992
2	**Rehab Bangunan Gorong-Gorong Pembawa (3 Unit)**			
2.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	10.89	622.908
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	10.89	1.581.228
2.3	Pembesian	m^3	54.79	925.883
2.4	Pekerjaan bongkaran pasangan batu	m^3	8.24	1.190.738
2.5	Plester 1:3 tebal 15 mm	m^2	7.06	529.785
2.6	Pekerjaan Beton K-225 (Ready Mix)	m2	8.24	8.661.072
2.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	4.12	522.029

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	4.12	210.542
				14.244.186
3	**Rehab Bangunan Ukur (4 Unit)**			
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	134.57	7.697.397
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	134.57	19.539.546
1.3	Pekerjaan bongkaran pasangan batu	m^3	49.58	7.164.891
1.3	Pasangan batu belah adk 1: 4	m^3	49.58	53.644.951
1.4	Pekerjaan Beton K-225 (Ready Mix)	m^2	21.60	22.702.680
1.5	Pembesian	m^3	88.80	1.500.690
1.6	Siaran dengan mortar tipe M	kg	164.37	9.763.487
1.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^2	49.58	6.282.295
1.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^2	49.58	2.533.743
				130.829.680
4	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**			
4.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	725.68	41.508.675
4.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	729.34	105.899.682
4.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	380.83	91.246.102
4.4	Pekerjaan Beton K-225 (Ready Mix)	m^3	380.83	400.268.012
4.5	Plester 1:3 tebal 15 mm	m^2	556.04	41.702.780
4.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	188.58	23.893.484
4.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	188.58	9.636.599
4.9	Precast K-225 (Uk. 1 x 0,8 x 0,08 m), Wiremesh M8-8 mm (ready mix)	bh	25.00	127.457.500

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
				841.612.835
5	**Rehab Bangunan Bronjong**			
5.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	1.670.01	95.524.309
5.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	295.53	42.910.704
5.3	Pekerjaan bongkaran pasangan batu	m^3	475.37	68.691.254
5.4	Pasangan bronjong	m^3	1.896.20	2.483.078.876
5.5	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	924.92	117.187.942
5.6	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	924.92	47.263.645
				2.854.656.731
			TOTAL II	**3.949.235.424**
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN RAMAN UTARA**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-
				-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	44.142.00	269.266.200
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	9.425.18	17.433.746.198
2.3	- Pekerjaan Bekisting	m^2	18.850.35	2.203.605.915
			TOTAL IV	**19.906.618.313**
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN RAMAN UTARA**			
1	Pekerjaan pemasangan patok Kilometer	patok	57	8.857.800
2	Pekerjaan pemasangan patok Hektometer	patok	451	65.755.800

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	1.006	240.132.200
			TOTAL V	**314.745.800**
VI	**PEKERJAAN PENDUKUNG PADA SALURAN RAMAN UTARA**			
1	Pembangunan sanggar P3A	unit	13.00	315.045.900
2	Pembangunan shelter pintu air	unit	-	-
3	Pembangunan trashrack	unit	2.00	6.332.040
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1	unit	51.00	293.795.700
	- Papan eksploitasi tipe 2	unit	9.00	41.265.000
	- Papan eksploitasi tipe 3	unit	14.00	46.569.600
			TOTAL VI	**703.008.240**
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN RAMAN UTARA**			
A	Perbaikan dan penggantian pintu air di UPTD Raman			
1	Pemasangan Spindel Pintu Air Mekanik Single Lengkap	unit	4.00	40.783.600
2	Pemasangan Spindel Pintu Air Mekanik Double Lengkap	unit	4.00	56.183.600
3	Pemasangan pintu crump baja lengkap, b=0.60 , h=0.60	unit	1.00	21.844.300
4	Pemasangan pintu crump baja lengkap, b=0.60 , h=0.80	unit	1.00	26.124.600
5	Pemasangan skin plate pintu crump baja, b=0.50 , h=1.00	unit	1.00	3.132.700
6	Pemasangan skin plate pintu sorong baja, b=0.35, h=0.75	unit	1.00	2.109.900
7	Pemasangan pintu sorong baja lengkap, b=0.40, h=0.60	unit	1.00	21.117.600
8	Pemasangan skin plate pintu sorong baja, b=0.50, h=0.60	unit	1.00	2.270.200
9	Pemasangan pintu sorong baja lengkap, b=0.80, h=1.40	unit	1.00	34.643.700
10	Pemasangan skin plate pintu sorong baja, b=0.90, h=0.80	unit	1.00	3.583.700

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
11	Pemasangan skin plate pintu sorong baja, b=1.30, h=1.75	unit	1.00	22.897.300
12	Pemasangan skin plate pintu sorong baja, b=1.20, h=0.90	unit	1.00	13.053.900
			TOTAL VII	**247.745.100**
	TOTAL RAB RAMAN UTARA			**87.288.504.000**

5.7.5 - Budget Plan for Batanghari Utara

TABLE 5-57 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF BATANGHARI UTARA ALT 1

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	255.915.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	11.788.000
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	39.823.700
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	510.992.900
			TOTAL	**1.031.205.800**
II	**PEKERJAAN PADA SALURAN BATANGHARI UTARA**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	108.253	1.418.114.300
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	1.711.50	126.651.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	-	-
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	12.354.8	706.692.249
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	12.354.8	1.793.911.095
2.6	Penanaman gebalan rumput	m^2	15.435.6	1.078.946.343
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	9.266.1	1.123.974.255

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.2	Pekerjaan lantai kerja K-100	m^3	3.537.8	4.361.426.549
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	687.9	2.099.918.582
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	400.3	1.193.350.164
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	6.7	26.206.233
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	6.185.0	10.405.079.293
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	-	-
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	-	-
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	875.7	2.221.495.746
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	642.9	1.601.992.048
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	40.0	97.930.157
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	768.1	1.869.573.532
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	26.0	63.180.483
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	9.4	22.761.989
3.7.17	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	2.385.0	5.773.247.189
3.7.18	Pekerjaan linning beton precast K-225 (uk. 1 x 1.2 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.031.5	2.489.354.525
3.7.19	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	74.8	179.995.571
3.7.20	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.137.6	2.735.019.557
3.7.22	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	35.7	85.788.903
3.7.23	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	18.9	45.657.588
3.7.24	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	-	-
3.7.26	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.7.27	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	-	-
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	1.596.3	3.723.352.592
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	747.3	1.886.910.387
				47.130.530.331
III	**PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA**			
1	**Rehab Bangunan Bagi Sadap (6 Unit)**			
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	110.82	6.339.003
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	110.82	16.091.315
1.3	Pekerjaan bongkaran pasangan batu	m^3	658.35	95.131.999
1.4	Pasangan batu belah adk 1: 4	m^3	658.35	712.272.041
1.5	Siaran dengan mortar tipe M	m^2	1.126.97	66.941.844
1.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	329.18	41.706.658
1.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	55.41	2.831.495
				941.314.356
2	**Rehab Bangunan Sadap (5 Unit)**			
2.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	72.42	4.142.681
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	72.42	10.516.037
2.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	-	-
2.4	Pekerjaan bongkaran pasangan batu	m^3	170.60	24.652.061
2.5	Pasangan batu belah adk 1: 4	m^3	170.60	184.574.845
2.6	Plester 1:3 tebal 15 mm	m^2	-	-
2.7	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
2.8	Bekisting	m^2	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.9	Siaran dengan mortar tipe M	m^2	397.46	23.609.330
2.10	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	39.79	5.040.918
2.11	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	39.79	2.033.077
				254.568.950
3	**Rehab Bangunan Jembatan (3 Unit)**			
3.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-
3.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	0.38	90.569
3.4	Pekerjaan bongkaran pasangan batu	m^3	4.63	669.393
3.5	Pasangan batu belah adk 1: 4	m^3	4.63	5.011.880
3.6	Plester 1:3 tebal 15 mm	m^2	53.69	4.026.675
3.7	Pekerjaan beton K-225 (Ready Mix)	m^3	1.51	1.748.023
3.8	Pembesian	kg	377.67	6.382.648
3.9	Bekisting	m^2	55.08	4.808.484
3.10	Siaran dengan mortar tipe M	m^2	31.72	1.884.358
3.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	2.51	317.414
3.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	2.51	128.018
3.13	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	97.60	39.147.360
3.14	Pekerjaan Pengelasan	titik	192.00	635.520
				64.850.342
4	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**			
4.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	858.41	49.101.052

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
4.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	858.41	124.641.132
4.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	176.44	42.275.982
4.4	Pekerjaan bongkaran pasangan batu	m^3	151.36	21.871.043
4.5	Pasangan batu belah adk 1: 4	m^3	151.36	163.752.814
4.6	Plester 1:3 tebal 15 mm	m^2	155.80	11.685.000
4.7	Pekerjaan beton K-225 (Ready Mix)	m^3	176.44	203.986.908
4.8	Pembesian	kg	78.13	1.320.397
4.9	Bekisting	m^2	231.40	20.201.220
4.10	Siaran dengan mortar tipe M	m2	167.60	9.955.452
4.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	163.90	20.766.174
4.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	163.90	8.375.308
				677.932.483
5	**Rehab Bangunan Terjun (6 Unit)**			
5.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
5.2	Timbunan & pemadatan dengan alat berat (tanah dari luar)	m^3	-	-
5.3	Pekerjaan pemasangan bowplank	m'	-	-
5.4	Pekerjaan bongkaran pasangan batu	m^3	99.21	14.335.123
5.5	Pasangan batu belah adk 1: 4	m^3	99.21	107.329.890
5.6	Plester 1:3 tebal 15 mm	m^2	-	-
5.7	Beton lantai kerja K-100	m^3	-	-
5.8	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
5.9	Pembesian	kg	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
5.10	Bekisting	m^2	-	-
5.11	Siaran dengan mortar tipe M	m^2	189.34	11.246.796
5.12	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	49.60	6.284.637
5.13	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	49.60	2.534.688
				141.731.133
6	**Rehab Bangunan Penguras (1 Unit)**			
6.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	239.12	13.677.778
6.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	239.12	34.720.514
6.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	-	
6.4	Pekerjaan bongkaran pasangan batu	m^3	341.87	49.400.157
6.5	Pasangan batu belah adk 1: 4	m^3	341.87	369.868.720
6.6	Plester 1:3 tebal 15 mm	m^3	-	-
6.7	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
6.8	Pembesian	kg	-	-
6.9	Bekisting	m^2	-	-
6.10	Siaran dengan mortar tipe M	m^2	615.29	36.548.072
6.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	170.93	21.657.439
6.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	170.93	8.734.768
				534.607.449
7	**Rehab Bangunan Washing Step R (Tangga Cuci) (6 Unit)**			
7.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
7.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
7.3	Pekerjaan bongkaran pasangan batu	m^3	16.63	2.402.838
7.4	Pasangan batu belah adk 1: 4	m^3	16.63	17.990.526
7.5	Plester 1:3 tebal 15 mm	m^3	65.45	4.909.050
7.6	Siaran dengan mortar tipe M	m^2	65.45	3.887.968
7.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	8.31	1.053.424
7.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	8.31	424.862
				30.668.668
8	**Rehab Bangunan Mercu Bendung**			
8.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	buah	2.925.00	38.317.500
8.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	7	518.000
8.3	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	180.00	1.674.000
8.4	Pekerjaan bongkaran pasangan batu	m^3	753.00	108.808.500
8.5	Pekerjaan pemasangan bowplank	m'	88.00	6.793.600
8.6	Bekisting	m^2	165.00	14.404.500
8.7	Pekerjaan beton K-225 (Ready Mix)	m^3	85.80	99.193.380
8.8	Siaran dengan mortar tipe M	m^2	825.00	49.005.000
8.9	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	466.50	59.105.550
8.10	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	466.50	23.838.150
				401.658.180
9	**Rehab Dinding Penahan Tanah Intake**			
9.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	44.98	2.572.856
9.2	Pekerjaan bongkaran pasangan batu	m^3	27.47	3.969.415

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
9.3	Pasangan batu belah adk 1: 4	m^3	27.47	29.719.793
9.4	Siaran dengan mortar tipe M	m^2	65.02	3.862.188
9.5	Pekerjaan beton K-225 (Ready Mix)	m^3	0.48	554.928
9.6	Pekerjaan Pengecatan	m^2	0.72	26.136
9.7	Pekerjaan Wipehole Pipa PVC dia 2"	m'	2.05	100.860
9.8	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	36.23	4.589.708
9.9	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	36.23	1.851.098
				47.246.981
				3.094.578.541
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-
				-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	-	-
	- Pekerjaan Bekisting	m^2	-	-
				-
				-
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN BATANGHARI UTARA**			
1	Pekerjaan pemasangan patok Kilometer	patok	68	10.567.200
2	Pekerjaan pemasangan patok Hektometer	patok	541	78.877.800

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	1.206	287.872.200
				377.317.200
VI	**PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA**			
1	Pembangunan sanggar P3A	unit	16.00	387.748.800
2	Pembangunan shelter pintu air	unit	13.00	112.650.200
3	Pembangunan trashrack	unit	2.00	6.332.040
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1	unit	42.00	241.949.400
	- Papan eksploitasi tipe 2	unit	18.00	82.530.000
	- Papan eksploitasi tipe 3	unit	7.00	23.284.800
				854.495.240
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA**			
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo			
1	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 0.9	Unit	1.00	3.602.100
2	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.0	Unit	1.00	3.874.100
3	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.1	Unit	1.00	3.997.700
4	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.38	Unit	1.00	4.563.700
5	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.85	Unit	1.00	5.414.000
6	Pemasangan skin plate pintu sorong baja, b = 0.7, h = 1.5	Unit	1.00	5.915.400
7	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	3.00	30.587.700
8	Pemasangan skin plate pintu sorong baja, b = 3.0, h = 3.0	Unit	3.00	145.769.700
9	Pemasangan Spindel Pintu Air Mekanik Ganda Lengkap	Unit	3.00	42.137.700

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
				245.862.100
				52.731.412.100

TABLE 5-58 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF BATANGHARI UTARA ALT 2

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	336.435.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	19.823.200
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	86.520.600
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	710.414.000
				1.365.879.000
II	**PEKERJAAN PADA SALURAN BATANGHARI UTARA**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	165.366	2.166.294.600
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	2.828.00	209.272.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	46.6	432.915
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	2.364.2	135.233.846
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	1.205.4	152.722.791

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	1.205.4	61.595.380
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	23.057.8	3.347.999.623
2.6	Penanaman gebalan rumput	m^2	33.535.2	2.344.106.985
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	17.067.5	2.070.289.443
3.2	Pekerjaan lantai kerja K-100	m^3	6.746.8	8.317.439.303
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	1.429.6	4.364.222.953
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	934.6	2.786.045.208
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	6.7	26.206.233
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	11.480.7	19.313.959.246
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	403.0	1,217,817,929
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	395.5	1,086,918,875
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.425.9	3,627,257,872
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	950.5	2,375,412,905
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	281.2	689,559,811
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.682.7	4,107,655,296
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	322.6	785,368,921
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	53.4	130,410,731
3.7.17	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	2.385.0	5,786,841,962
3.7.18	Pekerjaan linning beton precast K-225 (uk. 1 x 1.2 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.080.2	2,613,246,935

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.7.19	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	2.378.1	5,739,457,464
3.7.20	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.288.7	3,105,717,175
3.7.22	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	158.8	382,849,740
3.7.23	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.302.5	3,151,231,725
3.7.24	Pekerjaan linning beton precast K-225 (uk. 1 x 0.6 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	945.9	2.303.342.472
3.7.26	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	141.5	355.609.525
3.7.27	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	52.9	137.536.372
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	3.317.5	7.738.176.605
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	1.744.6	4.405.259.916
				98.059.137.468
III	**PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA**			
1	**Rehab Bangunan Bagi Sadap (6 Unit)**			
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	110.82	6.339.003
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	110.82	16.091.315
1.3	Pekerjaan bongkaran pasangan batu	m^3	658.35	95.131.999
1.4	Pasangan batu belah adk 1: 4	m^3	658.35	712.272.041
1.5	Siaran dengan mortar tipe M	m^2	1.126.97	66.941.844
1.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	329.18	41.706.658
1.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	55.41	2.831.495
				941.314.356
2	**Rehab Bangunan Sadap (5 Unit)**			
2.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	72.42	4.142.681

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	72.42	10.516.037
2.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	-	-
2.4	Pekerjaan bongkaran pasangan batu	m^3	170.60	24.652.061
2.5	Pasangan batu belah adk 1: 4	m^3	170.60	184.574.845
2.6	Plester 1:3 tebal 15 mm	m^2	-	-
2.7	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
2.8	Bekisting	m^2	-	-
2.9	Siaran dengan mortar tipe M	m^2	397.46	23.609.330
2.10	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	85.30	10.807.668
2.11	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	85.30	4.358.894
				262.661.517
3	**Rehab Bangunan Jembatan (3 Unit)**			
3.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-
3.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	0.38	90.569
3.4	Pekerjaan bongkaran pasangan batu	m^3	4.63	669.393
3.5	Pasangan batu belah adk 1: 4	m^3	4.63	5.011.880
3.6	Plester 1:3 tebal 15 mm	m^2	53.69	4.026.675
3.7	Pekerjaan beton K-225 (Ready Mix)	m^3	1.51	1.748.023
3.8	Pembesian	kg	377.67	6.382.648
3.9	Bekisting	m^2	55.08	4.808.484
3.10	Siaran dengan mortar tipe M	m^2	31.72	1.884.358

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	2.51	317.414
3.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	2.51	128.018
3.13	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	97.60	39.147.360
3.14	Pekerjaan Pengelasan	titik	192.00	635.520
				64.850.342
4	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**			
4.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	858.41	49.101.052
4.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	858.41	124.641.132
4.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	176.44	42.275.982
4.4	Pekerjaan bongkaran pasangan batu	m^3	151.36	21.871.043
4.5	Pasangan batu belah adk 1: 4	m^3	151.36	163.752.814
4.6	Plester 1:3 tebal 15 mm	m^2	155.80	11.685.000
4.7	Pekerjaan beton K-225 (Ready Mix)	m^3	176.44	203.986.908
4.8	Pembesian	kg	78.13	1.320.397
4.9	Bekisting	m^2	231.40	20.201.220
4.10	Siaran dengan mortar tipe M	m2	167.60	9.955.452
4.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	163.90	20.766.174
4.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	163.90	8.375.308
				677.932.483
5	**Rehab Bangunan Terjun (6 Unit)**			
5.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
5.2	Timbunan & pemadatan dengan alat berat (tanah dari luar)	m^3	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
5.3	Pekerjaan pemasangan bowplank	m'	-	-
5.4	Pekerjaan bongkaran pasangan batu	m^3	99.21	14.335.123
5.5	Pasangan batu belah adk 1: 4	m^3	99.21	107.329.890
5.6	Plester 1:3 tebal 15 mm	m^2	-	-
5.7	Beton lantai kerja K-100	m^3	-	-
5.8	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
5.9	Pembesian	kg	-	-
5.10	Bekisting	m^2	-	-
5.11	Siaran dengan mortar tipe M	m^2	189.34	11.246.796
5.12	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	49.60	6.284.637
5.13	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	49.60	2.534.688
				141.731.133
6	**Rehab Bangunan Penguras (1 Unit)**			
6.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	239.12	13.677.778
6.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	239.12	34.720.514
6.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3		
6.4	Pekerjaan bongkaran pasangan batu	m^3	341.87	49.400.157
6.5	Pasangan batu belah adk 1: 4	m^3	341.87	369.868.720
6.6	Plester 1:3 tebal 15 mm	m^3	-	-
6.7	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
6.8	Pembesian	kg	-	-
6.9	Bekisting	m^2	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
6.10	Siaran dengan mortar tipe M	m^2	615.29	36.548.072
6.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	170.93	21.657.439
6.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	170.93	8.734.768
				534.607.449
7	**Rehab Bangunan Washing Step R (Tangga Cuci) (6 Unit)**			
7.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
7.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-
7.3	Pekerjaan bongkaran pasangan batu	m^3	16.63	2.402.838
7.4	Pasangan batu belah adk 1: 4	m^3	16.63	17.990.526
7.5	Plester 1:3 tebal 15 mm	m^3	65.45	4.909.050
7.6	Siaran dengan mortar tipe M	m^2	65.45	3.887.968
7.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	8.31	1.053.424
7.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	8.31	424.862
				30.668.668
8	**Rehab Bangunan Mercu Bendung**			
8.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	buah	2.925.00	38.317.500
8.2	Operasi pompa air diesel daya 5 kW 10 saluran	hari	7	518.000
8.3	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	180.00	1.674.000
8.4	Pekerjaan bongkaran pasangan batu	m^3	753.00	108.808.500
8.5	Pekerjaan pemasangan bowplank	m'	88.00	6.793.600
8.6	Bekisting	m^2	165.00	14.404.500
8.7	Pekerjaan beton K-225 (Ready Mix)	m^3	85.80	99.193.380

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
8.8	Siaran dengan mortar tipe M	m^2	825.00	49.005.000
8.9	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	466.50	59.105.550
8.10	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	466.50	23.838.150
				401.658.180
9	**Rehab Dinding Penahan Tanah Intake**			
9.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	44.98	2.572.856
9.2	Pekerjaan bongkaran pasangan batu	m^3	27.47	3.969.415
9.3	Pasangan batu belah adk 1: 4	m^3	27.47	29.719.793
9.4	Siaran dengan mortar tipe M	m^2	65.02	3.862.188
9.5	Pekerjaan beton K-225 (Ready Mix)	m^3	0.48	554.928
9.6	Pekerjaan Pengecatan	m^2	0.72	26.136
9.7	Pekerjaan Wipehole Pipa PVC dia 2"	m'	2.05	100.860
9.8	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	36.23	4.589.708
9.9	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	36.23	1.851.098
				47.246.981
				3.102.671.108
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-
				-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	-	-
	- Pekerjaan Bekisting	m^2	-	-
				-
				-
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN BATANGHARI UTARA**			
1	Pekerjaan pemasangan patok Kilometer	patok	68	10.567.200
2	Pekerjaan pemasangan patok Hektometer	patok	541	78.877.800
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	1.206	287.872.200
				377.317.200
VI	**PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA**			
1	Pembangunan sanggar P3A	unit	16.00	387.748.800
2	Pembangunan shelter pintu air	unit	13.00	112.650.200
3	Pembangunan trashrack	unit	2.00	6.332.040
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1	unit	42.00	241.949.400
	- Papan eksploitasi tipe 2	unit	18.00	82.530.000
	- Papan eksploitasi tipe 3	unit	7.00	23.284.800
				854.495.240
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA**			
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo			
1	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 0.9	Unit	1.00	3.602.100
2	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.0	Unit	1.00	3.874.100

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.1	Unit	1.00	3.997.700
4	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.38	Unit	1.00	4.563.700
5	Pemasangan skin plate pintu sorong baja, b = 0.5, h = 1.85	Unit	1.00	5.414.000
6	Pemasangan skin plate pintu sorong baja, b = 0.7, h = 1.5	Unit	1.00	5.915.400
7	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	3.00	30.587.700
8	Pemasangan skin plate pintu sorong baja, b = 3.0, h = 3.0	Unit	3.00	195.269.700
9	Pemasangan Spindel Pintu Air Mekanik Ganda Lengkap	Unit	3.00	42.137.700
				295.362.100
	Total RAB Batanghari Utara			**104.085.457.000**

5.7.6 - Budget Plan for Sekampung Batanghari

TABLE 5-59 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF SEKAMPUNG BATANGHARI

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**				
1	Mobilisasi and demobilisasi	LS	1	221,265,000	221,265,000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162,507,200	162,507,200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44,495,000	44,495,000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	9,928,000	9,928,000
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5,684,000	5,684,000
6	Pengukuran /setting out	LS	1	34,413,500	34,413,500
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	442,715,700	442,715,700
				TOTAL I	**921,008,400**
II	**PEKERJAAN PADA SALURAN SEKAMPUNG BATANGHARI**				
1	**Pekerjaan Dewatering**				
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	47,798	13,100	626,153,800
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	773.50	74,000	57,239,000
2	**Pekerjaan Tanah**				
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	855.6	9,300	7,957,080
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	6,089.8	57,200	348,336,647
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	126,700	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	51,100	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	6,089.8	145,200	884,239,181
2.6	Penanaman gebalan rumput	m^2	13,298.6	69,900	929,570,742
3	**Pekerjaan Pasangan Beton**				

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	2,914.1	121,300	353,483,325
3.2	Pekerjaan lantai kerja K-100	m^3	1,957.9	1,232,800	2,413,700,649
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	123.8	3,052,700	377,952,589
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	813.7	2,981,000	2,425,760,758
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	3.3	3,895,100	12,900,571
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	2,803.6	1,682,300	4,716,559,763
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)				
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	10.8	3,014,300	32,602,669
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	548.2	2,610,100	1,430,923,639
3.7.3	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1,321.7	2,536,700	3,352,794,948
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1,384.8	2,439,300	3,377,845,068
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	124.9	2,445,300	305,519,303
3.7.6	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1,411.2	2,433,900	3,434,691,641
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	103.2	2,420,600	249,805,920
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	570.1	2,407,800	1,372,746,493
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	33.1	2,404,100	79,485,316
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	155.8	2,413,600	375,965,507
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	293.9	2,332,500	685,409,268
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	1,519.0	2,525,100	3,835,582,640
				TOTAL II	**31,687.226.516**

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
III	**PEKERJAAN BANGUNAN PADA SALURAN SEKAMPUNG BATANGHARI**				
1	**Rehab Bangunan Bagi Sadap (3 Unit)**				
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	243.15	57,200	13,908,167
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	243.15	145,200	35,305,346
1.3	Pekerjaan bongkaran pasangan batu	m^3	143.24	144,500	20,698,311
1.4	Pasangan batu belah adk 1: 4	m^3	143.24	1,081,900	154,972,341
1.5	Siaran dengan mortar tipe M	m^2	435.20	59,400	25,850,775
1.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	71.62	126,700	9,074,312
1.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	71.62	51,100	3,659,805
				TOTAL III.1	**263,469,056**
2	**Rehab Bangunan Sadap (5 Unit)**				
2.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	131.36	57,200	7,513,853
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	131.36	145,200	19,073,627
2.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	23.29	239,600	5,581,309
2.4	Pekerjaan bongkaran pasangan batu	m^3	4.13	144,500	596,556
2.5	Pasangan batu belah adk 1: 4	m^3	23.29	1,081,900	25,202,082
2.6	Plester 1:3 tebal 15 mm	m^2	4.13	75,000	309,631
2.7	Pekerjaan beton K-225 (Ready Mix)	m^3	1,435.51	1,156,100	1,659,593,636
2.8	Bekisting	m^2	60.10	87,300	5,246,950
2.9	Siaran dengan mortar tipe M	m^2	101.07	59,400	6,003,293

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
2.10	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	13.71	126,700	1,737,228
2.11	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	13.71	51,100	700,650
				TOTAL III.2	**1,731,558,816**
3	**Rehab Bangunan Jembatan (27 Unit)**				
3.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	57,200	-
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	145,200	-
3.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	6.49	239,600	1,556,058
3.4	Pekerjaan bongkaran pasangan batu	m^3	37.80	144,500	5,462,100
3.5	Pasangan batu belah adk 1: 4	m^3	56.24	1,081,900	60,840,863
3.6	Plester 1:3 tebal 15 mm	m^2	262.61	75,000	19,696,050
3.7	Pekerjaan beton K-225 (Ready Mix)	m^3	6.35	1,156,100	7,341,697
3.2	Pekerjaan lantai kerja K-100	m^3	7.9	1,232,800	9,780,485
3.8	Pembesian	kg	4,461.23	16,900	75,394,703
3.9	Bekisting	m^2	211.07	87,300	18,426,236
3.10	Siaran dengan mortar tipe M	m^2	358.72	59,400	21,308,234
3.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	22.15	126,700	2,806,050
3.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	22.15	51,100	1,131,722
3.13	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	883.38	401,100	354,323,718
3.14	Pekerjaan Pengelasan	titik	1,698.00	3,310	5,620,380
				TOTAL III.3	**583,688,296**
4	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**				

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
4.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	56.30	57,200	3,220,600
4.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	56.30	145,200	8,175,370
4.3	Pekerjaan bongkaran pasangan batu	m^3	19.58	144,500	2,828,619
4.4	Pasangan batu belah adk 1: 4	m^3	45.81	1,081,900	49,560,324
4.5	Plester 1:3 tebal 15 mm	m^2	7.51	75,000	563,115
4.6	Siaran dengan mortar tipe M	m2	96.74	59,400	5,746,368
4.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	9.79	126,700	1,240,090
4.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	9.79	51,100	500,147
				TOTAL III.4	**71,834,633**
5	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**				
5.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	17.17	57,200	982,329
5.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	17.17	145,200	2,493,604
5.3	Pekerjaan bongkaran pasangan batu	m^3	53.88	144,500	7,786,111
5.4	Pasangan batu belah adk 1: 4	m^3	2.13	1,081,900	2,307,823
5.5	Plester 1:3 tebal 15 mm	m^2	79.53	75,000	5,964,773
5.6	Pekerjaan beton K-225 (Ready Mix)	m^3	25.12	1,156,100	29,038,226
5.7	Pembesian	kg	1,742.65	16,900	29,450,797
5.8	Bekisting	m^2	57.74	87,300	5,041,029
5.9	Pekerjaan bongkaran beton dengan Jack hammer	m^3	15.26	239,600	3,657,470
5.6	Siaran dengan mortar tipe M	m2	5.64	59,400	335,180
5.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	26.94	126,700	3,413,496
5.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	26.94	51,100	1,376,714
				TOTAL III.5	**91,847,551**

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
6	**Pembuatan Bangunan Terjun (3 Unit)**				
6.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	673.97	57,200	38,550,937
6.2	Timbunan & pemadatan dengan alat berat (tanah dari luar)	m^3	673.97	199,600	134,523,899
6.3	Pekerjaan pemasangan bowplank	m'	62.40	77,200	4,817,280
6.4	Pekerjaan bongkaran pasangan batu	m^3	67.13	144,500	9,700,184
6.5	Pasangan batu belah adk 1: 4	m^3	66.02	1,081,900	71,425,415
6.6	Plester 1:3 tebal 15 mm	m^2	286.92	75,000	21,519,053
6.7	Pekerjaan beton K-225 (Ready Mix)	m^3	15.47	1,156,100	17,890,606
6.8	Pembesian	kg	3,760.57	16,900	63,553,716
6.9	Bekisting	m^2	275.53	87,300	24,053,411
6.10	Siaran dengan mortar tipe M	m^2	232.76	59,400	13,825,703
6.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	33.56	126,700	4,252,641
6.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	33.56	51,100	1,715,154
				TOTAL III.6	**405,827,999**
6	**Pelimpah Samping (1 Unit)**				
6.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	2.15	57,200	123,051
6.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	2.15	145,200	312,360
6.3	Pekerjaan bongkaran pasangan batu	m^3	2.68	144,500	386,670
6.4	Pasangan batu belah adk 1: 4	m^3	2.68	1,081,900	2,895,078
6.5	Siaran dengan mortar tipe M	m^2	6.86	59,400	407,294
6.6	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	1.34	126,700	169,520
6.7	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	1.34	51,100	68,370

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
				TOTAL III.7	**4,362,342**
7	**Bangunan Talang (1 Unit)**				
7.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	735.30	57,200	42,059,223
7.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	29.12	145,200	4,228,747
7.3	Pekerjaan beton K-225 (Ready Mix)	m^3	40.22	1,156,100	46,500,261
7.4	Pekerjaan beton K-400 (Ready Mix)	m^3	7.03	1,194,000	8,398,118
7.5	Pembesian	kg	3,270.23	16,900	55,266,962
7.6	Bekisting	m^2	62.41	87,300	5,448,144
7.7	Plester 1:3 tebal 15 mm	m^3	62.41	75,000	4,680,536
7.8	Pasangan Bronjong	m^3	12.10	1,309,500	15,844,950
7.90	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	353.09	126,700	44,736,345
7.10	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	353.09	51,100	18,042,835
				TOTAL III.8	**245,206,122**
				TOTAL III	**3,397,794,816**
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN SEKAMPUNG BATANGHARI**				
1	**Pekerjaan Jalan Onderlag (Telford)**				
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	6,100	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	164,800	-
				TOTAL IV.1	**-**
2	**Pekerjaan Jalan Inspeksi Beton K-225**				
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	13,862.00	6,100	84,558,200
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	2,272.80	1,849,700	4,203,998,160

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
	- Pekerjaan Bekisting	m^2	4,545.60	116,900	531,380,640
				TOTAL IV.2	**4,819,937,000**
				TOTAL IV	**4,819,937,000**
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN SEKAMPUNG BATANGHARI**				
1	Pekerjaan pemasangan patok Kilometer	patok	42	155,400	6,526,800
2	Pekerjaan pemasangan patok Hektometer	patok	370	145,800	53,946,000
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	646	238,700	154,200,200
				TOTAL V	**214,673,000**
VI	**PEKERJAAN PENDUKUNG PADA SALURAN SEKAMPUNG BATANGHARI**				
1	Pembangunan sanggar P3A	unit	24.00	24,234,300	581,623,200
2	Pembangunan shelter pintu air	unit	2.00	8,665,400	17,330,800
3	Pembangunan trashrack	unit	3.00	3,166,020	9,498,060
4	Pemasangan papan eksploitasi				
	- Papan eksploitasi tipe 1	unit	106.00	5,760,700	610,634,200
	- Papan eksploitasi tipe 2	unit	22.00	4,585,000	100,870,000
	- Papan eksploitasi tipe 3	unit	17.00	3,326,400	56,548,800
				TOTAL VI	**1,376,505,060**
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN SEKAMPUNG BATANGHARI**				
A	Perbaikan dan penggantian pintu air di UPTD Sekampung				
	Pemasangan pintu romijn baja lengkap, b = 0.5, h = 0.75	Unit	1.00	27,304,900	27,304,900
	Pemasangan pintu romijn baja lengkap, b = 0.55, h = 0.75	Unit	1.00	27,606,200	27,606,200
	Pemasangan pintu romijn baja lengkap, b = 0.75, h = 0.45	Unit	1.00	34,186,700	34,186,700
	Pemasangan pintu romijn baja lengkap, b = 0.8, h = 1.40	Unit	1.00	39,591,600	39,591,600

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
	Pemasangan pintu romijn baja lengkap, b = 0.9, h = 0.8	Unit	1.00	36,615,900	36,615,900
	Pemasangan pintu crump baja lengkap, b = 0.4, h = 0.8	Unit	1.00	27,984,300	27,984,300
	Pemasangan pintu crump baja lengkap, b = 0.5, h = 0.6	Unit	1.00	28,706,000	28,706,000
	Pemasangan pintu crump baja lengkap, b = 0.52, h = 0.78	Unit	1.00	28,721,300	28,721,300
	Pemasangan pintu crump baja lengkap, b = 0.6, h = 1.0	Unit	1.00	30,520,100	30,520,100
	Pemasangan pintu crump baja lengkap, b = 0.6, h = 1.1	Unit	1.00	30,657,700	30,657,700
	Pemasangan pintu crump baja lengkap, b = 0.82, h = 0.8	Unit	1.00	36,578,200	36,578,200
	Pemasangan pintu crump baja lengkap, b = 0.94, h = 1.0	Unit	1.00	38,260,500	38,260,500
	Pemasangan pintu crump baja lengkap, b = 1.1, h = 1.0	Unit	1.00	37,369,200	37,369,200
	Pemasangan pintu sorong baja lengkap, b = 0.4, h = 0.7	Unit	2.00	22,241,300	44,482,600
	Pemasangan pintu sorong baja lengkap, b = 0.4, h = 0.8	Unit	1.00	22,791,200	22,791,200
	Pemasangan pintu sorong baja lengkap, b = 0.5, h = 0.7	Unit	1.00	22,719,400	22,719,400
	Pemasangan pintu sorong baja lengkap, b = 0.65, h = 0.8	Unit	1.00	29,634,800	29,634,800
	Pemasangan pintu sorong baja lengkap, b = 0.94, h = 1.0	Unit	1.00	29,348,600	29,348,600
	Pemasangan pintu sorong baja lengkap, b = 0.95, h = 0.75	Unit	1.00	27,476,300	27,476,300
	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	1.00	10,195,900	10,195,900
B	Perbaikan dan penggantian pintu air di UPTD Batanghari				
1	Pemasangan pintu sorong baja lengkap, b = 0.65, h = 1.0	Unit	1.00	30,644,000	30,644,000
2	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	2.00	10,195,900	20,391,800
C	Perbaikan dan penggantian pintu air di UPTD Adipuro				
1	Pemasangan skin plate pintu sorong baja, b = 1.0, h = 1.4	Unit	1.00	14,746,600	14,746,600
2	Pemasangan skin plate pintu sorong baja, b = 3.25, h = 2.2	Unit	1.00	51,498,200	51,498,200
3	Pemasangan Spindel Pintu Air Mekanik Ganda Lengkap	Unit	3.00	14,045,900	42,137,700

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	HARGA SATUAN (Rp.)	JUMLAH HARGA (Rp.)
D	Perbaikan dan penggantian pintu air di UPTD Metro				
1	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	2.00	10,195,900	20,391,800
2	Pemasangan Spindel Pintu Air Mekanik Ganda Lengkap	Unit	3.00	14,045,900	42,137,700
				TOTAL VII	**832,699,200**
				GRAND TOTAL	**43,243,917,000**

5.7.7 - Budget Plan for Sekampung Bunut

TABLE 5-60 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF SEKAMPUNG BUNUT

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	147.455.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	4.422.400
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	8.737.100
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	490.187.300
				862.487.400
II	**PEKERJAAN PADA SALURAN SEKAMPUNG BUNUT**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	759	9.942.900
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	10.50	777.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	339.7	3.159.117
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	945.6	54.090.675
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	945.6	137.307.098
2.6	Penanaman gebalan rumput	m^2	3.386.5	236.715.651
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	665.6	80.742.675

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.2	Pekerjaan lantai kerja K-100	m^3	377.7	465.596.187
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	12.2	37.103.126
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	226.6	675.474.761
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	1.3	5.016.889
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	479.0	805.738.500
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	401.6	1.100.739.667
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	58.7	153.206.606
3.7.3	Pekerjaan linning beton precast K-225 (uk. 1 x 0.5 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	116.5	295.474.816
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	722.8	1.763.166.630
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 1.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	37.4	90.735.840
3.7.6	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	10.9	26.350.963
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	12.8	30.682.781
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	45.6	110.060.160
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 0.4 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	7.7	19.255.296
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	5.8	14.979.456
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	28.2	65.787.323
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	423.0	1.068.052.264
				7.250.156.380
III	**PEKERJAAN BANGUNAN PADA SALURAN BUNUT**			
1	**Rehab Bangunan Ukur (5 Unit)**			
1.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	266.27	15.230.873

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	266.27	38.662.985
1.3	Pekerjaan bongkaran pasangan batu	m^3	-	-
1.4	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	109.89	13.922.588
1.5	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	109.89	5.615.187
1.6	Pekerjaan bongkaran beton dengan Jack hammer	m^3	219.77	52.657.491
1.7	Pekerjaan beton K-225 (Ready Mix)	m^3	219.77	230.991.886
1.8	Pembesian	kg	995.94	16.831.411
1.9	Bekisting	m^2	105.31	9.193.781
1.10	Plester 1:3 tebal 15 mm	m^2	105.31	7.898.438
				391.004.640
2	**Rehab Bangunan Jembatan (9 Unit)**			
2.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-
2.3	Pekerjaan bongkaran beton dengan Jack hammer	m^3	1.39	332.086
2.4	Pekerjaan bongkaran pasangan batu	m^3	19.92	2.878.440
2.5	Pasangan batu belah adk 1: 4	m^3	19.92	21.551.448
2.6	Plester 1:3 tebal 15 mm	m^2	47.93	3.594.420
2.7	Pekerjaan beton K-225 (Ready Mix)	m^3	1.39	1.602.355
5.7	Beton lantai kerja K-100	m^3	0.73	896.470
2.8	Pembesian	kg	736.33	12.443.930
2.9	Bekisting	m^2	47.93	4.183.905
2.10	Siaran dengan mortar tipe M	m^2	24.90	1.479.060

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.11	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	10.65	1.349.735
2.12	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	10.65	544.368
2.13	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	358.96	143.978.856
2.14	Pekerjaan Pengelasan	titik	294.00	973.140
				195.808.212
3	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**			
3.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	59.85	3.423.369
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	59.85	8.690.089
3.3	Pekerjaan bongkaran pasangan batu	m^3	11.69	1.688.772
3.4	Pasangan batu belah adk 1: 4	m^3	11.69	12.644.165
3.5	Plester 1:3 tebal 15 mm	m^2	145.03	10.877.175
3.6	Siaran dengan mortar tipe M	m^2	145.03	8.614.723
3.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	5.84	740.371
3.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	5.84	298.603
3.9	Pekerjaan beton K-225 (Ready Mix)	m^3	41.97	48.522.211
3.10	Pembesian	kg	964.97	16.308.022
3.11	Bekisting	m^2	145.03	12.661.032
3.12	Pekerjaan bongkaran beton dengan Jack hammer	m^3	41.97	10.056.156
				134.524.686
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**			
4.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	1.44	82.368
4.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	1.44	209.088

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
4.3	Pekerjaan bongkaran pasangan batu	m^3	-	-
4.4	Pasangan batu belah adk 1: 4	m^3	-	-
4.5	Plester 1:3 tebal 15 mm	m^2	1.36	102.000
4.6	Siaran dengan mortar tipe M	m2	-	-
4.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	0.13	16.218
4.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	0.13	6.541
4.9	Pekerjaan beton K-225 (Ready Mix)	m^3	0.26	295.962
4.10	Pembesian	kg	35.26	595.860
4.11	Bekisting	m^2	1.36	118.728
4.12	Pekerjaan bongkaran beton dengan Jack hammer	m^3	0.26	61.338
				1.488.102
5	**Rehab Bangunan Penguras (1 Unit)**			
5.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	-	-
5.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	-	-
5.3	Pekerjaan bongkaran pasangan batu	m^3	12.00	1.734.000
5.4	Pasangan batu belah adk 1: 4	m^3	12.00	12.982.800
5.5	Plester 1:3 tebal 15 mm	m^2	-	-
5.6	Siaran dengan mortar tipe M	m^2	8.70	516.780
5.7	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	6.00	760.200
5.8	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	6.00	306.600
5.9	Pekerjaan beton K-225 (Ready Mix)	m^3	-	-
5.10	Pembesian	kg	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
5.11	Bekisting	m^2	-	-
5.12	Pekerjaan bongkaran beton dengan Jack hammer	m^3	-	-
				16.300.380
				739.126.020
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN SEKAMPUNG BUNUT**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-
				-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	60.718.00	370.379.800
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	15.481.35	28.635.853.095
	- Pekerjaan Bekisting	m^2	30.962.70	3.619.539.630
				32.625.772.525
				32.625.772.525
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN SEKAMPUNG BUNUT**			
1	Pekerjaan pemasangan patok Kilometer	patok	63	9.790.200
2	Pekerjaan pemasangan patok Hektometer	patok	491	71.587.800
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	920	219.604.000
				300.982.000
VI	**PEKERJAAN PENDUKUNG PADA SALURAN SEKAMPUNG BUNUT**			
1	Pembangunan sanggar P3A	unit	19.00	460.451.700

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2	Pembangunan shelter pintu air	unit	10.00	86.654.000
3	Pembangunan trashrack	unit	3.00	9.498.060
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1	unit	75.00	432.052.500
	- Papan eksploitasi tipe 2	unit	8.00	36.680.000
	- Papan eksploitasi tipe 3	unit	13.00	43.243.200
				1.068.579.460
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN SEKAMPUNG BUNUT**			
A	Perbaikan dan penggantian pintu air di UPTD Adipuro			
1	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	2.00	20.391.800
2	Pemasangan Spindel Pintu Air Mekanik Ganda Lengkap	Unit	6.00	84.275.400
B	Perbaikan dan penggantian pintu air di UPTD Pekalongan			
1	Pemasangan pintu crump baja lengkap b = 0.75, h = 1.1	Unit	1.00	39.896.900
2	Pemasangan pintu sorong baja lengkap b = 0.5, h = 0.9	Unit	2.00	57.089.800
3	Pemasangan pintu sorong baja lengkap b = 0.4, h = 0.7	Unit	1.00	22.241.300
4	Pemasangan pintu sorong baja lengkap b = 0.5, h = 0.5	Unit	1.00	22.240.300
5	Pemasangan pintu sorong baja lengkap b = 0.6, h = 1.0	Unit	1.00	38.812.700
				284.948.200
	Total RAB Sekampung Bunut			**43.132.051.200**

5.7.8 - Budget Plan for Rumbia Barat

TABLE 5-61 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF RUMBIA BARAT

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	68.585.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	4.918.400
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	8.752.900
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	472.541.900
				765.484.400
II	**PEKERJAAN PADA SALURAN RUMBIA BARAT**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	64.883	849.967.300
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	602.00	44.548.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	9.704.8	90.254.175
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	4.427.9	253.276.463
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	4.427.9	642.932.561
2.6	Penanaman gebalan rumput	m^2	3.392.6	237.143.439
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	2.322.0	281.661.666

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.2	Pekerjaan lantai kerja K-100	m^3	966.9	1.191.986.738
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	239.2	730.141.749
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	-	-
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	0.4	1.371.075
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	1.764.2	2.967.841.658
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	1.055.5	2.554.933.618
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 1.0 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	89.2	214.407.254
3.7.3	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	483.8	1.167.634.030
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	555.0	1.294.609.798
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	-	-
				12.522.709.524
III	**PEKERJAAN BANGUNAN PADA SALURAN RUMBIA BARAT**			
1	**Rehab Bangunan Ukur (5 Unit)**			
3.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	455.90	26.077.594
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	455.90	66.196.970
3.3	Pekerjaan bongkaran pasangan batu	m^3	-	-
3.4	Pekerjaan bongkaran beton dengan Jack hammer	m^3	218.46	52.342.728
3.5	Pekerjaan pemasangan bouwplank	m^2	101.23	7.814.956
3.6	Pekerjaan beton K-225 (Ready Mix)	m^3	218.46	252.560.219
3.7	Pembesian	kg	1.457.07	24.624.520
3.8	Bekisting	m^3	304.02	26.540.723

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.9	Pasangan batu belah adk 1: 4	m^3	-	-
3.10	Siaran dengan mortar tipe M	m^2	-	-
3.12	Plester 1:3 tebal 15 mm	m^2	265.22	19.891.309
3.13	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	109.23	13.839.365
3.14	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	109.23	5.581.622
				495.470.008
				495.470.008
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN RUMBIA BARAT**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	152.190.00	928.359.000
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	16.646.55	30.791.123.535
	- Pekerjaan Bekisting	m^2	33.293.10	3.891.963.390
				35.611.445.925
				35.611.445.925
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN RUMBIA BARAT**			
1	Pekerjaan pemasangan patok Kilometer	patok	78	12.121.200
2	Pekerjaan pemasangan patok Hektometer	patok	646	94.186.800
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	4.448	1.061.737.600
				1.168.045.600

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
VI	**PEKERJAAN PENDUKUNG PADA SALURAN RUMBIA BARAT**			
1	Pembangunan sanggar P3A	unit	26.00	630.091.800
2	Pembangunan shelter pintu air	unit	-	-
3	Pembangunan trashrack	unit	-	-
4	Pemasangan papan eksploitasi		-	
	- Papan eksploitasi tipe 1	unit	67.00	385.966.900
	- Papan eksploitasi tipe 2	unit	21.00	96.285.000
	- Papan eksploitasi tipe 3	unit	18.00	59.875.200
				1.172.218.900
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN RUMBIA BARAT**			
A	Perbaikan dan penggantian pintu air di UPTD Rumbia Barat			
1	Pemasangan Spindel Pintu Air Mekanik Tunggal Lengkap	Unit	7.00	71.371.300
				71.371.300
	Total RAB Rumbia Barat			**51.806.745.000**

5.7.9 - Budget Plan for Bekri

TABLE 5-62 BUDGET PLAN FOR REHABILITATION FORILITATION AND IMPROVEMENT OF BEKRI

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	209.550.000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162.507.200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44.495.000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	10.572.800
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5.684.000
6	Pengukuran /setting out	LS	1	28.451.400
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	622.616.600
				1.085.877.000
II	**PEKERJAAN PADA SALURAN BEKRI**			
1	**Pekerjaan Dewatering**			
1.1	Cofferdam dengan menggunakan sand bag Uk. 43 x 65 cm	Buah	6.776	88.765.600
1.2	Operasi pompa air diesel daya 5 kW 10 saluran	Hari	74	5.439.000
2	**Pekerjaan Tanah**			
2.1	Galian sedimen di saluran dengan mekanis (alat berat)	m^3	10.565.0	98.254.122
2.2	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	3.715.7	212.538.667
2.3	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	-	-
2.4	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	-	-
2.5	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	3.715.7	539.521.232
2.6	Penanaman gebalan rumput	m^2	11.027.7	770.834.832
3	**Pekerjaan Pasangan Beton**			
3.1	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m^3	3.649.5	442.680.310

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.2	Pekerjaan lantai kerja K-100	m^3	899.0	1.108.271.882
3.3	Pekerjaan sloop 30x40 beton K-225 insitu dan pembesian (ready mix)	m^3	20.0	61.121.159
3.4	Pekerjaan sloop 25x30 beton K-225 insitu dan pembesian (ready mix)	m^3	757.4	2.257.897.161
3.5	Pekerjaan beton (K-225) dan pembesian frame pengunci horizontal dan vertikal	m^3	3.7	14.333.968
3.6	Pekerjaan lantai beton K-225, wiremesh M6 - 6mm, tebal 10 cm (ready mix)	m^3	1.017.1	1.710.994.857
3.7	Pekerjaan linning beton precast K-225, wiremesh M8-8 mm (ready mix)			
3.7.1	Pekerjaan linning beton precast K-225 (uk. 1 x 0.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	7.7	23.149.824
3.7.2	Pekerjaan linning beton precast K-225 (uk. 1 x 0.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	13.1	35.782.579
3.7.3	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.116.8	2.724.160.283
3.7.4	Pekerjaan linning beton precast K-225 (uk. 1 x 0.8 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	29.5	72.030.322
3.7.5	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	340.1	827.856.232
3.7.6	Pekerjaan linning beton precast K-225 (uk. 1 x 1.1 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	1.204.9	2.932.791.636
3.7.7	Pekerjaan linning beton precast K-225 (uk. 1 x 1.2 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	207.6	503.048.803
3.7.8	Pekerjaan linning beton precast K-225 (uk. 1 x 1.3 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	943.0	2.288.276.373
3.7.9	Pekerjaan linning beton precast K-225 (uk. 1 x 1.6 x 0,08 m), wiremesh M8-8 mm (ready mix)	m^3	263.0	641.085.120
3.7.10	Pekerjaan linning beton precast K-225 (uk. 1 x 0.9 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	128.6	309.134.784
3.7.11	Pekerjaan linning beton precast K-225 (uk. 1 x 0.7 x 0,10 m), wiremesh M8-8 mm (ready mix)	m^3	7.7	18.536.448
3.9	Pekerjaan beton K-225 dan pembesian cap-frame saluran primer	m^3	46.5	108.373.548
3.10	Pekerjaan beton K-225 dan pembesian cap-frame saluran sekunder	m^3	957.2	2.417.118.361
				20.211.997.103
III	**PEKERJAAN BANGUNAN PADA SALURAN BEKRI**			
1	**Rehab Bangunan Ukur (3 Unit)**			

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.1	Pekerjaan galian tanah biasa s/d 1 m (man power)	m^3	52.10	2.980.349
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m^3	52.10	7.565.501
3.3	Pekerjaan bongkaran pasangan batu	m^3	51.47	7.436.765
3.4	Pasangan batu belah adk 1: 4	m^3	51.47	55.680.524
3.5	Siaran dengan mortar tipe M	m^3	52.86	3.139.789
3.6	Pekerjaan beton K-225 (Ready Mix)	m^3	0.09	101.274
3.7	Pembesian	m^3	51.98	878.432
3.8	Bekisting	m^2	2.82	246.186
3.9	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	25.73	3.260.339
3.10	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	25.73	1.314.944
				82.604.103
2	**Rehab Bangunan Jembatan (25 Unit)**			
2.1	Pekerjaan bongkaran beton dengan Jack hammer	m^3	1.85	442.402
2.2	Pekerjaan bongkaran pasangan batu	m^3	1.73	249.696
2.3	Pasangan batu belah adk 1: 4	m^3	1.73	1.869.523
2.4	Plester 1:3 tebal 15 mm	m^2	59.11	4.433.250
2.5	Pekerjaan beton K-225 (Ready Mix)	m^3	1.85	2.134.646
2.6	Pembesian	m^3	1.160.30	19.608.988
2.7	Pekerjaan lantai kerja K-100	m^3	0.59	731.991
2.8	Bekisting	m^2	62.64	5.468.786
2.9	Siaran dengan mortar tipe M	m^3	15.13	899.002
2.1	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	3.57	452.879

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
2.11	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	3.57	182.653
2.12	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	293.64	117.777.400
2.13	Pekerjaan Pengelasan	.	488.00	1.615.280
				155.866.496
3	**Rehab Bangunan Gorong-Gorong (3 Unit)**			
3.1	Pekerjaan Galian Tanah Biasa s/d 1 m (Man Power)	m^3	172.52	9.868.419
3.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m^3	172.52	25.050.601
3.3	Pekerjaan bongkaran pasangan batu	m^3	3.79	547.022
3.4	Pasangan batu belah adk 1: 4	m^3	3.79	4.095.662
3.5	Pekerjaan beton K-225 (Ready Mix)	m^3	22.12	25.572.932
3.6	Pembesian	m^3	1.622.89	27.426.797
3.7	Bekisting	m^2	1.622.89	141.678.068
3.8	Plester 1:3 tebal 15 mm	m^3	87.13	6.535.121
3.9	Siaran dengan mortar tipe M	m^3	22.31	1.325.480
3.10	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	1.89	239.819
3.11	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	1.89	96.723
				242.436.643
				480.907.243
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN SEKAMPUNG BEKRI**			
1	**Pekerjaan Jalan Onderlag (Telford)**			
1.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	-	-
1.2	Pekerjaan Jalan Onderlag	m^2	-	-

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
				-
2	**Pekerjaan Jalan Inspeksi Beton K-225**			
2.1	Pekerjaan Pembersihan dan Perataan Lapangan	m^2	364.056.00	2.220.741.600
2.2	- Pekerjaan Jalan Beton K-225, wiremesh M8-8mm	m^3	60.512.18	111.929.370.098
	- Pekerjaan Bekisting	m^2	121.024.35	14.147.746.515
				128.297.858.213
				128.297.858.213
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN SEKAMPUNG BEKRI**			
1	Pekerjaan pemasangan patok Kilometer	patok	132	20.512.800
2	Pekerjaan pemasangan patok Hektometer	patok	1.078	157.172.400
3	Pekerjaan pemasangan patok Sempadan irigasi	patok	2.400	572.880.000
				750.565.200
VI	**PEKERJAAN PENDUKUNG PADA SALURAN SEKAMPUNG BEKRI**			
1	Pembangunan sanggar P3A	unit	25.00	605.857.500
2	Pembangunan shelter pintu air	unit	-	-
3	Pembangunan trashrack	unit	-	-
4	Pemasangan papan eksploitasi			
	- Papan eksploitasi tipe 1 (0.8 X 1)	unit	162.00	933.233.400
	- Papan eksploitasi tipe 2 (1.5 X 1)	unit	14.00	64.190.000
	- Papan eksploitasi tipe 3 (1.7 X 1)	unit	27.00	89.812.800
				1.693.093.700
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN BEKRI**			

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
A	**Perbaikan dan penggantian Spindle pintu air**			
1	Pemasangan Spindel Pintu Air Mekanik Single Lengkap	unit	126.00	1.284.683.400
2	Pemasangan Spindel Pintu Air Mekanik Double Lengkap	unit	17.00	238.780.300
3	Pemasangan CGD Single Spindel Pintu Air Mekanik Lengkap	unit	56.00	570.970.400
B	**Perbaikan dan penggantian Plate Pintu Air**			
1	Pemasangan pintu sorong baja lengkap, b=0.30, h=0.45	Unit	2.00	40.164.400
2	Pemasangan pintu sorong baja lengkap, b=0.30 , h=0.50	Unit	6.00	121.425.600
3	Pemasangan pintu sorong baja lengkap, b=0.30 , h=0.65	Unit	1.00	20.803.600
4	Pemasangan pintu sorong baja lengkap, b=0.30 , h=0.70	Unit	1.00	20.392.700
5	Pemasangan pintu sorong baja lengkap, b=0.30 , h=1.00	Unit	2.00	44.375.000
6	Pemasangan pintu sorong baja lengkap, b=0.40 , h=0.50	Unit	1.00	20.872.900
7	Pemasangan pintu sorong baja lengkap, b=0.45 , h=1.00	Unit	2.00	47.698.200
8	Pemasangan pintu sorong baja lengkap, b=0.45 , h=1.30	Unit	2.00	53.086.800
9	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.50	Unit	10.00	215.083.000
10	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.60	Unit	7.00	177.769.200
11	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.65	Unit	1.00	26.995.900
12	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.70	Unit	10.00	260.256.000
13	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.75	Unit	3.00	66.515.400
14	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.80	Unit	13.00	300.890.200
15	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.85	Unit	5.00	143.727.000
16	Pemasangan pintu sorong baja lengkap, b=0.50 , h=0.90	Unit	9.00	264.387.600
17	Pemasangan pintu sorong baja lengkap, b=0.50 , h=1.10	Unit	1.00	24.184.000
18	Pemasangan pintu sorong baja lengkap, b=0.60 , h=0.50	Unit	2.00	44.300.400

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
19	Pemasangan pintu sorong baja lengkap, b=0.60 , h=0,80	Unit	2.00	53.421.600
20	Pemasangan pintu sorong baja lengkap, b=0.60 , h=0,90	Unit	2.00	54.408.000
21	Pemasangan pintu sorong baja lengkap, b=0.60 , h=1.00	Unit	1.00	30.826.500
22	Pemasangan pintu sorong baja lengkap, b=0.70 , h=0.70	Unit	4.00	120.489.200
23	Pemasangan pintu sorong baja lengkap, b=0.75 , h=0.50	Unit	1.00	22.788.000
24	Pemasangan pintu sorong baja lengkap, b=0.75 , h=0.75	Unit	1.00	28.307.900
25	Pemasangan pintu sorong baja lengkap, b=0.75 , h=0.80	Unit	3.00	86.160.000
26	Pemasangan pintu sorong baja lengkap, b=0.75 , h=1.30	Unit	1.00	30.282.100
27	Pemasangan pintu sorong baja lengkap, b=0.80 , h=0.70	Unit	1.00	28.826.700
28	Pemasangan pintu sorong baja lengkap, b=0.80 , h=0.80	Unit	1.00	29.160.000
29	Pemasangan pintu sorong baja lengkap, b=0.80 , h=0.95	Unit	1.00	30.953.000
30	Pemasangan pintu sorong baja lengkap, b=0.80 , h=1.10	Unit	1.00	32.810.800
31	Pemasangan pintu sorong baja lengkap, b=0.80 , h=1.20	Unit	2.00	67.917.400
32	Pemasangan pintu sorong baja lengkap, b=0.90 , h=0.75	Unit	1.00	30.320.000
33	Pemasangan pintu sorong baja lengkap, b=1.00 , h=1.30	Unit	2.00	77.152.000
34	Pemasangan pintu sorong baja lengkap, b=1.00 , h=1.40	Unit	2.00	81.300.800
35	Pemasangan pintu sorong baja lengkap, b=1.00 , h=1.50	Unit	1.00	42.806.100
36	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.45	Unit	3.00	64.214.400
37	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.60	Unit	2.00	56.224.800
38	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.70	Unit	1.00	26.025.600
39	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.75	Unit	1.00	22.171.800

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
40	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.80	Unit	7.00	247.826.600
41	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.85	Unit	1.00	28.735.700
42	Pemasangan pintu crump baja lengkap, b=0.50 , h=0.90	Unit	3.00	88.098.000
43	Pemasangan pintu crump baja lengkap, b=0.50 , h=1.00	Unit	3.00	72.513.000
44	Pemasangan pintu crump baja lengkap, b=0.75 , h=1.00	Unit	2.00	88.532.800
45	Pemasangan pintu double sorong baja lengkap, b=1.00 , h=0.90	Unit	1.00	56.942.700
46	Pemasangan pintu double sorong baja lengkap, b=1.50 , h=1.00	Unit	5.00	553.079.500
47	Pemasangan pintu double sorong baja lengkap, b=1.50 , h=1.20	Unit	1.00	111.090.200
48	Pemasangan pintu double sorong baja lengkap, b=1.50 , h=2.00	Unit	1.00	108.661.500
				6.359.408.700
	Total RAB Bekri			**158.879.707.000**

5.7.10 - Budget Plan for Feeder Canal

TABLE 5-63 BUDGET PLAN FOR REHABILITATION AND IMPROVEMENT OF FEEDER CANAL

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Mobilisasi and demobilisasi	LS	1	545,160,000
2	Sewa office container tipe B ukuran 40 feet	LS	1	162,507,200
3	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	44,495,000
4	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	2,835,200
5	Pembuatan papan nama proyek (5 papan nama)	LS	1	5,684,000
6	Pengukuran /setting out	LS	1	190,900
7	Keselamatan dan Kesehatan Kerja (K3)	LS	1	738,497,900
				1,499,370,200
II	**PEKERJAAN BANGUNAN PADA SALURAN FEEDER CANAL**			
1	**Feeder Canal 1**			
1.1	Galian Tanah Mekanis (Alat Berat)	m³	201,073.82	1,869,986,562
1.2	Timbunan tanah kembali (back fill) dipadatkan dengan stemper	m³	6,208.67	901,498,520
1.3	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m³	3,177.12	385,384,321
1.4	Pekerjaan beton K-225 (Ready Mix)	m³	22,613.66	26,143,653,665
1.5	Pembesian	kg	1,072,711.35	18,128,821,849
1.6	Bekisting	m²	14,545.14	1,269,790,958
1.8	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m³	99,021.14	12,545,978,036
1.9	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m³	99,021.14	5,059,980,092
				66,305,094,002
2	**Feeder Canal 2**			
2.1	Galian Tanah Mekanis (Alat Berat)	m³	267,893.39	2,491,408,518
2.2	Timbunan tanah kembali (back fill) dipadatkan dengan Stemper	m³	1,355.28	196,786,625
2.3	Pembongkaran bangunan (lining rusak) eksisting buangan hasil bongkaran sejauh 20 KM	m³	877.20	106,404,360
2.4	Pekerjaan beton K-225 (Ready Mix)	m³	12,662.20	14,638,765,679
2.5	Pekerjaan beton K-400 (Ready Mix)		220.35	263,099,431
2.6	Pembesian	Kg	1,293,357.73	21,857,745,682
2.7	Bekisting	m²	8,714.89	1,193,939,382
2.8	Pekerjaan Soil Nailing	m'	54,169.76	72,787,906,512
2.9	Pekerjaan Shotcrete	m²	11,879.33	6,813,984,569
3	Pekerjaan Tiang Pancang	m'	90.00	226,755,000
3.1	Pekerjaan Sheet Pile Beton Precast	m'	300.00	631,950,000
2.8	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m³	133,707.65	16,940,759,838
2.9	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m³	133,707.65	6,832,461,150
				144,981,966,746
3	**Rehab Bangunan Jembatan (5 Unit) Feeder Canal 1**			
3.1	Pekerjaan bongkaran beton dengan Jack hammer	m³	3.58	858,726
3.2	Pekerjaan bongkaran pasangan batu	m³	28.99	4,189,344
3.3	Pasangan batu belah adk 1: 4	m³	28.99	31,366,445
3.4	Plester 1:3 tebal 15 mm	m²	119.81	8,985,600
3.5	Pekerjaan beton K-225 (Ready Mix)	m³	3.58	4,143,462
3.6	Pembesian	kg	2,202.62	37,224,346
3.7	Bekisting	m²	119.81	16,413,696
3.8	Siaran dengan mortar tipe M	m²	36.24	2,152,656

No.	URAIAN PEKERJAAN	UNIT	QUANTITY	JUMLAH HARGA (Rp.)
3.9	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	12.70	1,609,597
3.10	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	12.70	649,174
3.11	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	513.08	205,796,388
3.12	Pekerjaan Pengelasan	titik	512.00	16,947,200
				330,336,634
4	**Rehab Bangunan Jembatan (5 Unit) Feeder Canal 2**			
4.1	Pekerjaan bongkaran beton dengan Jack hammer	m^3	3.04	727,617
4.2	Pekerjaan bongkaran pasangan batu	m^3	1.99	288,260
4.3	Pasangan batu belah adk 1: 4	m^3	1.99	2,158,261
4.4	Plester 1:3 tebal 15 mm	m^2	80.51	6,038,520
4.5	Pekerjaan beton K-225 (Ready Mix)	m^3	3.04	3,510,844
4.6	Pembesian	kg	1,801.91	30,452,318
4.7	Bekisting	m^2	97.76	13,393,120
4.8	Pekerjaan lantai kerja K-100	m^3	-	-
4.9	Siaran dengan mortar tipe M	m^2	52.30	3,106,763
4.10	Pekerjaan buangan dan perataaan hasil galian sejauh 20 km	m^3	1.52	192,381
4.11	Pekerjaan buangan dan perataaan hasil galian sejauh 5 km	m^3	1.52	77,590
4.12	Hand railing besi galvanized dia. 2" (isi beton K-100)	m'	388.48	155,819,328
4.13	Pekerjaan Pengelasan 10 cm	titik	832.00	27,539,200
				243,304,203
				211,860,701,585
III	**PEKERJAAN JALAN INSPEKSI**			
1	Jalan Inspeksi Makadam			
1.1	Pembersihan dan Perataan Lapangan	m^2	8,117.95	49,519,482
1.2	Penetrasi Makadam	m^2	4,870.77	14,628,379,577
				14,677,899,058
IV	**PEKERJAAN PINTU IRIGASI PADA FEEDER CANAL**			
A	Perbaikan dan penggantian pintu air di Feeder Canal			
1	Pemasangan pintu air crump baja elektromekanikal lengkap, b = 2, h = 2.5 m	Unit	9.00	1,916,298,000
2	Pemasangan pintu air crump baja elektromekanikal lengkap, b = 2, h = 2.8 m	Unit	8.00	1,651,352,000
3	Pemasangan pintu air crump baja elektromekanikal lengkap, b = 3, h = 3 m	Unit	6.00	1,308,336,000
				4,875,986,000
				232,913,956,000

5.7.11 - Budget Plan for SCADA

TABLE 5-64 BUDGET PLAN FOR SCADA PREPARATION

No.	URAIAN PEKERJAAN	SATUAN	QUANTITY	JUMLAH HARGA (Rp.)
I	**PERSIAPAN**			
1	Keselamatan dan Kesehatan Kerja (K3)	LS	1	9,539,000
2	Foto dan video dokumentasi kegiatan dengan penggunaan kamera drone	LS	1	6,061,000
3	Penggambaran dan pencetakan gambar Constructionterbangun (5 Set)	LS	1	1,645,600
				17,245,600
II	**PEKERJAAN RUMAH GENSET**			
1	Pembangunan Rumah Genset di 7 Sub DI. Way Sekampung	Unit	79	6,226,819,991
				6,226,819,991
III	**PINTU AIR DENGAN AREA > 2000 Ha**			
1	**Daerah Irigasi Punggur Utara**			
1.1	Automatic Water Level Record (AWLR)	Unit	70	2,065,000,000
1.2	Actuator 2,5 k Watt	Unit	11	257,400,000
1.3	Actuator 15 k Watt	Unit	52	2,225,600,000
1.4	Genset	Unit	30	7,251,750,000
1.5	CCTV	Unit	30	25,260,000
1.6	Elektrifikasi	Unit	30	667,714,800
1.7	Remote Terminal Unit (RTU)	Unit	133	7,315,000,000
				19,807,724,800
2	**Daerah Irigasi Rumbia Barat**			
2.1	Automatic Water Level Record (AWLR)	Unit	9	265,500,000
2.2	Actuator 2,5 k Watt	Unit	22	514,800,000
2.3	Actuator 15 k Watt	Unit	0	-
2.4	Genset	Unit	5	1,208,625,000
2.5	CCTV	Unit	5	4,210,000
2.6	Elektrifikasi	Unit	5	111,285,800
2.7	Remote Terminal Unit (RTU)	Unit	31	1,705,000,000
				3,809,420,800

No .	URAIAN PEKERJAAN	SATU AN	QUAN TITY	JUMLAH HARGA (Rp.)
3	**Daerah Irigasi Bekri**			
3.1	Automatic Water Level Record (AWLR)	Unit	23	678,500,000
3.2	Actuator 2,5 k Watt	Unit	28	655,200,000
3.3	Actuator 15 k Watt	Unit	2	85,600,000
3.4	Genset	Unit	12	2,900,700,000
3.5	CCTV	Unit	12	10,104,000
3.6	Elektrifikasi	Unit	12	267,085,920
3.7	Remote Terminal Unit (RTU)	Unit	53	2,915,000,000
				7,512,189,920
4	**Daerah Irigasi Sekmapung Bunut**			
4.1	Automatic Water Level Record (AWLR)	Unit	43	1,268,500,000
4.2	Actuator 2,5 k Watt	Unit	22	514,800,000
4.3	Actuator 15 k Watt	Unit	0	-
4.4	Genset	Unit	7	1,692,075,000
4.5	CCTV	Unit	7	5,894,000
4.6	Elektrifikasi	Unit	7	155,800,120
4.7	Remote Terminal Unit (RTU)	Unit	65	3,575,000,000
				7,212,069,120
5	**Daerah Irigasi Sekmapung Batanghari**			
5.1	Automatic Water Level Record (AWLR)	Unit	68	2,006,000,000
5.2	Actuator 2,5 k Watt	Unit	28	655,200,000
5.3	Actuator 15 k Watt	Unit	0	-
5.4	Genset	Unit	12	2,900,700,000
5.5	CCTV	Unit	12	10,104,000
5.6	Elektrifikasi	Unit	12	267,085,920
5.7	Remote Terminal Unit (RTU)	Unit	96	5,280,000,000
				11,119,089,920
6	**Daerah Irigasi Batanghari Utara**			

No.	URAIAN PEKERJAAN	SATUAN	QUANTITY	JUMLAH HARGA (Rp.)
6.1	Automatic Water Level Record (AWLR)	Unit	27	796,500,000
6.2	Actuator 2,5 k Watt	Unit	11	257,400,000
6.3	Actuator 15 k Watt	Unit	0	-
6.4	Genset	Unit	3	725,175,000
6.5	CCTV	Unit	3	2,526,000
6.6	Elektrifikasi	Unit	3	66,771,480
6.7	Remote Terminal Unit (RTU)	Unit	38	2,090,000,000
				3,938,372,480
7	**Daerah Irigasi Raman Utara**			
7.1	Automatic Water Level Record (AWLR)	Unit	37	1,091,500,000
7.2	Actuator 2,5 k Watt	Unit	20	468,000,000
7.3	Actuator 15 k Watt	Unit	0	-
7.4	Genset	Unit	10	2,417,250,000
7.5	CCTV	Unit	10	8,420,000
7.6	Elektrifikasi	Unit	10	222,571,600
7.7	Remote Terminal Unit (RTU)	Unit	57	3,135,000,000
				7,342,741,600
				60,741,608,640
IV	**PEKERJAAN INSTRUMEN JARAK JAUH**			
1	**UPSTREAM AREA (CATCHMENT AREA)**	Unit		
1.1	AWLR	Unit	8	236,000,000
1.2	AWS	Unit	3	778,500,000
1.3	ARR	Unit	9	555,300,000
1.4	RTU	Unit	20	1,100,000,000
				2,669,800,000
2	**DOWNSTREAM AREA (WAY SEKAMPUNG IRRIGATION SYSTEM)**			
2.1	Automatic Wether Station (AWS)			
A	Puggur Utara	Unit	1	259,500,000

No .	URAIAN PEKERJAAN	SATUAN	QUANTITY	JUMLAH HARGA (Rp.)
B	Rumbia Barat	Unit	1	259,500,000
C	Bekri	Unit	1	259,500,000
D	Sekampung Bunut	Unit	1	259,500,000
E	Sekampung Batanghari	Unit	1	259,500,000
F	Batanghari Utara	Unit	1	259,500,000
G	Raman Utara	Unit	1	259,500,000
2.2	Automatic Rainfall Recorder (ARR)			
A	Puggur Utara	Unit	5	308,500,000
B	Rumbia Barat	Unit	0	-
C	Bekri	Unit	1	61,700,000
D	Sekampung Bunut	Unit	4	246,800,000
E	Sekampung Batanghari	Unit	1	61,700,000
F	Batanghari Utara	Unit	1	61,700,000
G	Raman Utara	Unit	1	61,700,000
				2,618,600,000
				5,288,400,000
V	**MASTER TERMINAL UNIT (MTU)**			
1	Desktop Computer	Unit	4	160,000,000
2	Network Server	Unit	2	124,000,000
3	UPS	Unit	2	14,600,000
4	ADC	Unit	2	4,800,000
5	Power Suply	Unit	3	9,600,000
6	Large Screen 70"	Unit	2	54,000,000
7	Scada Software	Unit	1	330,000,000
8	DSS software	Unit	1	98,000,000
9	AC 1.5 pk	Unit	2	9,400,000
10	OS software	Unit	2	13,600,000

No .	URAIAN PEKERJAAN	SATUAN	QUANTITY	JUMLAH HARGA (Rp.)
11	CCTV/access pintu	Unit	102	74,664,000
12	VMS/access software	Unit	1	8,300,000
13	RAM 4 Terabyte	Unit	2	8,200,000
14	Antene 4G/5G	Unit	2	2,700,000
15	material instalasi	Unit	1	13,420,000
				925,284,000
VI	**Water Operation Center (WOC)**			
1	**WOC (Bendung Argoguruh) - Single lisence**			
1.1	PC server	Unit	1	52,382,000
1.2	LED 34 inch	Unit	1	26,202,000
1.3	WinCC system software V7.4 SP1 RC 2048	Unit	1	153,232,200
1.4	SIMANTIC telecontrol, software basic engineering V7.0	Unit	1	33,817,300
1.5	SIMANTIC telecontrol, software server runtime 12ST V7.4	Unit	1	66,382,800
				332,016,300
2	**MONITORING UNIT (BBWS Mesuji Sekampung)**			
2.1	PC client	Unit	1	69,843,400
2.2	LED 34 inch	Unit	1	52,382,000
2.3	SIMANTIC WinCC/Web navigator, 3 client lisence	Unit	1	132,058,300
				254,283,700
3	**SCADA SYSTEM**			
3.1	Developed PLC programing	Unit	1	123,970,000
3.2	Developed HMI & SCADA programing	Unit	1	123,970,000
3.3	Assembly panel	Unit	1	24,794,000
3.4	System integration test (Site Acceptance Test)	Unit	1	24,794,000
3.5	On-site Install, testing & commissioning	Unit	1	148,764,000
3.6	On-site training	Unit	1	24,794,000
3.7	Project scheduling, documentation, administration, reporting	Unit	1	24,794,000
				495,880,000

No.	URAIAN PEKERJAAN	SATUAN	QUANTITY	JUMLAH HARGA (Rp.)
4	**Connecting SIPASI and SCADA**	Unit	1	1,870,000,000
				1,870,000,000
				2,952,180,000
				76,151,538,000

6 - CONSTRUCTION METHODOLOGY, WORK IMPLEMENTATION SCHEDULE AND CONSTRUCTION COSTS

6.1 - Work Implementation Method

Implementation Method is a work plan used as a reference in the implementation of the work of a construction project. The implementation method includes activity grouping based on activities, time allocation and work methods for main jobs. The basic considerations used in the implementation of construction work are the realization of the structures according to the plan with consideration of time effectiveness and cost efficiency.

This implementation method contains descriptions of the contractor's strategy from pre-work to post-work (maintenance period), to carry out the work in accordance with the planning drawings, requirements and finish on time according to the contract.

Before the implementation begins, the contractor will be ready, set a strategy to carry out the work, both from a technical and financial perspective. The steps taken by the contractor include:

- Make a work time plan : Time Schedule
- Prepare personnel
- Prepare equipment
- Prepare cash flow

Time schedule and “S” curve are made rationally between one job and another. In this time schedule, the work weight is displayed divided by the time requirement so that we can monitor any time the work is over or late from the time we planned.

6.1.1 - Weir

The Way Sekampung Irrigation System has three (3) weir structures, namely the largest Argoguruh weir with a width of 55 m plus a new lighthouse with a length of 70 m.

6.1.2 - Irrigation Canal

The Way Sekampung Irrigation System (WSIS) has a total service area of 58,320 ha. WSIS is under the authority of the central government through the Mesuji Sekampung river basin organization or the Mesuji Sekampung River Basin Center (BBWS). The proposed Way Sekampung Irrigation Project covers the downstream development area of Way Sekampung, about 80 km from Bandar Lampung, the capital city of Lampung Province, spread through East Lampung Regency, Central Lampung Regency to Metro City.

The work of the Way Sekampung Irrigation Area canal is made in accordance with the drawings of the planning design results. Some typical canal work is made according to the type of damage that exists in the field. Repair of canals by replacing precast concrete linings, removal of sediment to get the correct dimensions of the canals and canals with soil condition still being repaired using cast-in-place and precast concrete.

From the entire length of the Primary canal of 225,738 m in the Way Sekampung system, there is damage to the canal lining along the 40,871 m and sediment deposits along the 27,850 m.

Meanwhile, in the Secondary canal along 503.986 m, there is damage to the canal lining 89,235 m, sediment deposits along the 130,239 m. The earth canal with a total length of 66,791 m is planned to be installed with precast concrete lining on the canal and cast in place at the bottom of the canal.

A description of the amount of damage from each sub-system is presented in the following table:

TABLE 6-1 CANAL LENGTH (M) WITH TYPES OF DAMAGE TO PRIMARY AND SECONDARY CANALS.

CANAL CONDITIONS	Punggur Utara	Sekampung Bunut	Sekampung Batanghari	Bekri	Batanghari Utara	Rumbia Barat	Raman Utara	TOTAL
Main Canal								
Canal length	38.472	48.425	41.622	16.127	31.900	21.000	28.192	225.738
Lining Damage	1.293	520	6.905	1.620	13.327	116	17.090	40.871
Sedimentation	13.920	-	200	5.747	160	7.823	-	27.850
Ground Canal	-	-	-	-	-	-	-	-
Secondary Canal								
Canal length	206.342	38.433	52.658	97.805	27.620	58.929	22.199	503.986
Lining Damage	49.928	2.077	17.822	1.426	10.348	10	7.624	89.235
Sedimentation	33.854	200	2.565	83.860	625	9.135	-	130.239
Ground Canal	50.086	518	1.700	-	2.099	-	12.388	66.791

The method of carrying out repairs depends on the amount of damage experienced by each canal segment, some canals only suffered damage to the left canal wall, some to the right canal, some were damaged to the left and right canal, and the most severe was damage to the canal wall and bottom. the canal.

The replacement of the canal lining must be carried out in a dry room, not submerged in water, for this reason a temporary insulation (*kisdam*) made of an iron frame and wooden boards will be used as an insulator so that water does not enter the work space. Then the drying of the land is carried out using a water pump or Alcon, the drying work aims to facilitate casting work, installing precast concrete modules and other work.

This series of equipment can be moved after being used to a place that needs it. With this equipment, the canal does not need to be completely drained, half the canal discharge can still be canalized to the fields that require irrigation water.

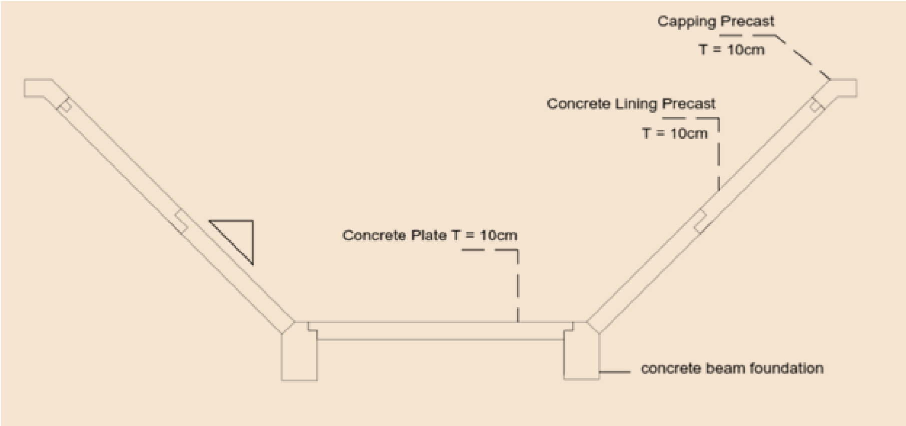
The demolition of the old damaged lining is carried out by manpower so as not to damage the adjacent undamaged lining, the soil layer that supports the concrete line must be repaired with massive compaction with a flat surface. For lining the left and right taluds using precast concrete with a thickness of 10 cm (reinforced with M-6 wiremesh) which is made at a predetermined location for each irrigation sub-system, so that the transportation is not too far away, while damage to the bottom of the canal must be cast in place with reinforced woven wire (wiremesh M-8).

After all the precast concrete slabs are installed in the canal, then the module connection is installed with a mortar mixture consisting of adhesive cement and sand with a composition of 1:2 with water solvent of 20 – 40% of the total weight of the mixture.

Canal Lining using Precast Concrete

Precast concrete is a concrete structural element molded to a predetermined size or adjusted to the canal profile, the manufacturing and maintenance process (curing) is not carried out where the element is installed, but in other places both in the workshop (precast plant) and in the field (precast). onsite). There are 3 types of modules as the main components of the canal lining profile such as: Wall/floor module, elbow module, and capping module. It can be seen in the figure below:

FIGURE 6-1 PRECAST CONCRETE SECTION ON CANAL LINING



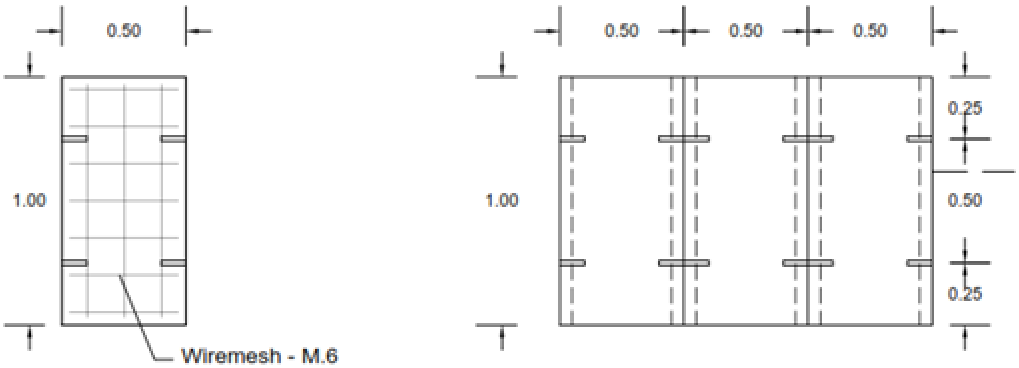
- <u>Type of precast concrete module</u>

  - Wall Module

The floor-wall module is made of precast concrete, at the top and bottom edges an L profile is formed and equipped with steel hooks and is placed at two points of the inner profile.

- As for the side edges, an L profile is formed and without steel hooks.
- Can be seen in the figure below.

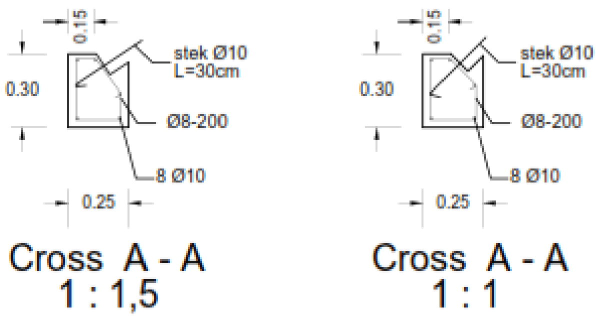
FIGURE 6-2 WALL MODULE (DETAIL REINFORCEMENT PLATE WITH WIREMESH/WOVEN WIRE)



  - Foot/Shoe Module

Foot/shoe module serves as a lock between the wall and floor modules. At the top edge towards the lining wall, notches are formed for mounting the lining walls and are equipped with steel hooks/cuts and are placed at two points of the inner profile. It can be seen in the figure below.

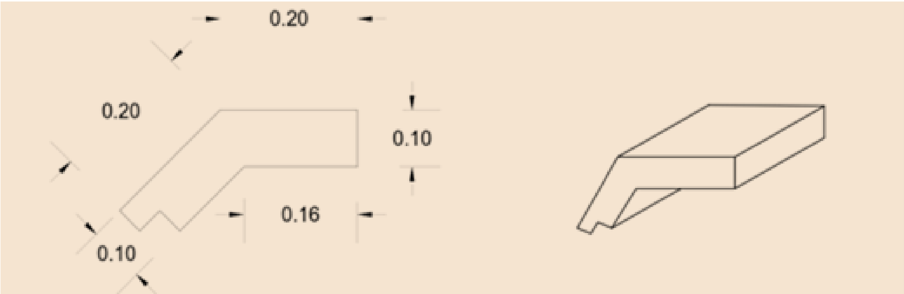
FIGURE 6-3 FOOT/SHOE MODULE



  - Capping Module

The top cover module is used as a lock between the elbow modules. At the bottom edge, a double L profile is formed (level L) and is equipped with a steel hook (a). It can be seen in Figure 5.

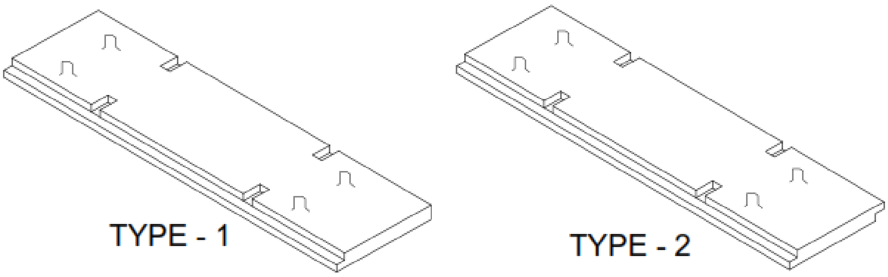
FIGURE 6-4 CAPPING MODULE



- Lock rod

To strengthen the connection between the modules, the precast wall is attached to the connection part made of plain steel with a diameter of 8 mm. This can be seen in Figure 6.

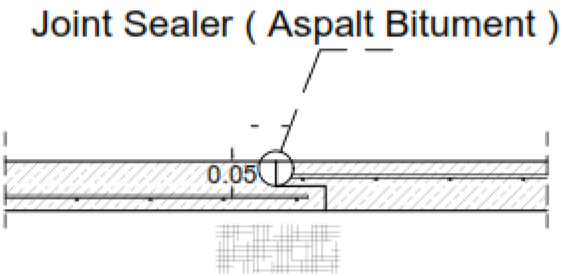
FIGURE 6-5 PERSPECTIVE OF LOCATION OF DOWEL JOINT ON PRECAST WALL



- Joint Cover Material

Between the joints of the modules, a mortar mixture consisting of cement adhesive and sand with a composition of 1 : 2 is installed with a water solvent of 20 – 40% of the total weight of the mixture.

FIGURE 6-6 CONNECTION DETAILS OF PRECAST CONCRETE MODULE WITH JOINT FILLER



- <u>Precast Panel Production Implementation</u>

  - Supervision and control of placing precast concrete must be prepared at least 24 hours before starting a casting.
  - Dosing and mixing of concrete must be carried out in accordance with SNI 2834 concerning procedures for making normal concrete mix plans
  - Additive in the form of a liquid must be mixed into water before being poured into the mixer.
  - Concrete must be poured at once and spread so that the entire mold is filled evenly

  - Compression or compaction and finishing of precast concrete must pay attention to the flatness of the surface, the flatness of the edges and the thickness of the center
  - Prior to the final finishing work, when the concrete in the mold is still plastic, it is necessary to check the flatness of the edges, evenness and thickness of the center. If the flatness does not meet the requirements, it must be repaired immediately.

- Sediment removal
  - Excavation of sedimentary soil is carried out according to grades, lines and elevations specified in the description or indicated by the Engineer and includes the disposal of materials/materials in any form encountered, including soil, stone, brick, concrete, masonry, organic materials and pavement materials old ones that are no longer in use.
  - Load the excavations onto the Dump Truck, transport and dispose of the excavations outside the work area/location.
  - Carry out excavations and disposals repeatedly, until the excavation limits and elevations have been determined.
  - The excavated/cutting surface must be cleaned of any loose material that will become hazardous after the work is completed.
  - The surface of the excavated/cutting slopes should be maintained in a stable condition
  - If the results of excavation/cutting are not in accordance with the planned elevation, re-excavate so that the elevation of the excavation results is in accordance with the plan.
  - In case of ground movement or landslide, stop work immediately
  - Preventing further landslides by repairing existing sheet piles or adding new sheet piles. If there is a water disturbance, the water must be drained/canalized immediately
  - Do not overload the edge of the excavation with a buildup of excavated soil or other materials.

6.1.3 - Irrigation Structure

Irrigation Structures are divided into two major groups, related to irrigation canals and drainage canals. In an open canal, there are various structures that are used to carry water from one upstream section to a downstream section. These Structures can be divided into two groups according to the type of hydraulic flow, namely:

(i) Structures with subcritical flow, and
(ii) Structures with supercritical flow

Included in the first group of Structures are culverts, flumes, Aqueduct and siphons. As for the second group, there are Structures measuring and regulating discharge, plunge Structures and sloped sewers.

In the Way Sekampung Irrigation System, there are 266 damaged irrigation Structures including 27 heavily damaged Structures and 239 lightly or moderately damaged Structures. In addition, two sediment control Structures will be constructed at the beginning of the Conduit Canals 1 and 2, as well as constructing a new Aqueduct in the Sekampung Batanghari Sub-System due to the destruction of the sewer culvert that passes through the SN secondary canal.

Method of Implementing Damaged Structure Repair

i. Measure the amount of damage to the Structure and then mark it with paint
ii. Carry out the demolition of the masonry in accordance with the measurement results, the results of the demolition are removed from the Structure area,
iii. Repair of damaged Structures with the size and location according to the design drawings with human power (man power).
iv. Plaster and broadcast according to the design drawings.

In carrying out the repair and reconstruction of the Structures, the method is the same for the two groups mentioned above.

The first time is the work of dewatering, if the canal must still be used to irrigate the fields, then the dewatering must be done by adding a cover dam and preparing a water pump, but if it is possible to close the canal, it is enough to just prepare a water pump with a hose.

If the contractor finds ground water inundation due to soil porosity, then in its implementation a dewatering system is used with pits at several locations by making ditches. The puddle water is canalized into the ditches so that it functions as a subdrain

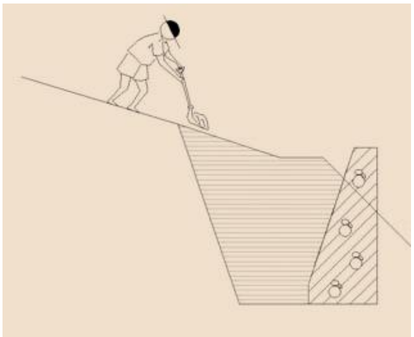
Furthermore, the dismantling of the damaged parts, for minor and moderate repairs, the disassembly is carried out manually, so as not to damage other parts that are not damaged. While the Structures are heavily damaged which must be completely overhauled and reconstructed, the demolition can be done using heavy equipment.

- Excavation using hoes and shovels around the parapet site.

FIGURE 6-7 EXCAVATION USING HOES AND SHOVELS AROUND PARAPET SITE

- Placement of excavated soil around the work site.
- After completing the wall repair, the excavated soil is used to backfill the former excavation.

FIGURE 6-8 LAND PILE



The surface of the ground that must be excavated first with the approval of the supervisor. This work is done manually or by human (digger). For the depth and width of the excavation, according to the plan description, the excavation is widened by ± 30 cm to facilitate the implementation of the work. If there are tree roots in the excavation, these roots must be removed by cutting/sawing to clean and transported out of the project. After the excavation is complete, the excavation will be cleaned of dirt/garbage. The equipment used is a hoe, crowbar, hammer, tape measure, dustpan and other equipment

The next step is to improve the condition of the subgrade which must be compacted and leveled and shaped according to the shape of the planned Structure.

For the flat part before the foundation is built, it must be covered with a layer of mashed concrete with a thickness of 5 cm to 10 cm depending on the size of the Structure.

The casting of the work floor is made directly in the field (site mix) using concrete mortar with a mix composition of 1 cement: 3 sand: 5 coral, plus enough clean water. The concrete is directly poured in the excavation, on top of the sand fill with a predetermined thickness, then the entire surface is leveled to obtain a horizontal surface line. The equipment used is a meter, concrete mixer, hammer, hoe, and other supporting equipment.

- <u>The implementation method of fixing the masonry</u>

The masonry work includes the repair work of damaged Structures being returned to their original form with masonry material.

- Installation of bouwplank to determine the size of the damage.
- Demolition of broken masonry
- Preparation of crushed stone material (clean condition).
- Mixing species (1Pc: 4Ps) using a concrete mixer.
- Structure repair work with masonry.
- Rock broadcast work.

- <u>Pair of Stones 1Pc : 4Ps</u>

Stone masonry work is river/mountain stone masonry work using a mixture of sand cement which is formed according to the description of implementation.
Implementation Method:

- The stone used must be clean and hard stone and has been approved by the Board of Directors.
- The sand used must be of good quality and has been approved by the Board of Directors.
- Species/mixture of masonry work must be of a mixture of cement and sand with a volume ratio of 1 pc: 4 psr using a concrete mixer.
- Pairs of stones must be arranged in such a way that between stones and stones are homogeneously filled, so that the stones do not coincide with each other.
- The arrangement of raen stones (face stones) must have a distance (width of grout between 1-2 cm).

- <u>Plastering 1Pc : 3Ps</u>

Plastering work is covering work on the top of the wall, the ends of the masonry canal in accordance with the description of implementation.
Implementation Method:

- The sand used must be of good quality and has been approved by the Board of Directors.
- Species/mixture of plastering work must be of a mixture of cement and sand with a volume ratio of 1 pc: 4 psr using a concrete mixer
- Plastering work is done in two layers to a thickness of 2 cm. If not instructed otherwise, the masonry shall be plastered on the top of the wall, the ends of the masonry canal, and for 0.10 m below the top trepi of the wall or as shown in the description.
- Plastering work 1: 3 must be flat, straight, smooth and neat so that the top of the wall, the ends of the surface masonry canal are covered.

- <u>Reinforced Concrete 1 : 2 : 3</u>
    - The manufacture of concrete must conform to the results of laboratory tests to obtain good quality, regarding the type of material to be used;
    - Concrete with the mix ratio specified in the employment contract.
    - Mixing is done using a concrete mixer (concrete mixer), to get good results/quality;
    - Concrete is used as a blanket for reinforcement that functions as a load-bearing structure and also functions as a water-resistant or leak-proof mixture;
    - This concrete is used in Structure structures. Concrete/casting must use a concrete vibrator (concrete vibrator) to get maximum results.
    - Reinforcement is installed and assembled for the type of reinforcement used in Structures. The distance and shape of the reinforcement must follow the image that has been determined to be true and the approval of the board of directors.

Backfill work

Backfill work of excavated soil is stockpiling work using backfill material from excavation results in the canal construction section with human power (Manual) then compacted with auxiliary tools.

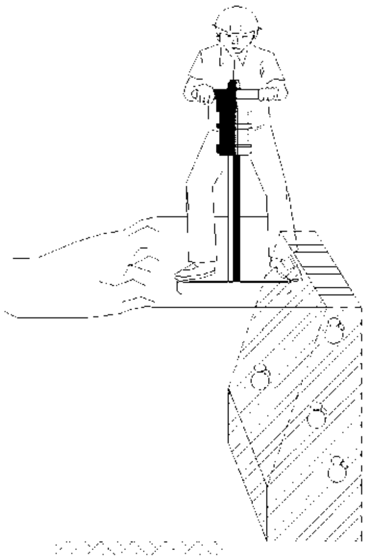
Implementation Method:

- Backfill material is taken from excavations that have been approved by the board of directors.
- The excavated soil is spread out and compacted using a tool
- The size and height are adjusted to the working description and approved by the directors

This work is done manually, namely by diggers. The former fill is compacted with a stamper to reach the maximum density. The equipment used is a hoe, stamper, hammer, tape measure, dustpan and others.

- Compaction of the embankment using a stamper

FIGURE 6-9 COMPACTION USING A STAMPER



6.1.4 - Sewer and Associated Structures

In the Way Sekampung irrigation system, rice fields that are irrigated technically have a drainage network with two functions:

a. As an internal drainage to drain excess water from rice fields to prevent puddles and damage to plants or to regulate the amount of ground water as needed by plants.
b. External drainaage to drain water from outside the irrigation area that flows through the irrigation area.

In the case of internal exhaust, excess water is accommodated in the quarter and tertiary drains which will drain it into the main exhaust network of the secondary and primary sewers.

The effluent from outside the irrigation area usually enters the irrigation area through natural drainage canals which will form part of the main discharge network in the project.

Methods The implementation of the repair or normalization of the secondary drain is carried out by removing sediment up to the excavation boundary line according to the detailed planning drawings.

The order of implementation of the secondary drain repair is as follows:

a. Preparation
   - Check the condition of the existing land/soil to be excavated.
   - Submit Detailed Drawings of all proposed or ordered canals for removal of sediment/sediment.

- All open excavations must be provided with warning signs and adequate barriers (barricades) to prevent workers or others from falling into them.
- Open excavation at traffic lane locations or road shoulder locations, must be given additional signs at night in the form of drums/barriers painted white with red or yellow lights to ensure the safety of road users.

b. Excavation of sedimentary soil/normalization of drains.
   - Soil excavation is carried out according to the grades, lines and elevations specified in the Drawings or indicated by the Engineer and includes the disposal of materials/materials in any form encountered, including soil, stone, brick, concrete, masonry, organic materials and old pavement materials. which is no longer used.
   - Load the excavations onto the Dump Truck, transport and dispose of the excavations outside the work area/location.
   - Carry out excavations and disposals repeatedly, until the excavation limits and elevations have been determined.
   - The excavated/cutting surface must be cleaned of any loose material that will become hazardous after the work is completed.
   - The surface of the excavated/cutting slopes should be maintained in a stable condition.

c. Excavation results check
   - Check whether the final excavation results are as planned
   - Coordinate with the measurement department to control and improve measurements during the process. Make sure to check the surface finish with a measuring tool.
   - All excavated surfaces must be flat.
   - The slope of the excavation/cutting slope must be in accordance with the planned elevation.
   - There is no loose material such as stone on the excavated surface in the final result.

d. Secondary Sewer Repair
   - If the results of excavation/cutting are not in accordance with the planned elevation, re-excavate so that the elevation of the excavation results is in accordance with the plan.
   - In case of ground movement or landslide, stop work immediately
   - Preventing further landslides by repairing existing sheet piles or adding new sheet piles. If there is a water disturbance, the water must be drained/canalized immediately
   - Should not overload the edge of the excavation with a buildup of excavated soil or other materials.

Waste Structure Repairs

Disposal Structure is a Structure that facilitates a canal when it crosses a irrigation canal, public road or other public facilities. Disposal Structures can be in the form of dumping culverts, dumping siphons and dumping Aqueduct. The method of implementing the repair of the disposal Structure is the same as the repair of the Structure, among others as follows:

Method of Implementing Damaged Structure Repair

a. Measure the amount of damage to the Structure and then mark it with paint.
b. Carry out the demolition of the masonry in accordance with the measurement results, the results of the demolition are removed from the Structure area,
c. Repair of damaged Structures with the size and location according to the design drawings with human power (man power).
d. Plaster and broadcast according to the design drawings.

The first time is the work of drying or dewatering, if the canal must still be used to irrigate the fields, then the drying must be done by adding a cover dam and preparing a water pump, but if it is possible to close the canal, it is enough to just prepare a water pump with a hose.

Furthermore, the dismantling of the damaged parts, for minor and moderate repairs, the disassembly is carried out manually, so as not to damage other parts that are not damaged. While the Structures are heavily damaged which must be completely overhauled and reconstructed, the demolition can be done using heavy equipment.

The next step is to improve the condition of the subgrade which must be compacted and leveled and shaped according to the shape and size of the planned Structure. Only then construct the damaged part of the river stone or concrete by following the shape, size and location of the Structure according to the plan drawing. For the stone masonry, it is continued with plastering and broadcast work.

And finally backfill, restore the shape of the land surface to its original shape and location and compacted with temper or other tools approved by the board of directors.

6.1.5 - Inspection Road

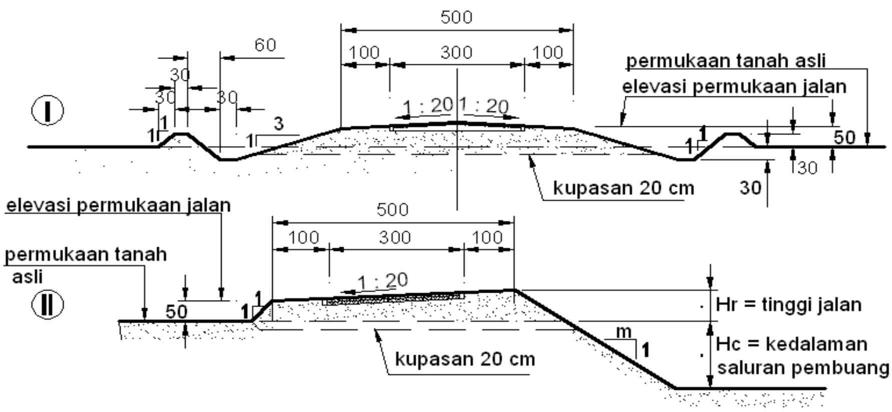
Inspection roads are planned, built and maintained by the Irrigation Service or BBWS Mesuji Sekampung. This road should be used to inspect, operate and maintain irrigation networks, sewers, i.e. canals and auxiliary structures. However, in most rural areas, these roads also function as main roads and are therefore also used by commercial vehicles with heavier axles than inspection vehicles.

Implementation Method:

Preparation, longitudinal or transverse profiles shall be prepared according to the cross-sectional design.

The inspection road foundation consists of a subbase course with a thickness of + 35 cm and a base course with a thickness of + 15 cm with a gradation according to the Bina Marga standard, namely a mixture of crushed stone and gravel or all crushed stone. The material for the subbase course and base course is laid out and compacted layer by layer with a thickness of not more than 15 cm. Compaction is carried out with a tandem roller/vibrator, and a water tank is used to add water to achieve optimum humidity so that maximum dry density is achieved.

FIGURE 6-10 TYPICAL CROSS SECTION OF INSPECTION ROAD



The surface must be free from unwanted objects such as dust and other loose materials. Holes and cracks shall be repaired in accordance with the provisions of the Specification. Technique. Old asphalt surfaces shall be treated with an Adhesive Coating in accordance with the provisions of this Specification, as directed by the Engineer.

Mechanical Method Overlay

1. Spreading and Compaction of Main Aggregate

The aggregate spreader truck shall be run at such a speed that the quantity of aggregate is as required and an even surface is obtained.

Initial compaction must use a 6 - 8 tons compactor moving at a speed of less than 3 km/hour. Compaction is carried out in a longitudinal direction, starting from the outer edge of the bed and proceeding toward the axis of the road. Rolling paths must overlap at least half the width of the compactor. Compaction should be continued until a flat and stable surface is obtained (minimum 6 passes).

2. Asphalt Spraying

The asphalt temperature in the distributor must be maintained at the temperature required for the type of asphalt used. The spraying temperature and spraying rate must be approved by the Engineer prior to commencement of the operation and must meet the required range.

3. Spreading and Compaction of Locking Aggregate

Immediately after spraying the asphalt, the locking aggregate shall be spread at the required rate and in such a manner that no wheels pass through the area which has not been covered with asphalt. The spread rate shall be such that, after compaction, the surface voids in the principal aggregate are filled and the principal aggregate is still visible.

Compaction of the lock aggregates shall begin immediately after deployment of the lock aggregates and shall be as described in the technical specification. Where necessary, additional locking aggregate should be added in small quantities and gently swept over the surface during compaction. Compaction shall be continued until the locking aggregate is embedded and fully locked in the underlying layer.

Manual Overlay Method

1. Spreading and Compaction of Main Aggregate

The amount of aggregate that is spread over the prepared surface shall be as required. Surface flatness can be obtained by spreading skills and using hand tools such as rakes.

Compaction shall be carried out as required for the mechanical method.

2. Asphalt Spraying

Spraying asphalt can be done using a hand sprayer with the required asphalt temperature. The amount of asphalt used should be as uniform as possible and at an approved spray rate.

3. Spreading and Compaction of Locking Aggregate

The spreading and compaction of the locking aggregate shall be carried out in the same manner as for the principal aggregate. The spread rate shall be such that, after compaction, the surface voids in the principal aggregate are filled and the principal aggregate is still visible. Compaction shall be as required for the mechanical method.

Locking Aggregate Maintenance

There is a delay between the work of the locking aggregate layer and the next layer, the Contractor shall maintain the locking aggregate surface in good condition until the next layer is laid.

6.1.6 - Office, Housing and Warehouse

The construction of offices, housing and warehouses at the location of the Way Sekampung irrigation sub-system has been carried out in all UPTDs of the seven sub-systems in Way Sekampung, only a few UPTDs have not been equipped with warehouses and there is a shortage of housing for some mantri or PPA staff on duty there.

The houses are classified according to the rank of the employee (in square meters). Usually these houses have a floor area of 36 m^2 (waterworker), 50 m^2 (irrigation observer) or 70 m^2 (head of irrigation section). The observer needs a small office (+36 m^2) which is usually a part of his house.

The standards for these houses are provided by the Directorate General of Human Settlements in collaboration with local officials such as the Public Works Department and the Directorate of Structure Planning.

The floor area for the offices of the Section Heads is also standardized in each province.

IMPLEMENTATION METHOD

I. WORK INTRODUCTION

1. Preparatory Work

a. Site Clearing and Soil Leveling
Clearing the site of bushes and weeds so that the Structure can be prepared for construction.
b. Bouwplank Measurement and Installation
Before the main work is carried out, measurements must be made at the project site, to obtain topographic and elevation drawings at the site.
c. Keet Board of Directors and Material Warehouse
The Keet Board of Directors facilities consist of a Work Room, Meeting Room, and other Supporting Facilities such as Toilets and Worship Rooms. The location of the Board of Directors Keet will be determined in accordance with the approval of the Board of Directors.

II. STRUCTURE WORK

1. Earthwork
a. Excavation Work
- Soil excavation work is carried out manually, excavation boundaries are adjusted to working drawings or under special conditions.
- Soil/excavated material is placed around the work site, good soil will be reused for stockpiling work.
- This foundation excavation work must follow the length, width, depth and slope of the excavation slope according to the dimensions on the plan drawings.
b. Backfill Earthwork
Disposal of the excavated soil to a place determined by the board of directors as a consideration for backfill.
c. Sand Backfill under Foundations and Floors
Before the foundation work is carried out, all the foundation excavation is sprinkled with backfill sand with a layer thickness according to the bestek.

2. Foundation Work

- After the depth of the foundation excavation is reached and approved by the Technical Director, then a working floor is made of 1 : 3 : 5 cast concrete with a thickness of 5 cm.
After the work floor is finished, a pile of river stone is made on it with a mixture of cement + sand mixture 1: 3. The volume of river stone is sought to be 20% of the volume of the continuous foundation.
- For each meeting on a continuous foundation related to the position of the structural column or practical column, cuttings of reinforcing iron are made with a length of at least 50 x the diameter of the iron.
- All dimensions and lengths of continuous foundations are carried out manually and adjusted to working drawings.

3. Structural Work

Structural work includes:

- Reinforced concrete cast sloof 1:2:3 (K-225)
- Practical column of reinforced concrete cast 1:2:3 (K-125)
- Structural column of reinforced concrete cast 1:2:3 (K-225) 225)Bathroom beams, walkways, reinforced concrete window shading 1:2:3 (K-175)
- Reinforced concrete cast structure beam 1:2:3 (K-225)
- Floor slab, not cast reinforced concrete 1:2:3 (K-225)
- Reinforced concrete laboratory table slab 1:2:3 (K-175)

For all structural items casting (sloof, column, ring beam) wood formwork is used which is lined inside with multiplex, with stutwerk reinforcement and scaffolding using beams.
The implementation of reinforced concrete casting, begins with installing the assembled iron in the construction position. Next, the tofu concrete is installed around the reinforcement. Next is the installation of formwork that has been coated with oil/lubricant on the surface and installation of studs/stiffeners.
The concrete used complies with technical specifications and has also been approved by the Field Directors. The quality and characteristics of the concrete used must be in accordance with the structural items stated in the contract, unless there is a change in the field with the approval of the Field Engineer.
Some of the parts that must be prepared by the contractor are as follows:

- Reinforcement lists and diagrams, showing bends, hooks, splices and overlaps.
- Shape, dimensions and strength of the mold/formwork and stutwerk.
- Casting method, which relates to technical implementation, use of tools and work tools.

Maintenance of concrete: All materials (cement, water, fine aggregate/sand, coarse aggregate/gravel, iron, and other additives) used must be based on technical specifications and working drawings.

III. ARCHITECTURAL WORK

1. Floor Work

a. Ceramic Floor Installation

Prepare equipment and materials to be used. Understand working drawings, installation patterns and others. After mixing well, fill in between the grout with cornat ingredients using a special spoon (shovel).

b. Ceramic Wall Installation

Soak the ceramic to be installed into a water bath (bucket). The ceramics are aerated by placing them on a ceramic holder/mat, after the soaking process. Create a spirit level line on the ceramic wall around ± 1m to determine the height and level of the ceramic installation.

2. Wall Work

Pairs of bricks on the walls around the Structure are installed with stone, the walls starting from the surface of the sloof to peil 20 cm above the floor surface are installed with brick trasram bricks with a mixture of 1Pc: 2Ps. For the walls of the bathroom/toilet, transram bricks are installed 1Pc: 2Ps as high as 1.5 meters from the floor surface.
While the other walls are installed in pairs of 1Pc: 4Ps bricks with a mixture of 1 cement: 4 sand according to the bestek drawing. Walls that have been installed must be treated by wetting them continuously for at least 7 days after installation
Prior to plastering, the surface of the brick wall must be cleaned and moistened with water, the ribs are scraped to a depth of 1 cm. The minimum stucco thickness is 1.5 cm and the maximum is 2.5 cm. Joints of plaster must be smooth and straight.

3. Ceiling Work

a. Furing frame installation

Before installing the ceiling frame, the frame is installed according to each material.
Mark the ceiling level on the adjacent wall according to the shop drawings. Install the furing frame that is attached directly to the wall according to the marking. Installing the dividing frame, cross meeting with the closet system and leveling the connection.

b. Gypsum ceiling installation

Gypsum ceiling material 9 mm thick, must have a sharp parallel cut side, no surface defects, relatively the same motif. Installing the ceiling on the side that has been determined by one person while another person does the installation of nails.

4. Roof Work

Roof Tile Metal Lisplank GRC The volume of work and the measurements used must be in accordance with the working drawings. The slope and angle of the roof slope must be right to avoid leakage. The first sheet of galvalume zinc roof is placed in the lower left corner of the Structure, then the second sheet of galvalume zinc roof is overwritten and so on. To tie the ribs/flasing and the legs of the galvalume zinc roofing roof, rivet nails are used. During the maintenance period, the contractor must repair all defects, deficiencies and hidden defects that occurred at the time of the first handover at the contractor's expense.

5. Aluminum Frame/Gate/Window Work

Before starting the implementation the contractor is required to examine the drawings and conditions in the field (size and peel of the hole and make a finished sample with a scale of 1:1), for some types of frames determined by the Board of Directors and construction management supervisors. The fabrication process must be ready before work begins by making a complete shop drawing with instructions from the directors and construction management supervisors including floor plans, location, brand, quality, shape and size.

6. Paint Job

Before plastering the wall, the plaster must be completely dry, there are no cracks and the contractor asks for the supervisor's approval. After 7 days the plaster was installed with an iron color experiment, then cleaned. For textured emulsion spray paint, on the outer wall used plaster of 1 Pc : 5 Ps where the sand was sifted finely, sprayed with a spray machine on a flat plastering area of 1 Pc : 5 Ps.

6.2 - Schedule

6.2.1 - Activities Schedule

TABLE 6-2 ACTIVITIES SCHEDULE IN PUNGGUR UTARA

ANALISA TK PUNGGUR UTARA 1		BULAN KE -																							
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Bagi Sadap (5 Unit)																								
2	Rehab Bangunan Bagi (2 Unit)																								
3	Rehab Bangunan Sadap (7 Unit)																								
4	Rehab Bangunan Jembatan (9 Unit)																								
5	Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)																								
6	Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)																								
7	Pembuatan Bangunan Terjun (5 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA																								
A	Perbaikan dan penggantian pintu air di KPD Rantau Fajar																								
B	Perbaikan dan penggantian pintu air di UPTD Seputih Raman																								

TABLE 6-3 JADWAL PEKERJAAN PUNGGUR UTARA 2

JADWAL PEKERJAAN PUNGGUR UTARA 2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	I I	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Bagi Sadap (8 Unit)																								
2	Rehab Bangunan Ukur (7 Unit)																								
3	Rehab Bangunan Jembatan (22 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)																								
5	Pembuatan Bangunan Terjun (1 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Jalan Inspeksi Beton K-225																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Trimurdjo																								
B	Perbaikan dan penggantian pintu air di UPTD Punggur																								
C	Perbaikan dan penggantian pintu air di UPTD Kampung Gajah																								

TABLE 6-4 JADWAL PEKERJAAN BATANGHARI UTARA

JADWAL PEKERJAAN BATANGHARI UTARA ALT 1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN BATANGHARI UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA**																								
1	**Rehab Bangunan Bagi Sadap (6 Unit)**																								
2	**Rehab Bangunan Sadap (5 Unit)**																								
3	**Rehab Bangunan Jembatan (3 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembawa(2 Unit)**																								
5	**Pembuatan Bangunan Terjun (6 Unit)**																								
6	**Pembuatan Bangunan Penguras (1 Unit)**																								
7	**Pembuatan Bangunan Washing Step R (Tangga Cuci) (6 Unit)**																								
8	**Rehab Bangunan Mercu Bendung**																								
9	**Rehab Dinding Penahan Tanah Intake**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN BATANGHARI UTARA**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA**																								
A	**Perbaikan dan penggantian pintu air di UPTD Purbolinggo**																								

TABLE 6-5 JADWAL PEKERJAAN BATANGHARI UTARA

JADWAL PEKERJAAN BATANGHARI UTARA ALT 2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA																								
1	Rehab Bangunan Bagi Sadap (6 Unit)																								
2	Rehab Bangunan Sadap (5 Unit)																								
3	Rehab Bangunan Jembatan (3 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembawa(2 Unit)																								
5	Pembuatan Bangunan Terjun (6 Unit)																								
6	Pembuatan Bangunan Penguras (1 Unit)																								
7	Pembuatan Bangunan Washing Step R (Tangga Cuci) (6 Unit)																								
8	Rehab Bangunan Mercu Bendung																								
9	Rehab Dinding Penahan Tanah Intake																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN BATANGHARI UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo																								

TABLE 6-6 JADWAL PEKERJAAN SEKAMPUNG BATANGHARI

JADWAL PEKERJAAN SEKAMPUNG BATANGHARI		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
NO.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Bagi Sadap (5 Unit)**																								
2	**Rehab Bangunan Bagi (2 Unit)**																								
3	**Rehab Bangunan Sadap (7 Unit)**																								
4	**Rehab Bangunan Jembatan (9 Unit)**																								
5	**Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)**																								
6	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**																								
7	**Pembuatan Bangunan Terjun (5 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Penetrasi Macadam**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA**																								
A	**Perbaikan dan penggantian pintu air di KPD Rantau Fajar**																								
B	**Perbaikan dan penggantian pintu air di UPTD Seputih Raman**																								

TABLE 6-7 JADWAL PEKERJAAN RAMAN UTARA

JADWAL PEKERJAAN RAMAN UTARA		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
NO.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Bagi Sadap (5 Unit)																								
2	Rehab Bangunan Bagi (2 Unit)																								
3	Rehab Bangunan Sadap (7 Unit)																								
4	Rehab Bangunan Jembatan (9 Unit)																								
5	Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)																								
6	Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)																								
7	Pembuatan Bangunan Terjun (5 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Penetrasi Macadam																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA																								
A	Perbaikan dan penggantian pintu air di KPD Rantau Fajar																								
B	Perbaikan dan penggantian pintu air di UPTD Seputih Raman																								

TABLE 6-8 JADWAL PEKERJAAN SEKAMPUNG BUNUT

JADWAL PEKERJAAN SEKAMPUNG BUNUT		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN BUNUT**																								
1	**Rehab Bangunan Ukur (5 Unit)**																								
2	**Rehab Bangunan Jembatan (9 Unit)**																								
3	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**																								
5	**Pembuatan Bangunan Penguras (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN SEKAMPUNG BUNUT**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN SEKAMPUNG BUNUT**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN SEKAMPUNG BUNUT**																								
A	**Perbaikan dan penggantian pintu air di UPTD Punggur**																								
B	**Perbaikan dan penggantian pintu air di UPTD Pekalongan**																								

TABLE 6-9 JADWAL PEKERJAAN RUMBIA BARAT

JADWAL PEKERJAAN RUMBIA BARAT		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
NO.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Bagi Sadap (5 Unit)																								
2	Rehab Bangunan Bagi (2 Unit)																								
3	Rehab Bangunan Sadap (7 Unit)																								
4	Rehab Bangunan Jembatan (9 Unit)																								
5	Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)																								
6	Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)																								
7	Pembuatan Bangunan Terjun (5 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Penetrasi Macadam																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA																								
A	Perbaikan dan penggantian pintu air di KPD Rantau Fajar																								
B	Perbaikan dan penggantian pintu air di UPTD Seputih Raman																								

TABLE 6-10 JADWAL PEKERJAAN BEKRI

JADWAL PEKERJAAN BEKRI		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Ukur (3 Unit)																								
2	Rehab Bangunan Jembatan (25 Unit)																								
3	Rehab Bangunan Gorong-Gorong (3 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BEKRI																								
2	Pekerjaan Jalan Perkerasan Beton																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN BEKRI																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER BEKRI																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER BEKRI																								
A	Perbaikan dan penggantian Spindle Pintu Air																								
B	Perbaikan dan penggantian Plate Pintu Air																								

TABLE 6-11 JADWAL PEKERJAAN FEEDER CANAL 1 & 2

JADWAL PEKERJAAN FEEDER CANAL 1 & 2		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN BANGUNAN PADA SALURAN FEEDER CANAL																								
1	Feeder Canal 1																								
2	Feeder Canal 2																								
3	Rehab Bangunan Jembatan (5 Unit) Feeder Canal 1																								
4	Rehab Bangunan Jembatan (5 Unit) Feeder Canal 2																								
III	PEKERJAAN JALAN INSPEKSI																								
IV	PEKERJAAN PINTU IRIGASI PADA FEEDER CANAL																								

6.2.2 - Personnel Schedule for Construction

TABLE 6-12 JADWAL ANALISA TENAGA KERJA PUNGGUR UTARA 1

ANALISA TK PUNGGUR UTARA 1		BULAN KE -																							
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Bagi Sadap (5 Unit)**																								
2	**Rehab Bangunan Bagi (2 Unit)**																								
3	**Rehab Bangunan Sadap (7 Unit)**																								
4	**Rehab Bangunan Jembatan (9 Unit)**																								
5	**Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)**																								
6	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**																								
7	**Pembuatan Bangunan Terjun (5 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA**																								
A	**Perbaikan dan penggantian pintu air di KPD Rantau Fajar**																								
B	**Perbaikan dan penggantian pintu air di UPTD Seputih Raman**																								

TABLE 6-13 JADWAL ANALISA TENAGA KERJA PUNGGUR UTARA 2

ANALISA TK PUNGGUR UTARA 2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Bagi Sadap (8 Unit)**																								
2	**Rehab Bangunan Ukur (7 Unit)**																								
3	**Rehab Bangunan Jembatan (22 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**																								
5	**Pembuatan Bangunan Terjun (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Inspeksi Beton K-225**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA**																								
A	**Perbaikan dan penggantian pintu air di UPTD Trimurdjo**																								
B	**Perbaikan dan penggantian pintu air di UPTD Punggur**																								
C	**Perbaikan dan penggantian pintu air di UPTD Kampung Gajah**																								

TABLE 6-14 JADWAL ANALISA TENAGA KERJA BATANGHARI UTARA

ANALISA TK BATANGHARI UTARA ALT 1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA																								
1	Rehab Bangunan Bagi Sadap (6 Unit)																								
2	Rehab Bangunan Sadap (5 Unit)																								
3	Rehab Bangunan Jembatan (3 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembawa(2 Unit)																								
5	Pembuatan Bangunan Terjun (6 Unit)																								
6	Pembuatan Bangunan Penguras (1 Unit)																								
7	Pembuatan Bangunan Washing Step R (Tangga Cuci) (6 Unit)																								
8	Rehab Bangunan Mercu Bendung																								
9	Rehab Dinding Penahan Tanah Intake																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN BATANGHARI UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo																								

ANALISA TK BATANGHARI UTARA ALT 2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA																								
1	Rehab Bangunan Bagi Sadap (6 Unit)																								
2	Rehab Bangunan Sadap (5 Unit)																								
3	Rehab Bangunan Jembatan (3 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembawa(2 Unit)																								
5	Pembuatan Bangunan Terjun (6 Unit)																								
6	Pembuatan Bangunan Penguras (1 Unit)																								
7	Pembuatan Bangunan Washing Step R (Tangga Cuci) (6 Unit)																								
8	Rehab Bangunan Mercu Bendung																								
9	Rehab Dinding Penahan Tanah Intake																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN BATANGHARI UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo																								

TABLE 6-16 JADWAL ANALISA TENAGA KERJA SEKAMPUNG BATANGHARI

ANALISA TK SEKAMPUNG BATANGHARI		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Bagi Sadap (3 Unit)**																								
2	**Rehab Bangunan Sadap (5 Unit)**																								
3	**Rehab Bangunan Jembatan (21 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**																								
5	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**																								
6	**Pembuatan Bangunan Terjun (3 Unit)**																								
7	**Pelimpah Samping (1 Unit)**																								
8	**Bangunan Talang (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER BATANGHARI UTARA**																								
A	**Perbaikan dan penggantian pintu air di UPTD Sekampung**																								

TABLE 6-17 JADWAL ANALISA TENAGA KERJA RAMAN UTARA

ANALISA TK RAMAN UTARA		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Jembatan (9 Unit)**																								
2	**Rehab Bangunan Gorong-Gorong Pembawa (3 Unit)**																								
3	**Rehab Bangunan Ukur (4 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**																								
5	**Rehab Bangunan Bronjong**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA**																								
A	**Perbaikan dan penggantian pintu air di UTPD Raman**																								

TABLE 6-18 JADWAL ANALISA TENAGA KERJA SEKAMPUNG BUNUT

ANALISA TK SEKAMPUNG BUNUT		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Rehab Bangunan Ukur (5 Unit)**																								
2	**Rehab Bangunan Jembatan (9 Unit)**																								
3	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**																								
5	**Pembuatan Bangunan Penguras (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN SEKAMPUG BUNUT**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN SEKAMPUNG BUNUT**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN SEKAMPUNG BUNUT**																								
A	**Perbaikan dan penggantian pintu air di UPTD Punggur**																								
B	**Perbaikan dan penggantian pintu air di UPTD Pekalongan**																								

TABLE 6-19 JADWAL ANALISA TENAGA KERJA RUMBIA BARAT

ANALISA TK RUMBIA BARAT		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN RUMBIA BARAT**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN RUMBIA BARAT**																								
1	**Rehab Bangunan Ukur (5 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN RUMBIA BARAT**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN RUMBIA BARAT**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN RUMBIA BARAT**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN RUMBIA BARAT**																								
A	**Perbaikan dan penggantian pintu air di UPTD Purbolinggo**																								

TABLE 6-20 JADWAL ANALISA TENAGA KERJA BEKRI

ANALISA TK BEKRI		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Ukur (3 Unit)**																								
2	**Rehab Bangunan Jembatan (25 Unit)**																								
3	**Rehab Bangunan Gorong-Gorong (3 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN BEKRI**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN BEKRI**																								

TABLE 6-21 JADWAL ANALISA TENAGA KERJA FEEDER CANAL 1 & 2

ANALISA TK FEEDER CANAL 1 & 2		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN BANGUNAN PADA SALURAN FEEDER CANAL**																								
1	**Feeder Canal 1**																								
2	**Feeder Canal 2**																								
3	**Rehab Bangunan Jembatan (5 Unit) Feeder Canal 1**																								
4	**Rehab Bangunan Jembatan (5 Unit) Feeder Canal 2**																								
III	**PEKERJAAN JALAN INSPEKSI**																								
IV	**PEKERJAAN PINTU IRIGASI PADA FEEDER CANAL**																								

6.2.3 - Schedule for Project Equipment

TABLE 6-22 JADWAL ANALISA ALAT PUNGGUR UTARA 1

ANALISA ALAT PUNGGUR UTARA 1		BULAN KE -																							
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Bagi Sadap (5 Unit)																								
2	Rehab Bangunan Bagi (2 Unit)																								
3	Rehab Bangunan Sadap (7 Unit)																								
4	Rehab Bangunan Jembatan (9 Unit)																								
5	Rehab Bangunan Gorong-Gorong Pembuang (4 Unit)																								
5	Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)																								
5	Pembuatan Bangunan Terjun (1 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Rantau Fajar																								
B	Perbaikan dan penggantian pintu air di UPTD Seputih Raman																								

TABLE 6-23 JADWAL ANALISA ALAT PUNGGUR UTARA 2

ANALISA ALAT PUNGGUR UTARA 2		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**																								
5	**Pembuatan Bangunan Terjun (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Perkerasan Beton**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA**																								
A	**Perbaikan dan penggantian pintu air di UPTD Trimurdjo**																								
B	**Perbaikan dan penggantian pintu air di UPTD Punggur**																								
C	**Perbaikan dan penggantian pintu air di UPTD Kampung Gajah**																								

TABLE 6-24 JADWAL ANALISA ALAT BATANGHARI UTARA

ANALISA ALAT BATANGHARI UTARA ALT 1		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA																								
1	Rehab Bangunan Bagi Sadap (6 Unit)																								
2	Rehab Bangunan Sadap (5 Unit)																								
3	Rehab Bangunan Jembatan (3 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembawa(2 Unit)																								
5	Pembuatan Bangunan Terjun (6 Unit)																								
6	Pembuatan Bangunan Penguras (1 Unit)																								
7	Pembuatan Bangunan Washing Step R (Tangga Cuci) (6 Unit)																								
8	Rehab Bangunan Mercu Bendung																								
9	Rehab Dinding Penahan Tanah Intake																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo																								

TABLE 6-25 JADWAL ANALISA ALAT BATANGHARI UTARA

ANALISA ALAT BATANGHARI UTARA ALT 2		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA																								
1	Rehab Bangunan Bagi Sadap (6 Unit)																								
2	Rehab Bangunan Sadap (5 Unit)																								
3	Rehab Bangunan Jembatan (3 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembawa(2 Unit)																								
5	Pembuatan Bangunan Terjun (6 Unit)																								
6	Pembuatan Bangunan Penguras (1 Unit)																								
7	Pembuatan Bangunan Washing Step R (Tangga Cuci) (6 Unit)																								
8	Rehab Bangunan Mercu Bendung																								
9	Rehab Dinding Penahan Tanah Intake																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo																								

TABLE 6-26 JADWAL ANALISA ALAT SEKAMPUNG BATANGHARI

ANALISA ALAT SEKAMPUNG BATANGHARI		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA**																								
1	**Rehab Bangunan Bagi Sadap (3 Unit)**																								
2	**Rehab Bangunan Sadap (5 Unit)**																								
3	**Rehab Bangunan Jembatan (21 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**																								
5	**Rehab Bangunan Gorong-Gorong Pembawa (2 Unit)**																								
6	**Pembuatan Bangunan Terjun (3 Unit)**																								
7	**Pelimpah Samping (1 Unit)**																								
8	**Bangunan Talang (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA**																								
1	**Pekerjaan Jalan Perkerasan Beton**																								
V	**PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER BATANGHARI UTARA**																								
A	**Perbaikan dan penggantian pintu air di UPTD Sekampung**																								

TABLE 6-27 JADWAL ANALISA ALAT RAMAN UTARA

ANALISA ALAT RAMAN UTARA		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Jembatan (9 Unit)																								
2	Rehab Bangunan Gorong-Gorong Pembawa (3 Unit)																								
3	Rehab Bangunan Ukur (4 Unit)																								
4	Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)																								
5	Rehab Bangunan Bronjong																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Jalan Perkerasan Beton																								
V	PEKERJAAN PEMASANGAN PATOK PADA SALURAN PUNGGUR UTARA																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER PUNGGUR UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER PUNGGUR UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Raman																								

TABLE 6-28 JADWAL ANALISA ALAT SEKAMPUNG BUNUT

ANALISA ALAT SEKAMPUNG BUNUT		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	**URAIAN PEKERJAAN**																								
I	**PERSIAPAN**																								
II	**PEKERJAAN PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Pekerjaan Dewatering**																								
2	**Pekerjaan Tanah**																								
3	**Pekerjaan Pasangan Beton**																								
III	**PEKERJAAN BANGUNAN PADA SALURAN BUNUT**																								
1	**Rehab Bangunan Ukur (5 Unit)**																								
2	**Rehab Bangunan Jembatan (9 Unit)**																								
3	**Rehab Bangunan Gorong-Gorong Pembuang (3 Unit)**																								
4	**Rehab Bangunan Gorong-Gorong Pembawa (1 Unit)**																								
5	**Pembuatan Bangunan Penguras (1 Unit)**																								
IV	**PEKERJAAN JALAN INSPEKSI PADA SALURAN SEKAMPUNG BUNUT**																								
1	**Pekerjaan Jalan Onderlag (Telford)**																								
2	**Pekerjaan Jalan Perkerasan Beton**																								
VI	**PEKERJAAN PENDUKUNG PADA SALURAN SEKAMPUNG BUNUT**																								
VII	**PEKERJAAN PINTU IRIGASI PADA SALURAN SEKAMPUNG BUNUT**																								
A	**Perbaikan dan penggantian pintu air di UPTD Punggur**																								
B	**Perbaikan dan penggantian pintu air di UPTD Pekalongan**																								

TABLE 6-29 JADWAL ANALISA ALAT RUMBIA BARAT

ANALISA ALAT RUMBIA BARAT		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN BATANGHARI UTARA																								
1	Pembuatan Bangunan Ukur (5 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BATANGHARI UTARA																								
1	Pekerjaan Jalan Onderlag (Telford)																								
2	Pekerjaan Jalan Perkerasan Beton																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN BATANGHARI UTARA																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN BATANGHARI UTARA																								
A	Perbaikan dan penggantian pintu air di UPTD Purbolinggo																								

TABLE 6-30 JADWAL ANALISA ALAT BEKRI

ANALISA ALAT BEKRI		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN PADA SALURAN PUNGGUR UTARA																								
1	Pekerjaan Dewatering																								
2	Pekerjaan Tanah																								
3	Pekerjaan Pasangan Beton																								
III	PEKERJAAN BANGUNAN PADA SALURAN PUNGGUR UTARA																								
1	Rehab Bangunan Ukur (3 Unit)																								
2	Rehab Bangunan Jembatan (25 Unit)																								
3	Rehab Bangunan Gorong-Gorong (3 Unit)																								
IV	PEKERJAAN JALAN INSPEKSI PADA SALURAN BEKRI																								
2	Pekerjaan Jalan Perkerasan Beton																								
VI	PEKERJAAN PENDUKUNG PADA SALURAN PRIMER BEKRI																								
VII	PEKERJAAN PINTU IRIGASI PADA SALURAN PRIMER BEKRI																								
A	Perbaikan dan penggantian Spindle Pintu Air																								
B	Perbaikan dan penggantian Plate Pintu Air																								

TABLE 6-31 JADWAL ANALISA ALAT FEEDER CANAL 1 & 2

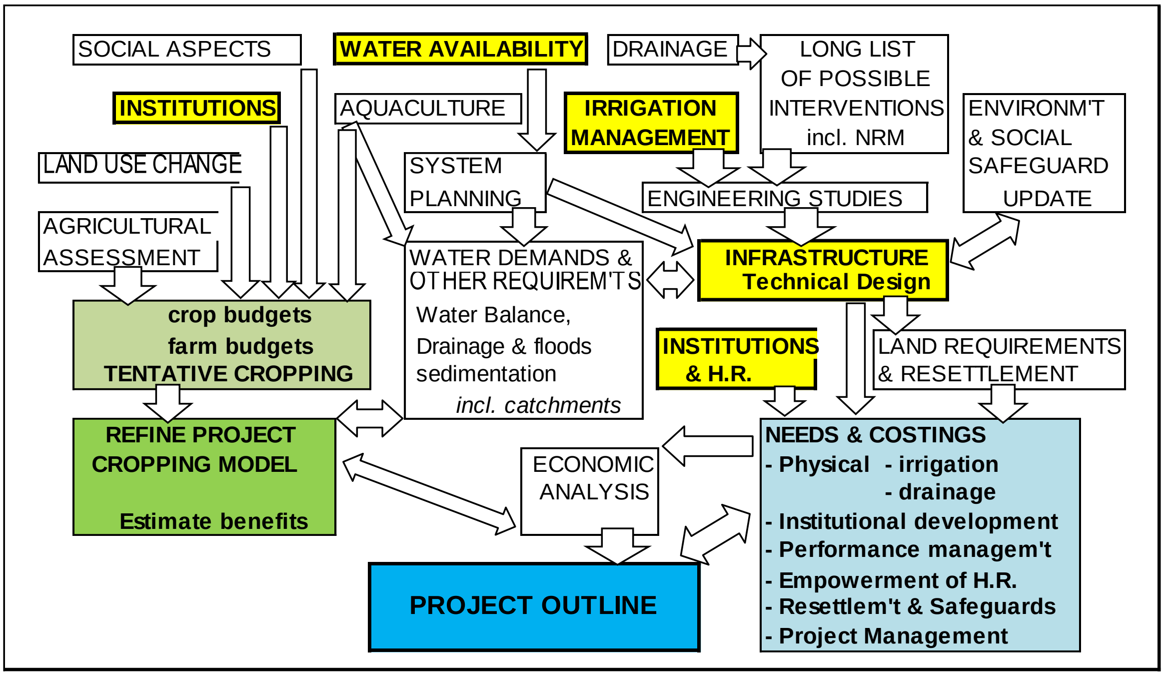
ANALISA ALAT FEEDER CANAL 1 & 2		1		2		3		4		5		6		7		8		9		10		11		12	
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
No.	URAIAN PEKERJAAN																								
I	PERSIAPAN																								
II	PEKERJAAN BANGUNAN PADA SALURAN FEEDER CANAL																								
1	Feeder Canal 1																								
2	Feeder Canal 2																								
3	Rehab Bangunan Jembatan (5 Unit) Feeder Canal 1																								
4	Rehab Bangunan Jembatan (5 Unit) Feeder Canal 2																								
III	PEKERJAAN JALAN INSPEKSI																								
IV	PEKERJAAN PINTU IRIGASI PADA FEEDER CANAL																								

6.3 - Cost Estimates and Economic Financial Analysis (EFA)

6.3.1 - EFA Methodology

The flow diagram for the modernization of the management of the Way Sekampung irrigation area.

FIGURE 6-11 DIAGRAM OF CONSTRUCTION OF THE WAY SEKAMPUNG IRRIGATION SYSTEM



Basic principles of economic analysis:

- Project time is estimated for 25 years. That is, assuming adequate maintenance, the irrigation system must be able to maintain its expected benefits for 25 years before another major renovation may be required.
- Fully integrated economic analysis with financial analysis. Economic analysis is about project design.
- Economic analysis is built on the work of engineers, cannot produce quality analysis without basic technical knowledge.
- Internal rate of return (IRR) and net present value (NPV) are summary metrics, ADB requirements threshold 9%, 6% for poverty targets or environmental projects but subject to prior approval.
- NPV and IRR calculation: invest (costs) today, get returns tomorrow; But a dollar today is worth more than a dollar tomorrow. Discount for bringing all future returns to their current equivalent (present value).
- Values are expressed in 2021 constant prices to exclude inflation.
- Eligible criteria: if NPV>= 0; and IRR > discount rate threshold.
- Scenarios with project and without project:

e. Project costs and benefits are determined by comparing the two scenarios.

f. No-project scenario: most likely a no-project investment situation, and current cropping patterns and project technologies are expected to continue throughout the life of the project.

g. Scenario with the project: the most likely situation with the project investment, and the entire functional area is expected to be continuously irrigated throughout the life of the project, enabling farmers to adopt appropriate cropping patterns and technologies.

h. Phase 1 of the 2021-2023 Project in the Sub-System in Punggur Utara Irrigation Area

i. Phase 2 of the 2023 Project in the Sub-System in Rumbia Barat Irrigation Area

j. Phase 2 of the 2024 Project in the Sub-System in Irigasi Bekri and Sekampung Bunut Irrigation Areas

k. Phase 3 of the 2025 Project in the Sub-System in Sekampung Batanghari, Raman Utara and Batanghari Utara Irrigation Areas

- Assessment of irrigation benefits::

No	Assessment of Benefits	Without Project	With Project
1	Functional area changes	Planted area in 25 years reduced by 4% from IP without project	Planted area in 25 years reduced by 4% of IP with the project.
2	Planting Intensity (IP)	206%, IP Rice 184% and Corn 22%.	231%, IP Rice 188% and Corn 43%.
3	Productivity	-	Increase in rice 5% and corn 7%.
4	Cropping Pattern Change	Rice-Rice-Rice Pattern; Rice-Rice-*Palawija*; Rice-*Palawija*-rice. The *Palawija* cropping pattern is the majority of corn	Rice-Rice-*Palawija* and Rice-*Palawija*-Rice cropping patterns. The *palawija* cropping pattern leads to corn and HVCs, such as chili, sweet corn, and other high value crops

6.3.2 - Cost Estimate

TABLE 6-32 AGRICULTURAL INTENSITY AND PROJECT INVESTMENT COSTS FOR THE WAY SEKAMPUNG IRRIGATION AREA

No	Irrigation System	Cropping Intensity (%)		Project Cost (IDR Billion)				
		w/o	w-p	Short Term (2021-2025)	Mid Term (2026-2035)	Long Term (2036-2045)	Total	
1	Punggur Utara	196	233	546.4	194.4	149.7	890.5	
2	Rumbia Barat	206	212	41.0	10.8	8.3	60.0	
3	Bekri	273	293	64.3	20.3	15.6	100.2	
4	Sekampung Bunut	215	222	87.1	29.7	22.9	139.7	
5	Sekampung Batanghari	199	214	145.8	53.5	41.2	240.5	
6	Raman Utara	188	233	192.2	79.1	60.9	332.2	
7	Batanghari Utara	201	223	174.6	71.7	55.2	301.5	
Total Way Sekampung			**206**	**231**	**1,216**	**459.5**	**353.7**	**2,029.2**

6.3.3 - Sensitivity Analysis

a. Punggur Utara Irrigation Area

TABLE 6-33 ECONOMIC ANALYSIS AND SENSITIVITY OF PUNGGUR UTARA IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**397,100**	**22.8%**		
+10% investment cost	340,672	20.0%	-1.42	70.37%
+10% O&M costs	384,958	22.5%	-3.06	32.70%
+10% input cost	302,494	19.5%	-2.38	41.97%
-10% crop price	206,356	16.4%	4.80	-20.82%
-10% with-project yield	129,755	13.2%	6.73	-14.85%
+1 year delay	433,667	30.9%	-0.92	108.60%

Investment cost	0%	
	ENPV	EIRR
	397,100	22.8%
0%	397,100	22.8%
10%	340,672	20.0%
20%	284,244	17.7%
30%	227,816	15.6%
40%	171,387	13.7%

O&M cost	0%	
	ENPV	EIRR
	397,100	22.8%
0%	397,100	22.8%
10%	384,958	22.5%
20%	372,816	22.2%
30%	360,674	21.9%
40%	348,532	21.7%

Construction delay	0	
	ENPV	EIRR
	397,100	22.8%
0	397,100	22.8%
1	433,667	30.9%
2	467,214	#NUM!

Input price	0%	
	ENPV	EIRR
	397,100	22.8%
0%	397,100	22.8%
5%	349,797	21.1%
10%	302,494	19.5%
15%	255,191	17.9%
20%	207,888	16.3%

Crop price	0%	
	ENPV	EIRR
	397,100	22.8%
0%	397,100	22.8%
-5%	301,728	19.6%
-10%	206,356	16.4%
-15%	110,984	13.1%
-20%	15,612	9.6%

W/P Crop Yield	0%	
	ENPV	EIRR
	397,100	22.8%
0%	397,100	22.8%
-10%	129,755	13.2%
-20%	129,755	13.2%
-30%	129,755	13.2%
-40%	129,755	13.2%

b. Rumbia Barat Irrigation Area

TABLE 6-34 ECONOMIC ANALYSIS AND SENSITIVITY OF RUMBIA BARAT IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**31,325**	**25.5%**		
+10% investment cost	26,919	22.0%	-1.41	71.10%
+10% O&M costs	30,526	25.2%	-2.55	39.20%
+10% input cost	14,883	18.0%	-5.25	19.05%
-10% crop price	-4,261	#NUM!	11.36	-8.80%
-10% with-project yield	-9,140	4.1%	12.92	-7.74%
+1 year delay	31,325	25.5%	0.00	#DIV/0!

Investment cost	0%	
	ENPV	EIRR
	31,325	25.5%
0%	31,325	25.5%
10%	26,919	22.0%
20%	22,514	19.0%
30%	18,108	16.5%
40%	13,703	14.3%

O&M cost	0%	
	ENPV	EIRR
	31,325	25.5%
0%	31,325	25.5%
10%	30,526	25.2%
20%	29,726	24.9%
30%	28,927	24.6%
40%	28,128	24.3%

Construction delay	0	
	ENPV	EIRR
	31,325	25.5%
0	31,325	25.5%
1	31,325	25.5%
2	972	9.3%

Input price	0%	
	ENPV	EIRR
	31,325	25.5%
0%	31,325	25.5%
5%	23,528	21.9%
10%	14,883	18.0%
15%	4,990	13.0%
20%	-6,749	#NUM!

Crop price	0%	
	ENPV	EIRR
	31,325	25.5%
0%	31,325	25.5%
-5%	11,883	17.9%
-10%	-4,261	#NUM!
-15%	-18,115	#NUM!
-20%	-30,359	#NUM!

W/P Crop Yield	0%	
	ENPV	EIRR
	31,325	25.5%
0%	31,325	25.5%
-10%	-9,140	4.1%
-20%	-9,140	4.1%
-30%	-9,140	4.1%
-40%	-9,140	4.1%

c. Bekri Irrigation Area

TABLE 6-35 ECONOMIC ANALYSIS AND SENSITIVITY OF BEKRI IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**37,934**	**25.4%**		
+10% investment cost	30,681	20.9%	-1.91	52.30%
+10% O&M costs	36,438	24.9%	-3.94	25.36%
+10% input cost	-21,072	#NUM!	-15.55	6.43%
-10% crop price	-64,008	#NUM!	26.87	-3.72%
-10% with-project yield	-13,602	2.7%	13.59	-7.36%
+1 year delay	37,934	25.4%	0.00	#DIV/0!

Investment cost	0%	ENPV	EIRR
		37,934	25.4%
	0%	37,934	25.4%
	10%	30,681	20.9%
	20%	23,427	17.3%
	30%	16,174	14.3%
	40%	8,921	11.7%

O&M cost	0%	ENPV	EIRR
		37,934	25.4%
	0%	37,934	25.4%
	10%	36,438	24.9%
	20%	34,942	24.4%
	30%	33,446	23.9%
	40%	31,950	23.4%

Construction delay	0	ENPV	EIRR
		37,934	25.4%
	0	37,934	25.4%
	1	37,934	25.4%
	2	-10,525	6.3%

Input price	0%	ENPV	EIRR
		37,934	25.4%
	0%	37,934	25.4%
	5%	10,113	14.4%
	10%	-21,072	#NUM!
	15%	-57,254	#NUM!
	20%	-100,876	#NUM!

Crop price	0%	ENPV	EIRR
		37,934	25.4%
	0%	37,934	25.4%
	-5%	-18,173	#NUM!
	-10%	-64,008	#NUM!
	-15%	-102,771	#NUM!
	-20%	-136,597	#NUM!

W/P Crop Yield	0%	ENPV	EIRR
		37,934	25.4%
	0%	37,934	25.4%
	-10%	-13,602	2.7%
	-20%	-13,602	2.7%
	-30%	-13,602	2.7%
	-40%	-13,602	2.7%

d. Sekampung Bunut Irrigation Area

TABLE 6-36 ECONOMIC ANALYSIS AND SENSITIVITY OF SEKAMPUNG BUNUT IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**53,524**	**24.0%**		
+10% investment cost	43,583	20.1%	-1.86	53.84%
+10% O&M costs	51,366	23.5%	-4.03	24.80%
+10% input cost	26,487	18.7%	-5.05	19.80%
-10% crop price	362	9.2%	9.93	-10.07%
-10% with-project yield	-3,598	8.0%	10.67	-9.37%
+1 year delay	59,950	41.5%	-1.20	83.29%

Investment cost	0%	ENPV	EIRR
		53,524	24.0%
	0%	53,524	24.0%
	10%	43,583	20.1%
	20%	33,641	16.9%
	30%	23,700	14.1%
	40%	13,759	11.8%

O&M cost	0%	ENPV	EIRR
		53,524	24.0%
	0%	53,524	24.0%
	10%	51,366	23.5%
	20%	49,207	23.1%
	30%	47,049	22.6%
	40%	44,891	22.1%

Construction delay	0	ENPV	EIRR
		53,524	24.0%
	0	53,524	24.0%
	1	59,950	41.5%
	2	65,846	#NUM!

Input price	0%	ENPV	EIRR
		53,524	24.0%
	0%	53,524	24.0%
	5%	41,434	21.6%
	10%	26,487	18.7%
	15%	7,394	13.6%
	20%	-17,719	#NUM!

Crop price	0%	ENPV	EIRR
		53,524	24.0%
	0%	53,524	24.0%
	-5%	24,307	17.9%
	-10%	362	9.2%
	-15%	-19,897	#NUM!
	-20%	-37,547	#NUM!

W/P Crop Yield	0%	ENPV	EIRR
		53,524	24.0%
	0%	53,524	24.0%
	-10%	-3,598	8.0%
	-20%	-3,598	8.0%
	-30%	-3,598	8.0%
	-40%	-3,598	8.0%

e. Sekampung Batanghari Irrigation Area

TABLE 6-37 ECONOMIC ANALYSIS AND SENSITIVITY OF SEKAMPUNG BATANGHARI IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**106,121**	**25.5%**		
+10% investment cost	88,819	21.6%	-1.63	61.33%
+10% O&M costs	102,194	25.0%	-3.70	27.02%
+10% input cost	65,251	21.2%	-3.85	25.97%
-10% crop price	3,523	10.3%	9.67	-10.34%
-10% with-project yield	12,715	11.0%	8.80	-11.36%
+1 year delay	106,121	25.5%	0.00	#DIV/0!

Investment cost 0%

	ENPV	EIRR
	106,121	25.5%
0%	106,121	25.5%
10%	88,819	21.6%
20%	71,516	18.3%
30%	54,214	15.6%
40%	36,911	13.2%

O&M cost 0%

	ENPV	EIRR
	106,121	25.5%
0%	106,121	25.5%
10%	102,194	25.0%
20%	98,267	24.6%
30%	94,339	24.1%
40%	90,412	23.6%

Construction delay 0

	ENPV	EIRR
	106,121	25.5%
0	106,121	25.5%
1	106,121	25.5%
2	106,121	25.5%

Input price 0%

	ENPV	EIRR
	106,121	25.5%
0%	106,121	25.5%
5%	87,909	23.5%
10%	65,251	21.2%
15%	35,947	17.9%
20%	-3,306	#NUM!

Crop price 0%

	ENPV	EIRR
	106,121	25.5%
0%	106,121	25.5%
-5%	48,862	19.3%
-10%	3,523	10.3%
-15%	-33,660	#NUM!
-20%	-65,186	#NUM!

W/P Crop Yield 0%

	ENPV	EIRR
	106,121	25.5%
0%	106,121	25.5%
-10%	12,715	11.0%
-20%	12,715	11.0%
-30%	12,715	11.0%
-40%	12,715	11.0%

f. Raman Utara Irrigation Area

TABLE 6-38 ECONOMIC ANALYSIS AND SENSITIVITY OF RAMAN UTARA IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**11,050**	**10.3%**		
+10% investment cost	-12,390	7.6%	-21.21	4.71%
+10% O&M costs	5,243	9.6%	-52.55	1.90%
+10% input cost	-25,643	5.7%	-33.21	3.01%
-10% crop price	-114,924	#NUM!	114.01	-0.88%
-10% with-project yield	-57,772	1.8%	62.28	-1.61%
+1 year delay	11,050	10.3%	0.00	#DIV/0!

Investment cost 0%

	ENPV	EIRR
	11,050	10.3%
0%	11,050	10.3%
10%	-12,390	7.6%
20%	-35,830	5.3%
30%	-59,269	3.2%
40%	-82,709	1.2%

O&M cost 0%

	ENPV	EIRR
	11,050	10.3%
0%	11,050	10.3%
10%	5,243	9.6%
20%	-564	8.9%
30%	-6,371	8.2%
40%	-12,178	7.4%

Construction delay 0

	ENPV	EIRR
	11,050	10.3%
0	11,050	10.3%
1	11,050	10.3%
2	-137,362	-1.6%

Input price 0%

	ENPV	EIRR
	11,050	10.3%
0%	11,050	10.3%
5%	-6,818	8.2%
10%	-25,643	5.7%
15%	-45,899	2.3%
20%	-68,299	#NUM!

Crop price 0%

	ENPV	EIRR
	11,050	10.3%
0%	11,050	10.3%
-5%	-59,369	#NUM!
-10%	-114,924	#NUM!
-15%	-160,312	#NUM!
-20%	-198,645	#NUM!

W/P Crop Yield 0%

	ENPV	EIRR
	11,050	10.3%
0%	11,050	10.3%
-10%	-57,772	1.8%
-20%	-57,772	1.8%
-30%	-57,772	1.8%
-40%	-57,772	1.8%

g. Batanghari Utara Irrigation Area

TABLE 6-39 ECONOMIC ANALYSIS AND SENSITIVITY OF BATANGHARI UTARA IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (IDR mil)	EIRR (%)	SI	SV (%)
Base Case	**45,860**	**15.0%**		
+10% investment cost	24,579	12.0%	-4.64	21.55%
+10% O&M costs	40,599	14.4%	-11.47	8.72%
+10% input cost	24,380	12.4%	-4.68	21.35%
-10% crop price	-42,766	#NUM!	19.33	-5.17%
-10% with-project yield	-24,276	5.7%	15.29	-6.54%
+1 year delay	59,087	20.6%	-2.88	34.67%

Investment cost	ENPV	EIRR
0%		
	45,860	15.0%
0%	45,860	15.0%
10%	24,579	12.0%
20%	3,299	9.4%
30%	-17,981	7.1%
40%	-39,261	5.0%

O&M cost	ENPV	EIRR
0%		
	45,860	15.0%
0%	45,860	15.0%
10%	40,599	14.4%
20%	35,339	13.8%
30%	30,078	13.1%
40%	24,817	12.5%

Construction delay	ENPV	EIRR
0		
	45,860	15.0%
0	45,860	15.0%
1	59,087	20.6%
2	71,222	#NUM!

Input price	ENPV	EIRR
0%		
	45,860	15.0%
0%	45,860	15.0%
5%	35,832	13.8%
10%	24,380	12.4%
15%	10,799	10.7%
20%	-5,971	7.9%

Crop price	ENPV	EIRR
0%		
	45,860	15.0%
0%	45,860	15.0%
-5%	-3,621	8.3%
-10%	-42,766	#NUM!
-15%	-74,841	#NUM!
-20%	-102,010	#NUM!

W/P Crop Yield	ENPV	EIRR
0%		
	45,860	15.0%
0%	45,860	15.0%
-10%	-24,276	5.7%
-20%	-24,276	5.7%
-30%	-24,276	5.7%
-40%	-24,276	5.7%

h. Way Sekampung Irrigation Area

TABLE 6-40 ECONOMIC ANALYSIS AND SENSITIVITY OF WAY SEKAMPUNG IRRIGATION AREA

SENSITIVITY ANALYSIS SUMMARY

Sensitivity Test	ENPV (Rp M)	EIRR (%)	SI	SV (%)
Base Case	**422,729**	**23.5%**		
+10% investment cost	305,835	18.2%	-2.77	36.16%
+10% O&M costs	398,839	23.0%	-5.65	17.69%
+10% input cost	280,928	18.5%	-3.35	29.81%
-10% crop price	122,734	13.1%	7.10	-14.09%
-10% with-project yield	-195,092	3.8%	14.62	-6.84%
+1 year delay	520,611	#NUM!	-2.32	43.19%

Investment cost	ENPV	EIRR
0%		
	422,729	23.5%
0%	422,729	23.5%
10%	305,835	18.2%
20%	188,942	14.1%
30%	72,048	10.8%
40%	-44,845	7.9%

O&M cost	ENPV	EIRR
0%		
	422,729	23.5%
0%	422,729	23.5%
10%	398,839	23.0%
20%	374,948	22.5%
30%	351,058	22.0%
40%	327,168	21.4%

Construction delay	ENPV	EIRR
0		
	422,729	23.5%
0	422,729	23.5%
1	520,611	#NUM!
2	610,412	#NUM!

Input price	ENPV	EIRR
0%		
	422,729	23.5%
0%	422,729	23.5%
5%	351,828	21.0%
10%	280,928	18.5%
15%	210,027	16.1%
20%	139,127	13.7%

Crop price	ENPV	EIRR
0%		
	422,729	23.5%
0%	422,729	23.5%
-5%	272,758	18.1%
-10%	122,734	13.1%
-15%	-27,344	8.1%
-20%	-177,477	2.7%

W/P Crop Yield	ENPV	EIRR
0%		
	422,729	23.5%
0%	422,729	23.5%
-10%	-195,092	3.8%
-20%	-195,092	3.8%
-30%	-195,092	3.8%
-40%	-195,092	3.8%

7 - PREPARATION OF TENDER DOCUMENTS AND TECHNICAL SPECIFICATIONS

At the stage of Detailed Engineering Design (DED) Modernization of Irrigation Management for the Rehabilitation and Improvement of 7 (seven) Irrigation Area (1. Punggur Utara, 2. Rumbia Barat, 3. Bekri, 4. Sekampung Bunut, 5. Sekampung Batanghari, 6. Batanghari Utara, and 7. Raman Utara) At the location of the Way Sekampung Irrigation System, detailed technical planning was produced including the preparation of documents for selecting goods/services and technical specifications that match the needs of the work and field conditions for the implementation of this work.

After the DED is completed, it will proceed to the Procurement Phase, which will be carried out in the next few years with funding from the Program for Strengthening the sustainable agricultural irrigation system and institutional capacity, improving irrigation management, operation and maintenance, as well as repairing irrigation infrastructure or IPDMIP (Integrated Participatory Development and Management of Irrigation Program). This procurement activity is carried out based on the allocation of funds that have been approved by the competent authority, so that the division of work (packages) can be carried out with consideration of the effectiveness of the work. This preparatory activity is carried out with a cycle of less than one year. After the selection document is ready, it can be immediately submitted to the Election Working Group (human resources determined by the leadership of the Goods/Services Procurement Unit (UKPBJ) at the Ministry/Institution/Local Government which is the center of excellence for the Procurement of Goods/Services) to manage the selection of providers (contractor/consultant).

The provider selection method is one of the procurement implementation processes defined at the planning stage. The provider selection method is the responsibility of the workgroup for the procurement of goods and services (UKPBJ) or procurement officials in deciding what method will be used to obtain the goods/services required by the Ministry/Institution/Regional Apparatus (K/L/PD).

Procurement of goods/services is an activity that starts from the identification of needs until the handover of the work.

The implementation of the procurement of goods/services through the provider includes the preparation of the procurement of goods/services through the provider, the preparation for the selection of the provider, the implementation of the selection of the provider, the implementation of the contract and the handover of the work.

In principle, the preparation/making of election documents has been regulated and must follow the provisions included in various decisions as follows:

a. Presidential Regulation of the Republic of Indonesia Number 16 of 2018 concerning Government Procurement of Goods/Services
b. Regulation of the Government Goods/Services Procurement Policy Agency (LKPP) Number 9 of 2018 concerning Guidelines for the Implementation of Procurement of Goods/Services Through Providers
c. Tender/Selection/Prequalification is carried out based on the Regulation of the Minister of Public Works and Public Housing Number 14 of 2020 concerning Standards and Guidelines for Procurement of Construction Services Through Providers:
   (1) I. Attachment of Standard Documents for Selection of Direct Procurement of Construction Services;
   (2) II. Attachment of Standard Documents for Selection of Construction Consultancy Services; and

(3) III. Attachment of Standard Construction Work Selection Documents..

d. Circular Letter of the Minister of Public Works and Public Housing Number 22/SE/M/2020 of 2020 concerning Requirements for Selection and Evaluation of Construction Services Procurement Bidding Documents in accordance with Minister of Public Works and Public Housing Regulation Number 14 of 2020 concerning Standards and Guidelines for Procurement of Construction Services through Providers..
e. User Guide Electronic Procurement System (SPSE) v4.3 for Commitment Making Officials (PPK).
f. Implementation of this procurement is carried out electronically, by accessing the Electronic Procurement System (SPSE) application at the LPSE website address: *http://lpse.pu.go.id*
g. Procurement Implementation Schedule can be seen on the LPSE website.
h. Selection Document is taken in softcopy form through the SPSE application.

7.1 - Preparation of Procurement of Goods/Services through Providers

Preparation of Procurement of Goods/Services through Providers by PPK (PERPRES No 16/2018) includes the following activities:

a. Setting HPS:
   (1) HPS is calculated with expertise and uses data that can be accounted for.
   (2) HPS has taken into account the benefits and indirect costs (overhead costs).
   (3) HPS value is open and not confidential.
   (4) Total HPS is the result of calculation of HPS plus Value Added Tax (VAT).
   (5) HPS is used as:
      a) A tool to assess the fairness of the bid price and/or the reasonableness of the unit price;
      b) The basis for setting the highest legal bidding limit in the Procurement of Goods/Construction Works/Other Services; and
      c) The basis for determining the value of the Performance Guarantee for bids whose value is lower than 80% (eighty percent) of the HPS value.
   (6) HPS shall not be the basis for calculating the amount of state losses.
   (7) The preparation of HPS is excluded for the procurement of goods/services with a maximum budget ceiling of Rp10,000,000.00 (ten million rupiah), E-purchasing, and integrated work Tenders.
   (8) Determination of HPS no later than 28 (twenty eight) working days before the deadline for:
      a) Submission of bids for election with post-qualification; or
      b) Submission of qualification documents for election with prequalification.

b. Determining the draft contract:
   (1) Type of Goods/Services Procurement Contract: Unit Price.
   (2) Unit Price Contract is a contract for the procurement of other goods/services with a fixed unit price for each unit or work element with certain technical specifications for the completion of all work within the stipulated time limit with the following conditions:
      a) The volume or quantity of the work is still approximate at the time the Contract is signed;
      b) Payments based on the results of joint measurements of the realization of the volume of work; and
      c) The final contract value is determined after all work is completed.

c. Establishing technical specifications/TORs:

(1) In preparing technical specifications/TORs:
   a) Using domestic products;
   b) Using SNI certified products; and
   c) Maximizing the use of green industrial products.

(2) In the preparation of technical specifications/KAK it is possible to mention the mark on:
   a) Components of goods/services;
   b) Spare parts;
   c) Part of an existing system;
   d) Goods/services in electronic catalogs; or
   e) Goods/services in Quick Tender.

(3) Fulfillment of the use of domestic products as referred to in c.(1) letter a and SNI certified products as referred to in c.(1) letter b shall be carried out as long as they are available and sufficient.

d. Determining down payment, down payment guarantee, performance guarantee, maintenance guarantee, guarantee certificate, and/or price adjustment.

7.2 - Tender Preparation/Selection/Prequalification

Preparation for procurement through the Provider (Regulation of the Minister of PUPR No. 14/2020) is carried out by PPK and can be assisted by the Support Team, Team/Experts, and/or Managers of Procurement of Goods/Services including the following activities:

a. Review and determination of technical specifications/TORs:
   (1) Review of technical specifications/KAK is carried out based on the latest data/information.
   (2) PPK stipulates the technical specifications/KAK that have been approved by the PA/KPA in the technical specification/KAK document based on the results of the review.
   (3) In the event that the required goods/services are not available in the market, PPK proposes alternative technical specifications/KAK to obtain PA/KPA approval.

b. Determination of detailed engineering design for the selection of Construction Work Providers.

c. Preparation and determination of HPS:
   (1) The preparation of HPS is based on:
      a) The results of the estimated cost/RAB that have been prepared at the procurement planning stage;
      b) The budget ceiling listed in the budget implementation checklist or for the election process carried out before the determination of the budget implementation list refers to the budget ceiling listed in the work plan and budget of the ministry/institution or regional apparatus; and
      c) The results of the review of the estimated cost/RAB.
   (2) HPS as referred to in number (1) is calculated with expertise and using data that can be accounted for.
   (3) Calculation of HPS as referred to in number (2) for Construction Work Tenders is based on the results of cost calculations carried out by the designer consultant (engineer's estimate) based on the detailed engineering design.

(4) The total value of HPS is open and not confidential and at the highest is the same as the value of the budget ceiling.
(5) PPK may assign a Team/Experts to provide input in the preparation of HPS.
(6) In the case of Construction Works with a budget ceiling value of more than Rp100,000,000,000.00 (one hundred billion rupiah) and Construction Consulting Services with a budget ceiling value of more than Rp10,000,000,000.00 (ten billion rupiah), the results of the review The estimated cost/RAB as referred to in number (1) letter c) must obtain approval from the Middle High Leadership Official at the ministry/institution for work that is financed from the state revenue and expenditure budget or a Primary High Executive Officer in the regional government for work that is financed from the budget. regional income and expenditure.
(7) PPK determines HPS no later than 28 (twenty eight) working days before the deadline:
    a) Submission of bid documents for post-qualification selection; or
    b) Submission of qualification documents for election with prequalification.

d. Drafting and stipulating the draft contract:

<u>Contracts in Construction Consultancy Services</u>
(1) Form of Contract in Construction Consultancy Services: letter of agreement, for the selection method of Selection.
(2) Types of Contracts in Construction Consultancy Services: Contracts for the time of assignment.
(3) The time assignment contract for Construction Consulting Services is used in the event that:
    a) Contracts based on personnel and non-personnel elements (*input based*);
    b) The time required to complete the work is uncertain;
    c) TOR with a task concept adjusts to the needs of the work and field conditions.
(4) The payment method for the results of the work for the Contract during the assignment as referred to in number (3) is carried out with the following conditions:
    a) Payment of personnel costs is made with remuneration in accordance with the list of quantities and prices based on the actual volume of assignments and the provisions in the Contract; and
    b) Payment of non-personnel costs is made in accordance with the list of quantities and prices based on actual performance and the provisions of the Contract.

e. Determination of down payment, down payment guarantee, performance guarantee, maintenance guarantee, and/or price adjustment.

Technical specifications/TOR, HPS, detailed engineering design for supplier selection, Contract design and down payment, Advance payment guarantee, implementation guarantee, maintenance guarantee, and/or price adjustments that have been determined are written down into procurement preparation documents.

Procurement preparation documents for the Tender/Selection/Prequalification method are submitted to UKPBJ..

7.3 - Technical Specifications/TOR

These Technical Specifications/TORs are provisions that must be read together with the drawings and the Quantity and Price List, both of which together describe the work to be carried out. The term works includes the supply and installation of all equipment and materials to be incorporated in the constructions, which are required according to the contract documents, as well as all labor required to install and operate such equipment and materials. The specifications for the work to be performed and the materials to be used shall be applied both to the part where the specification is found and to other parts of the work where the work or material is found.

7.3.1 - Preparation of Technical Specifications/TORs

Technical specifications for procurement of construction works include:

a. Specifications of construction Structure materials;
b. Specifications for construction equipment and Structure equipment;
c. Process/activity specifications;
d. Specification of construction method/implementation method/work method; and
e. Construction job specifications.

7.3.2 - Technical Specification Structure

The technical specification structure for each Payment Item is prepared with the following provisions:

a. Including the scope of Construction Work required;
b. Stating the brand and type and as much as possible use domestic production;
c. As much as possible, striving to use Indonesian national standards;
d. Construction method/implementation method/work method must be logical, realistic, safe, secure, and can be implemented;
e. Implementation period must be in accordance with the implementation method;
f. Including the type, type, capacity, and minimum number of main equipment required in the execution of the work;
g. Including the requirements for the materials used in the execution of the work;
h. Including the requirements for testing materials and product results;
i. Including the desired product performance criteria (output performance);
j. Including measurement procedures and payment procedures; and
k. Including JOB DESCRIPTION, hazard identification, and risk determination related to Construction Safety in Construction Works.

7.4 - Structure Design Drawings

Based on the design drawings/plans (which are the details of the parts of the construction/Structure to be worked on) as well as the technical specifications stated in the tender document, the procedure for preparing/making work drawings (shop drawings) can be carried out, making it easier for the provider (implementation unit) work) to carry out the work,

Based on the working drawings, it will be obtained:

a. Quantity of material requirements in detail: type, quality and size
b. Amount of residual material, so that it can be used for other purposes (if any)
c. Number and type of fixed and auxiliary equipment needs
d. Type and number of tools
e. Type, number, classification and qualification of the workforce
f. Allocation of time needed to produce the job
g. Allocation of real costs to produce the job

Working drawings must adapt to field conditions which sometimes cannot be exactly the same as the design/plan drawings.

It is not enough to calculate the amount of material needed by using working drawings alone, but also to study the technical specifications that are part of the contract.

It is not enough to determine the amount and type of equipment by looking at the working drawings, but also to study the technical specifications that are part of the contract, the Budget Plan, the overall drawing, and field conditions.

Working drawings are made based on pre-planned drawings and detailed drawings and technical specifications stated in the contract document.

8 - OPERATION AND MAINTENANCE GUIDELINES

The Sekampung Irrigation Area system has a total service area of 58,320 ha which is administratively located in Lampung Province which includes 3 regencies/cities, namely: East Lampung Regency, Central Lampung Regency, and Metro City. The Way Sekampung Irrigation System with the main source from the Argoguruh Weir is divided into 2 Feeder Canals, namely Feeder Canal 1 which supplies the main Sekampung Bunut and Sekampung Batanghari canals; Feeder Canal 2 which supplies the Punggur Utara Primary Canal to Rumbia and Bekri. In addition, there is a Raman Weir which supplies the Raman Primary Canal and a Garongan Weir which supplies the North Batang Hari Main Canal.

Network operation, which is defined as an effort to regulate irrigation water and its disposal, keeps water services running as expected. While maintenance is an effort to maintain and secure the irrigation network so that it can always function properly so as to facilitate the implementation of operations and maintain its sustainability. With maintenance, the condition of the irrigation network is restored to optimal condition before damage occurs. As an O&M management activity, it follows the management cycle, namely planning, implementation, and evaluation.

The Operation and Maintenance Guidelines presented in this plan are based on PUPR Ministerial Regulation 12 of 2015 It is hoped that these guidelines can be used by irrigation managers, both at the level of policy making, distribution planning to implementation and monitoring and evaluation in the operation and maintenance of existing irrigation networks and weirs. in the Sekampung System.

8.1 - Operating Manual

Irrigation network operation is an effort to regulate irrigation water and its disposal, including activities to open and close irrigation structures of gates, draw up a planting plan, draw up a class system, draw up a water distribution plan, calibrate gates/structures, collect data, monitor, and conduct evaluations. In its arrangement, this operating manual is adapted to the concept of modernization and the SIPASI program, which is a program that is specifically used as an information system and irrigation service developed by the PPC program.

(i) **Data collection (water discharge, rainfall, total planted area based on cropping patterns, etc.).** The discharge data was collected using the AWLR (Automatic Water Level Record) device which was installed at Argoguruh Weir, Raman Weir and Garongan Weir and several other places. AWS (Automatic Weather Station) rainfall logs are retrieved from several rainfall **recording** devices installed in several places. Real-Time AWS is used to generate meteorological data to monitor the state of natural disasters such as hurricanes, floods, and weather. This automated and telemetry device is directly connected to the Sipas program at the Water Operation Center (WOC). Meanwhile, data on planting area and cropping patterns were collected and inputted into SIPASI.

(ii) **Calibration of water flow meter.** Calibration testing of equipment and tools aims to adjust the measurement output to the applicable standard quantities which are carried out after each component of the tool is assembled. Several telemetry equipment, measuring structures and floodgates are calibrated periodically. Calibration is carried out so that when field measurements are made, the data is obtained.

(iii) **Planning for water allocation and distribution, cropping patterns, drainage, etc.** To regulate the cropping cycle and water distribution, planning is carried out starting from the farmer level carried out by P3A. In irrigation areas, planning preparation is carried out by the Coordinator or UPIM/UPTD stagas. Meanwhile, at the district/city and provincial levels, the Komir is responsible. To maintain soil fertility and control pests, drying (bero) is carried out at least once every two years or 4 MT once. Drying was carried out for 2 months. The technical implementation is carried out in rotation for each Irrigation Area.

(iv) **Water allocation and distribution.** mantri in the SIPASI program, filling out the operation board or other means or with other tools as a medium of information for farmers and other stakeholders, arranging the opening and closing of the floodgates as needed). Through the SIPASI program, the water allocation in Sekampung System uses 3 (three) types of inputs, namely inputs made by the admin related to the tertiary area and water requirement, inputs recorded by AWLR and AWS, and input regarding real time water demand schedules and discharge conditions. water and plants..

(v) **Gate arrangement based on flood discharge.**. The work of regulating the sluices on the weir is related to the arrival of river discharge. Argoguruh, Raman and Garongan weir gate arrangements are carried out by the Weir Operations Officer (POB) on the orders of the weir mantri from the three weirs. The gate arrangement is carried out to control possible flooding..

(vi) **Long storage gate arrangement.** The proposed policy is the need to regulate irrigation networks to maintain normal and stable water levels in the Main and Secondary Canals. If there is a shortage of debit supplies in the weir, it is necessary to apply distribution and provide water by considering the K-factor, reducing the water allotment at the intake gate.

(vii) **Coordination between institutions.** Regarding the distribution of water in conditions of insufficient water discharge in the Argoguruh, Raman and Garongan weirs, currently BPSDA Region II usually coordinates with the dam managers in Batutegi and policies are implemented by each UPTD/Korwil. In the future, water supply shortages can be monitored by UPIM/WOC under the auspices of BBWS-MS. UPIM/WOC will immediately coordinate with the manager of the Way Sekampung Reservoir/Batu Tegi Reservoir (WSR/BTR) which is also managed under the control of BBWS-SM. For the implementation of coordination of water distribution in the field, the farmer/P3A reports to the mantri, the mantri registers it in SIPASI and at the same time the mantri immediately orders the PPA to open the gates as needed).

(viii) **Monitoring and evaluation, and reporting.** Irrigation network operations are carried out in order to achieve the operational objectives, namely:

1) In accordance with the spirit of modernization, water is distributed to secondary/primary networks or given to tertiary plots in a timely manner and in quantity (according to water requirement at various stages of plant growth)/and in a manner (according to the availability of irrigation water);
2) Available water can be used or utilized effectively and efficiently;
3) Available water is shared fairly and equitably;
4) Negative consequences that may be caused by excess water can be avoided.
5) Real time monitoring can be carried out by all relevant stakeholders from the operation monitor screen connected to the WOC

(ix) **Attachments to the operating guidelines** mainly consist of, among others, a) Water Flow Chart in the Sekampung System Irrigation Network, b) List of Irrigation Facilities in the Sekampung System, c) Division of Tertiary Blocks in the Sekampung Irrigation System, d) Job Description of O & M Personnel, e) Maximum Permitted Discharge in Canals, f) Maximum Permitted Discharges in Shared Structures, Annual Irrigation Plans, Calculation of Irrigation Water Required and Water Balance, g) nHQ Relationship in Structure Measures, g) Maps and Drawings, h) List of Argoguruh Dam Facilities, and SIPASI Manual.

8.2 - Guidelines for Network Maintenance

To obtain optimal maintenance results, procedures/procedures are needed with reference to the stages: a) securing irrigation networks; b) maintenance of irrigation networks; c) periodic maintenance; emergency repairs; and d) several supporting attachments.

(i) **Network security.** Security and prevention of damage is carried out by irrigation officers who will be carried out by the UPIM Irrigation Security Task Force (SPI) stationed in UPTD. In its implementation, this officer will coordinate with PPA/Mantri and P3A/GP3A. This activity is very important to keep the Structure from being damaged quickly caused by human activities as well as by animals and natural processes. should have been prevented. The security process is carried out in 2 stages, namely mitigation by equipping safety devices, carrying out safeguards, and coordinating with existing farmer organizations, both WUA and others. In the second stage, action is taken against violations that are criminal in nature and in coordination with the village security authorities and the police. This task is mainly the task of special officers, the Irrigation Safety Task Force (SPI) which is part of UPIM.

(ii) **Routine maintenance.** Routine maintenance is a routine activity carried out by officers to maintain and keep Structures and equipment functioning optimally. Some of the devices that must be routinely maintained include floodgates, electrical panels, floodgate opening and closing panels, Structures, and other supporting devices such as generators, and IT equipment such as AWLR, AWS. As is known, modernization irrigation management is carried out with a semi-automatic process and is supported by telematrix devices and controlled by the SIPASI program. In the process, modernization is also equipped with various electrical-mechanical operated equipment and devices, such as floodgates. Some equipment and devices will use existing devices by adding components that support the operation of SIPASI, but it can be new equipment that does not exist before. To operate and maintain the equipment so that it can function optimally and prevent damage and obstacles that occur, the operator of the equipment must read and follow the instructions for use prepared by the manufacturer.

(iii) **Periodic maintenance.** Periodic maintenance is maintenance and repair activities carried out periodically which are planned and carried out by the party in charge of Irrigation and can cooperate with P3A/ GP3A/ IP3A on a self-managed basis based on ability, and can also be carried out on a contractual basis. Periodic maintenance is carried out periodically according to the condition of the Irrigation Network. Each type of periodic maintenance activity can have different periods.

(iv) **Periodic maintenance.** Variety of Periodic Maintenance works include: a) Maintenance of Weirs, Retrieval Structures and Regulatory Structures; b) Repair of weir towers, stilling ponds, foundations, embankment protection construction and others; c) Measuring Structure; d) Canals; e) Embankment; f) Sludge Disposal; g) Gates; and h) Disposal of plants. Periodic maintenance schedule is carried out according to the type, for example grass cleaning which is scheduled 3 (three) times a year, once or twice a year for certain equipment maintenance.

(v) **Emergency repairs.** Emergency repairs are carried out due to natural disasters and or heavy damage due to extraordinary events (such as destruction/breakdown of embankments, landslides that cover the network, broken embankments etc.) Extraordinary Events / Natural Disasters must be immediately reported by the technicians to the observer and the head of the Sub UPIM Unit in stages and then coordinated and reported to the relevant Office and the local Regent/Mayor. The report clearly and accurately states the location, date/time, and damage due to disaster/KLB events..

(vi) The entire implementation of such maintenance activities must be monitored and evaluated. With the aim of whether the results of the maintenance implementation are in accordance with the objectives, or there are still perfection or improvements.

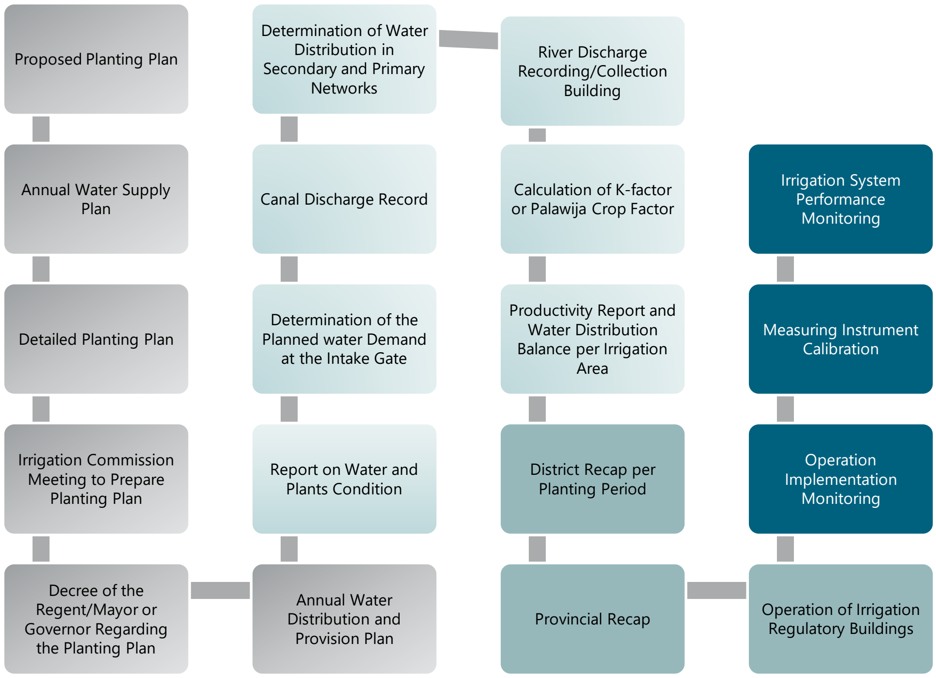
(vii) Attachment of maintenance guidelines. In some cases, attachments used in network operations, are also used as maintenance guide attachments. The guidelines will consist of: a) Water Flow Chart in the Sekampung Irrigation Network System; b) List of Sekampung System Irrigation Facilities; c) Division of Tertiary Blocks in the Sekampung Irrigation System; d) Job Description of O & M Personnel, Blanks P, and e) Maps and Drawings.

9 - INSTITUTIONS & HUMAN RESOURCES

9.1 - Operation and Maintenance Framework in Modernization and Its Legality

Irrigation Network Operation & Maintenance (OPJI) consists of 19 steps from planning, implementation to monitoring. In the flow scheme below, blue is a planning activity cluster, green is an implementation cluster, and yellow is a monitoring cluster. In the implementation cluster, it is divided into two clusters, light green is a process that has adapted the modernization process and dark green still uses the ongoing process.

FIGURE 9-1 OPERATION AND MAINTENANCE FLOW IN MODERNIZATION



With additional telemetry and automatic equipment, such as the Automatic Water Level Recorder (AWLR) to detect and record water level or rainfall monitoring stations, the Autoatic Rainfall Recorder (ARR), and Automatic Weather Stations (AWS) an integrated system designed for data collection. weather data is automatically connected directly to the SIPASI system managed by WOC, so some information that previously had to be recorded manually by field officers such as the mantri and PPA, with the SIPASI system the process was not done manually but was recorded automatically from the installed stations, both AWLR in multiple gauge Structures, ARR and AWS for rainfall and weather monitoring.

Modernization in irrigation management in Indonesia is mandated by Circular No. 01/SE/D/2019, Directorate General of Water Resources, Ministry of Public Works and Public Housing, which emphasizes the importance of realizing national food security and farmers' welfare. In order to increase the productivity of agricultural activities, participatory irrigation management based on a holistic, effective and sustainable approach must first be carried out. This condition can be achieved through various efforts to modernize the irrigation system as outlined in the 5 Pillar matrix in 45 steps.

But the overall process of operation and maintenance activities is ordered and supported by several regulations:

1. Law No. 17 of 2019 concerning Water Resources;
2. Presidential Instruction No. 2 of 1984 concerning the Development of Water-Using Farmers' Associations (P3A);

3. PUPR Ministerial Decree No. 8/PRT/M/2015 concerning Determination of Irrigation Network Borders; 11
4. PUPR Ministerial Decree No. 12/PRT/M/2015 concerning Exploitation and Irrigation Maintenance;
5. PUPR Ministerial Decree No. 14/PRT/M/2015 concerning Criteria and Determination of the Status of Irrigation Areas;
6. PUPR Ministerial Decree No. 17/PRT/M/2015 concerning the Irrigation Commission;
7. PUPR Ministerial Decree No. 23/PRT/M/2015 concerning Management of Irrigation Assets
8. PUPR Ministerial Decree No. 30/PRT/M/2015 concerning Development and Management of Irrigation Systems;
9. Circular of the Directorate General of Natural Resource of PUPR No. 01/D/2019 concerning Modernization

9.2 - Institutional and HR for Modernization of Operations and Maintenance

9.2.1 - UPIM and UPTD Institutions

Modern Irrigation Management Unit (UPIM) is a work unit responsible for the operation and maintenance of an Irrigation Area based on participatory, needs-based, effective, efficient, and sustainable principles that ensure a better level of service to farmers using water.

Increasing agricultural production in the context of realizing national food security and community welfare needs to be supported by better and increasing performance of the agricultural sector. Management of irrigation water that has been carried out so far is considered not to be effective, efficient, and unsustainable so that the level of irrigation services to support increased agricultural production is still not optimal.

To achieve effective, efficient, and sustainable irrigation services, the implementation of modernization of irrigation system management is one of the options. The implementation of modernization is mandated in the 2015-2019 Long Term Development Plan. In this regard, the Director General of Water Resources has issued Circular No. 01/SE/D/2019, which requires the formation of a professional organization: Modern Irrigation Management Unit (UPIM).

9.2.2 - Function and Tasks

The main task of the established institution is to ensure that the new task of irrigation services is embedded in the modern paradigm. That is, the organization runs to provide irrigation more effectively, efficiently and in accordance with their demands (the interests of farmers in increasing the productivity of their farms). In carrying out activities and services, the organization will be supported by IT-based irrigation services and institutions that will work well for data collection, communication. In carrying out its main tasks, the UPIM Division has:

Function :

1. Implementation of material assessment, operation and maintenance policies;
2. Implementation and facilitation of the management of the field of operation and maintenance.
3. Operation of networks and information systems and modern irrigation management, SIPASI, and their supporting devices.

Details of Operations and Maintenance Duties:

1. Conducting an assessment of the Operation and Maintenance Sector work program;
2. Organizing the operation of systems and equipment, namely Sipasi and its equipment for planning, O&M, and monitoring of planting and water distribution;
3. Organizing the procurement of equipment and equipment that supports the organization's operating processes;
4. Deployment of human resources necessary for the operation of the organization;
5. Organizing the deployment and coordination with network resources in managing the organization;
6. Carrying out maintenance and maintenance of organizational devices and assets;.

7. Organizing the planning and utilization of the budget for the operation of the organization;
8. Organizing operation and maintenance facilitation;
9. Organizing coordination of UPTD;
10. Organizing reporting and evaluation of Operations and Maintenance Sector activities carried out by the organization;
11. Conducting staff reviews as a material for consideration of policy making;
12. Organizing coordination with the Provincial and Regency/City Water Resources Management Offices;
13. Carry out other tasks in accordance with the main tasks and functions.

9.2.3 - implementation of UPIM

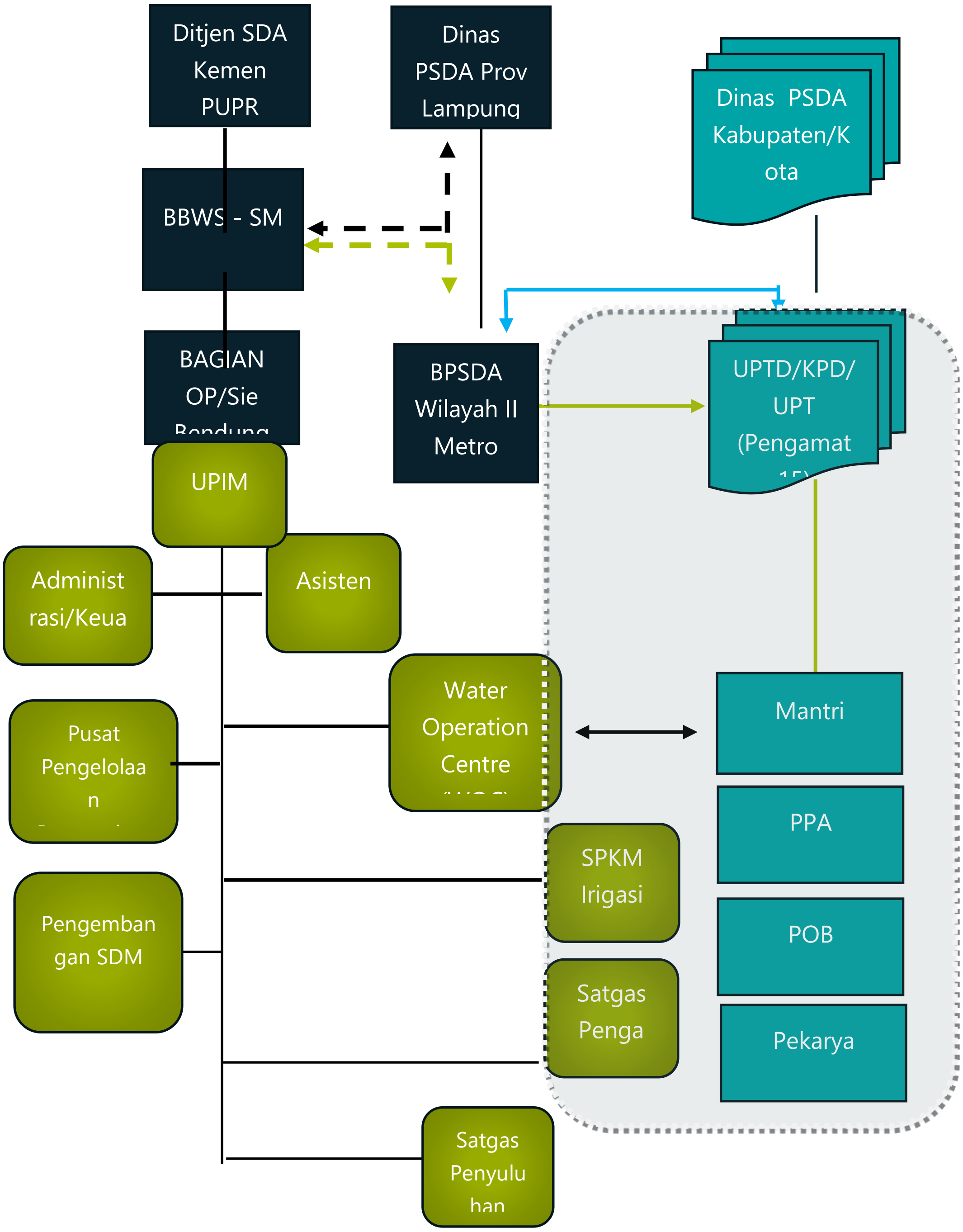
For the smooth implementation of UPIM, support for institutional development is needed, including: policies and implementation guidelines that can be understood by all stakeholders, adequate infrastructure, and intelligent human resources.Modern Organizational Structure for O and P

UPIM is a work unit responsible for operation and maintenance in Irrigation Areas based on participatory, need-based, effective, efficient, and sustainable principles that ensure a better level of service to water-using farmers (Journal of Irrigation-Vol.12 No1 May 2017) . Undoubtedly, improving the performance of irrigation operations and maintenance in an Irrigation Area is intended to support the achievement of national food security. Ideally, the management of the operation and maintenance of existing irrigation networks organized by the Regency Irrigation UPTD could be integrated with the proposed modern institutions such as the Water Operation Center (WOC), Knowledge Management Center (KMC), Special Car Maintenance Unit (SPKM), Task Force Irrigation Maintenance (SPI), and so on.

As explained earlier, the management of UPIM will be jointly with the Argoguruh Weir and in accordance with the provisions of the weir under management by the Central River Basin appointed by the Central government. Therefore, the UPIM structure is also proposed to be directly under BBWS MS. In its operation, the dam is the main task of the Operations and Maintenance Sector.

However, in the early stages, the two operating and maintenance institutions are different organizations with different management and relationship mechanisms, but in their operations the two institutions must cooperate and coordinate with each other. Clearly the proposed structure is:

FIGURE 9-2 ORGANIZATIONAL STRUCTURE OF UPIM WAY SEKAMPUNG



Information:

1. The relationship between the Directorate General of Water Resources (Ditjen SDA) to BBWS SM is a direct command as an implementing unit in the central authority area in Lampung Province. Because it is located in the province of Lampung, BBWS – SM coordinates with the Water Resources Management Office in the

Province which has a mandate to manage the irrigation Operational & Maintenance Assistance (TP-OP) given to the province.

2. In operational management, BBWS – SM coordinates with BPSDA Region II which is the implementing unit at the provincial level. While in TP OP operations in the field UPTD/KPD/UPT provide human resources such as Mantri and PPA. However, because the Provincial PSDA Service does not have direct command to the UPTD at the district level, the two institutions must be bound by a mutual agreement.
3. Organizationally, UPIM organizes 1). Knowledge Management Center, 2) Human Resources Development, 3) WOC, 4) SPKM, 5) Irrigation Safety Task Force and 6) Irrigation Extension Task Force.
4. In operations, the WOC which controls Sipasi and its apparatus cooperates intensely with the UPTD and especially the waterworkers.
5. The Irrigation Security Task Force and Mobile Special Maintenance Task Force (SPKM) are UPIM organs placed in 15 UPTDs.

9.2.3.1 - UPIM Personnel and Qualifications

TABLE 9-1 PERSONNEL, NEEDS, FUNCTIONS AND QUALIFICATIONS OF UPIM

No	Position	Need	Functions	Qualification
1	Manager/Head of UPIM	1	Responsible for the organization in general, externally and internally	S1 – Civil Engineering
2	Assistant Manager	2	1. Provide input in collecting information and analyzing water availability 2. Provide input and analyze information about agricultural problems	S1 - Hydrology S1 - Agriculture
3	Secretariat	2	Organize and manage: a. General administration dan human resources b. Manage payments, administration and financial reporting	D3 – Finance S1 - Management
4	Water Operation Center	3	Manage and operate the planning, operation and recording of water sharing and remote station operation: Automatic Water Level Recorder (AWLR), Automatic Weather Station (AW), Automatic Rainfall Recorder (ARR).	S1 - Information System S1 - Irrigation Engineering or S1 - Hydrology
5	Knowledge Management Center & HR	2	Process, develop and disseminate data and knowledge on Irrigation Management.	S1 – Agricultural Economics/Agronomy S1 – Irrigation Engineering
6	Mobile Special Maintenance Task Force (SPKM), 2 personnel in 15 UPTD	30	Mechanical Operator Electric Operator	Vocational High School in Technicians Civil/Irrigation
7	Irrigation Security Task Force, 4 personnel in 15 UPTD	60	Safeguarding irrigation policies and assets	D3 - Mechanical Engineering

No	Position	Need	Functions	Qualification
8	Irrigation Extension & Training Officer	1	Implementation of counseling, training & counseling on irrigation	S1- Extension

9.2.3.2 - UPIM Personnel Job Description

1. Manager/Head of UPIM

The Manager/Head of UPIM has the main task of leading and being responsible for the entire operation and maintenance of the irrigation system, from planning, implementation, monitoring and evaluation as well as reporting. UPIM's detailed duties may include:

- **a.** Program planning and budget for operation and maintenance of primary and secondary irrigation systems in their working areas;
- **b.** Structure communication, coordination and cooperation with WUAs, irrigation institutions, and other related parties to support the effectiveness of the implementation of the main tasks and functions;
- **c.** Implementation of irrigation system operations, including regulation of irrigation gates and their disposal, opening and closing of gates, preparation of cropping patterns, preparation of group systems, preparation of water distribution plans, implementation of gate/Structure calibration, data collection;
- **d.** Carrying out maintenance of the irrigation system in the context of safeguarding and securing its functions properly for the smooth operation of the operation and its sustainability;
- **e.** Supervising and controlling the operation and maintenance of the irrigation system in the Irrigation Area itself.
- **f.** Organizing counseling and counseling, developing knowledge management and human capital in which there is a knowledge management center;
- **g.** Empowering WUAs and provide assistance to them for the development and management of irrigation systems in their working areas (as requested and based on the principle of self-reliance);
- **h.** Carrying out monitoring and evaluation in the implementation of the operation and maintenance of the irrigation system in its own working area and the level of water service delivered to farmers.

2. Assistant Manager

In general, the assistant's task is to assist the manager's function in managing the UPTD organization and specifically related to water planning and distribution tasks. Specifically, the assistant manager's duties are:

- **a.** Collecting information related to water availability
- **b.** Performing information processing
- **c.** Providing input on water availability
- **d.** Gathering information about agriculture
- **e.** Performing information processing
- **f.** Performing input information about agricultural problems

3. General and Administration/Secretariat

In general, this section is responsible for organizing and managing general administration and HR. This section is also responsible for managing and managing the organization's finances. Specifically, this section serves to:

- **a.** Set office protocol
- **b.** Arrange accommodation and staff mobilization
- **c.** Manage organizational equipment and assets
- **d.** Manage general administration and HR
- **e.** Make expenses and shopping payments
- **f.** Do recording and administration
- **g.** Make financial reports

h. Coordinate and collaborate with the treasurer of TP OP/BBWS

4. Water Operation Centre (WOC)

In general, WOC functions to collect data, process, and then provide information that can be used for planning and decision making. In implementing its function, some of the tasks performed are:

- **a.** WOC collects data and conveys data consisting of water level selection, gate position, flow rate, field site safety data, camera feed and weather data from telemetry equipment, and then the data to the central site..
- **b.** WOC makes timely set point changes to the flow control system (gateway).
- **c.** Water level or flow rate is determined remotely and field location
- **d.** WOC also inputs changes to gate positions and other device settings as needed.
- **e.** WOC conducts monitoring and data collection with automatic and electrical equipment.

5. Knowledge Management Center & Human Resource

Human resources are present as a combination of knowledge, skills, experience, and other relevant workforce attributes that are in the organization's workforce and will drive productivity, performance, and the achievement of strategic goals. Meanwhile, the knowledge management function is in charge of acquisition, assimilation, internalization, socialization, transformation, exploitation/utilization, coordination, collaboration, and communication.

In detail, the tasks of this field are:

- **a.** Data collection of water demand and availability, analysis of water demand and availability, preparation of water balance, planning and implementation of water distribution, as well as monitoring and evaluation.
- **b.** Developing the Human Capital function in charge of matters relating to recruitment, recruitment, and placement of employees;
- **c.** Developing training and development programs; work management; career development; compensation and rewards; culture and work environment.
- **d.** Supporting the operation of technicians and networks in accessing information, sharing knowledge, and the availability of systems related to technicians and knowledge networks.
- **e.** Developing knowledge management to influence employee performance.
- **f.** Familiarizing and improving HR capabilities with modern IT and equipment
- **g.** Designing various trainings to increase the competence of UPIM officers, starting from field officers such as canal officers (PS), Sluice Gate Officers (PPA), and Waterworkers..

6. Mobile Special Maintenance Task Force (SPKM) (SPKM - *Satgas Pemeliharaan Khusus Mobile*)

This unit has very flexible assignments, not dependent on working hours. Due to its mobile nature, this unit is at the forefront of carrying out repairs and maintenance. In carrying out its duties, this unit has the following functions: 1) compliance and 2) performance.

- **a.** Maintenance activities include routine inspections to record the condition and function of irrigation networks (canals and Structures):
- **b.** Serving complaints quickly in the field
- **c.** Performing damage level analysis, analysis of causes of damage, development of solutions, and implementation of repairs,
- **d.** Performing routine maintenance, periodic maintenance, emergency maintenance, and rehabilitation.

7. Irrigation Security Task Force

The Irrigation Security Task Force is carried out by field officers who are experts in handling conflicts in collaboration with Public Order Enforcers/*Satpol PP* (Law Violations) and PPNS (Civil Servant Investigators) in the function of securing irrigation canals or networks from security efforts from those who destroy networks, theft of equipment, activities and infrastructure that cause pollution. in the network, improper collection of water, illegal construction, control of drains, other violations (for example, bathing animals), and sanctions for violations. However, security efforts prioritize mitigation efforts and a violent approach.

The tasks of the Irrigation Security Task Force include:

- **a.** Securing water and spatial planning areas in which there is an early warning system in its implementation.
- **b.** Managing the early warning system, including risk analysis, monitoring and warning, socialization and communication, as well as rapid response capabilities.
- **c.** Conducting prevention through socialization, communication and empowerment with farmer organizations
- **d.** Preventing people who will do damage or violation.
- **e.** Reporting to the leadership for follow-up to the authorities for criminal violations.

8. Extension and Counseling Task Force

This unit is tasked with facilitating learning between actors in irrigation management in providing knowledge related to irrigation management and then knowledge of agricultural techniques and institutions. In addition, there are socialization and education efforts to the community, both O&M personnel and members of farmer organizations (P3A) to increase awareness of irrigation networks. This unit reports directly to the Head of UPIM. This section is in charge of:

- **a.** Exploring the needs and problems at the farmer level
- **b.** Developing teaching materials and learning media
- **c.** Formulating in the form of an extension plan
- **d.** Carrying out monitoring and evaluation

9.2.3.3 - Need for UPTD Implementing Personnel

In accordance with the Minister of Public Works and Public Housing No. 12 2015, UPTD personnel or other names consist of:

1. Head of Branch/Observer/UPTD/Branch Service/Regional Coordinator: 1 personnel + 5 staff per 5,000 – 7,500 Ha
2. Mantri/Waterworker : 1 personnel per 750 – 1,500 Ha
3. Weir Operation Officer (POB): 1 personnel per weir, several workers can be added for large weirs
4. Sluice Gate Officer (PPA): 1 personnel per 3 – 5 intake structures and offtake structures on canals between 2 – 3 km or service area 150 to sd. 500 ha

Based on the functional area and the provisions outlined in the PUPR Ministerial Regulation No. 12/PRT/M2015, overall in Sekampung Sistem with 15 UPTD/Regional Coordinator/UPT, it is estimated that 301 personnel outside the Observer Staff, POB and canal workers are needed, with details: 15 Observers, 31 Waterworkers, and 248 PPA. Theoretically, they should be given training both to improve performance and fulfill modern irrigation management institutions, because the implementation of modernization is carried out in stages held initially in North Puinggur and Rumbia, the focus of training will also be prioritized in North Paunggur and Rumbai. Thus, the training in year 1 and year 2 respectively is participated by 16 waterworkers and 85 PPA in Punggur Utara, and 3 waterworkers and 24 PPA in Rumbia.

TABLE 9-2 O&M PERSONEL NEEDS UNDER UPTD

IRRIGATION AREA	TOTAL AREA IN 2009 (HA)	OBSERVER'S NEEDS	WATERWORKER'S NEEDS	TOTAL GATES	PPA'S NEEDS
1. Bekri Irrigation Area	5,119	1	3	223	45
2. Punggur Utara Irrigation Area	21,428	6	14	425	85

IRRIGATION AREA	TOTAL AREA IN 2009 (HA)	OBSERVER'S NEEDS	WATERWORKER'S NEEDS	TOTAL GATES	PPA'S NEEDS
3. Rumbia Barat Irrigation Area	5,031	1	3	122	24
4. Batanghari Utara Irrigation Area	4,765	1	3	92	18
5. Raman Utara Irrigation Area	4,279	1	3	98	20
6. Sekampung Bunut Irrigation Area	5,577	3	4	117	23
7. Sekampung Batanghari Irrigation Area	9,861	2	7	165	33
	56,060	15	37	1,242	248

9.2.3.4 - UPTD Personnel Duties

Main Duties and Functions of Officers in Operations in the Field

1. Head of Branch/Observer/UPTD/Branch Service//Regional Coordinator
   a. Preparing the preparation of RTTG and RTTD according to the proposal of P3A/GP3A/IP3A farmers
   b. Informing the magnitude of the k-factor for the distribution of water if the river discharge decreases (Factor K. analyzed and determined by SIPASI)
   c. Coordinating with UPIM
   d. Collaborating with UPMI in organizing SPKM and SPI
   e. Attending meetings at the branch office/observer/UPTD/office branch/regional coordinator weekly to find out operational problems, attended by the waterworker/irrigation interpreter, sluice gate officer (PPA), weir operation officer and P3A/GP3A/IP3A.
   f. Attending meetings at the sub-district and PSDA offices in each regency.
   g. Fostering P3A/GP3A/IP3A to participate in Operation activities
   h. Assisting in the process of applying for assistance for operating costs submitted by P3A/GP3A/IP3A.
   i. Making operational activity reports to the Department.
   j.
2. Branch Staff/Observer/UPTD/Branch Service/Regional Coordinator
   a. Assisting the head of the branch/observer/UPTD/office branch/korwil in the implementation of irrigation network operations
   b. Assisting the head of the branch/UPTD or other names in the field of administration

3. Waterworkers
   a. Assisting the head of the branch/observer/UPTD/office branch/korwil for tasks related to operations.
   - Receiving water demands from WUAs submitted through PPA (covering area and schedule for distribution);
   - Recording P3A demands via PPA into the SIPASI system
   - Giving instructions to PPA to arrange the floodgates according to the required discharge, the schedule is set and the condition of water availability;

   b. Giving advice to Farmers about planting & types of crops;
   - Managing the turn settings;
   - Filling operation/exploitation board

   c. Making an operation report (directly entered into the form in SIPASI):
   - Cropping Data Collection & Crop Damage;
   - Collecting data on the Proposed Planting Plan;
   - Reporting flood events to Rantig/ Observer;

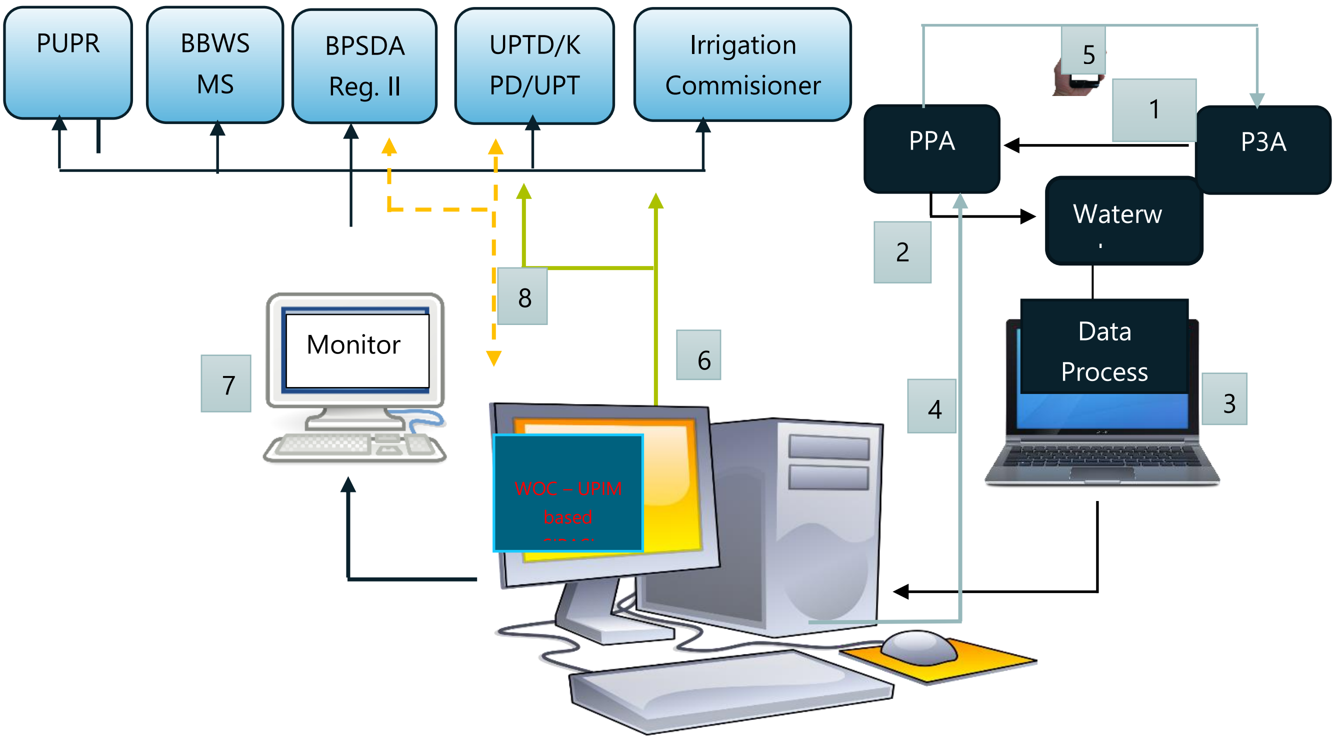
4. Water Gate Officer (PPA)
   - **a.** Receiving water demands from P3A in tertiary according to the area and time specified;
   - **b.** Submitting to the mantri the water request from P3A
   - **c.** Opening and closing the floodgates so that the flow of water flows in accordance with the orders of the Irrigation Officer/Mantri.
   - **d.** Reporting to the SPKM staff and a copy to the mantri if there is a disruption in operations
   - **e.** Maintaining the gate according to the procedures specified in maintenance
   - **f.** Cleaning the drain around the gate is his responsibility

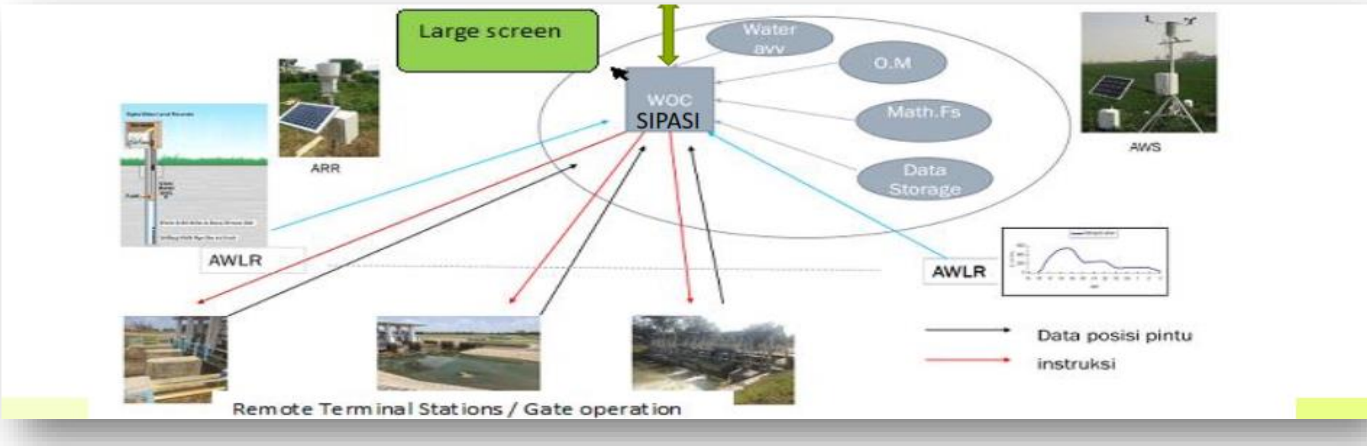
5. Weir Operation Officer (POB)
   - **a.** Implementing the arrangement of the weir drain gate against the incoming flood
   - **b.** Carrying out the drainage of the mud bag
   - **c.** Opening/closing the main intake gate, according to the planned discharge and schedule.

9.2.4 - SIPASI Process and Stakeholders

The management of modern irrigation operations and maintenance based on SIPASI supported by the SCADA system and on a new institution called UPIM with the support of the WOC, a Knowledge development center, and several task forces within it.

FIGURE 9-3 PROCESS AND RESPONSIBLE FOR WATER DISTRIBUTION THROUGH SIPASI





Information:

1. Farmers through P3A submit requests for water distribution in tertiary plots to PPA by submitting information on the area to be irrigated and the desired time/schedule.
2. PPA directly or by telephone/SMS/WA conveys to the Mantri the WUA request along with the time and extent.
3. Waterworkers takes notes through the CPU/tablet provided at the UPTD/waterworkers offices and asks the WOC to provide water to P3A.
4. WOC realizes the provision of water to the PPA to open the gate at the intended tertiary.
5. PPA opens the gate through the command button on the gate Structure in the tertiary.
6. WOC can provide data needed for Komir and UPTD/KPD/UPT for Planting System planning and Water Distribution Plan and for UPTD in making policy on water distribution.
7. PUPR, BBWS and BPSDA Region II can monitor in real time the water distribution process and can provide feedback in the form of policies
8. As the implementing unit controlling the operation of irrigation networks, BPSDA Region II at the Lampung Province PSDA Service and UPTD/KPD/UPT districts/cities have the authority to monitor WOC through existing monitor screens and coordinate with each other between these units to ensure that services run effectively.

9.3 - STAGES OF ACTIVITIES

TABLE 9-3 ACTIVITIES FOR MODERNIZATION PREPARATION

No	Activities for Modernization Preparation
1.	Maturation of the discussion and formulation of the UPIM concept
2.	UPIM & SIPASI socialization to stakeholders
3	UPIM & SIPASI socialization to Irrigation Commissioner
4	Distribution Socialization in the Pilot Tertiary Plot (60 Tertiary Plots, 6 MT)
5	Workshop on irrigation modernization at the provincial and district/city levels 80 people
6	Workshop on strengthening the role of the Irrigation Commissioner

TABLE 9-4 INSTITUTIONAL ACTIVITIES

No	Institutional Activities
1	Construction of working facilities for UPIM & WOC

No	Institutional Activities
2	4-wheeled vehicles (Cars for UPIM operations)
3	2-wheeled vehicles (Operational motorcycles for SPKM members)
4	Strengthening Institutional & Legal P3A
5	Establishment of GP3A (new) and Legal Entity
6	Establishment of IP3A (new) and Legal Entities
7	Provision of annual facilities for the Secretariat of the Irrigation Commission
8	P3A Business Capital Assistance
9	Recruitment/Test of Freelance Daily Workers (PTHL) to become PPPK or PNS (annual routine activity AND 30% CONTRIBUTION)
10	Orientation for the placement of non-PNS PPA workers (annual routine activities AND 30% CONTRIBUTION)
11	Development of incentive and allowance system
12	Construction of working facilities for UPIM & WOC
13	Hydrology Training for UPTD
14	Organizational Management Training for Irrigation Commission Secretariat staff
15	Training on Procedures for Providing Water to Tertiary Plots with SIPASI (5 UPTD staff, 15 Korwil, 60 Mantri, 275 PPA, 120 WUA Members)
16	WOC operation training (2 people)
17	Hydrology Training for P3A
18	Training for Trainers (TOT) for Irrigation Manager
19	Irrigation Modernization Training for UPTD Staff
20	Hydrology Training for UPTD
21	Organizational Management Training for Irrigation Commission Secretariat staff
22	Training on Procedures for Providing Water to Tertiary Plots with SIPASI (5 UPTD staff, 15 Korwil, 60 Mantri, 275 PPA, 120 WUA Members)
23	WOC operation training (2 people)
24	Professional certification and leadership training for irrigation management staff
25	Introductory Training on Modernization of Irrigation Management for WUA/GP3A/IP3A
26	Training on Water Supply to Tertiary Plots with SIPASI for P3A
27	GP3A Role Enhancement Training in Business
28	Aknop Preparation Training for UPTD
29	WUA Organizational and Organizational Management Training
30	Business Development Training for GP3A
31	Communication & Leadership Training for WUAs
32	Training on Irrigation Management, Water Efficiency and Farmer to Farmer training

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