KYAMBOGO UNIVERSITY

DIRECTORATE OF RESEARCH AND GRADUATE TRAINING

INVESTIGATING THE PERFORMANCE OF RURAL ROAD DRAINAGE SYSTEMS IN UGANDA: A CASE STUDY OF KATAKWI DISTRICT

BY

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DECLARATION

I, **Andrew Echatu,** hereby declare that this research report is my original composition and has never been published anywhere or submitted in any other institution for the award of any qualification.

………………………………… **………………………**

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APPROVAL

This is to certify that this dissertation has been compiled under our supervision and is now ready for submission to the board of examiners of Kyambogo University.

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DEDICATION

I dedicate this research report to my family especially my wife Ms. Akello Josephine and my children Caleb, Dorothy, Racheal and Ephraim. I know that during this period of research you missed out on a Father and Husband, and I will be forever grateful to you for allowing me time to complete this project. May God bless you all.

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This work has been successful due to the assistance and cooperation of so many personalities. First, I thank the Almighty God, whose wisdom, ability and divine provision has enabled me to complete my studies. May his name be glorified forever? Special thanks go to my supervisors Dr. Sam Bulolo and Asso. Prof. Lawrence Muhwezi and Chris Byaruhanga for all the support, guidance, encouragement and important ideas, which have made this research have the value it is worth.

I would be negligent not to mention the several opinion leaders including the staff at Katakwi District Local Government, whose information was invaluable.

Last, but not least, I thank my family whose sacrifice, tolerance of competition for resources, support, cooperation and love kept me moving amidst all rough and smooth worlds and to all my course-mates and friends for the teamwork that supported me academically, socially, morally and spiritually.

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ABSTRACT

This study was carried out to investigate the performance of rural road drainage systems in Uganda, a case study of Katakwi district roads. Specifically, the study covered the assessment of the current state of rural road drainage condition; the factors affecting the performance of rural road drainage systems, and the development of sustainable drainage management solutions for rural roads. The study adopted the analytical research design utilizing both qualitative and quantitative approaches to the research. Data was collected from 15 roads using observation methods and photography. The study established that none of the rural roads surveyed had good drainage systems. The findings show that 18 per cent of the drainage systems were in a bad state which means that they were in danger of failure or had already failed. Furthermore, the majority of the entire rural road drainage systems i.e. 68 per cent were in a poor state or needed major interventions, while only 14 per cent were in a fair state which was an indication of the requirement for minor interventions. The study also observed that the key factors affecting the performance of the drainage systems of key roads in Katakwi district included poor land use, topography, poor workmanship and construction practices, lack of or inadequate maintenance and flooding. However, the major factor contributing to the poor status of the drainages were lack of proper designs and lack of maintenance. The design for the improvement of the drainage system focused on road side drains for Korikori-Kapujan. The design which included estimation of catchment areas, calculation of design discharge and hydraulic design was done with a result of a trapezoidal section with bottom width of 200mm, depth of 300mm, and side slopes of 1:1. The study recommended that maintenance practices should be given priority; this includes removal and cleaning up of the drains. This can be achieved by increasing budgetary allocation for maintenance.

KEY WORDS: (Drainage, rural road, performance, culverts, design)

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The Katakwi district is located in the Teso sub-region of the Northern Highlands of Uganda within the Lake Opeta and Bisina wetland system. It is characterized by extensive plains with grassy savannas and frequent shrub vegetation, prone to flooding (Nature Uganda, 2010). The weather in Katakwi District is unpredictable, with intermittent heavy rainfalls during the first and second rainy seasons from March to June and August to October, causing inundation and flooding in many parts of the district. Average annual rainfall varies between 1000mm and 1500mm. There are also typical sub-counties with very high flood risk such as Ongongoja, Palaam, Ngariam and Magoro, while other parts of the district are rated as moderate flood risk. Floods pose a major threat to local roads and can frequently damage road structures (Bles et al., 2016), with long-term side effects such as massive disruption of traffic and access to emergency services (Versini, Gaume, and Andrieu, 2010). The Katakwi district has several arterial roads totaling about 125 km, but rural arterial roads make up the bulk of the district's road network at 314 km or 72%. 241.88 km of rural highways are passable or passable by car (UNDP, 2019). In poor condition are roads with inadequate drainage systems. Currently 12% of the rural road network is in good condition, 18% in fair condition, 70% in poor condition (UBOS, 2020).

Therefore, rural roads in the district should have drainage systems of sufficient capacity to drain all accumulated standing water, especially in flooded areas where special precautions should be taken (New Jersey - Transportation Ministry, 2015, Road Design Manual). Local road structures must have adequate drainage to remove precipitation from the surface as quickly as possible. Otherwise, premature deformation and pavement deterioration will occur (Gichaga, 2017). In Uganda, more so, Katakwi District, there are many such roads which lack proper drainage systems. Sustainable and long-term planning is crucial and thus the consideration of good drainage constitutes an important input for decision-making in planning for the rural road infrastructure in Katakwi District. This research, therefore, was concerned with the improvement of the performance of rural road drainage systems in Uganda.

1.2 Statement of the Problem

Intermittent heavy rains have caused persistent flooding and landslides across the country (Uganda Road Fund, 2020). Several areas of northern Uganda are at risk of impassable critical infrastructure, such as the Gweri road between Soroti and Katakwi in eastern Uganda flooded by the Awoja River, and the completely blocked Ajeleiek Bridge to Amuria. In addition, cracks in rural roads in Katakwi District, which are believed to be caused by weak soil, have occurred as a result of inundation of some road sections as a result of inadequate drainage on some road sections after heavy rains have occurred. This has made passenger transport extremely difficult, slowing business and impacting economic growth. Figure 1.1 below shows poor drainage along one of the roads threatening road quality in Katakwi district.

Figure 1. 1: Poor drainage along Usuk-Ongongoja road which poses threat to the quality of roads in Katakwi district

If the current situation is not addressed, it would affect the economic growth of the population hence hampering the area's development. It is against this background that the researcher conducted this study towards the improvement of the performance of the drainage systems in the rural roads of Katakwi district.

1.3 Objectives of the study

1.3.1 Main objective

The main objective of this study was to assess the performance of rural road drainage systems in Uganda, a case study of Katakwi District.

1.3.2 Specific Objectives

i. To establish the current status of the drainage systems of key rural roads in Katakwi district.
ii. To determine the factors that affect the performance of drainage systems of rural roads in Katakwi District.
iii. To design a sustainable drainage system for Katakwi District rural roads.

1.4 Research Questions

i. What is the status of the drainage systems in Katakwi District?

ii. What are the factors that affect the performance of the drainage systems of Katakwi road?

iii. What is the best and most appropriate drainage system design that can improve the rural road condition in Katakwi District?

1.5 Justification of the Study

Effective drainage systems are crucial for maintaining road infrastructure and preventing damage caused by water accumulation. This study aims to identify the potential issues in rural roads in Katakwi District, where inadequate drainage can lead to road degradation, safety hazards and transportation disruptions. By evaluating the performance of theses drainage systems, the research can contribute valuable insights to enhance road resilience, minimize maintenance costs, and improve overall accessibility in rural communities. Therefore, relevant district authorities should implement proper design with adequate drainage to promote economic growth by facilitating the movement of people and goods. Most importantly, good roads reduce recurring road spending through repair and maintenance (MoWT, Annual Sector Performance Review report, 2014-2015; MoWT, Strategic Implementation Plan, 2015-2023).

1.6 Significance of the Study

The findings are relevant to policy makers such as the Department of Labor and Transport with economic recovery policies that include providing good road networks with good drainage systems. The findings of this study will help the Katakwi District Authority find appropriate and capable solutions to the persistent poor road network problem that has led to the district's rural road network under performance. This study will be used by scientists as a reference for further research to improve the performance of local road drainage systems. Measure adequacy of drainage systems for rural roads and surrounding areas. Identify the challenges faced by agencies responsible for maintaining road drainage systems in local road networks.

1.7 Scope of the Study

The scope of the study was segmented into three, i.e.; Content scope, Geographical scope and periodical scope.

1.7.1 Content Scope

The study assessed the performance of rural road drainage systems in Uganda particularly within Katakwi district focusing on the existing drainage system. The study also addressed the effects of inadequate drainage systems on roads and the surrounding environment and investigated the reasons for inadequate drainage systems within Katakwi district roads and the challenges faced by the institutions mandated with the responsibility of maintaining them.

1.7.2 Geographical Scope

The survey was conducted in Napak district in the north, Nakapiripirit district in the east, Kumi district in the south, Ngora and Soroti districts in the southwest, and Katakwi district bordering Amuria district in the west (width: 1.9150; length: : 33.9550).); lies between 1,050 and 1,130 m above sea level. It has a total area of 2,507 km^2, land area of 2,177 km^2 and open water and wetlands of 177 km^2 (KDLG, 2018).

1.7.3 Time Scope

The study was carried out for five (5) months, i.e. May-October, 2022. This enabled the researcher to engage respondents for study findings.

1.8 Conceptual Framework

Independent Variables ***Dependent Variables***

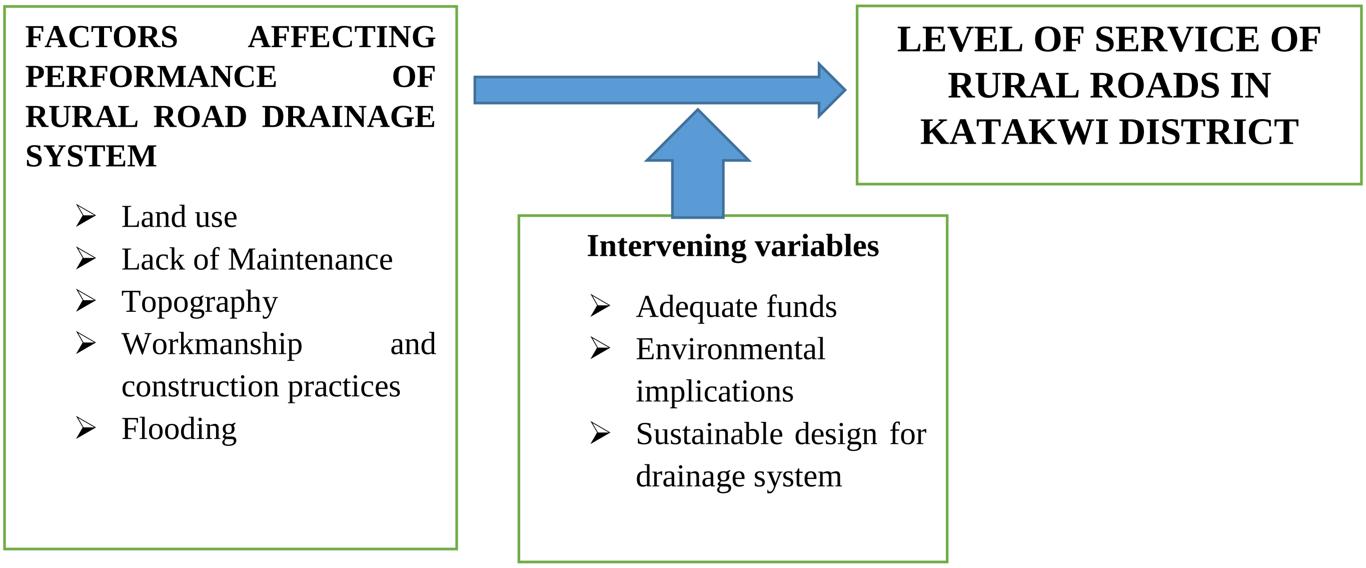


Figure 1. 2: Conceptual Framework of the study

The framework depicts the relationship between factors affecting the performance of rural road drainage systems. The performance of rural road drainage systems adequately depended on the land use, topography/ terrain, workmanship and construction practices, among others.

1.9 Chapter Summary

This chapter provides the background to the study, a statement of the problem, specific objectives, research questions, research rationale, the significance of the study, and conceptual framework. The next chapter provides a literature review under which key issues related to the research topic by referring to previous research, books and journals are reviewed.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The review of literature in this research was done based on both conceptual and empirical literature reviews. Definitions, concepts and theories relevant to the study were provided together with views derived from previous works of other scholars. The material used, cited compared and contrasted in this study was obtained from articles, magazines, dissertations, journals, writings and works of previous scholars.

2.1 General Description of Road Drainage Systems

A drainage system includes the pavement and the water handling system. They must be properly designed, built, and maintained. The water handling system includes road surface, shoulders, drains and culverts; curb, gutter and storm sewer. When a road fails, whether it's concrete, asphalt or gravel, inadequate drainage often is a major factor. Poor design can direct water back onto the road or keep it from draining away (Zumrawi 2014).

2.1.1 Effects of inadequate Road Drainage system on the performance of rural roads

A fundamental goal of road drainage design is to reduce and/or eliminate the energy produced by flowing water. The destructive power of flowing water increases exponentially with increasing velocity (FAO, 1998). Therefore, water must not develop sufficient volume or velocity to cause undue wear along the drainage system. Providing proper drainage is of paramount importance in road design and cannot be overstated. Presence of excess water within the pavement adversely affects the technical properties of the materials that make up the pavement. All major failures following road surface erosion and undercarriage weakening are the result of improper or poorly designed drainage. The following factors affect the performance of local road drainage systems:

2.1.2 Factors affecting the performance of rural road drainage systems

2.1.2.1 Land Use

In agricultural areas around the world, wetlands are often drained to increase or streamline agricultural production. This drainage can be concentrated in small-scale wetlands that temporarily flood seasonally, consolidate into permanent pools with less surface water, and grow larger and deeper with more drainage. Interestingly, this consolidation drainage has received little attention in the literature. Consolidation drainage can improve connectivity between remaining wetlands through drainage ditches that can raise water levels in consolidation wetlands (Merkey, 2006). Higher water levels in compacted wetlands can mean that much more extreme droughts are needed to dry out completely, simply because those wetlands are larger and deeper. This process transforms the wetland from a hydrologically variable wetland to an essentially permanently flooded wetland, fundamentally altering wetland community composition and its function in the landscape (Wellborn et al. 1996, Snodgrass et al. 1996, Snodgrass et al. al. 2001). Poor land use affects the performance of local road drainage systems. This will depend on how the community uses the land that the highway traverses. Examples include landscape change, poor agricultural practices such as growing crops along road reserves, deforestation and other destruction of natural resources.

2.1.2.2 Topography

Catchment topography is a substantially permanent property that primarily affects the concentration or temporal distribution of runoff from the catchment. River systems vary in their efficiency as institutions for collecting and channeling water (Gregory, 2019). The geometrical design elements of roads depend on the terrain they pass through. The Katakwi

District is characterized by flat or gently undulating terrain, which opposes the construction of unrestricted horizontal and vertical continuous roads (topographic gradient of approximately 5%). Obstacles are few and far between. Flat terrain tends to absorb water from upstream, which can adversely affect road structure.

2.1.2.3 Workmanship and construction practices

Poor workmanship in the construction and installation of drainage systems affects the performance of local road drainage systems. This is reflected in the poor installation of culverts. Such as headwall score checks that may be due to poor oversight by technical staff.

2.1.2.4: Lack or inadequate maintenance

Poorly maintained roads distort drainage systems and lead to poor roads. Poor maintenance of a rural road drainage system has a significant impact on its performance. This is evidenced by clogged or broken culverts, muddy mitered ditches and ditches, eroded rims, etc., and is primarily attributed to under-allocation of road maintenance funds.

2.1.2.5: Drainage/ catchment area

Catchments are the major watersheds that affect runoff. The larger the contributing drainage area, the greater the flood runoff. Regardless of the method used to assess flood discharge, peak discharge is directly related to catchment area.

2.2: Road Surface Drainage

Surface drainage includes all means by which surface water is removed from roadways. Granulation of the aggregate and bitumen mixture should be adjusted to prevent water penetration into the compacted pavement. This is done by properly choosing a sufficiently impervious wear course and providing the surface with the necessary cross slope to drain water quickly. Studies have shown that bituminous mixtures recommended for road construction are not sufficiently permeable to the various top layers when installed. This water ingress into the course occurs when the road surface cracks. For a good surface drainage system, road construction should incorporate shoulders, cross-slopes, longitudinal slopes and longitudinal channels (Dawson, 2008).

2.2.1: Shoulders

The shoulders help support the sidewalk laterally, carry water from the sidewalk into the waterway, and provide a way in case a vehicle loses control or needs to be stopped in an emergency. It should be slightly steeper than the pavement and should be able to withstand occasional traffic. Erosion and exudation of the shoulder are major problems and should be addressed by using less erodible surface materials (Moulton, 2011).

2.2.2: Cross slope

A Cross slope is provided to provide a drainage gradient so that water will run off the surface to a drainage system such as a street gutter or ditch. Water will flow faster on a paved surface.

Therefore, the slope of a road surface does not need to be steep. The cross slope should not be too steep. If it is, the water running off the side will start eroding the shoulder and sides of the road (Moulton, 2011).

2.2.3: Longitudinal Drainage

The main purpose of longitudinal drainage is to collect and remove water on the road, in the immediate vicinity, or from adjacent areas (Mwangi, 2013). Removing water from the pavement at the same location and reducing the likelihood that water will seep into the roadway or pavement layer or foundation, reducing the potential for deterioration, is fundamental to maintaining road safety (Van, 2014). Longitudinal surface drainage systems include gutters, channels, ditches, permeable surfaces and troughs, complemented by respective manholes, storage facilities and catchments.

Ditches carry water from roadways to streams and other natural waterways. To achieve this, grooves must be properly shaped for safety, maintenance, and water flow and erosion control. The trench should be at least 30 centimeters below the bottom of the gravel base to drain the sidewalk. Well-maintained and smooth waterways are free of dense vegetation (tall grass) and stagnant water, and have sufficient gradients to ensure self-cleaning and continuous flow (Van, 2014).

2.2.4 Culverts

The purpose of a culvert is to carry water safely from one side of the road to the other. Water may come from natural streams or surface water runoff from road structures or areas close to roads. Culverts must be durable and have sufficient hydraulic capacity to carry a constant volume of water over a period of time (Nasoor, 2015).

2.2.4.1 General Considerations in Designing Culverts

While designing culverts, designers should analyze the existing flow conditions in the areas upstream and immediately downstream of the proposed cross culvert. Upstream and downstream land use should be documented on the drainage report, with photographic documentation of the area if possible. This documentation of the existing condition of adjacent drainage areas prior to construction may provide useful information for subsequent inquiries from adjacent property owners (Nasoor, 2015).

Storm-water intakes are an important part of a city's storm water collection and transportation system. Water intakes may collect excess water from the street, divert flow to sewers, and provide maintenance access to storm sewer systems. They can be made of cast iron or concrete and are installed at the edge of the gully or the bottom of the trough. Geometric features of roads often determine the location of drains (Chanson, 2010). Their main function is to divert runoff from roads into gutters. There are three types of intake (Bruun, 2013). The air intake must be free of debris and mud to work as intended and avoid flooding the road.

2.3 Description and Function of Rural Road Drainage System

Drainage systems consist of inlets, catch water outlets, ditches, miters and culverts. The layout and hydraulic capacity of storm drainage structures and transfer lines shall be designed to avoid/minimize damage to adjacent facilities and to reduce the risk of traffic disruption due to flooding. Various types of structures are used in drainage systems (Şen, 2018).

2.3.1 Description of Rural Road Drainage System

The Surface Drainage System collects rainwater and drains it from the surface and adjacent areas to prevent flooding. Reduces the likelihood of water intrusion into the road and maintains bearing capacity. Designing an appropriate surface drainage system is an important part of road planning (Desai and Peerbhay, 2016). Underground drainage systems drain groundwater as well as seepage from roads and inner dikes.

2.3.2: Functions of Road Drainage Systems

A drainage system collects, transports, and disposes of surface/groundwater that originates at or near the site or flows into streams adjacent to the site. Prevents erosion of the rear escarpment by runoff from the hill above. It traps water and keeps it out of gutters, which can increase runoff in gutters (Mwangi, 2013).

2.3.3: Maintenance

Maintenance extends the life of roads and consequently has significant financial benefits. A road system that is well maintained also brings important social and environmental benefits. When designing a road, much emphasizes should be given to the future maintenance requirements, who will be responsible for carrying out this work, and how it will be funded. These maintenance practices should be identified in the form of a maintenance management plan. A level of priority should be given to each maintenance activity to ensure the whole road system is adequately maintained. For example:

Routine maintenance (required continually): includes grass cutting, drain clearing, re-cutting ditches, tree pruning and culvert maintenance.

Recurrent maintenance (required at intervals during the year with a frequency that depends on traffic volume): on unpaved roads, it includes repairing potholes and ruts, dragging and grading. On paved roads it includes repairing potholes, patching, repairing edges and sealing cracks.

Periodic maintenance (required only at intervals of several years): includes gravelling of unpaved roads, resealing (surface dressing, slurry seal) and re-gravelling shoulders.

Urgent Maintenance (required in response to emergencies): calls for immediate action when a road is blocked either as a result of an accident or a natural event. Tasks include the removal of debris and other obstacles.

Neglected drainage rapidly leads to the deterioration of the road. The execution of this work should therefore be monitored at regular intervals to ensure it is carried out effectively. However, although the effects of poor road drainage maintenance activities on the road are frequently highlighted in road maintenance manuals, the implications for the environment are not. Consequently, if indirect impacts are located away from the road, where they are not directly visible, and a false sense of complacency can develop. The importance of the environment, therefore, needs to be emphasized in future maintenance management plans. Guidance is also required on the level of priority given to the various mitigation measures that can be incorporated, such as the cleaning of retention ponds and maintaining the diversity of habitat within a drainage channel, especially if funds are limited.

2.4: Technical performance indicators of the drainage system

2.4.1: Capacity

The drainage system must have the capacity to handle the expected volume of water runoff during heavy rainfall events. It should be designed to prevent flooding and ponding on the surface of the road.

2.4.2: Flow rate

The drainage system should be designed to efficiently convey water away from the road. This involves ensuring that the flow rate of the drainage system such as culverts, side drains and channels are adequate to handle peak flow rates.

2.4.3: Slope and gradient

Proper slope and gradient in the drainage channels are crucial for ensuring that water flows away from the road effectively. Incorrect slopes can lead to stagnant water and erosion.

2.4.4: Inlet design

The design of inlets and catch basins should allow for easy collection of surface water runoff. Their location and spacing should be optimized to prevent water from pooling on the road.

2.4.5: Sedimentation and erosion control

The drainage system should include features such as sediment basins or settling ponds to capture sediment and prevent it from entering the road. Proper erosion control measures should be in place to prevent soil erosion that can clog drainage channels and reduce their effectiveness.

2.5: Failures of Road Drainage System

According to Nyuyo, (2013), pavement maintenance mainly consists of sealing cracks, patching and repairing damaged surfaces. It's an inexpensive remedy to extend the life of your patch before more expensive maintenance is required. Water puddles on or near roads, a common sight during heavy rains, are a harbinger of trouble. Water penetrates the road structure unless the surrounding and underlying ground is relatively watertight. The purpose of drainage design is to control surface runoff and control free water in roadbeds and roadbeds (Mwai, 2011).

Table 2. 1Effects of water on the road surface

Positive effects of water on the road	Negative effects of water on the road
• Establishing and maintaining vegetation for erosion control • Working gravel road surfaces • Providing dust control; and • Cleansing the road and pavement surface	• Softening and reducing the load-carrying ability of subgrades and shoulders; Increasing the disintegration of pavements and gravel surfaces; • Eroding roadside surfaces; • Depositing sediment and debris in ditches, pipes, catch basins and waterways; and contributing to frost heaves and spring break-up. • Creating driving hazards for motorists. • Damaging adjacent property.

Source: UNH report (2016)

Control and elimination of water that contributes to these types of roadway damage is the primary reason for establishing adequate drainage and its maintenance. To do this, government institutions must be mandated with the construction and maintenance of road plan (Mwangi, 2013).

Some roads are built over or near natural groundwater. Additionally; seasonal fluctuations in water levels after heavy rains are to be expected. If the road slope cannot be maintained above the water table, downspouts or ditches may be required to reduce the water level below the road. The use of free-draining fill gravel is necessary to prevent moisture ingress into the road structure (Lytton et al, 2012).

2.6: Summary of the literature review

The literature review focused on the assessment of the drainage systems of existing rural roads in Katakwi district. Drainage systems involve the side drains, mitre drains, culverts and surface road drainage. Proper drainage design when implemented will not only improve the lifespan of the road but also improves its aesthetics.

Side drains are a type of drainage systems that are constructed along the sides of roads and drain away water from the road. Side drains can be earth lined, concrete lined or stone pitched depending on the availability of materials and availability of funds and classes of roads. Side drains are the most economical drainage systems for rural roads as most of them are earth lined.

However there are a few literature gaps that need to be addressed in respect to rural road drainage which among others include;

- Community Engagement and Perception: There is a gap in literature regarding the involvement of local communities in the planning, maintenance, and evaluation of rural road drainage systems. Understanding community perceptions and participation levels is lacking.
- Climate Variability Impact: Given Uganda's varied climate patterns, there is insufficient research on how changing weather conditions, including increased rainfall or droughts, affect the performance and effectiveness of rural road drainage systems.
- Limited Comprehensive Studies: There is lack of comprehensive studies that thoroughly evaluate the performance of rural road drainage systems across different regions in Uganda. Existing research is concentrated in specific areas, leaving gaps in understanding the broader national context.
- Effectiveness of Drainage Systems: Literature may not adequately address the effectiveness of existing drainage systems in preventing road damage, soil erosion, and flooding in rural areas of Uganda. Assessing the real impact of these systems is essential.

- Maintenance and Sustainability: Research gaps exist regarding the long-term maintenance and sustainability of rural road drainage systems in Uganda. This includes understanding the challenges faced in maintaining these systems and their overall longevity.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This section highlights the research strategy that was employed to achieve the study's objectives. The chapter presents the research design, the study population and its composition together with the sample size that the researcher used, the sources of data, data collection methods, data collection instruments and data analysis.

3.1 Research Design

A research design is the method that guides the researcher to collect data, manage the data and triangulate it into possible reporting of the findings. There exist different of research designs like cross sectional research design, correlational research design, analytical research design and many others. For the case of this study, the researcher adopted the analytical research design. The analytical research design was adopted by using facts and information which are available and after collecting these data the researcher analyzed and made a critical evaluation of the materials. It was adopted because it would easily give the researcher chance of analyzing the state of drainage systems along the selected roads in the area.

3.2 Research Approach

Even though quantitative and qualitative approaches have inherent strengths and weaknesses it has been established from the works of several scholars like Wiggins (2011) that they complement each other when utilized in the mixed method approach. This study, therefore, adopted a partially mixed, sequential, but cross-sectional approach where a quantitative tool was utilized to establish relationships and it was coupled with the observation which was used to strengthen the study.

3.3 Population

In this study, the total population included 17 respondents from Katakwi district local government. The sample size was obtained using Slovin's formula;

$$n = \frac{N}{1+Ne^2} \quad \text{…………………………………………………………………Eqn. (3.1)}$$

Where, n = Sample size

N = Population universe and a = Confidence level (a + e=100).

The formula adopted a confidence level of 95% and the margin of error, e, is therefore 5% which is acceptable in social science research. The breakdown for each of the groups was calculated as follows:

Table 3. 1: Sample size of respondents

Category of respondents	**Population of respondents**	**Sample size**	**Sampling technique**
District engineer	1	1	Purposive sampling
Road inspector	1	1	Purposive sampling
Road overseer	1	1	Purposive sampling
Supervisor of works	1	1	Purposive sampling
Road user	13	11	Simple random sampling
Total	**17**	**15**	

The sample size used for the study was 15 respondents and these included 1 district engineer, 1 road inspector, 1 road overseer, 1 supervisor of works and 11 road users. These were asked to comment on the nature of drainage systems along the roads and were also very important in directing the researcher the areas that need urgent attention.

3.4: Sampling Strategy and Criteria

I applied purposive and simple random sampling. Purposive sampling was used to select the key informants manly the district engineer, road inspector, road overseer and the supervisor of works. This type of sampling helped to get to the required information easily. Simple random sampling was used to select road users in order to give those equal chances of being selected in the study and to avoid bias.

3.5: Description of Study Area

The study was conducted in Katakwi district local Government. The rural roads that were assessed included but are not limited to the following roads: Katakwi-Toroma Rd, Toroma-Kokorio Road, Magoro-Lake Bisinia Road; Usuk-Ongongoja Road; Kapujan-Kokorio Road; Magoro-LakeOpetaRoad; Getom-Toroma Road; Adacar-Arengecora Road; Alelesi-Omodoi-Adere Road; Ngariam-Palaam Road; Odoot-Olupe-Oriao Road; Toroma-Akurao Road; Ongongoja-Obwobwo Road; Omodoi-Ngariam Road; Adacar-Aketa Road; Ocorimongin-Omodoi Road; Odoot-Ngariam Road; Magoro-Angisa Road.

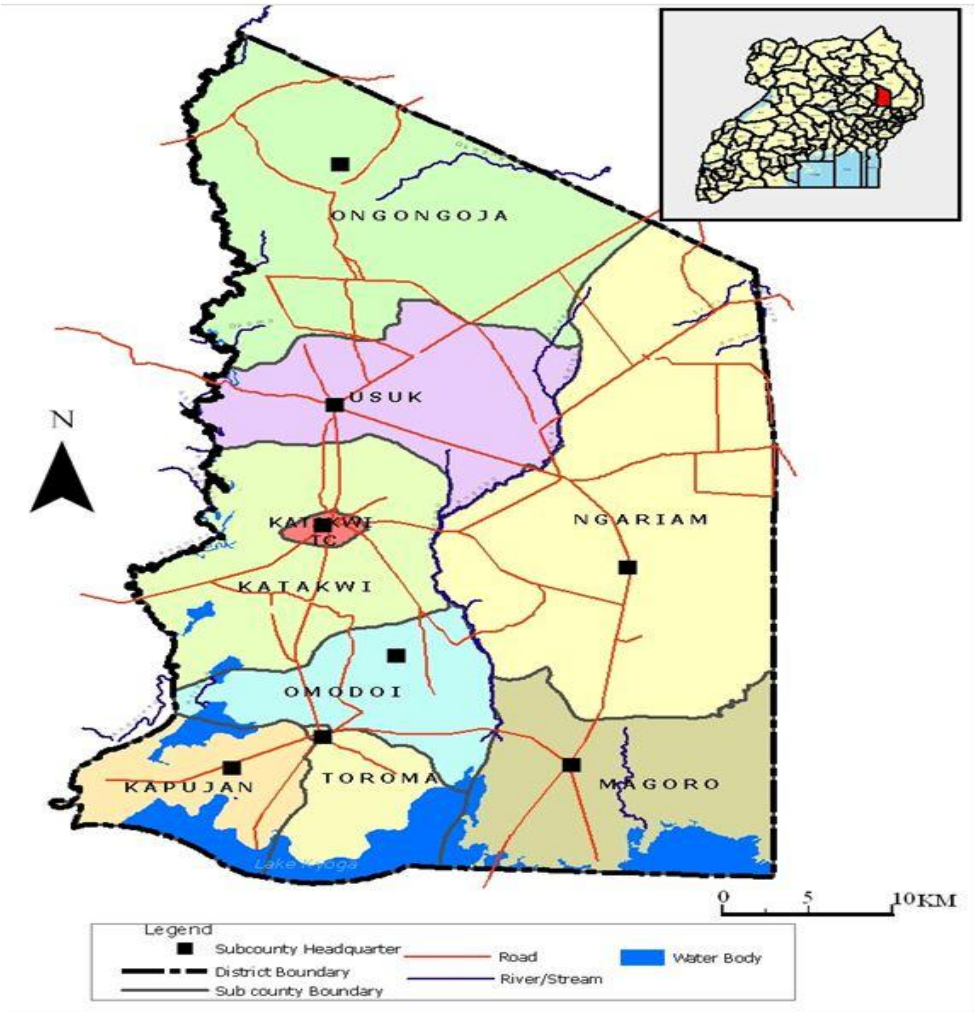


Figure 3.1: GIS map of study area

3.6: Sources of Data

The study used both primary and secondary sources of data.

3.6.1: Primary Data Sources

Primary data were gathered through an observation checklist/Road section Condition assessment form/ Structural Form (see appendices 1 and 2) and a random selection of the district roads in Katakwi district.

3.6.2: Secondary Data Sources

This was executed by the use of any information from District offices, and other resource centers like the Ministry of Works. The researcher utilized the standard design manuals which were so helpful in designing culverts. The researcher also collected the annual rain fall data from the Ministry of Water and Environment, Directorate of Water Resource Management. The method assisted the researcher in getting a wider view of the study.

3.7: Data Collection Instruments

3.7.1: Road Section Condition Assessment Form

The researcher utilized the Road section condition assessment form/ Structural Form (see appendices 1 and 2) to collect data for the study. This tool was used because it helps to ascertain the status of the performance of drainage systems on rural roads in Katakwi district and it gives firsthand information on the study variables. The researcher physically observed the performance situation of the drainage system on Katakwi district roads. A digital camera was used to take photographs of the current state of the road and the drainage system.

3.7.2: Photography

According to Kothari (2004), photography is an indirect way of data collection. It was majorly used to capture the current status of the drainage system in Katakwi district roads. It was meant to give a visual understanding of the research topic to the readers of this research project, the extent of deterioration, maintenance and the state of the drainage system.

3.8: Structure condition assessment

3.8.1: Survey Plan

Before implementation of the Survey, the Survey plan was made for efficiency and accuracy control of the field work.

Following were first prepared;

- Survey map of existing rural roads in Katakwi District (Road network map)
- Road inventory list by local government

3.8.2: Structure Condition Survey

Structure condition survey for rural roads was conducted separately from the road condition survey. The following methodology and procedure was used:

- Vehicle: where structure was found, the vehicle was stopped
- Tape: the length was Measured, width and size of the structures
- Camera: photographs of the structure were taken where necessary.
- Field Note: a survey record was written including structure condition assessment
- Determination of the structure condition through rating that represents the collective judgment of the survey team (good/fair/poor/ bad).
- Vehicle: a re-start was made after procedure was completed.

3.9: Data Processing, Analysis and Presentation

3.9.1: Data Processing

The data collected were carefully edited, sorted and coded to eliminate the inconsistencies and errors that may have been encountered. Observation checklist /Road section Condition assessment form/ Structural Form (see appendices 1 and 2) was organized and coded to get structured answers, especially for some questions in the background of the study.

3.9.2: Data Analysis

The findings were interpreted in light of the research objectives and literature review to answer the questions. Qualitative data were analyzed using Ms. Excel. Quantitative data were analyzed to establish patterns, trends and relationships from the information gathered to come up with some conclusions and recommendations on the data quantified in form of graphs, frequency distributions and tables. Qualitative data were collected, transcribed and grouped. Double data entry and checking were used to minimize errors.

3.9.3: Data Presentation

After analyzing data, then it was presented in tables, charts and percentages using Microsoft Excel 2016 for easy understanding. This helped the researcher to interpret the well-coded data into meaningful conclusions and recommendations for the study. Considerations highly adhered to consistency and accuracy of data.

3.10: Drainage Design

3.10.1: Hydrologic Design

(a) Meteorological Data

The Meteorological Department in Kampala and Soroti provided rainfall parameter data that was used in the estimation of the surface runoff.

(b) Estimation of Runoff

A topographical map covering the whole area was used to estimate the area of the catchment that serves this road with runoff water as a collecting pan.

(c) Reduction of Levels

The centerline levels of the existing road surface were taken to obtain the longitudinal profile.

(d) Drainage Facilities Design

Manning's formula was used to estimate the capacity of the drainage facilities. It is given as:

$$Q = \frac{A}{n} R^{2/3} S_o^{1/2} \quad \text{.................................Eqn (3.2)}$$

Where Q = Capacity discharge of the drainage facility (m^3/s)

A = Cross-sectional area (m^2)

R = Hydraulic radius (m)

S_o = Longitudinal slope

n = Manning's Coefficient

3.11: Chapter Summary

This chapter has dealt with methodology reflecting research design, target population, sampling procedure, and data collection instrument. The next chapter provided a presentation, analysis and interpretation of the findings.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.0: Introduction

This chapter presents analyses of the results of the data collected based on the objectives and research questions formulated in chapter one. The chapter provides the details of the findings which include the status of the drainage systems of key rural roads in Katakwi district; the factors that affect the performance of drainage systems of rural roads in Katakwi District and the design for the improvement of the drainage systems for Katakwi district roads.

4.1: Status of the Drainage Systems of Key Rural Roads in Katakwi District

4.1.1: Road geometry

On extermination of the geometric parameters, the following results were obtained focusing on the road width and the shoulder widths.

Figure 4.1: General Existing Road Widths

Table 4. 1: Percentage deviation of road geometry

Deviance %age from design standard for geometry	
Road width	76.3
Shoulders	100
	88.15

Table 4. 2: Showing road design classes

Design class	Right of Way width [m]	Road way width [m]	Carriage way			Shoulder width [m]	Median width [m]
			Width [m]	Lane width [m]	No. of lane		
Ia Paved	60	20.80-24.60	14.6	3.65	4	2 x 2.5	1.2 – 5.0
Ib Paved	60	11.0	7.0	3.5	2	2 x 2.0	-
II Paved	50	10.0	6.0	3.0	2	2 x 2.0	-
III Paved	50	8.6	5.6	2.8	2	2 x 1.5	-
A Gravel	40	10.0	6.0	3.0	2	2 x 2.0	-
B Gravel	30	8.6	5.6	2.8	2	2 x 1.5	-
C Gravel	30	6.4	4.0	4.0	1	2 x 1.2	-

The roads being rural minor and made of gravel were meant to at least be designed to a standard of gravel class C as per the geometric road design manual for Uganda (2010). However, the roads geometric parameters of road width and shoulder widths showed a general non-conformity of 88.15% by comparing them with the road manual standards. This high level of non-conformity is an indicator of poor designs both for geometric and drainage structures. This partly explains the high percentages of poor and bad drainages along the road hence need for better designs.

4.1.2: Drainage

The results were tabulated according to lengths of each road in order to determine the status of the existing drainage system. The parameters that were used to measure the status of the drainage system included good, fair, poor and bad condition. The status of the drainage existing was accessed using field visual survey with observations. It's upon this that the current status was divided into;

1. Good –No water on the road during rain, no erosion or silt deposits; Good roadside drainage
2. Fair- Some water on the road during rain, some erosion/scouring in roadside drains, or drains half silted.
3. Poor – Much water on the road during rain, severe erosion scouring in roadside drains or drains fully silted.
4. Bad- Non-existent/non-functional drainage system

The results were tabulated according to lengths of each road (See Appendices).

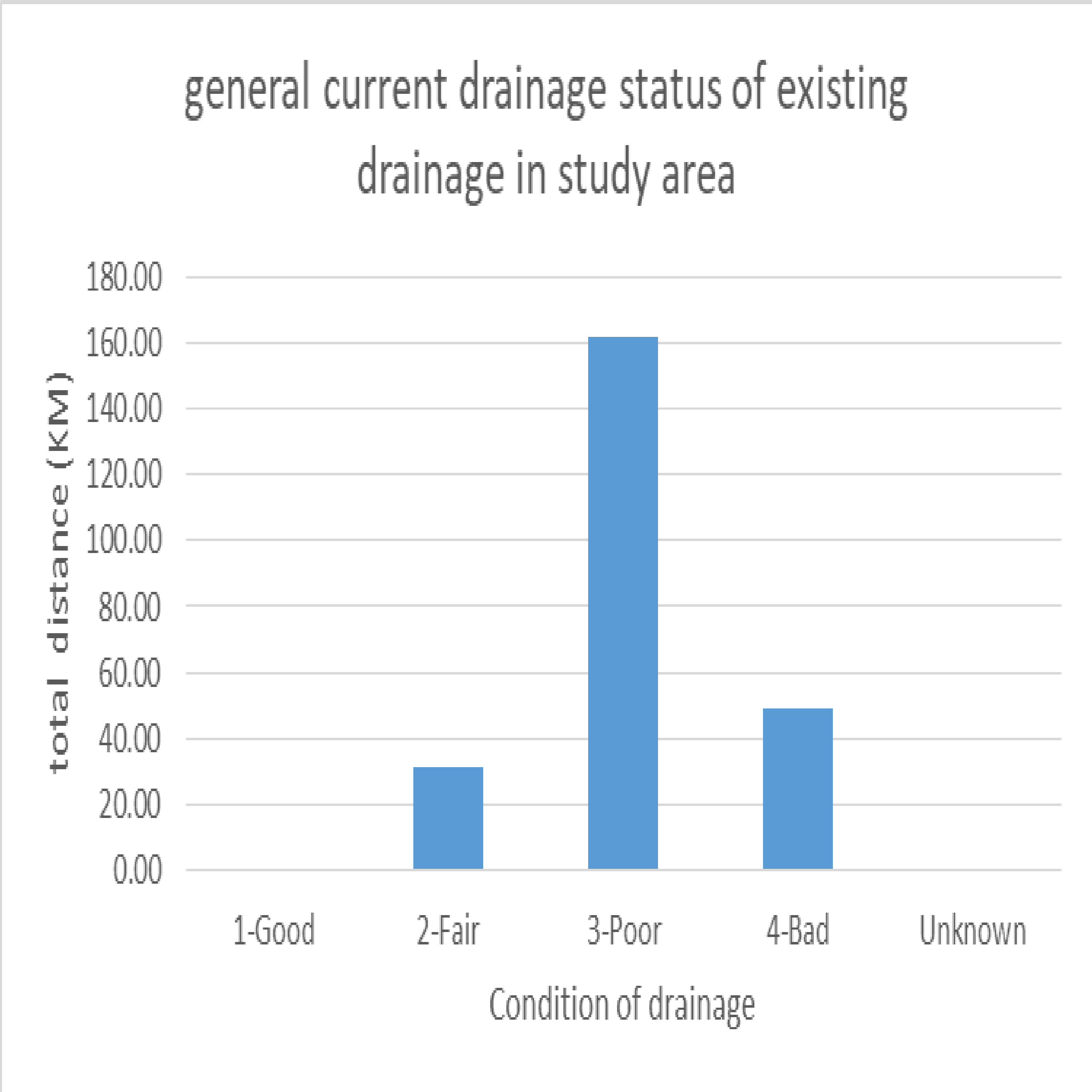


Figure 4. 2: Current status of drainage in study area

Table 4. 3: Drainage Condition Left and Right Lengths (Km)

Road Name	1-Good	2-Fair	3-Poor	4-Bad	Total
Katakwi – Toroma Road		18.42	0.29		18.71
Toroma - Kokorio Road			4.55	6.59	11.14
Magoro – Lake Bisina Road			7.51		7.51
Usuk - Ongongoja Road			21.53	5.43	26.96
Kapujan - Kokorio Road				4.45	4.45
Magoro – Lake Opeta Road			8.61		8.61
Getom - Toroma Road		4.34	1.86	4.47	10.66
Adacar - Arengecora Road			5.03	9.70	14.73
Alelesi – Omodoi - Adere Road			17.17		17.17
Ngariam - Palaam Road		7.90		5.96	13.86
Odoot - Olupe - Oriao Road			19.93		19.93
Toroma - Akurao Road			11.45		11.45
Ongongoja - Obwobwo Road			5.11		5.11
Omodoi - Ngariam Road			16.01	1.98	17.99
Adacar - Aketa Road		2.25	12.50		14.74
Ocorimongin - Omodoi Road			6.48	5.75	12.23
Odoot - Ngariam Road			11.77		11.77
Magoro - Angisa Road			14.85		14.85
Grand Total		**32.90**	**164.65**	**44.32**	**241.88**

From table and figure 4.2 above, it can be seen that none of the rural roads surveyed had poor drainage systems. The findings show that 18 per cent of the drainage systems were in a bad state which means that they were in danger of failure or had already failed. Furthermore, the majority of the entire rural road drainage systems i.e. 68 percent were in a poor state or needed major repairs, while only 14 per cent were in a fair state which was an indication of the requirement for minor repairs which is in agreement with the Katakwi district development plan statistics 2015/16 to 2019/20

4.2: Factors Affecting the Performance of the Drainage Systems of Key Rural Roads in Katakwi District

This was the second objective of the study. The researcher was interested in investigating the factors affecting the performance of the drainage systems on key roads in Katakwi district. The data collected is presented below.

4.2.1: Poor Land Use

From observations and consultations with the local people and technical staff at the local government, poor land use was one of the key factors affecting the performance of the drainage systems of key roads in Katakwi district. This was mainly common along Katakwi Toroma road, Toroma-Kokorio road, Kapujan-Kokorio Road, Getom-Toroma road and many more. Poor land use affects the performance of rural road drainage systems. This is determined by the way communities utilize the land through which the rural road passes. Examples include modification of landscape, poor agricultural practices such as the cultivation of crops along the road reserves, deforestation and destruction of other natural resources. Figure 4.3 below indicates human land use activities affecting drainage systems in Katakwi. Where we can see people's socio-economic activities like land encroachments and farming largely resulted in the dumping of soil and waste in the drainage systems.

Figure 4. 3: Poor land use causing poor drainage

According to F.A.O (2019), the drainage water outlet is a critical point in any project, both from a viewpoint of downstream water quality and for the functioning of the project itself, because any flow stagnation in the conveyance channels causes problems upstream. Therefore, attempts must be made to prevent erosion and not locate outlet structures at points where heavy siltation may be expected. Moreover, the adverse downstream negative impacts on water supplies, fish, riparian habitats, wetlands and other valuable ecosystems must be minimized.

Similarly, (Merkey 2006) indicates that higher water levels in compacted wetlands can mean that much more extreme droughts are needed to dry out completely, simply because those wetlands are larger and deeper. This process transforms the wetland from a hydrologically variable wetland to an essentially permanently flooded wetland, fundamentally altering wetland community composition and its function in the landscape. Poor land use affects the performance of local road drainage systems. This will depend on how the community uses the land that the highway traverses.

4.2.2: Topography

Another factor that contributed to poor drainage systems along roads in Katakwi district included the flat topography that affects the flow of water. Katakwi district sub-catchment is largely flat with a few hilly areas in different locations of the sub-catchment with the highest hills located at the tip of the catchment to the North East in Katakwi district. Generally, the sub-catchment comprises undulating land, rocky outcrop, rivers, forests as well as wetlands. The sub-catchment landscape is generally a plateau with gently undulating plains with hills and inselbergs in certain areas. The highest point of the catchment is located on top of the hills of Ongongoja at an elevation of about 1647 meters and the terrain reduces t with the lowest point of the sub-catchment at 1050 meters. Figure 4.4 below shows the flat terrain of some of the areas in Katakwi district.

Figure 4. 4: Poor drainage along Usuk-Ongongoja road

According to Ministry of Works and Transport (2010), the geometric design elements of a road depend on the traversed terrain of the land through which the road passes. Katakwi district is characterized by a flat or gently rolling country which offers few obstacles to the construction of a road having continuously unrestricted horizontal and vertical alignment (transverse terrain slope around 5%). The flat terrain is prone to the absorption of water from upstream which could be detrimental to road structure.

4.2.3: Poor Workmanship and construction practices

Poor workmanship was also discovered along road projects in Katakwi district. This was a major cause of poor drainage systems. In figure 4.5 below, it can be seen that light tools are being used on a road project with poorly constructed drainage patterns. A line culvert is seen to be placed almost above the road drainage invert.

Figure 4. 5: Poor workmanship

Poor workmanship during the construction and installation of the drainage system adversely affects the performance of the rural road drainage system. This is evidenced in the poor installation of culverts; headwalls score checks etc. which could be attributed to inadequate supervision by technical personnel. These findings are in agreement with Johnson (2014) who indicated that one of the causes of poor rod quality is poor workmanship which is manifested in many road projects in developing nations. This happens mostly when there is bureaucracy in the tender awarding system which makes it possible for incompetent.

4.2.4: Lack or inadequate maintenance

Lack of maintenance was manifested along many roads in Katakwi district and this affected the drainage systems along these roads. According to the FY 2020/21, Katakwi District spent UGX 15,178,178,000 on road infrastructural projects and this is limited funds. The unit cost per kilometer on average in Uganda costs between *$750,000 and $1m* (Shs2.5b to Shs3.5b) (UNRA, 2020). According to Musisi, (2021), the unit cost per kilometer on average in Uganda costs between $750,000 and $1m (Shs2.5b to Shs3.5b) while the same in Kenya goes for $300,000 (approximately Shs1b) and $330,000 (Shs1.1b) in Rwanda, a country with mountainous terrain. There has been a lot of discussion on the cost of our road works and the

President's explanation has been that previously the high costs were fuelled by massive corruption in the sector but recent reforms notwithstanding, the costs remain high. Lack or inadequate maintenance was observed many on Aketa-Adacar road, Usuk- Ongongoja road, Ngariam-Palaam road, Getom-Toroma road as indicated in figures 4.6, 4.7 and 4.8 below

Figure 4. 6: Poor drainage along Usuk-Ongongoja road

Figure 4. 7: Poor drainage along Ngariam-Palaam road

Figure 4. 8: Poor drainage along Getom-Toroma road

From the figures above, it is evident that inadequate maintenance of rural road drainage facilities significantly affects their performance. This results into flooding which further affects the road drainage systems. According to Gregory (2018), flooding in urban areas is not just related to heavy rainfall and extreme climatic events; it is also related to changes in the built-up areas themselves. In the case of Maiduguri, the problems of street flooding began when some socio economic and anthropogenic activities gained momentum as a means of face lifting the city as State Capital. The influx of people from both rural and adjoining states led to increased demand for housing. Houses were hurriedly built to meet the burgeoning demand for shelter as a result of insurgency. This is evidenced by clogged and broken culverts, silted mitre drains and ditches, eroded shoulders etc. and it is majorly attributed to the lack or inadequate allocation of funding towards road maintenance.

4.2.5 Flooding

Floods frequently occur in low-lying areas, areas along river banks and close to wetlands. Wetlands and Flood plains have been encroached on for mainly rice farming compromising their ecosystem services of flood regulation. Land degradation and deforestation play a large role in the onset of flood events. Homes and crops are always affected and in some incidences pit latrines collapse, increasing the risk of waterborne diseases. Floods in Katakwi district mainly in the sub-counties of Madera, Kangole and Kabarwa. Floods are normally experienced during April – June mainly in low-lying areas surrounding flood plains and R. Sironko. In Apeduru-Apapai, flooding occurs mainly in the sub-counties of Usuk and Ngariam. Wetlands and floodplains have been encroached on for crop cultivation which compromises the flood-regulating ecosystem service.

These findings are in agreement with Halton, (2017) who indicated that as floodwaters spread they can threaten lives, inundate properties and businesses, destroy belongings, damage vital infrastructure and prevent access to essential public services. Often the effects of flood are long term and can be very costly, disruptive and distressing for communities involved. Figure 4.7 below shows flooding and blocking access roads due to flooding in Ameritele Village, Aakun Parish, Usuk Sub County, and Katakwi District.

Figure 4.9: Blocked access road due to flooding in Ameritele village, in Usuk Sub County Katakwi district

A common problem with poor drainage is erosion water that runs over land and down slopes without catch basin or trench drain containment carries soil, mulch, and debris with it and robs trees and plants of nutrients. Drainage quality is an important parameter which affects the highway pavement performance. These findings are in agreement with (Rokade, Agarwal & Shrivastava, 2012) who indicated that the excessive water content in the pavement base, sub-base, and sub-grade soils can cause early distress and lead to a structural or functional failure of pavement. Drainage is the most important aspect of road design. Proper design of drainage is necessary for the satisfactory and prolonged performance of the pavement. In designing drainage, the primary objective is to properly accommodate water flow along and across the road and conveniently transport and deposit the water o the downstream without any obstruction in the flow.

4.3: Design for the improvement of the drainage systems for Katakwi district roads

4.3.1: Introduction to the Design

Good drainage design in rural roads is critical to the success of road construction. If drainage is inadequate, maintenance costs can be increased, the life span of the road can be reduced, and adverse impacts on the environment and local communities can result such as increased health risks, damage to food and water supplies, and depletion of natural resources. Many of these problems can be avoided if consideration is given to the design, construction and maintenance of adequate road drainage. The time and expense needed to implement adequate road drainage more than off-sets the greater costs of trying to mitigate problems after construction and is much more effective in the long term. The design was done using the rational method and most parameters were determined with guidance from the Ugandan drainage design manual.

4.3.2: Design for side drain along Kapujan-Korikori road 4.4km

The design for this drainage was done using the rational method while following the Ugandan road design manual. It was done following the steps below;

- Estimation of catchment Area, A
- Determining the runoff coefficient, C
- Determining the time of concentration T_c
- Calculation of the rainfall intensity, I
- Calculation of the discharge, Q

4.3.2.1: Catchment Area (Hectares, Ha)

The area was estimated by first studying the topography of the area adjacent to the road using Google earth pro. The road was found to serve up to 100m of land offset from the road.

$A = 100 \times LENGTH\ OF\ ROAD$……………………………………….………..Eqn (4.1)

$A = 100 \times 4450 = 445{,}000m^2 = 44.5Ha$……………………………………….Eqn (4.2)

4.3.2.2 Runoff coefficient

According to the site survey, the area was found to be a rural setting with most of the land being used for cultivation with a few scattered residential homes. Figure 4.10 shows Katakwi district located in zone H with mean annual precipitation of 1197mm. Values from table 4.3 of the Uganda road design manual were used to estimate the runoff coefficient.

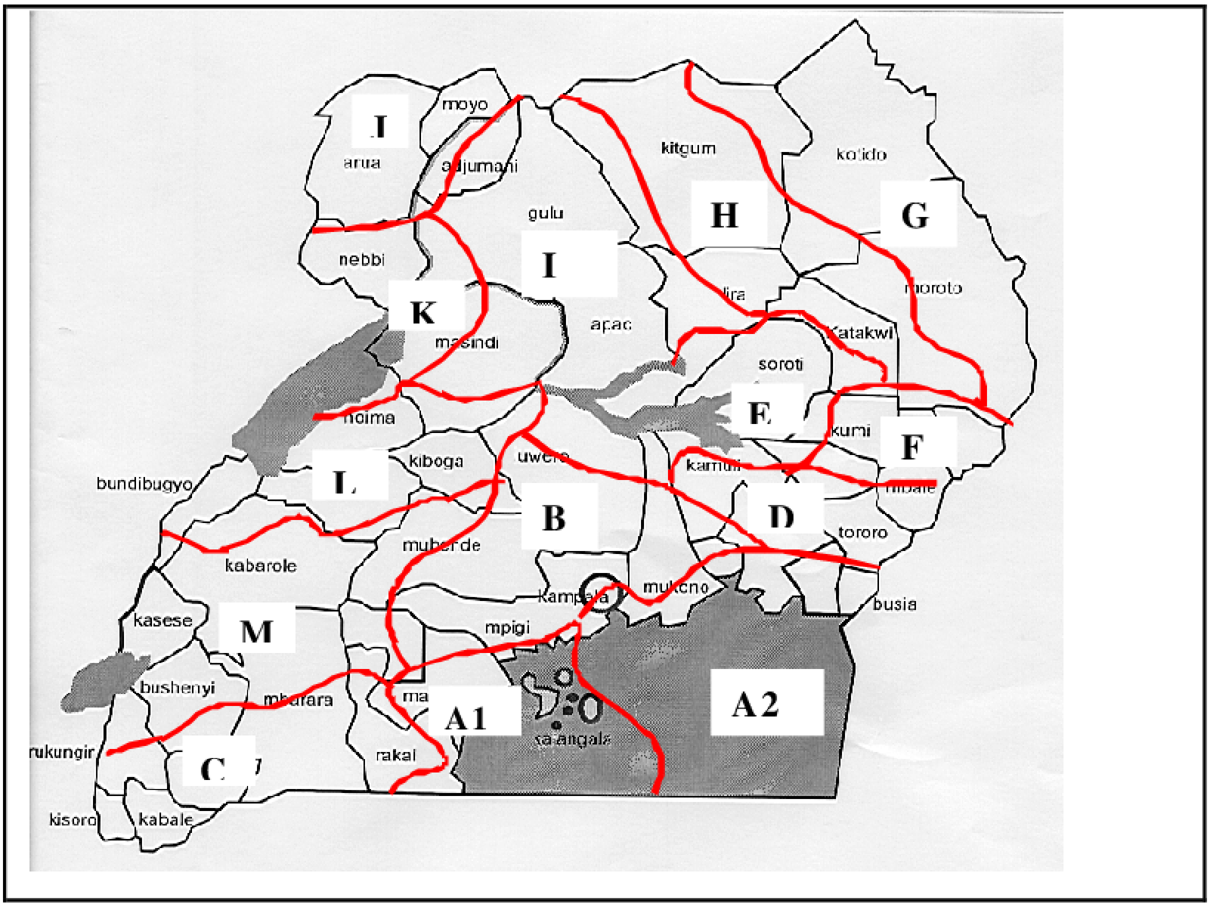


Figure 4.10: Showing rainfall zones of Uganda

Table 4.4: Typical values of rational co-efficient for rural areas

Factor		Component	MAP (mm)		
			<300	300- 600	>600
C_s	**average slope of hillsides in catchment**	3.5% flat 3.5%-11% soft to moderate 11%-35% steep >35% very steep	0.01 0.04 0.09 0.18	0.02 0.06 0.12 0.22	0.03 0.08 0.16 0.26
C_k	**Permeability of soil**	very permeable permeable semi-permeable impermeable	0.02 0.04 0.08 0.15	0.03 0.06 0.12 0.21	0.04 0.08 0.16 0.26
C_v	**Vegetation**	Dense forest or very loose deposits Cultivated land or thin forest Grassland bare rock	0.02 0.04 0.13 0.24	0.03 0.07 0.17 0.26	0.04 0.11 0.21 0.28

Note: 1. For contour cultivated lands $C = 0.80 \times (C_s + C_k + C_v)$

2. 100% dense wood : flat<3.5% $C = 0.60 \times (C_s + C_k + C_v)$

steep>11% $C = 0.80 \times (C_s + C_k + C_v)$

3. For lakes, swamps and dams $C = 1.00 \times (C_s + C_k + C_v)$

Katakwi district being in a plain area with average slope of 7% and MAP >600 mm, C_s = 0.08

Katakwi district being predominately covered with ancient Precambrian crystalline basement and MAP >600 mm C_k = 0.16

Most of the land being used for cultivation, C_v = 0.11.

$$C = 0.8(C_S + C_V + C_K)$$

$$C = 0.8(0.08 + 0.16 + 0.11)$$

C = 0.28

4.3.2.3 Time of concentration

A standard minimum time of concentration of 10 minutes was chosen because, on calculation using brasby-williams formulae, the values were ranging between 1-1.5min hence using the minimum.

Table 4.5: Minimum time of concentration as per road design manual

Location	Standard t_c (minutes)
Road inlet pits	5
Small areas less than 0.4 hectare	10

4.3.2.4 Rainfall intensity

The Watkins and fiddles method was adopted in calculation of the intensity duration curves. The value of rainfall intensity corresponding to the time of concentration was chosen.

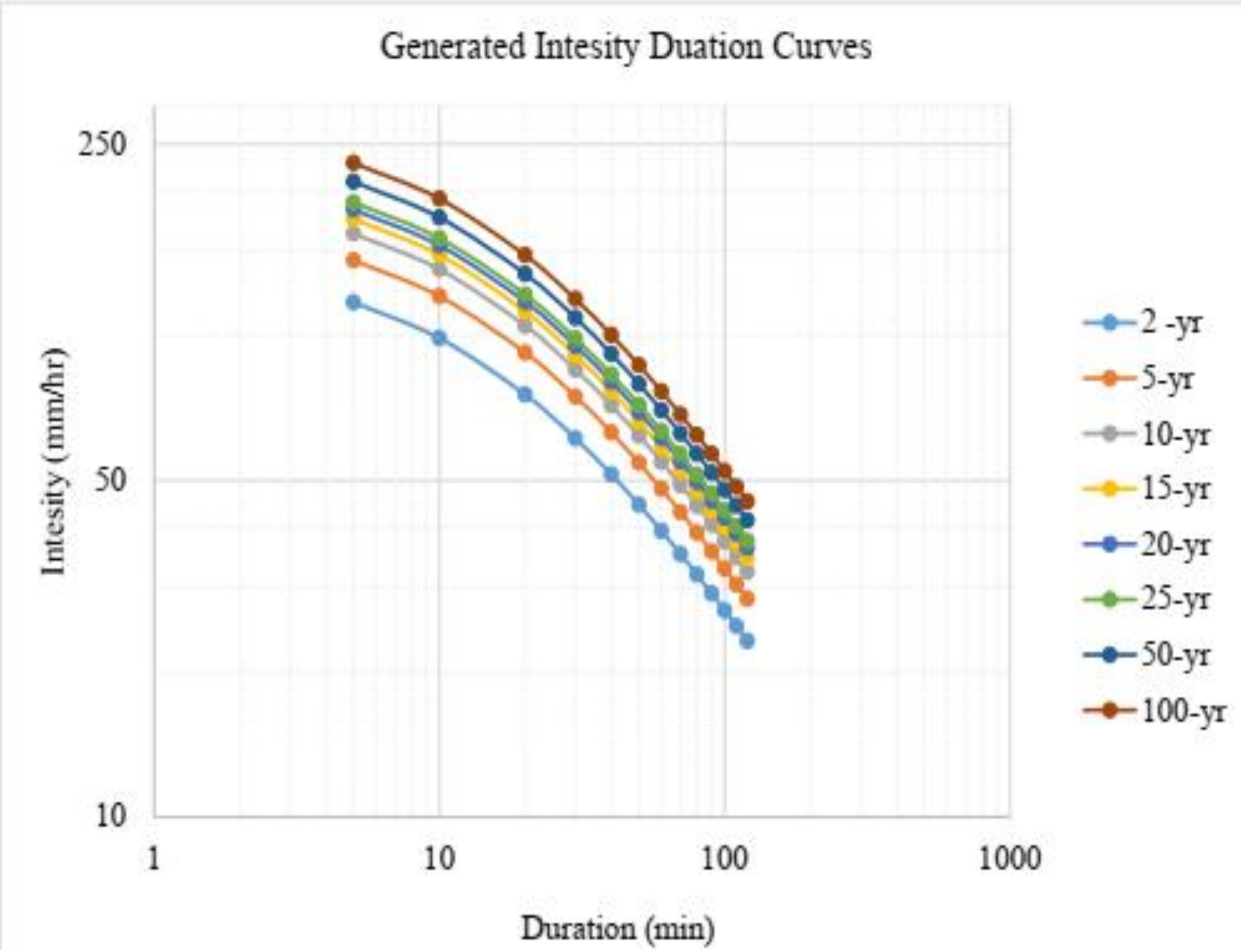


Figure 4. 11: Intensity Duration Frequency Curves

Table 4. 6: Recurrence intervals for structures in Ugandan Drainage manual

Structure Type	Geometric Design Standard			
	PIa, PIb	PIII Gravel A	PIII, Gravel B	Gravel C
Gutters and Inlets*	10/5	2	2	-
Side Ditches	10	10	5	5
Ford/Low-Water Bridge	-	-	-	5
Culvert, pipe (***see Note***) Span < 2m	25	10	5	5
Culvert, 2m < span < 6m	50	25	10	10
Short Span Bridges 6m < span < 15m	50	50	25	25
Medium Span Bridges 15m < span < 50m	100	50	50	50
Long Span Bridges spans > 50m	100	100	100	100
Check/Review Flood	200	200	100	100
PIa = Paved Ia PIb = Paved Ib PII = Paved II PIII = Paved III				

4.3.2.5 Discharge

By considering individual chainages of 40m each, the average discharge from each proportion was found to be;

$Q = \frac{CIA}{360} = \frac{0.28 \times 125 \times 0.4}{360} = 0.039 m^3/s$…………………………………………Eqn (4.3).

Where;

C= the catchment runoff coefficient

I= the rainfall intensity (mm/hr.)

A= area of catchment (ha)

This road had two low areas; at km 0+180 (from 0+000 to 0+690) and 2+440 (from 0+690 to 4+440). The following design values were obtained.

Table 4. 7: Design flows from consecutive adjacent areas to point of outlet (culvert)

Chainages	Discharge	Cumulative Discharge	
0+000			
0+40	0.039		
0+80	0.039	0.078	
0+120	0.039	0.117	
0+160	0.039	0.156	
0+200	0.039	0.195	culvert
0+240	0.039	0.234	
0+280	0.039	0.195	
0+320	0.039	0.156	
0+360	0.039	0.117	
0+400	0.039	0.078	
0+440	0.039	0.117	
0+480	0.039	0.078	
0+520	0.039	0.117	
0+560	0.039	0.078	
0+600	0.039	0.117	
0+640	0.039	0.078	
0+680	0.039		

Table 4. 8: Summary of the design flows

Section	Design discharge (m^3/s)
0+000 to 0+690	0.234
0+690 to 4+440	0.67

4.3.2.6 Hydraulic design
Shape selection

Because the section was to be in earth, the trapezoidal section was chosen

Slopes

The slopes were chosen following those of the existing road to avoid cutting of much earth.

Table 4. 9: showing average longitudinal slopes

Section	Longitudinal slope (%)
0+000 to 0+690	1.2
0+690 to 4+440	1.4

Sizing

Sizing was done using the following procedure;

A value of bottom width **B** was chosen.

The wetted perimeter **P** was obtained in terms of **Y** (flow depth)

The wetted area **A** was also obtained in terms of **Y**

The hydraulic radius **R** was obtained from;

$R = \frac{A}{P}$……………………………………………………………………………Eqn (4.4)

Manning's equation was fitted into the continuity equation and rearranged to obtain equation;

$AR^{(2/3)} = \frac{Qn}{S^{(1/2)}}$ ……………………………………………………………Eqn (4.5)

Values for discharge, manning's constant and longitudinal slope were substituted into the equation which was solved to obtain the flow depth (y).

The value of the bottom width (B) was chosen as 200mm with side slopes of 1:1 therefore Z=1 to maximize on the available space since it's a minor road. Because it's a rural gravel road, the drainage lining was earth (manning value, **n** of 0.02) from chow. Results for ch 0+000 to 0+690.

Where;

$$A = (B \times y) + (z \times y^2)$$

$$A = (0.2 \times y) + (1 \times y^2)$$

$$\mathbf{A = (0.2y) + (y^2)}$$

$$P = B + 2y \times \sqrt{1 + z^2}$$

$$P = 0.2 + 2y \times \sqrt{1 + 1^2}$$

$$\mathbf{P = 0.2 + 2.82y}$$

$$R = \frac{A}{P}$$

$$\boldsymbol{R} = \frac{(\mathbf{0.2y}) + (\mathbf{y^2})}{\mathbf{0.2 + 2.82y}}$$

By substituting the value of R, A Q, S and n

$$AR^{(2/3)} = \frac{Qn}{S^{(1/2)}}$$

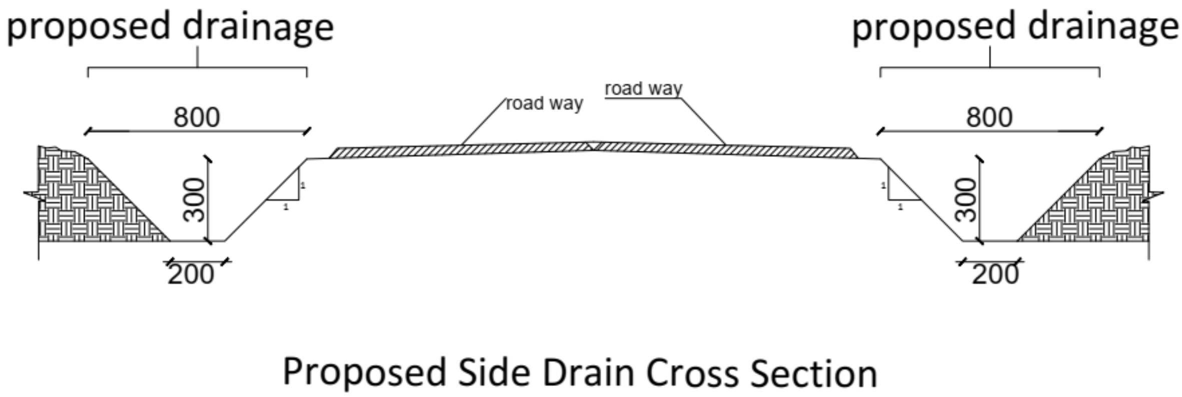
$$((\mathbf{0.2y}) + (\mathbf{y^2})) \times \frac{\left((\mathbf{0.2y}) + (\mathbf{y^2})\right)^{\frac{2}{3}}}{(\mathbf{0.2 + 2.82y})^{\frac{2}{3}}} = \frac{0.234 \times 0.02}{0.012^{\frac{1}{2}}}$$

Hence the value of y= 0.3m (300mm)

Table 4. 10: Tables showing the design values for the two sections

Section 0+000 to 0+690	
shape	trapezoidal
manning's value n	0.02
LONG slope s	1.20
depth y (m)	0.30
bottom width b (m)	0.20
Side slope	1.00
top width (m)	0.80
wetted area A (m2)	0.15
wetted Perimeter P (m)	1.05
Hydraulic radius R	0.141
Design velocity V (m/s)	13.02
design capacity (m3)	2.04
operating velocity (m/s)	3.33

Section 0+690 to 4+440	
shape	trapezoidal
manning's value n	0.02
LONG slope s	1.40
depth y (m)	0.30
bottom width b (m)	0.20
Side slope	1.00
top width (m)	0.80
wetted area A (m2)	0.15
wetted Perimeter P (m)	1.05
Hydraulic radius R	0.141
Design velocity V (m/s)	14.71
design capacity (m3)	2.21
operating velocity (m/s)	3.33



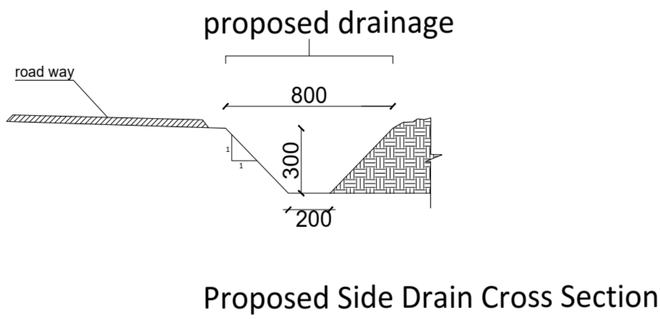


Figure 4. 12: Proposed side drain designs

4.3.2.7 Discussion

The design proposal was done successfully and offered as a solution to the drainage challenges facing this road of which the major issue was lack of proper drainage and alignment designs. However, routine maintenance is required for the drainages to clear any obstructions for them to function optimally.

4.4: Construction concept

During the construction process, it is essential that the drainage features are constructed at the same time as the road formation itself, or preferably (if possible) ahead of formation works. Especially when works are carried out during the rainy season, it is important that the drainage system is functional to avoid completed road formation work from being damaged or washed away. Mitre and discharge drains will lead away unexpected rain water, and a catch water drain may prevent it from reaching the road at all.

4.4.1: Sloping of the side drain

Sloping of the side drain is done in 2 steps. In most cases, first the back slope is cut, and then the fore slope. The reason for this following order is that in road rehabilitation, the best material from the old road surface such as laterite is most likely to be found closer to the centre line, and this is the material, which should preferably be placed back in the top layer of the new formation.

4.4.1.1: Back sloping

Back slope is the slope from the toe of ditch to the top of slope on the backside of the ditch. After ditching is completed, the back slope is cut. The loose material will fall in the ditch, but can easily by shovelled out and thrown on the centre third of the road. Where the cut face behind the side ditch is more than 1.0 meter high, it may be easier to carry out the back sloping operation even before the ditching operation.

4.4.1.2: Fore sloping

Fore slopes extend from the shoulder edge to a drainage ditch directly to the ground surface. The second step of the sloping operation is the cutting of the fore slope. It is again important to see to it that the material is placed on the centre third of the road width. Good organization of the workers and proper assignment of tasks, also contributes to the quality of the works.

4.4.1.3: Construction practices that can improve the design of drainage in Katakwi

- The side drain excavation should be constructed as per the design drawings and should not have irregularities.
- The side drain size should be bigger where the anticipated run-off volume is higher or where it is necessary to increase the material collected from the side drain excavation for the formation.

- The inclination of the side drain should permit the draining of the water into the mitre drains, culverts or water courses.
- The profile of the side drain should be controlled as per standard specifications or as designed and so must its inclination.
- If the soil quality is adequate the material obtained from excavating the side drains should be deposited on the road formation. If the soil is inappropriate it must be deposited out of the side drain area in a layer not thicker than 15 cm or transported away from the road area completely.
- If the mitre drain conducts the water onto natural terrain, the invert level of the mitre at discharge point and the level of the terrain should be the same at the link
- The joints between the culverts should be smooth and closed with concrete to allow the transport of the water without leakage through the joints.
- The backfill around the pipes can be carried out using the material excavated from the trench or gravel approved by the Engineer.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.0: Introduction

This chapter presents the conclusion and recommendations on the details of the findings which include the status of the drainage systems of key rural roads in Katakwi district; the factors that affect the performance of drainage systems of rural roads in Katakwi District and a design for the improvement of the drainage systems for Katakwi district roads.

5.1: Conclusions

The study concluded that none of the rural roads surveyed had good drainage systems. The findings show that 18 per cent of the drainage systems were in a bad state which means that they were in danger of failure or had already failed. Furthermore, the majority of the entire rural road drainage systems i.e. 68 per cent were in a poor state or required major repairs, while only 14 per cent were in a fair state which was an indication of the requirement for minor repairs.

The key factors affecting the performance of the drainage systems of key roads in Katakwi district included poor land use, topography, poor workmanship and construction practices, lack of or inadequate maintenance and flooding. However, the major factor contributing to the poor status of the drainages were lack of proper designs and lack of maintenance.

The design for the improvement of the drainage system focused on road side drains for Korikori-Kapujan. The design was of a trapezoidal section with bottom width of 200mm, depth of 300mm, and side slopes of 1:1. This design proposal was found sufficient to drain away all the necessary storm water. So such designs should be carried out even for rural gravel roads to allow them operate for reasonable periods sustainably.

5.2: Recommendations

Maintenance practices should be given priority; this includes removal and cleaning up of the drains. This can be achieved by increasing budgetary allocation for maintenance. Given that Katakwi district lies in a relatively flat area, efforts should be made to reduce runoff from the structures, this can be done by increasing vegetation cover through tree plantations around the structures and discouraging the creation of impervious layers that lead to high values of water accumulation in these areas. This will increase rainwater infiltration into the ground.

Encouraging rainwater harvesting technologies by building water collection tanks for water storage within the industrial area thus reducing the amount of water that goes as surface runoff in the area hence reducing peak flows drastically.

Discourage encroachment of reserve areas for flood-prone lands thus leaving enough room for plants and machinery for maintenance and repair.

There’s a need for adequate funding for rural road drainage design and construction/ maintenance and the need to use the approved drainage designs while executing and implementing drainage construction on rural roads.

5.3: Improvement of the specifications of drainage manual that can fit condition of drainage of Katakwi

From road design and construction manual volume V July 2018, the standard specifies;

- The minimum bottom width for side drains of 300mm but I would recommend 200mm ; Minimum longitudinal gradient of the side drain of 2% but I would recommend 1.2% for Katakwi district due to it being in a flat terrain and also to reduce the cost of construction and ease of maintenance.

- The minimum culvert diameter size of 600mm but for Katakwi being a flat area I would recommend the inclusion of 450mm diameter size culverts.
- The road gradient of 4%, the maximum allowable mitre drain spacing of 200m but I would recommend 100m for effective water disposal off the road.
- The road gradient of 4%, the scour check interval distance of 17m but I would recommend 10m due to loose type of soil in Katakwi district.

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Appendices

Appendix-1 Form 1: Road Section condition Assessment Form

District & Urban Road **ROAD SECTION CONDITION ASSESSMENT FORM** **Form 1**

District/City Code:		**District/City Name:**		**Municipality/Town Code:**		**Municipality/Town Name:**				
Road Code		**Road Name:**		**Road Class:**		**Start Village:**		**End Village:**		
Surveyed by:		**Survey Date:**		**Survey Vehicle:**		**Weather:**		**Road Condition:**		(Dry or Wet)
Road Length:	**0.00 km**	**Garmin Raw Data File Name:**		**Track Name:**		**Survey Direction:**		(Forward or Reverse)		

Road Sectiton No.	Road Section Chainage (km)		Road Section Length	Road Surface Type	Drainage Condition Factor		Shoulder Condition Factor		Roughness Surface Conditon Factor	Carriageway Width	Shoulder Width	Waypoint (Start point)			Waypoint (End point)			Average Speed	Remarks
	start	end	(km)		left	right	left	right		(m)	(m)	No.	Latitude	Longtitude	No.	Latitude	Longtitude	km/hrs	
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)	(xiv)	(xv)	(xiii)	(xiv)	(xv)	(xxvi)	(xvii)
	Record Odometer Reading in GPS (Start)		*Calculated as (iii) - (ii)*	*Stop and perform Check*	*Stop and perform Visual Check*		*Stop and perform Visual Check*		*Based on Average Speed (xxiv)*	*Stop and perform Measurement*		*Record From GPS*			*Record From GPS*			*Record from GPS the Speed - Moving Avg.*	
	0.00	0.00																	

Appendix-2 Form 2: Structure Inventory / Condition Assessment Form

District & Urban Road | **STRUCTURE INVENTORY / CONDITION ASSESSMENT FORM** | **Form 2**

District/City Code: ______ **District/City Name:** ______ **Municipality/Town Code:** ______ **Municipality/Town Name:** ______

Road Code ______ **Road Name:** ______ **Road Class:** ______

Surveyed by: ______ **Survey Date:** ______ **Road Length:** ______ **km** **Garmin Raw Data File Name:** ______

Structure No.	Waypoint			Structure Type	No. of Spans (bridge only)	Dimensions		Openings (culvert only)		Structure Condition	Comments
	No.	Latitude	Longtitude			Width	Length	Quantity	Size		
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	*(xii)*
	Record From GPS			*(See below)*	*Stop and Conduct Measurements*	*Stop and Conduct Measurements*		*Stop and Conduct Measurements*		*Stop and Conduct Visual Inspection (1 - Good / 2 - Fair / 3 - Poor / 4 - Bad)*	*Record any comments*

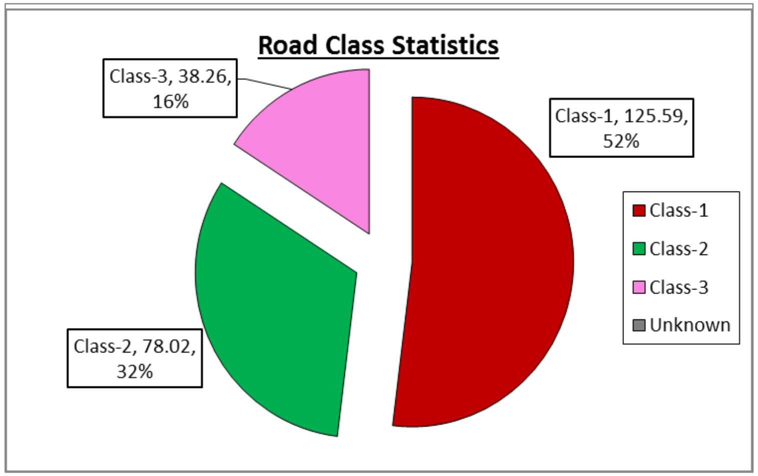
Structure Type

1	R/C bridge	4	Steel Truss bridge	7	Concrete pipe culvert	10	Vented ford
2	Composite bridge	5	Timber bridge	8	Steel pipe culvert	11	Drift
3	Bailey bridge	6	Other Bridge type	9	Concrete box culvert	12	Other structure type

Appendix 3: Statistics

Road Class Statistics(March 2021)

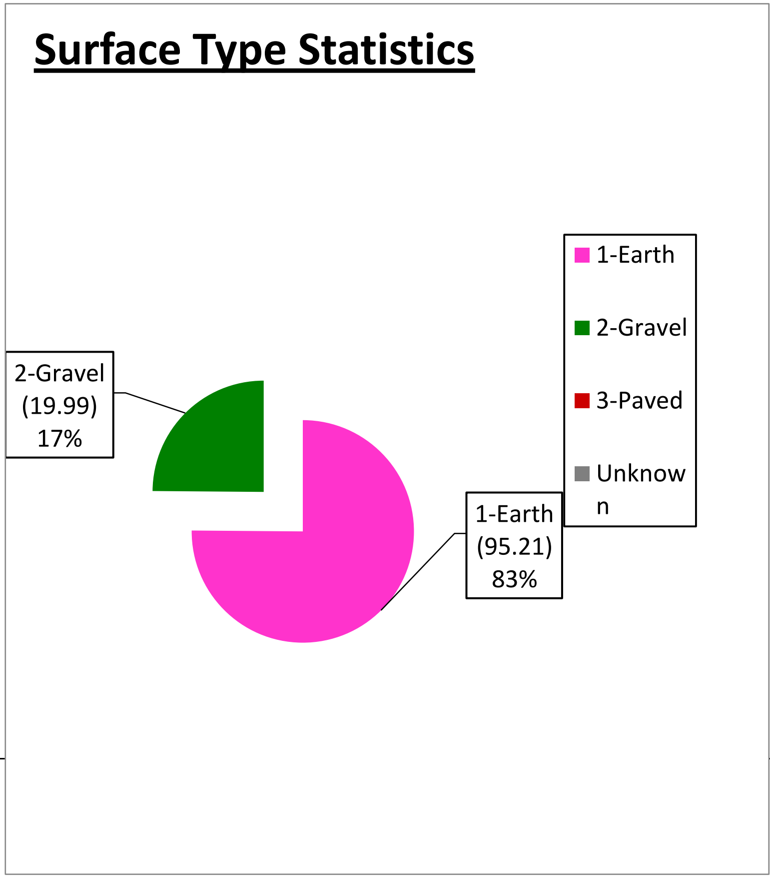
Road Code	Road Name	Class-1	Class-2
2072504	Katakwi - Toroma Road	18.71	0.00
2072510	Toroma - Kokorio Road	11.14	0.00
2072514	Magoro - LakeBisinia Road	7.51	0.00
2072524	Usuk - Ongongoja Road	26.96	0.00
2072525	Kapujan - Kokorio Road	0.00	0.00
2072526	Magoro - LakeOpeta Road	8.61	0.00
2072527	Getom - Toroma Road	0.00	10.66
2072530	Adacar - Arengecora Road	14.73	0.00
2072531	Alelesi - Omodoi - Adere Road	0.00	17.17
2072532	Ngariam - Palaam Road	0.00	0.00
2072533	Odoot - Olupe - Oriao Road	19.93	0.00
2072534	Toroma - Akurao Road	0.00	11.45
2072536	Ongongoja - Obwobwo Road	0.00	0.00
2072537	Omodoi - Ngariam Road	17.99	0.00
2072538	Adacar - Aketa Road	0.00	14.74
2072539	Ocorimongin - Omodoi Road	0.00	12.23
2072540	Odoot - Ngariam Road	0.00	11.77
2072541	Magoro - Angisa Road	0.00	0.00
Grand Total		**125.58**	**78.02**



b) Statistics

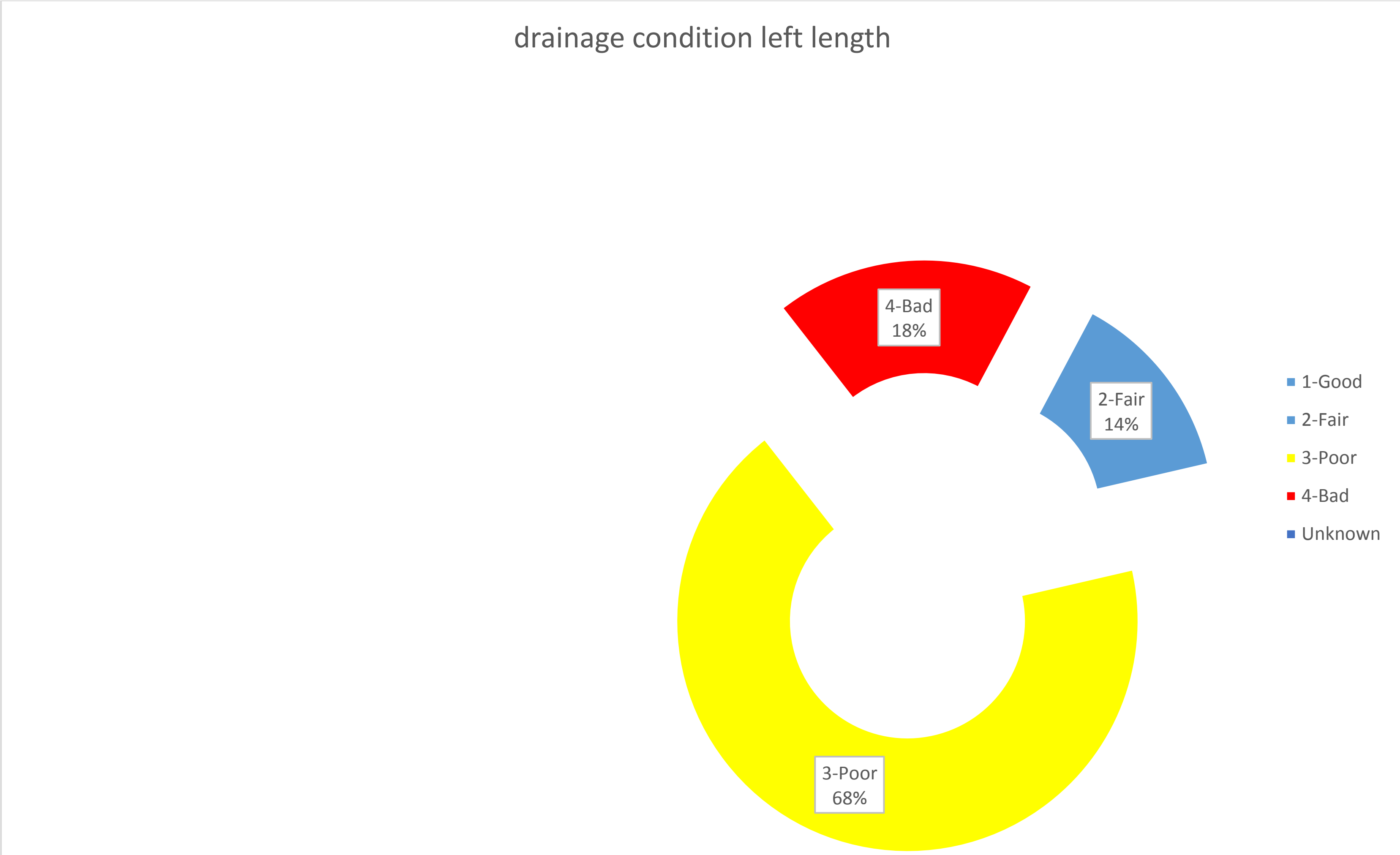
Surface Type Statistics(March 2021)

Road Code	Road Name	1-Earth	2-Gravel	3-Paved	Grand Total
2072504	Katakwi - Toroma Road	3.17	18.71		3.17
2072510	Toroma - Kokorio Road	0.63			0.63
2072514	Magoro - LakeBisinia Road	16.90			16.90
2072524	Usuk - Ongongoja Road	6.76			6.76
2072525	Kapujan - Kokorio Road	11.36			11.36
2072526	Magoro - LakeOpeta Road	7.06			7.06
2072527	Getom - Toroma Road	3.28			3.28
2072530	Adacar - Arengecora Road	4.92			4.92
2072531	Alelesi - Omodoi - Adere Road	5.00			5.00
2072532	Ngariam - Palaam Road	10.31			10.31
2072533	Odoot - Olupe - Oriao Road		4.72		4.72
2072534	Toroma - Akurao Road	5.79			5.79
2072536	Ongongoja - Obwobwo Road	3.54			3.54
2072537	Omodoi - Ngariam Road	1.22			1.22
2072538	Adacar - Aketa Road	2.63			2.63
2072539	Ocorimongin - Omodoi Road	3.47			3.47
2072540	Odoot - Ngariam Road	2.14			2.14
2072541	Magoro - Angisa Road		5.77		5.77
Grand Total		**88.19**	**29.20**	**0.00**	**98.68**



b)
Statistics

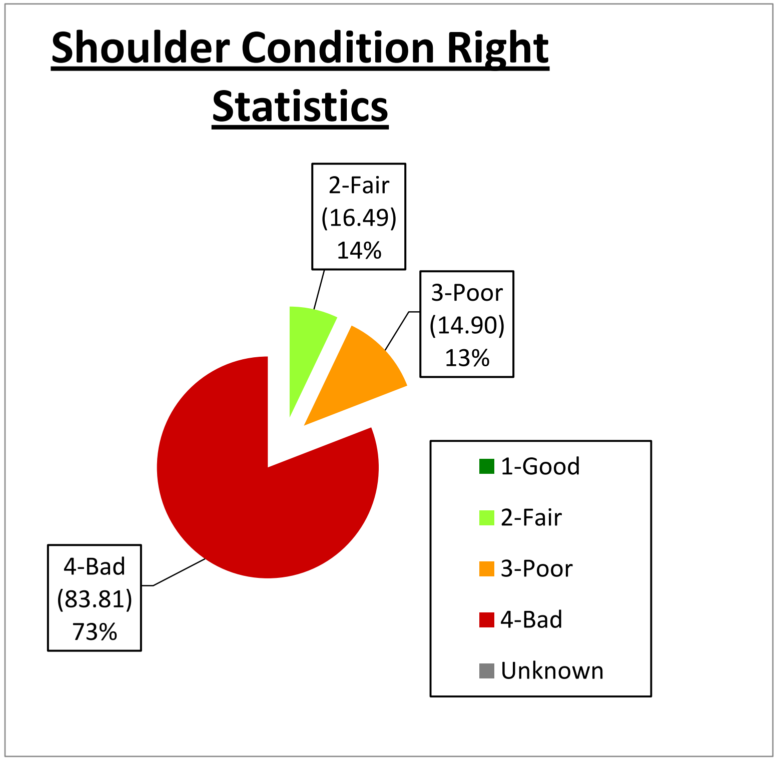
Drainage Condition Left Statistics							
		Drainage Condition Left Length (Km)					
Road Code	**Road Name**	**1-Good**	**2-Fair**	**3-Poor**	**4-Bad**	**Unknown**	**Grand Total**
2072504	Katakwi- Toroma Road		18.42	0.29			18.71
2072504	Toroma - Kokorio Road			4.55	6.59		11.14
2072514	Magoro- Lake Bisina Road			7.51			7.51
2072524	Usuk-Ongongoja Road			21.53	5.43		26.96
2072525	Kapujan- Kokorio Road				4.45		4.45
2072526	Magoro -Lake Opeta Road			8.61			8.61
2072527	Getom- Toroma Road		4.34	1.86	4.47		10.67
2072530	Adacar-Arengecora Road			5.03	9.70		14.73
2072531	Alelesi-Omodoi Adere Road			17.17			17.17
2072532	Ngariam -Palam Road		7.90		5.96		13.86
2072533	Odoot- Olupe Oriao Road			19.93			19.93
2072534	Toroma- Okurao Road			11.45			11.45
2072536	Ongongoja-Obwobwo Road			5.11			5.11
2072537	Omodoi -Ngariam Road			16.01	1.98		17.99
2072538	Adacar- Aketa Road		2.25	12.50			14.75
2072539	Ocorimomgin- Omodoi Road			6.48	5.75		12.23
2072540	Odoot- Ngariam Road			11.77			11.77
2072541	Magoro-Angisa Road			14.85			14.85
Grand Total		**0.00**	**32.91**	**164.65**	**44.33**	**0.00**	**241.89**


drainage condition left length
4-Bad
18%
2-Fair
14%
3-Poor
68%
1-Good
2-Fair
3-Poor
4-Bad
Unknown

b)
Statistics
Shoulder Condition Right Statistics(March 2021)

District Road Network

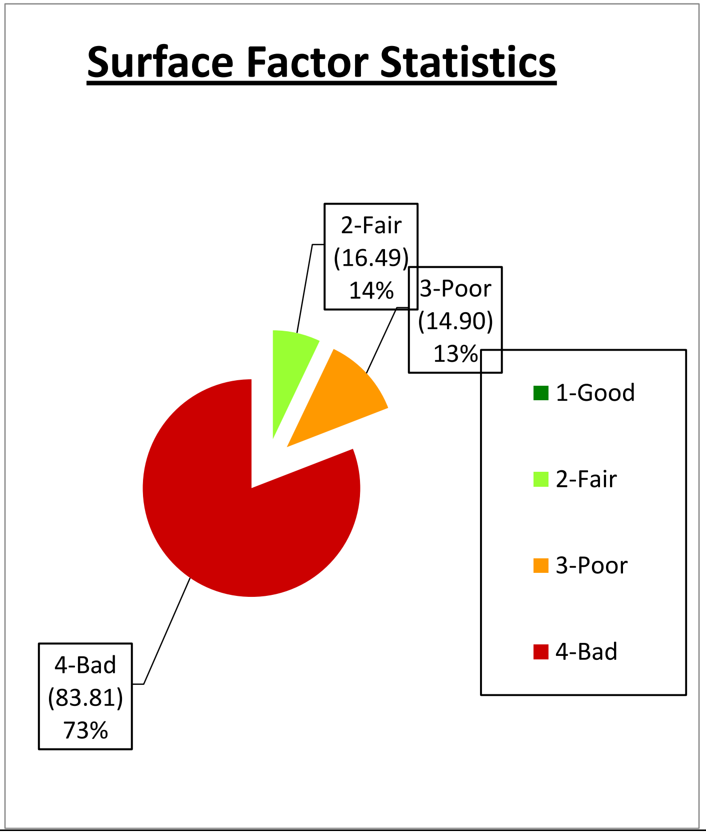
Road Code	Road Name	1-Good	2-Fair	3-Poor	4-Bad	Grand Total
2072504	Katakwi - Toroma Road				3.17	3.17
2072510	Toroma - Kokorio Road				0.63	0.63
2072514	Magoro - LakeBisinia Road				16.90	16.90
2072524	Usuk - Ongongoja Road				6.76	6.76
2072525	Kapujan - Kokorio Road			5.46	5.90	11.36
2072526	Magoro - LakeOpeta Road				7.06	7.06
2072527	Getom - Toroma Road				3.28	3.28
2072530	Adacar - Arengecora Road				4.92	4.92
2072531	Alelesi - Omodoi - Adere Road				5.00	5.00
2072532	Ngariam - Palaam Road				10.31	10.31
2072533	Odoot - Olupe - Oriao Road			4.72		4.72
2072534	Toroma - Akurao Road				5.79	5.79
2072536	Ongongoja - Obwobwo Road				3.54	3.54
2072537	Omodoi - Ngariam Road		1.22			1.22
2072538	Adacar - Aketa Road			1.70	0.93	2.63
2072539	Ocorimongin - Omodoi Road				3.47	3.47
2072540	Odoot - Ngariam Road				2.14	2.14
2072541	Magoro - Angisa Road		5.77			5.77



Grand Total	**0.00**	**6.99**	**11.88**	**79.81**	**98.68**

b)
Statistics
Surface Condition Factor Statistics(March 2021)

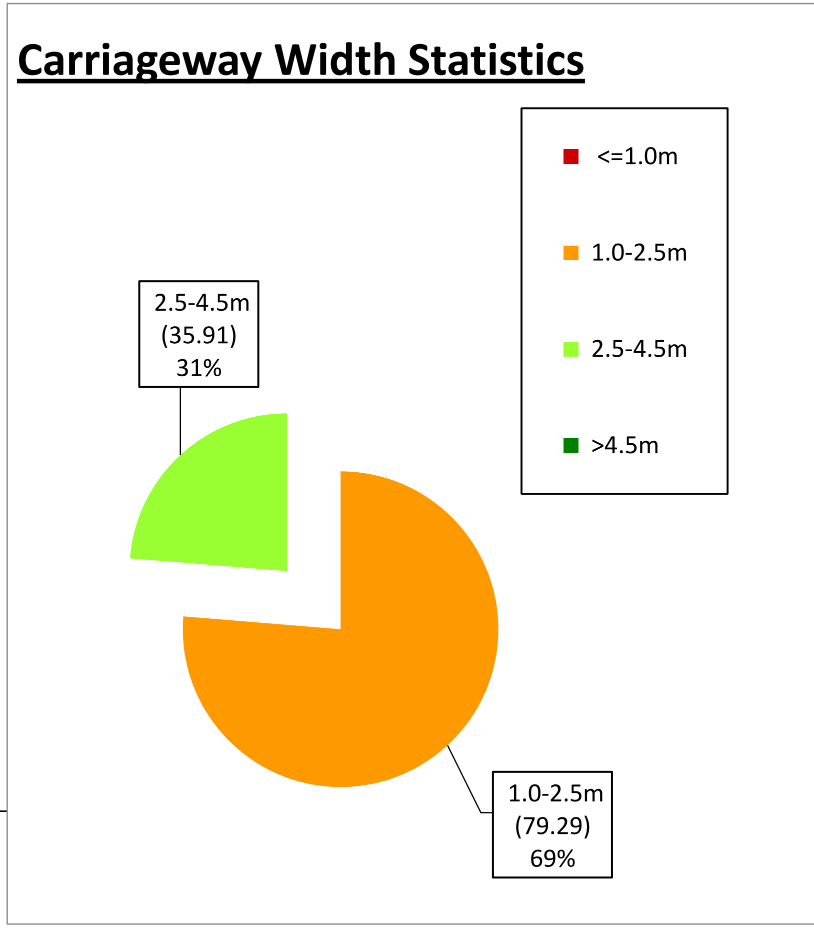
		Surface Condition Factor Length (Km)				
Road Code	**Road Name**	**1-Good**	**2-Fair**	**3-Poor**	**4-Bad**	**Grand Total**
2072504	Katakwi - Toroma Road				3.17	3.17
2072510	Toroma - Kokorio Road				0.63	0.63
2072514	Magoro - LakeBisinia Road				16.90	16.90
2072524	Usuk - Ongongoja Road				6.76	6.76
2072525	Kapujan - Kokorio Road			5.46	5.90	11.36
2072526	Magoro - LakeOpeta Road				7.06	7.06
2072527	Getom - Toroma Road				3.28	3.28
2072530	Adacar - Arengecora Road				4.92	4.92
2072531	Alelesi - Omodoi - Adere Road				5.00	5.00
2072532	Ngariam - Palaam Road				10.31	10.31
2072533	Odoot - Olupe - Oriao Road			4.72		4.72
2072534	Toroma - Akurao Road				5.79	5.79
2072536	Ongongoja - Obwobwo Road				3.54	3.54
2072537	Omodoi - Ngariam Road		1.22			1.22
2072538	Adacar - Aketa Road			1.70	0.93	2.63
2072539	Ocorimongin - Omodoi Road				3.47	3.47
2072540	Odoot - Ngariam Road				2.14	2.14
2072541	Magoro - Angisa Road		5.77			5.77
Grand Total		**0.00**	**6.99**	**11.88**	**79.81**	**98.68**



b) Statistics

Carriageway Width Statistics(March 2021)

		Length of Carriageway Width (Km)				
Road Code	**Road Name**	**<=1.0m**	**1.0-2.5m**	**2.5-4.5m**	**>4.5m**	**Grand Total**
2072504	Katakwi - Toroma Road		3.17			3.17
2072510	Toroma - Kokorio Road		0.63			0.63
2072514	Magoro - LakeBisinia Road		16.90			16.90
2072524	Usuk - Ongongoja Road		6.76			6.76
2072525	Kapujan - Kokorio Road		4.02	7.34		11.36
2072526	Magoro - LakeOpeta Road		7.06			7.06
2072527	Getom - Toroma Road		3.28			3.28
2072530	Adacar - Arengecora Road		4.92			4.92
2072531	Alelesi - Omodoi - Adere Road		5.00			5.00
2072532	Ngariam - Palaam Road		10.31			10.31
2072533	Odoot - Olupe - Oriao Road			4.72		4.72
2072534	Toroma - Akurao Road		3.15	2.64		5.79
2072536	Ongongoja - Obwobwo Road		3.54			3.54
2072537	Omodoi - Ngariam Road			1.22		1.22
2072538	Adacar - Aketa Road		0.93	1.70		2.63
2072539	Ocorimongin - Omodoi Road		3.47			3.47
2072540	Odoot - Ngariam Road		2.14			2.14
2072541	Magoro - Angisa Road			5.77		5.77



Grand Total	**0.00**	**75.29**	**23.39**	**0.00**	**98.68**

b) Statistics

Shoulder Width Statistics(March 2021)

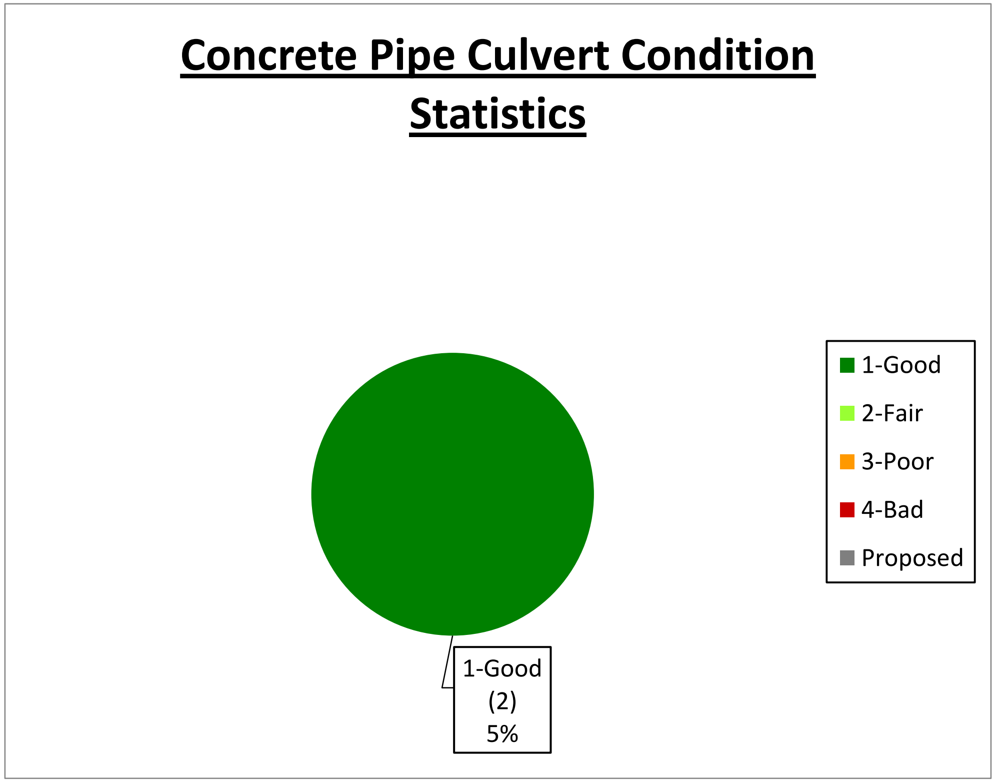
		Shoulder Width Length (km)		
		Narrow	**Wide**	**Grand Total**
Road Code	**Road Name**	**<= 1m**	**> 1m**	
2072504	Katakwi - Toroma Road	3.17		3.17
2072510	Toroma - Kokorio Road	0.63		0.63
2072514	Magoro - LakeBisinia Road	16.90		16.90
2072524	Usuk - Ongongoja Road	6.76		6.76
2072525	Kapujan - Kokorio Road	11.36		11.36
2072526	Magoro - LakeOpeta Road	7.06		7.06
2072527	Getom - Toroma Road	3.28		3.28
2072530	Adacar - Arengecora Road	4.92		4.92
2072531	Alelesi - Omodoi - Adere Road	5.00		5.00
2072532	Ngariam - Palaam Road	10.31		10.31
2072533	Odoot - Olupe - Oriao Road	4.72		4.72
2072534	Toroma - Akurao Road	5.79		5.79
2072536	Ongongoja - Obwobwo Road	3.54		3.54
2072537	Omodoi - Ngariam Road	1.22		1.22
2072538	Adacar - Aketa Road	2.63		2.63
2072539	Ocorimongin - Omodoi Road	3.47		3.47
2072540	Odoot - Ngariam Road	2.14		2.14
2072541	Magoro - Angisa Road	5.77		5.77
Grand Total		**98.68**	**0.00**	**98.68**

b) Structure Statistics

Structure Condition Statistics(March 2021)

		Concrete Pipe Culvert				**Steel Pipe Culvert**				
Road Code	**Road Name**	**1-Good**	**2-Fair**	**3-Poor**	**4-Bad**	**1-Good**	**2-Fair**	**3-Poor**	**4-Bad**	**Total**
2072504	Katakwi - Toroma Road	11	15	2	0					**28**
2072510	Toroma - Kokorio Road	2	1	4	4					**11**
2072514	Magoro - LakeBisinia Road		0	1	1					**2**
2072524	Usuk - Ongongoja Road	9	21	10	1					**42**
2072525	Kapujan - Kokorio Road		1	4	1		**2**			**8**
2072526	Magoro - LakeOpeta Road		2	4	2					**8**
2072527	Getom - Toroma Road		6	2	5					**13**
2072530	Adacar - Arengecora Road	1	11	2	0					**14**
2072531	Alelesi - Omodoi - Adere Road	4	12	4	3					**23**
2072532	Ngariam - Palaam Road	4	6	5	2					**17**
2072533	Odoot - Olupe - Oriao Road	11	5	5	1					**22**
2072534	Toroma - Akurao Road	5	1	0	0					**6**
2072536	Ongongoja - Obwobwo Road		1	3	3					**7**
2072537	Omodoi - Ngariam Road	11	7	10	0					**28**
2072538	Adacar - Aketa Road	2	8	1	1					**12**
2072539	Ocorimongin - Omodoi Road	5	9	3	1					**18**

2072540	Odoot - Ngariam Road	1	13	1	0					**15**
2072541	Magoro - Angisa Road	3	12	6	2					**23**
Grand Total		**69**	**131**	**67**	**27**		**2**			**297**

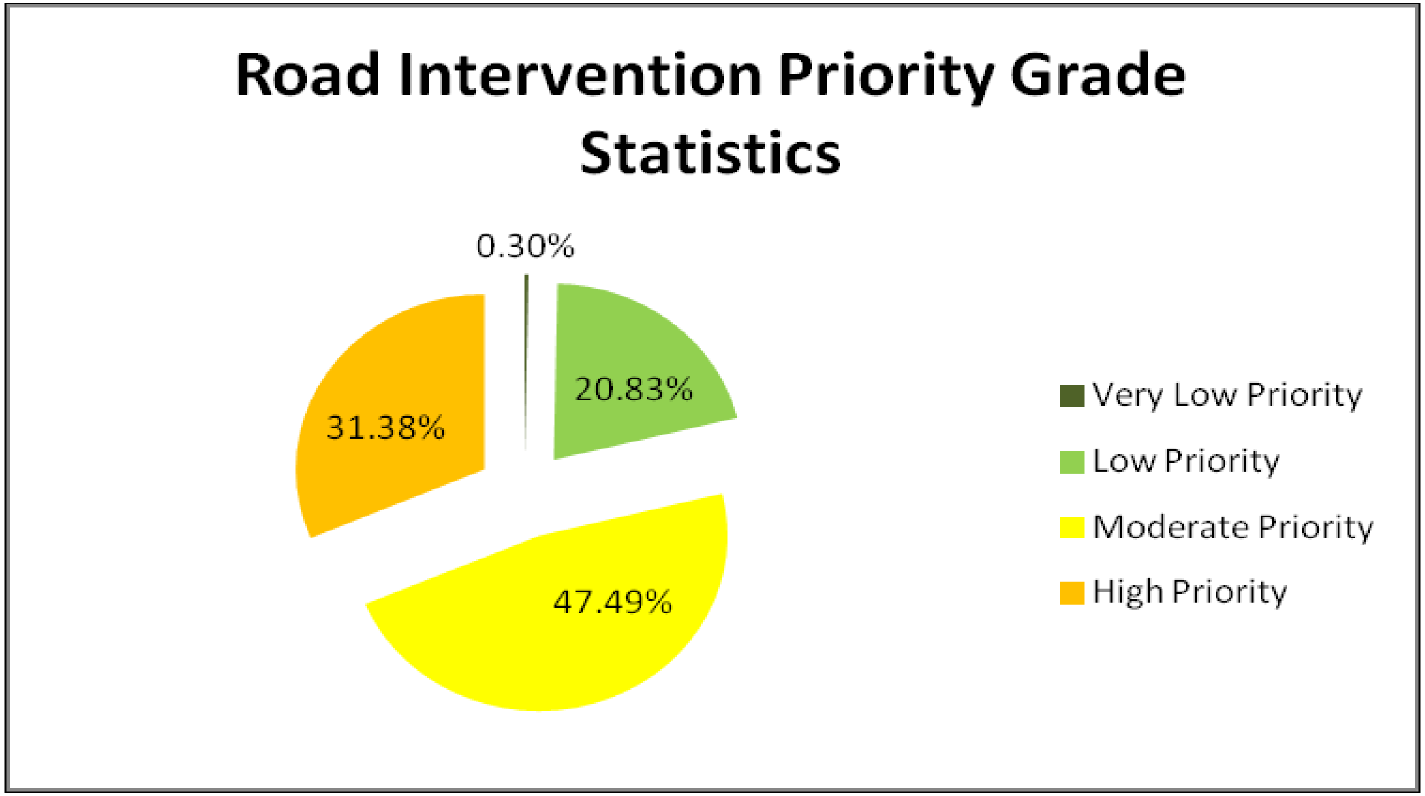


b) Structure Statistics

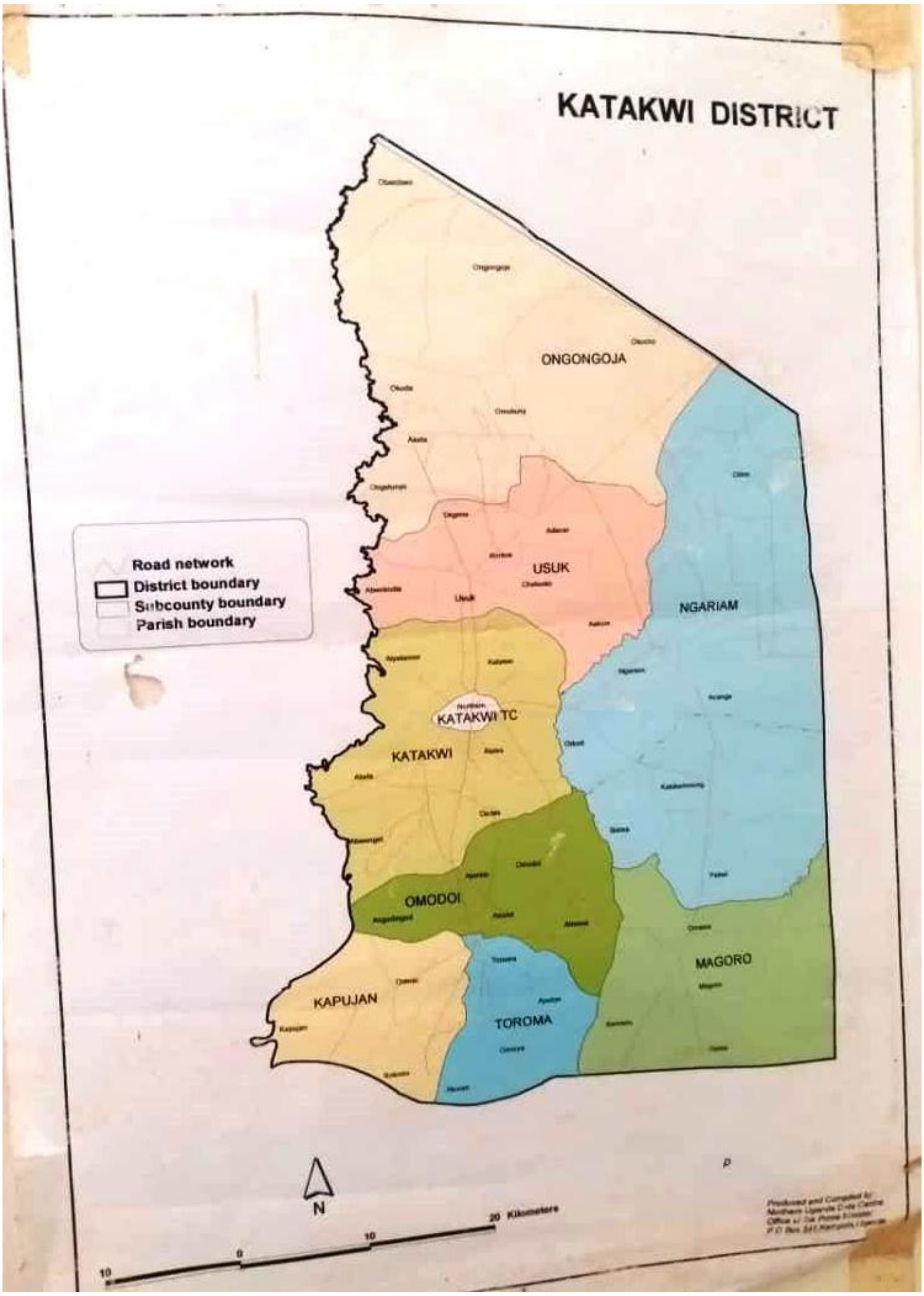
Structure Condition Statistics (March 2021)

		Ranking in (Km)				
Road Code	**Road Name**	**Very Low Priority**	**Low Priority**	**Moderate Priority**	**High Priority**	**Total Length**
2072504	Katakwi - Toroma Road	0	18.71	0	0	18.71
2072510	Toroma - Kokorio Road	0	0.92	5.03	5.19	11.14
2072514	Magoro - LakeBisinia Road	0	0	1.06	6.45	7.51
2072524	Usuk - Ongongoja Road	0	0.67	9.48	16.81	26.96
2072525	Kapujan - Kokorio Road	0	0	0	4.45	4.45
2072526	Magoro - LakeOpeta Road	0	0	8.27	0.34	8.61
2072527	Getom - Toroma Road	0	4.34	0.57	5.76	10.67
2072530	Adacar - Arengecora Road	0	0	9.72	5.01	14.73
2072531	Alelesi - Omodoi - Adere Road	0	0	9.57	7.6	17.17
2072532	Ngariam - Palaam Road	0	2.38	11.48	0	13.86
2072533	Odoot - Olupe - Oriao Road	0.74	11.54	7.66	0	19.94
2072534	Toroma - Akurao Road	0	1.92	4.5	5.03	11.45
2072536	Ongongoja - Obwobwo Road	0	0	3.47	1.64	5.11
2072537	Omodoi - Ngariam Road	0	2.59	14.39	1.01	17.99
2072538	Adacar - Aketa Road	0	0	7.77	6.97	14.74
2072539	Ocorimongin - Omodoi Road	0	0	6.56	5.67	12.23

2072540	Odoot - Ngariam Road	0	5.01	6.03	0.73	11.77
2072541	Magoro - Angisa Road		2.29	9.32	3.24	14.85
Grand Total		**0**	**50.37**	**114.88**	**75.9**	**241.89**



Appendix 4: Map of Katakwi District roads



Appendix 5: Google map showing details of Kapujan-Kokorio Road

Appendix 6: Rainfall Data

Station Number : 82245 **Year: 1970**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	-	-	-	52.662	9.270	1.899	0.006
2	-	-	-	-	-	-	-	-	51.531	8.778	1.756	0.002
3	-	-	-	-	-	-	-	-	47.511	7.733	1.620	0.000
4	-	-	-	-	-	-	-	-	44.323	6.848	1.553	0.000
5	-	-	-	-	-	-	-	-	42.139	6.029	1.553	0.000
6	-	-	-	-	-	-	-	-	38.475	5.726	1.553	0.000
7	-	-	-	-	-	-	-	-	37.139	5.432	1.553	0.000
8	-	-	-	-	-	-	-	-	36.065	5.149	1.543	0.000
9	-	-	-	-	-	-	-	-	35.101	4.831	1.148	0.000
10	-	-	-	-	-	-	-	-	34.472	3.920	1.543	0.000
11	-	-	-	-	-	-	-	-	36.065	3.322	1.543	0.000
12	-	-	-	-	-	-	-	-	36.065	3.166	1.379	0.000
13	-	-	-	-	-	-	-	-	33.187	3.572	1.299	0.000
14	-	-	-	-	-	-	-	-	28.740	3.150	1.144	0.000
15	-	-	-	-	-	-	-	-	24.666	3.014	0.991	0.000
16	-	-	-	-	-	-	-	-	21.236	2.997	0.905	0.000
17	-	-	-	-	-	-	-	-	17.925	2.836	0.890	0.000
18	-	-	-	-	-	-	-	-	16.111	2.789	0.803	0.000
19	-	-	-	-	-	-	-	-	15.635	2.431	0.657	0.000
20	-	-	-	-	-	-	-	-	15.588	2.682	0.585	0.000
21	-	-	-	-	-	-	-	-	15.162	2.635	0.574	0.000
22	-	-	-	-	-	-	-	-	14.250	2.458	0.489	0.000
23	-	-	-	-	-	-	-	-	14.382	2.362	0.420	0.000
24	-	-	-	-	-	-	-	-	14.160	2.288	0.323	0.000
25	-	-	-	-	-	-	-	20.769	13.547	2.288	0.256	0.000
26	-	-	-	-	-	-	-	24.828	11.972	2.387	0.218	0.000
27	-	-	-	-	-	-	-	32.356	11.412	2.517	0.155	0.000
28	-	-	-	-	-	-	-	40.147	11.374	2.302	0.090	0.000
29	-		-	-	-	-	-	47.775	10.954	2.274	0.043	0.000
30	-		-	-	-	-	-	52.458	10.079	2.063	0.018	0.000
31	-		-		-		-	52.765		1.972		0.000
Mean	-	-	-	-	-	-	-	38.728e	26.398	3.844	0.960	0.000
Flow (MCM)	-	-	-	-	-	-	-	103.730e	68.423	10.296	2.488	0.001
Maximum	-	-	-	-	-	-	-	52.765e	52.662	9.270	1.899	0.006
Minimum	-	-	-	-	-	-	-	20.769e	10.079	1.972	0.018	0.000
Runoff (mm)	-	-	-	-	-	-	-	74.045e	48.842	7.349	1.776	0.001

Flow (cumecs)

Annual Statistics

Maximum : - Minimum : - Mean : - cumecs

Total : - Runoff : - mm

Possible data flags

No data stored "-" Estimated values "e"

Station Number : 82245
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Year: 1971

Latitude : 1:51:50 N | Longitude : 33:51:15 E | Elevation : 1042.4 metres | Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.000	0.890	3.408	3.030	6.081	4.461	0.401
2	0.000	0.000	0.000	0.000	0.000	0.000	0.905	3.444	3.114	6.055	4.294	0.377
3	0.000	0.000	0.000	0.000	0.000	0.000	1.008	3.626	3.198	6.370	3.666	0.193
4	0.000	0.000	0.000	0.000	0.000	0.000	1.291	3.626	3.215	6.974	3.285	0.118
5	0.000	0.000	0.000	0.000	0.000	0.000	1.428	3.444	3.215	7.438	3.608	0.101
6	0.000	0.000	0.000	0.000	0.000	0.000	1.543	3.444	3.215	8.675	3.608	0.099
7	0.000	0.000	0.000	0.000	0.000	0.000	1.553	3.626	3.215	8.385	3.250	0.079
8	0.000	0.000	0.000	0.000	0.000	0.000	1.564	3.645	3.198	7.350	3.114	0.049
9	0.000	0.000	0.000	0.000	0.000	0.000	1.663	3.645	3.030	6.372	3.014	0.032
10	0.000	0.000	0.000	0.000	0.000	0.000	1.564	3.645	3.014	5.727	2.824	0.005
11	0.000	0.000	0.000	0.000	0.000	0.000	1.532	3.702	3.030	5.196	2.666	0.000
12	0.000	0.000	0.000	0.000	0.000	0.000	1.329	4.358	3.233	5.148	2.981	0.000
13	0.000	0.000	0.000	0.000	0.000	0.000	1.309	5.080	3.646	4.837	2.997	0.000
14	0.000	0.000	0.000	0.000	0.000	0.000	1.329	5.125	4.070	4.150	2.776	0.000
15	0.000	0.000	0.000	0.000	0.000	0.000	1.522	4.853	4.150	4.109	2.156	0.000
16	0.000	0.000	0.000	0.000	0.000	0.000	1.438	4.397	4.567	4.109	1.850	0.000
17	0.000	0.000	0.000	0.000	0.000	0.000	1.428	4.355	4.588	4.089	1.814	0.000
18	0.000	0.000	0.000	0.000	0.000	0.000	1.428	4.255	4.418	3.892	1.686	0.000
19	0.000	0.000	0.000	0.000	0.000	0.000	1.438	3.306	4.830	4.200	1.564	0.000
20	0.000	0.000	0.000	0.000	0.000	0.001	1.554	3.198	4.897	5.572	1.543	0.000
21	0.000	0.000	0.000	0.000	0.000	0.005	1.675	3.030	5.125	8.178	1.428	0.000
22	0.000	0.000	0.000	0.000	0.000	0.014	1.697	2.997	5.172	8.227	1.300	0.000
23	0.000	0.000	0.000	0.000	0.000	0.030	1.814	2.836	5.361	7.733	1.100	0.000
24	0.000	0.000	0.000	0.000	0.000	0.046	1.850	2.836	4.920	7.733	0.999	0.000
25	0.000	0.000	0.000	0.000	0.000	0.056	2.101	2.997	4.897	7.123	0.947	0.000
26	0.000	0.000	0.000	0.000	0.000	0.091	2.140	3.030	5.172	5.629	0.544	0.000
27	0.000	0.000	0.000	0.000	0.000	0.186	2.317	3.198	5.677	5.408	0.458	0.000
28	0.000	0.000	0.000	0.000	0.000	0.467	2.790	3.215	5.930	4.902	0.453	0.000
29	0.000		0.000	0.000	0.000	0.616	3.014	3.215	6.478	4.610	0.453	0.000
30	0.000		0.000	0.000	0.000	0.769	3.198	3.198	6.586	4.482	0.448	0.000
31	0.000		0.000		0.000		3.233	3.030		4.376		0.000
Mean	0.000	0.000	0.000	0.000	0.000	0.076	1.727	3.605	4.273	5.907	2.176	0.047
Flow (MCM)	0.000	0.000	0.000	0.000	0.000	0.197	4.626	9.657	11.076	15.822	5.641	0.126
Maximum	0.000	0.000	0.000	0.000	0.000	0.769	3.233	5.125	6.586	8.675	4.461	0.401
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.890	2.836	3.014	3.892	0.448	0.000
Runoff (mm)	0.000	0.000	0.000	0.000	0.000	0.141	3.302	6.893	7.906	11.295	4.026	0.090

Flow (cumecs)

Annual Statistics

Maximum : 8.675 | Minimum : 0.000 | Mean : 1.484 | cumecs

Total : 46.811 MCM | Runoff : 33.415 mm

Possible data flags

No data stored "-" | Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Year: 1972

Latitude : 1:51:50 N   Longitude : 33.51:15 E   Elevation : 1042.4 metres   Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.968	0.458	0.001	0.000	0.017
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.743	0.448	0.000	0.000	0.016
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.561	0.401	0.000	0.000	0.011
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.472	0.392	0.000	0.000	0.007
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.443	0.350	0.000	0.000	0.006
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.302	0.341	0.000	0.000	0.005
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.274	0.286	0.000	0.000	0.003
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.066	0.137	0.000	0.000	0.001
9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.319	0.123	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.771	0.094	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.721	0.091	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.775	0.092	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.000	0.001	1.327	0.111	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.000	0.001	2.123	0.113	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	0.000	0.003	2.952	0.113	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	0.000	0.016	3.198	0.123	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	0.000	0.117	3.250	0.123	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	0.000	0.184	3.517	0.103	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	0.000	0.253	3.626	0.101	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.000	0.299	3.663	0.099	0.000	0.002	0.000
21	0.000	0.000	0.000	0.000	0.000	0.000	0.350	3.853	0.082	0.000	0.006	0.000
22	0.000	0.000	0.000	0.000	0.000	0.000	0.444	3.912	0.082	0.000	0.010	0.000
23	0.000	0.000	0.000	0.000	0.000	0.000	0.458	4.232	0.099	0.000	0.016	0.000
24	0.000	0.000	0.000	0.000	0.000	0.000	0.483	4.589	0.101	0.000	0.018	0.000
25	0.000	0.000	0.000	0.000	0.000	0.000	0.544	4.764	0.103	0.000	0.033	0.000
26	0.000	0.000	0.000	0.000	0.000	0.000	0.950	4.818	0.123	0.000	0.035	0.000
27	0.000	0.000	0.000	0.000	0.000	0.000	1.539	3.344	0.125	0.000	0.035	0.000
28	0.000	0.000	0.000	0.000	0.000	0.000	2.038	2.960	0.123	0.000	0.035	0.000
29	0.000	0.000	0.000	0.000	0.000	0.000	2.359	0.843	0.105	0.000	0.030	0.000
30	0.000		0.000	0.000	0.000	0.000	2.621	0.580	0.103	0.000	0.024	0.000
31	0.000		0.000		0.000		2.805	0.514		0.000		0.000
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.499	2.628	0.172	0.000	0.008	0.002
Flow (MCM)	0.000	0.000	0.000	0.000	0.000	0.000	1.336	7.040	0.445	0.000	0.021	0.006
Maximum	0.000	0.000	0.000	0.000	0.000	0.000	2.805	4.818	0.458	0.001	0.035	0.017
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.514	0.082	0.000	0.000	0.000
Runoff (mm)	0.000	0.000	0.000	0.000	0.000	0.000	0.954	5.025	0.317	0.000	0.015	0.004

Flow (cumecs)

Annual Statistics

Maximum : 4.818   Minimum : 0.000   Mean : 0.276   cumecs

Total : 8.721 MCM   Runoff : 6.225 mm

Possible data flags

No data stored "-"   Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Printed on: 15-Feb-2017 Page: 1

Station Number : 82245 **Year: 1973**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	-	-	0.000	0.784	4.089	-	0.000
2	0.000	0.000	0.000	0.000	0.000	-	-	0.000	0.962	4.154	-	0.000
3	0.000	0.000	0.000	0.000	0.000	-	-	0.000	1.351	4.318	-	0.000
4	0.000	0.000	0.000	0.000	0.000	-	-	0.000	1.554	3.760	-	0.000
5	0.000	0.000	0.000	0.000	0.000	-	-	0.000	1.710	3.426	-	0.000
6	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.197	3.216	-	0.000
7	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.828	3.014	-	0.000
8	0.000	0.000	0.000	0.000	0.000	-	-	0.000	3.427	2.820	-	0.000
9	0.000	0.000	0.000	0.000	0.000	-	-	0.000	3.854	2.782	-	0.000
10	0.000	0.000	0.000	0.000	0.000	-	-	0.000	4.089	4.242	-	0.000
11	0.000	0.000	0.000	0.000	0.000	-	-	0.000	3.972	4.991	-	0.000
12	0.000	0.000	0.000	0.000	0.000	-	-	0.000	3.536	5.432	-	0.000
13	0.000	0.000	0.000	0.000	0.000	-	-	0.000	3.116	5.676	-	0.000
14	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.728	5.432	-	0.000
15	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.472	5.149	-	0.000
16	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.472	4.920	-	0.000
17	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.620	5.102	-	0.000
18	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.666	4.875	-	0.000
19	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.965	4.653	-	0.000
20	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.728	4.830	-	0.000
21	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.374	4.610	-	0.000
22	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.127	4.335	-	0.000
23	0.000	0.000	0.000	0.000	0.000	-	-	0.000	1.985	3.893	-	0.000
24	0.000	0.000	0.000	0.000	0.000	-	-	0.000	1.960	3.627	-	0.000
25	0.000	0.000	0.000	0.000	0.000	-	-	0.000	1.875	3.233	-	0.000
26	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.378	2.918	-	0.000
27	0.000	0.000	0.000	0.000	0.000	-	-	0.000	2.982	2.635	-	0.000
28	0.000	0.000	0.000	0.000	0.000	-	-	0.003	3.233	2.374	-	0.000
29	0.000		0.000	0.000	0.000	-	-	0.032	3.646	2.181	-	0.000
30	0.000		0.000	0.000	0.000	-	-	0.185	4.070	2.576	-	0.000
31	0.000		0.000		0.000		-	0.454		2.472		0.000
Mean	0.000	0.000	0.000	0.000	0.000	-	-	0.022	2.622	3.927	-	0.000
Flow (MCM)	0.000	0.000	0.000	0.000	0.000	-	-	0.058	6.796	10.518	-	0.000
Maximum	0.000	0.000	0.000	0.000	0.000	-	-	0.454	4.089	5.676	-	0.000
Minimum	0.000	0.000	0.000	0.000	0.000	-	-	0.000	0.784	2.181	-	0.000
Runoff (mm)	0.000	0.000	0.000	0.000	0.000	-	-	0.042	4.851	7.508	-	0.000

Flow (cumecs)

Annual Statistics

Maximum : - Minimum : - Mean : - cumecs
Total : - Runoff : - mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Year: 1974

Station Number : 82245
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000e	-	-	2.288	0.581	0.715	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	-	-	2.274	0.715	0.715	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	-	-	2.140	0.715	0.592	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	-	-	2.126	0.621	0.585	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	-	-	2.049	0.624	0.645	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	-	-	1.972	0.963	0.615	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	-	-	1.960	1.083	0.580	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	-	-	1.837	1.206	0.547	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	-	-	1.756	1.504	0.514	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	-	-	1.675	1.851	0.509	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	-	-	1.543	1.686	0.453	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	-	-	1.319	1.543	0.397	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	-	-	1.206	1.319	0.342	0.000e	0.000
14	0.000	0.000	0.000	0.000	0.000	-	-	1.187	1.153	0.257	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	-	-	1.083	1.041	0.186	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	-	-	0.913	0.991	0.152	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	-	-	0.846	0.944	0.125	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	-	-	0.728	0.921	0.101	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	-	-	0.651	1.153	0.079	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	-	-	0.580	1.007	0.047	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000	-	-	0.514	0.944	0.019	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000	-	-	0.491	0.897	0.016	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000	-	-	0.849	0.944	0.014	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000	-	-	0.775	0.983	0.043	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000	-	-	0.683	0.897	0.036	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000	-	-	0.585	0.817	0.026	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000	-	-	0.574	0.802	0.014	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000	-	-	0.519	0.728	0.007	0.000	0.000
29	0.000		0.000	0.000	0.000	-	-	0.514	0.651	0.003	0.000	0.000
30	0.000		0.000	0.000	0.000	-	-	0.509	0.597	0.000	0.000	0.000
31	0.000		0.000		0.000		-	0.468		0.000		0.000
Mean	0.000	0.000	0.000	0.000	0.000	-	-	1.181	0.996	0.269	0.000	0.000
Flow (MCM)	0.000	0.000	0.000	0.000	0.000	-	-	3.163	2.581	0.720	0.000	0.000
Maximum	0.000	0.000	0.000	0.000	0.000	-	-	2.288	1.851	0.715	0.000	0.000
Minimum	0.000	0.000	0.000	0.000	0.000	-	-	0.468	0.581	0.000	0.000	0.000
Runoff (mm)	0.000	0.000	0.000	0.000	0.000	-	-	2.258	1.843	0.514	0.000	0.000

Flow (cumecs)

Annual Statistics

Maximum : - Minimum : - Mean : - cumecs Runoff : - mm

Total : -

Possible data flags

No data stored "-" Estimated values "e"

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 1975**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.000	0.803	6.723	125.213	-	-	-
2	0.000	0.000	0.000	0.000	0.000	0.000	0.657	7.289	122.346	-	-	-
3	0.000	0.000	0.000	0.000	0.000	0.000	0.517	7.146	118.485	-	-	-
4	0.000	0.000	0.000	0.000	0.000	0.000	0.453	6.694	103.029	-	-	-
5	0.000	0.000	0.000	0.000	0.000	0.000	0.397	6.863	92.990	-	-	-
6	0.000	0.000	0.000	0.000	0.000	0.000	0.354	7.317	79.045	-	-	-
7	0.000	0.000	0.000	0.000	0.000	0.000	0.397	7.617	78.644	-	-	-
8	0.000	0.000	0.000	0.000	0.000	0.000	0.448	8.772	71.874	-	-	-
9	0.000	0.000	0.000	0.000	0.000	0.000	0.458	9.526	62.917	-	-	-
10	0.000	0.000	0.000	0.000	0.000	0.000	0.514	14.258	55.455	-	-	-
11	0.000	0.000	0.000	0.000	0.000	0.003	0.580	30.058	55.211	-	-	-
12	0.000	0.000	0.000	0.000	0.000	0.037	0.651	41.918	54.691	-	-	-
13	0.000	0.000	0.000	0.000	0.000	0.176	0.728	52.302	48.651	-	-	-
14	0.000	0.000	0.000	0.000	0.000	0.390	0.862	58.347	44.430	-	-	-
15	0.000	0.000	0.000	0.000	0.000	0.509	1.155	60.465	41.331	-	-	-
16	0.000	0.000	0.000	0.000	0.000	0.610	1.522	61.378	39.417	-	-	-
17	0.000	0.000	0.000	0.000	0.000	0.651	1.587	63.221	38.575	-	-	-
18	0.000	0.000	0.000	0.000	0.000	0.710	1.989	62.758	32.632	-	-	-
19	0.000	0.000	0.000	0.000	0.000	1.071	2.702	63.338	28.953	-	-	-
20	0.000	0.000	0.000	0.000	0.000	1.206	3.182	70.368	26.811	-	-	-
21	0.000	0.000	0.000	0.000	0.000	1.319	3.215	108.828	25.553	-	-	-
22	0.000	0.000	0.000	0.000	0.000	1.532	3.339	128.514	23.776	-	-	-
23	0.000	0.000	0.000	0.000	0.000	1.543	3.645	129.784	22.610	-	-	-
24	0.000	0.000	0.000	0.000	0.000	1.438	3.853	-	21.954	-	-	-
25	0.000	0.000	0.000	0.000	0.000	1.418	3.953	-	22.373	-	-	-
26	0.000	0.000	0.000	0.000	0.000	1.309	4.833	-	23.835	-	-	-
27	0.000	0.000	0.000	0.000	0.000	1.153	5.409	-	22.791	-	-	-
28	0.000	0.000	0.000	0.000	0.000	1.041	5.879	-	23.277	-	-	-
29	0.000e		0.000	0.000	0.000	0.983	6.343	-	23.338	-	-	-
30	0.000e		0.000	0.000	0.000	0.897	6.640	-	23.338	-	-	-
31	0.000		0.000		0.000		6.667	-		-		-
Mean	0.000	0.000	0.000	0.000	0.000	0.600	2.379	44.065e	51.785	-	-	-
Flow (MCM)	0.000	0.000	0.000	0.000	0.000	1.555	6.373	118.022e	134.226	-	-	-
Maximum	0.000	0.000	0.000	0.000	0.000	1.543	6.667	129.784e	125.213	-	-	-
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.354	6.694e	21.954	-	-	-
Runoff (mm)	0.000	0.000	0.000	0.000	0.000	1.110	4.549	84.248e	95.814	-	-	-

Flow (cumecs)

Annual Statistics

Maximum : - Minimum : - Mean : - cumecs
Total : - Runoff : - mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 1996**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	0.004	1.189	4.701	9.040	7.074	3.560	0.040
2	-	-	-	-	-	0.004	1.214	4.451	8.643	6.704	3.535	0.027
3	-	-	-	-	-	0.012	1.239	4.311	8.189	6.644	3.371	0.019
4	-	-	-	-	-	0.172	1.244	4.311	7.267	6.348	3.346	0.010
5	-	-	-	-	-	0.234	1.287	4.427	6.704	6.290	3.266	0.004
6	-	-	-	-	-	0.280	1.322	4.441	6.644	5.976	3.251	0.004
7	-	-	-	-	-	0.317	1.399	4.441	6.348	5.673	3.172	0.002
8	-	-	-	-	-	0.323	1.455	4.488	6.290	5.618	3.118	0.001
9	-	-	-	-	-	0.354	1.507	5.246	6.004	5.353	3.057	0.000
10	-	-	-	-	-	0.391	1.512	8.424	5.948	5.301	2.907	0.000
11	-	-	-	-	-	0.451	1.517	9.949	5.673	5.045	2.877	0.000
12	-	-	-	-	-	0.494	1.576	11.039	5.700	5.020	2.733	0.000
13	-	-	-	-	-	0.523	1.762	13.454	6.321	5.020	2.712	0.000
14	-	-	-	-	-	0.553	2.663	17.012	7.367	5.020	2.622	0.000
15	-	-	-	-	-	0.589	3.150	17.390	7.849	4.995	2.401	0.000
16	-	-	-	-	-	0.699	3.436	17.953	8.223	4.749	2.241	-
17	-	-	-	-	-	0.793	3.569	17.953	8.643	4.583	2.089	-
18	-	-	-	-	-	0.869	3.854	17.390	9.040	4.441	1.877	-
19	-	-	-	-	-	0.914	4.078	17.334	9.113	4.427	1.577	-
20	-	-	-	-	-	0.956	4.292	16.950	9.486	4.311	1.363	-
21	-	-	-	-	-	0.997	4.451	15.670	9.561	4.292	1.305	-
22	-	-	-	-	-	1.000	4.701	14.249	9.946	4.198	1.144	-
23	-	-	-	-	-	1.008	4.749	13.620	10.024	4.179	1.046	-
24	-	-	-	-	0.000	1.088	4.995	13.056	10.380	4.087	0.953	-
25	-	-	-	-	0.000	1.136	5.020	12.507	9.985	4.069	0.823	-
26	-	-	-	-	0.000	1.140	4.995	11.973	9.524	3.969	0.623	-
27	-	-	-	-	0.000	1.164	4.749	11.454	9.077	3.871	0.495	-
28	-	-	-	-	0.000	1.189	4.701	10.910	8.643	3.809	0.392	-
29	-	-	-	-	0.000	1.189	4.451	10.025	8.223	3.757	0.290	-
30	-		-	-	0.000	1.189	4.311	9.524	7.784	3.748	0.155	-
31	-		-		0.002		4.513	9.113		3.653		-
Mean	-	-	-	-	0.000e	0.668	3.061	10.896	8.055	4.910	2.077	0.007e
Flow (MCM)	-	-	-	-	0.001e	1.731	8.199	29.183	20.877	13.152	5.383	0.019e
Maximum	-	-	-	-	0.002e	1.189	5.020	17.953	10.380	7.074	3.560	0.040e
Minimum	-	-	-	-	0.000e	0.004	1.189	4.311	5.673	3.653	0.155	0.000e
Runoff (mm)	-	-	-	-	0.001e	1.235	5.853	20.832	14.903	9.388	3.842	0.014e

Flow (cumecs)

Annual Statistics

Maximum : - Minimum : - Mean : - cumecs
Total : - Runoff : - mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 | **Year: 1997**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N | Longitude : 33:51:15 E | Elevation : 1042.4 metres | Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	0.278	0.052	0.142	0.000	0.000	0.006	1.450	0.000	0.148	3.645
2	-	-	0.234	0.053	0.153	0.000	0.000	0.001	1.418	0.000	0.127	3.653
3	-	-	0.178	0.065	0.538	0.000	0.000	0.000	1.241	0.000	0.140	3.662
4	-	-	0.136	0.061	0.804	0.000	0.000	0.000	1.022	0.000	0.211	3.757
5	-	-	0.084	0.073	0.705	0.000	0.000	0.000	0.735	0.000	0.307	3.871
6	-	-	-	0.076	0.619	0.000	0.000	0.000	0.431	0.000	0.368	4.157
7	-	-	-	0.091	0.592	0.000	0.000	0.000	0.211	0.000	0.438	4.923
8	-	-	-	0.093	0.658	0.000	0.000	0.000	0.035	0.000	0.492	5.020
9	-	-	-	0.094	0.868	0.000	0.000	0.000	0.001	0.000	0.523	4.995
10	-	-	-	0.113	1.038	0.000	0.000	0.002	0.000	0.000	0.569	4.749
11	-	-	-	0.124	1.116	0.000	0.000	0.003	0.000	0.000	0.619	4.583
12	-	-	-	0.124	1.181	0.000	0.000	0.002	0.000	0.000	0.681	4.441
13	-	-	0.148	0.114	1.148	0.000	0.000	0.003	0.000	0.000	0.722	4.418
14	-	0.584	0.136	0.143	1.193	0.000	0.000	0.004	0.000	0.000	0.827	4.198
15	-	0.568	0.115	0.227	1.278	0.000	0.001	0.004	0.000	0.000	1.069	4.069
16	-	0.538	0.112	0.604	1.235	0.000	0.001	0.007	0.000	0.000	1.092	3.767
17	-	0.521	0.094	1.007	1.082	0.000	0.000	0.049	0.000	0.000	1.092	3.502
18	-	0.492	0.092	1.168	0.793	0.000	0.000	0.104	0.000	0.000	1.092	3.347
19	-	0.440	0.084	1.077	0.493	0.000	0.000	0.239	0.000	0.000	1.092	3.157
20	-	0.389	0.083	0.696	0.120	0.000	0.000	0.351	0.000	0.000	1.149	2.814
21	-	0.346	0.073	0.251	0.017	0.000	0.002	0.425	0.000	0.000	1.379	2.501
22	-	0.344	0.054	0.141	0.000	0.000	0.016	0.485	0.000	0.000	1.621	2.035
23	-	0.365	0.058	0.075	0.000	0.000	0.268	0.582	0.000	0.000	1.688	1.576
24	-	0.385	0.059	0.028	0.000	0.000	0.362	0.667	0.000	0.000	1.698	1.304
25	-	0.367	0.058	0.004	0.000	0.000	0.385	0.775	0.000	0.000	1.761	1.138
26	-	0.364	0.053	0.000	0.000	0.000	0.367	0.873	0.000	0.000	1.899	0.867
27	-	0.343	0.052	0.000	0.000	0.000	0.354	0.960	0.000	0.009	2.330	0.608
28	-	0.310	0.052	0.000	0.000	0.000	0.328	1.108	0.000	0.103	2.969	0.417
29	-		0.053	0.002	0.000	0.000	0.267	1.189	0.000	0.149	3.339	0.322
30	-		0.058	0.100	0.000	0.000	0.176	1.265	0.000	0.174	3.502	0.253
31	-		0.056		0.000		0.074	1.372		0.163		0.225
Mean	-	0.424e	0.100e	0.222	0.509	0.000	0.084	0.338	0.218	0.019	1.165	2.967
Flow (MCM)	-	1.025e	0.268e	0.575	1.363	0.000	0.225	0.905	0.565	0.052	3.019	7.947
Maximum	-	0.584e	0.278e	1.168	1.278	0.000	0.385	1.372	1.450	0.174	3.502	5.020
Minimum	-	0.310e	0.052e	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.127	0.225
Runoff (mm)	-	0.732e	0.191e	0.410	0.973	0.000	0.160	0.646	0.404	0.037	2.155	5.672

Flow (cumecs)

Annual Statistics

Maximum : - | Minimum : - | Mean : - | cumecs

Total : - | Runoff : - mm

Possible data flags

No data stored "-" | Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Station Number : 82245 **Year: 1998**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.208	0.106	0.000	0.000	0.000	1.344	3.653	6.445	12.598	4.208	10.024	4.464
2	0.190	0.051	0.000	0.000	0.000	1.349	3.662	7.589	12.462	4.179	10.420	4.371
3	0.154	0.021	0.000	0.000	0.000	1.394	3.748	8.223	11.973	4.078	10.460	4.292
4	0.169	0.005	0.000	0.000	0.000	1.403	3.765	8.643	11.454	3.978	10.460	4.189
5	0.253	0.002	0.000	0.000	0.000	1.455	3.853	9.114	10.950	3.969	10.420	4.078
6	0.292	0.001	0.000	0.000	0.000	1.512	3.853	9.987	10.500	3.987	10.024	3.969
7	0.343	0.000	0.000	0.000	0.000	1.576	3.757	10.868	10.460	4.170	9.985	3.862
8	0.377	0.000	0.000	0.000	0.000	1.698	3.662	10.950	10.420	4.179	9.946	3.757
9	0.304	0.000	0.000	0.000	0.000	1.876	3.645	11.245	10.024	4.087	9.561	3.603
10	0.253	0.000	0.000	0.000	0.000	2.031	3.560	11.929	9.946	4.078	9.486	3.404
11	0.244	0.000	0.000	0.000	0.000	2.235	3.552	12.017	9.524	4.106	9.113	3.212
12	0.453	0.000	0.000	0.000	0.000	2.317	3.552	12.553	9.113	4.455	9.076	2.990
13	0.619	0.000	0.000	0.000	0.000	2.394	3.603	13.573	9.151	4.921	8.859	2.792
14	1.202	0.000	0.000	0.000	0.000	2.473	3.653	14.199	9.869	4.535	8.607	2.474
15	1.594	0.000	0.000	0.000	0.000	2.560	3.662	15.484	9.524	4.971	8.223	2.211
16	1.849	0.000	0.000	0.000	0.000	2.799	3.757	20.341	9.077	5.020	7.816	2.065
17	2.019	0.000	0.000	0.000	0.000	2.981	3.853	20.079	8.643	5.020	7.455	1.950
18	2.101	0.000	0.000	0.000	0.000	3.080	3.862	18.763	8.223	5.097	7.422	1.788
19	2.155	0.000	0.000	0.000	0.000	3.259	3.880	17.674	7.849	5.922	7.390	1.662
20	2.107	0.000	0.000	0.000	0.000	3.494	4.060	16.675	7.783	6.498	7.042	1.537
21	2.167	0.000	0.000	0.000	0.007	3.645	4.069	16.032	7.455	7.074	6.704	1.350
22	2.222	0.000	0.000	0.000	0.144	3.662	3.978	15.457	7.232	7.784	6.496	1.214
23	2.071	0.000	0.000	0.000	0.378	3.748	3.915	14.802	7.011	8.470	6.147	1.116
24	1.983	0.000	0.000	0.000	0.503	3.757	3.853	14.150	6.674	9.487	5.784	1.019
25	1.860	0.000	0.000	0.000	0.647	3.809	3.765	13.620	6.177	9.946	5.353	0.874
26	1.472	0.000	0.000	0.000	0.775	3.862	3.774	13.010	5.757	10.024	5.301	0.703
27	1.127	0.000	0.000	0.000	0.954	3.853	3.969	12.018	4.923	10.420	5.045	0.540
28	0.707	0.000	0.000	0.000	1.133	3.765	4.189	11.329	4.583	10.460	5.020	0.415
29	0.535		0.000	0.000	1.218	3.757	4.418	11.800	4.441	10.460	4.995	0.330
30	0.353		0.000	0.000	1.291	3.705	4.488	11.248	4.418	10.420	4.725	0.253
31	0.218		0.000		1.340		5.075	13.295		10.024		0.200
Mean	1.019	0.007	0.000	0.000	0.271	2.693	3.874	13.004	8.607	6.323	7.912	2.280
Flow (MCM)	2.730	0.016	0.000	0.000	0.725	6.980	10.375	34.829	22.309	16.937	20.508	6.107
Maximum	2.222	0.106	0.000	0.000	1.340	3.862	5.075	20.341	12.598	10.460	10.460	4.464
Minimum	0.154	0.000	0.000	0.000	0.000	1.344	3.552	6.445	4.418	3.969	4.725	0.200
Runoff (mm)	1.949	0.012	0.000	0.000	0.517	4.983	7.406	24.862	15.925	12.090	14.639	4.359

Flow (cumecs)

Annual Statistics

Maximum : 20.341 Minimum : 0.000 Mean : 3.832 cumecs
Total : 120.861 MCM Runoff : 86.274 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 1999**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.006	4.441	4.198	6.176	2.513
2	0.131	0.000	0.000	0.000	0.000	0.000	0.000	0.059	4.427	4.189	6.319	2.349
3	0.108	0.000	0.000	0.000	0.000	0.000	0.000	0.098	4.311	4.189	6.290	2.167
4	0.093	0.000	0.000	0.000	0.000	0.000	0.000	0.186	4.245	4.179	6.003	1.990
5	0.074	0.000	0.000	0.000	0.000	0.000	0.000	0.226	4.198	4.087	5.976	1.789
6	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.282	4.292	4.106	5.976	1.601
7	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.364	4.302	4.408	5.976	1.427
8	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.438	4.302	4.441	5.976	1.304
9	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.502	4.302	4.427	5.811	1.304
10	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.641	4.292	4.311	5.618	1.161
11	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.741	4.198	4.302	5.485	0.986
12	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.866	4.179	4.302	5.379	0.870
13	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.932	4.096	4.245	5.592	0.720
14	0.003	0.000	0.000	0.000	0.000	0.000	0.000	1.161	4.189	4.189	5.353	0.633
15	0.001	0.000	0.000	0.000	0.000	0.000	0.000	1.140	4.292	4.198	5.275	0.569
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.104	4.302	4.283	4.774	0.397
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.214	4.302	4.301	4.701	0.238
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.349	4.311	4.998	4.451	0.226
19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.513	4.427	5.619	4.302	0.214
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.693	4.464	5.948	4.189	0.163
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.887	4.701	5.948	4.069	0.136
22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.089	4.725	5.646	3.819	0.113
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.286	4.701	5.353	3.653	0.088
24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.568	4.488	5.327	3.502	0.054
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.967	4.701	5.327	3.355	0.037
26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.349	4.725	5.353	3.266	0.027
27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.645	4.701	5.646	3.196	0.021
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.757	4.464	5.976	2.937	0.018
29	0.000		0.000	0.000	0.000	0.000	0.000	3.889	4.371	6.319	2.726	0.015
30	0.000		0.000	0.000	0.000	0.000	0.000	4.274	4.292	6.614	2.635	0.008
31	0.000		0.000		0.000		0.001	4.427		6.319		0.005
Mean	0.022	0.000	0.000	0.000	0.000	0.000	0.000	1.602	4.391	4.927	4.759	0.747
Flow (MCM)	0.058	0.000	0.000	0.000	0.000	0.000	0.000	4.290	11.382	13.197	12.336	2.000
Maximum	0.158	0.000	0.000	0.000	0.000	0.000	0.001	4.427	4.725	6.614	6.319	2.513
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	4.096	4.087	2.635	0.005
Runoff (mm)	0.041	0.000	0.000	0.000	0.000	0.000	0.000	3.062	8.125	9.421	8.806	1.428

Flow (cumecs)

Annual Statistics

Maximum : 6.614 Minimum : 0.000 Mean : 1.371 cumecs
Total : 43.225 MCM Runoff : 30.855 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 2000**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.435	3.978	7.834	4.087
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.438	4.255	13.576	4.078
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.416	4.087	14.055	4.069
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.414	3.969	12.645	3.978
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.416	3.871	12.417	3.969
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.438	3.862	11.456	3.960
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.444	3.862	10.542	3.871
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.490	3.926	10.460	3.853
9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.494	4.942	9.992	3.765
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.494	5.676	9.449	3.748
11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.083	0.494	6.556	8.715	3.662
12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.093	0.494	6.319	8.572	3.653
13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.103	0.494	5.786	7.883	3.645
14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.114	0.499	5.046	7.750	3.560
15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.139	0.551	4.593	7.105	3.544
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.187	0.589	4.302	6.828	3.461
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.192	0.681	4.189	6.291	3.395
18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.189	0.756	4.087	5.700	3.258
19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.155	0.836	4.087	5.486	3.164
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.175	0.961	4.727	5.327	3.072
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.178	1.149	6.591	5.327	2.988
22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.194	1.452	7.391	5.301	2.974
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.223	1.769	7.816	5.045	2.849
24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.242	2.231	8.154	5.020	2.719
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.261	2.616	7.621	4.872	2.635
26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.283	2.820	6.859	4.701	2.553
27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.337	3.149	6.291	4.451	2.433
28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.343	3.355	5.700	4.302	2.323
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.343	3.502	5.673	4.198	2.310
30	0.000		0.000	0.000	0.000	0.000	0.000	0.344	3.706	5.976	4.179	2.241
31	0.000		0.000		0.000		0.000	0.380		6.379		2.167
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.155	1.219	5.373	7.649	3.290
Flow (MCM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.414	3.161	14.392	19.827	8.812
Maximum	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.380	3.706	8.154	14.055	4.087
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.414	3.862	4.179	2.167
Runoff (mm)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.296	2.256	10.273	14.153	6.290

Flow (cumecs)

Annual Statistics

Maximum : 14.055 Minimum : 0.000 Mean : 1.474 cumecs
Total : 46.607 MCM Runoff : 33.270 mm

Possible data flags

No data stored "-" Estimated values "e"

Station Number : 82245 **Year: 2001**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.059	0.144	0.000	0.000	0.002	0.143	0.796	1.512	4.332	9.449	5.046	9.992
2	1.955	0.118	0.000	0.000	0.009	0.126	0.832	1.542	6.725	8.787	4.749	9.486
3	1.854	0.084	0.000	0.000	0.022	0.125	0.869	1.849	6.616	10.040	4.701	9.077
4	1.761	0.056	0.000	0.000	0.065	0.124	0.876	1.826	5.784	11.800	4.451	8.643
5	1.719	0.040	0.000	0.000	0.095	0.115	0.914	1.788	6.413	11.454	4.311	8.223
6	1.601	0.027	0.000	0.000	0.136	0.131	0.956	1.751	8.057	10.629	4.245	7.589
7	1.512	0.020	0.000	0.000	0.176	0.149	1.000	1.698	8.555	9.116	4.189	6.500
8	1.455	0.015	0.000	0.000	0.208	0.162	1.046	1.724	12.264	8.023	4.189	5.700
9	1.372	0.010	0.000	0.000	0.238	0.167	1.092	1.756	14.205	7.044	4.198	5.592
10	1.287	0.006	0.000	0.000	0.225	0.203	1.136	1.761	16.252	6.321	4.302	5.046
11	1.197	0.003	0.000	0.000	0.208	0.192	1.164	1.832	17.391	5.647	4.151	4.725
12	1.160	0.002	0.000	0.000	0.185	0.177	1.193	2.030	18.888	5.071	4.775	4.441
13	1.092	0.000	0.000	0.000	0.164	0.156	1.239	2.305	22.236	4.995	6.024	4.152
14	1.046	0.000	0.000	0.000	0.163	0.131	1.287	2.460	24.037	4.725	8.247	4.023
15	1.000	0.000	0.000	0.000	0.165	0.117	1.295	2.473	25.576	4.464	10.385	3.951
16	0.935	0.000	0.000	0.003	0.202	0.150	1.340	2.479	25.936	4.427	11.764	3.757
17	0.852	0.000	0.000	0.011	0.258	0.191	1.371	2.574	28.157	4.311	13.479	3.560
18	0.775	0.000	0.000	0.014	0.290	0.225	1.413	2.878	28.307	4.292	13.619	3.436
19	0.728	0.000	0.000	0.012	0.323	0.261	1.561	3.080	27.403	4.198	13.667	3.172
20	0.765	0.000	0.000	0.007	0.364	0.298	1.642	3.339	25.863	4.189	14.150	2.981
21	0.719	0.000	0.000	0.003	0.385	0.321	1.805	3.452	25.576	4.189	14.496	2.728
22	0.666	0.000	0.000	0.003	0.365	0.356	1.815	3.552	24.104	4.189	14.794	2.553
23	0.600	0.000	0.000	0.003	0.344	0.412	1.756	3.653	23.287	4.198	14.744	2.427
24	0.538	0.000	0.000	0.002	0.341	0.440	1.693	3.828	21.927	4.302	14.199	2.163
25	0.481	0.000	0.000	0.001	0.310	0.469	1.631	4.161	19.474	4.474	13.573	1.833
26	0.427	0.000	0.000	0.000	0.270	0.523	1.576	4.189	18.703	4.996	12.553	1.627
27	0.376	0.000	0.000	0.000	0.247	0.581	1.541	4.179	17.619	5.301	11.973	1.432
28	0.312	0.000	0.000	0.000	0.275	0.636	1.512	4.087	15.932	5.541	11.204	1.318
29	0.269		0.000	0.000	0.251	0.719	1.512	4.087	12.999	6.261	10.500	1.239
30	0.218		0.000	0.000	0.209	0.787	1.512	4.179	9.761	6.261	10.460	1.164
31	0.184		0.000		0.170		1.512	4.179		5.647		1.069
Mean	0.997	0.019	0.000	0.002	0.215	0.286	1.319	2.781	17.413	6.269	9.115	4.310
Flow (MCM)	2.671	0.045	0.000	0.005	0.576	0.742	3.533	7.448	45.133	16.791	23.625	11.543
Maximum	2.059	0.144	0.000	0.014	0.385	0.787	1.815	4.189	28.307	11.800	14.794	9.992
Minimum	0.184	0.000	0.000	0.000	0.002	0.115	0.796	1.512	4.332	4.189	4.189	1.069
Runoff (mm)	1.907	0.032	0.000	0.004	0.411	0.530	2.522	5.317	32.217	11.986	16.864	8.240

Flow (cumecs)

Annual Statistics

Maximum : 28.307 Minimum : 0.000 Mean : 3.560 cumecs
Total : 112.281 MCM Runoff : 80.149 mm

Possible data flags

No data stored "-" Estimated values "e"

Station Number : 82245 **Year: 2002**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.997	0.039	0.000	0.000	0.000	1.116	1.160	0.007	0.000	0.000	0.000	0.000
2	0.917	0.035	0.000	0.000	0.000	1.239	1.270	0.004	0.001	0.000	0.000	0.000
3	0.872	0.030	0.000	0.000	0.000	1.344	1.390	0.003	0.005	0.000	0.000	0.000
4	0.829	0.023	0.000	0.000	0.000	1.450	1.399	0.001	0.018	0.000	0.000	0.000
5	0.741	0.016	0.000	0.000	0.000	1.512	1.399	0.000	0.034	0.000	0.000	0.000
6	0.684	0.014	0.000	0.000	0.000	1.566	1.399	0.000	0.045	0.000	0.000	0.000
7	0.633	0.012	0.000	0.000	0.000	1.576	1.394	0.000	0.052	0.000	0.000	0.000
8	0.584	0.010	0.000	0.000	0.000	1.616	1.335	0.000	0.056	0.000	0.000	0.000
9	0.538	0.007	0.000	0.000	0.000	1.512	1.185	0.000	0.059	0.000	0.000	0.000
10	0.494	0.007	0.000	0.000	0.000	1.386	1.001	0.000	0.062	0.000	0.000	0.000
11	0.453	0.006	0.000	0.000	0.000	1.125	0.839	0.000	0.098	0.000	0.000	0.000
12	0.414	0.006	0.000	0.000	0.000	0.915	0.753	0.000	0.094	0.000	0.000	0.000
13	0.377	0.004	0.000	0.000	0.000	0.706	0.644	0.000	0.091	0.000	0.000	0.000
14	0.343	0.003	0.000	0.000	0.000	0.600	0.504	0.000	0.070	0.000	0.000	0.000
15	0.321	0.002	0.000	0.000	0.000	0.681	0.450	0.000	0.040	0.000	0.000	0.000
16	0.290	0.002	0.000	0.000	0.000	0.552	0.270	0.000	0.017	0.000	0.000	0.000
17	0.261	0.001	0.000	0.000	0.000	0.404	0.203	0.000	0.010	0.000	0.000	0.000
18	0.242	0.001	0.000	0.000	0.000	0.308	0.244	0.000	0.009	0.000	0.000	0.000
19	0.225	0.000	0.000	0.000	0.000	0.204	0.216	0.000	0.007	0.000	0.000	0.000
20	0.200	0.000	0.000	0.000	0.000	0.137	0.184	0.000	0.004	0.000	0.000	0.000
21	0.177	0.000	0.000	0.000	0.000	0.084	0.151	0.000	0.003	0.000	0.000	0.000
22	0.163	0.000	0.000	0.000	0.000	0.051	0.129	0.000	0.002	0.000	0.000	0.000
23	0.143	0.000	0.000	0.000	0.001	0.044	0.089	0.000	0.000	0.000	0.000	0.000
24	0.125	0.000	0.000	0.000	0.016	0.094	0.062	0.000	0.000	0.000	0.000	0.000
25	0.113	0.000	0.000	0.000	0.092	0.135	0.038	0.000	0.000	0.000	0.000	0.000
26	0.094	0.000	0.000	0.000	0.207	0.357	0.023	0.000	0.000	0.000	0.000	0.000
27	0.083	0.000	0.000	0.000	0.344	0.550	0.012	0.000	0.000	0.000	0.000	0.000
28	0.071	0.000	0.000	0.000	0.506	0.751	0.009	0.000	0.000	0.000	0.000	0.000
29	0.059		0.000	0.000	0.767	0.932	0.008	0.000	0.000	0.000	0.000	0.000
30	0.052		0.000	0.000	0.794	1.046	0.009	0.000	0.000	0.000	0.000	0.000
31	0.043		0.000		0.972		0.008	0.000		0.000		0.000
Mean	0.372	0.008	0.000	0.000	0.119	0.800	0.573	0.001	0.026	0.000	0.000	0.000
Flow (MCM)	0.997	0.019	0.000	0.000	0.320	2.073	1.536	0.001	0.067	0.000	0.000	0.000
Maximum	0.997	0.039	0.000	0.000	0.972	1.616	1.399	0.007	0.098	0.000	0.000	0.000
Minimum	0.043	0.000	0.000	0.000	0.000	0.044	0.008	0.000	0.000	0.000	0.000	0.000
Runoff (mm)	0.712	0.013	0.000	0.000	0.228	1.480	1.096	0.001	0.048	0.000	0.000	0.000

Flow (cumecs)

Annual Statistics

Maximum : 1.616 Minimum : 0.000 Mean : 0.158 cumecs
Total : 4.990 MCM Runoff : 3.562 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Station Number : 82245 **Year: 2003**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	3.942	4.078	9.077	9.076	13.622	3.164	0.298
2	0.000	0.000	0.000	0.000	0.000	3.889	4.179	9.524	9.300	12.245	3.072	0.280
3	0.000	0.000	0.000	0.000	0.000	4.069	4.198	9.985	9.600	10.912	2.981	0.258
4	0.000	0.000	0.000	0.000	0.000	4.189	4.292	10.420	10.421	9.639	2.892	0.208
5	0.000	0.000	0.000	0.000	0.000	4.292	4.311	10.420	10.909	9.523	2.805	0.159
6	0.000	0.000	0.000	0.000	0.000	4.302	4.474	10.063	10.950	9.523	2.719	0.131
7	0.000	0.000	0.000	0.000	0.000	4.302	4.971	10.420	10.991	9.523	2.635	0.113
8	0.000	0.000	0.000	0.000	0.000	4.302	5.020	10.301	11.411	9.486	2.513	0.093
9	0.000	0.000	0.000	0.000	0.000	4.292	5.020	10.868	11.497	9.113	2.394	0.075
10	0.000	0.000	0.000	0.000	0.000	4.198	5.020	10.909	11.973	9.040	2.323	0.059
11	0.000	0.000	0.000	0.000	0.000	4.179	5.020	10.500	12.553	8.678	2.200	0.043
12	0.000	0.000	0.000	0.000	0.000	4.078	5.020	10.500	13.525	8.607	2.012	0.035
13	0.000	0.000	0.000	0.000	0.000	3.969	5.020	10.909	13.572	8.223	1.826	0.030
14	0.000	0.000	0.000	0.000	0.000	3.862	5.020	10.991	13.102	7.816	1.693	0.025
15	0.000	0.000	0.000	0.000	0.000	3.774	5.020	11.369	13.149	7.233	1.571	0.020
16	0.000	0.000	0.000	0.000	0.002	3.862	5.020	11.503	14.102	6.498	1.460	0.014
17	0.000	0.000	0.000	0.000	0.010	3.951	5.045	11.973	14.298	5.976	1.372	0.009
18	0.000	0.000	0.000	0.000	0.035	3.871	5.327	12.017	15.303	5.487	1.261	0.006
19	0.000	0.000	0.000	0.000	0.094	3.862	5.790	12.462	15.405	4.874	1.136	0.003
20	0.000	0.000	0.000	0.000	0.126	3.853	7.625	12.462	15.457	4.451	1.004	0.002
21	0.000	0.000	0.000	0.000	0.170	3.765	8.161	12.017	15.979	4.302	0.914	0.004
22	0.000	0.000	0.000	0.000	0.246	3.765	9.912	11.461	16.139	4.189	0.832	0.003
23	0.000	0.000	0.000	0.000	0.355	3.862	10.995	10.950	17.224	4.078	0.741	0.002
24	0.000	0.000	0.000	0.000	0.457	3.969	12.285	10.909	17.334	3.969	0.650	0.001
25	0.000	0.000	0.000	0.000	0.907	4.124	11.456	10.500	17.279	3.862	0.579	0.000
26	0.000	0.000	0.000	0.000	1.812	4.170	10.542	10.420	16.729	3.757	0.499	0.000
27	0.000	0.000	0.000	0.000	2.758	3.978	10.222	10.024	16.353	3.653	0.464	0.000
28	0.000	0.000	0.000	0.000	3.301	3.871	9.946	9.908	15.718	3.552	0.410	0.000
29	0.000		0.000	0.000	3.544	3.871	9.524	9.151	15.353	3.452	0.326	0.000
30	0.000		0.000	0.000	3.569	3.969	9.077	9.076	14.745	3.355	0.301	0.000
31	0.000		0.000		3.757		8.714	9.076		3.258		0.000
Mean	0.000	0.000	0.000	0.000	0.682	4.013	6.784	10.650	13.648	6.835	1.625	0.060
Flow (MCM)	0.000	0.000	0.000	0.000	1.827	10.401	18.170	28.526	35.376	18.308	4.212	0.162
Maximum	0.000	0.000	0.000	0.000	3.757	4.302	12.285	12.462	17.334	13.622	3.164	0.298
Minimum	0.000	0.000	0.000	0.000	0.000	3.765	4.078	9.076	9.076	3.258	0.301	0.000
Runoff (mm)	0.000	0.000	0.000	0.000	1.304	7.425	12.970	20.363	25.252	13.069	3.007	0.115

Flow (cumecs)

Annual Statistics

Maximum : 17.334 Minimum : 0.000 Mean : 3.692 cumecs
Total : 116.415 MCM Runoff : 83.100 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Station Number : 82245 **Year: 2004**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	2.892	0.460	0.402	2.167	0.863	0.075	0.223
2	0.000	0.000	0.000	0.000	0.000	2.762	0.480	0.354	2.241	0.810	0.093	0.209
3	0.000	0.000	0.000	0.000	0.000	2.629	0.511	0.312	2.317	0.756	0.118	0.190
4	0.000	0.000	0.000	0.000	0.000	2.479	0.553	0.298	2.433	0.716	0.226	0.143
5	0.000	0.000	0.000	0.000	0.000	2.394	0.600	0.281	2.553	0.649	0.332	0.112
6	0.000	0.000	0.000	0.000	0.000	2.279	0.644	0.283	2.635	0.584	0.302	0.076
7	0.000	0.000	0.000	0.000	0.000	2.161	0.616	0.334	2.712	0.511	0.278	0.060
8	0.000	0.000	0.000	0.000	0.000	2.030	0.587	0.408	2.712	0.464	0.238	0.049
9	0.000	0.000	0.000	0.000	0.000	1.883	0.568	0.402	2.642	0.390	0.158	0.039
10	0.000	0.000	0.000	0.000	0.000	1.632	0.550	0.393	2.642	0.312	0.101	0.030
11	0.000	0.000	0.000	0.000	0.000	1.374	0.526	0.440	2.712	0.269	0.082	0.022
12	0.000	0.000	0.000	0.000	0.000	1.169	0.521	0.492	2.762	0.223	0.056	0.016
13	0.000	0.000	0.000	0.000	0.002	1.043	0.497	0.536	2.856	0.177	0.038	0.011
14	0.000	0.000	0.000	0.000	0.007	0.874	0.492	0.571	2.966	0.138	0.027	0.007
15	0.000	0.000	0.000	0.000	0.031	0.762	0.469	0.616	2.892	0.113	0.019	0.006
16	0.000	0.000	0.000	0.000	0.097	0.700	0.453	0.649	2.805	0.093	0.012	0.014
17	0.000	0.000	0.000	0.000	0.253	0.616	0.438	0.684	2.677	0.075	0.009	0.057
18	0.000	0.000	0.000	0.000	0.378	0.569	0.416	0.737	2.513	0.059	0.007	0.102
19	0.000	0.000	0.000	0.000	0.531	0.523	0.416	0.793	2.355	0.046	0.006	0.150
20	0.000	0.000	0.000	0.000	0.818	0.478	0.440	0.832	2.235	0.040	0.006	0.209
21	0.000	0.000	0.000	0.000	1.188	0.416	0.464	0.893	2.025	0.034	0.006	0.259
22	0.000	0.000	0.000	0.000	1.569	0.377	0.483	0.956	1.794	0.025	0.007	0.280
23	0.000	0.000	0.000	0.000	1.970	0.343	0.541	1.000	1.688	0.018	0.010	0.295
24	0.000	0.000	0.000	0.000	2.495	0.321	0.613	1.073	1.557	0.017	0.022	0.252
25	0.000	0.000	0.000	0.000	2.798	0.295	0.666	1.189	1.314	0.015	0.101	0.200
26	0.000	0.000	0.000	0.000	2.981	0.198	0.713	1.300	1.261	0.013	0.221	0.163
27	0.000	0.000	0.000	0.000	3.149	0.138	0.664	1.513	1.189	0.024	0.241	0.192
28	0.000	0.000	0.000	0.000	3.156	0.260	0.571	1.773	1.140	0.031	0.241	0.143
29	0.000	0.000	0.000	0.000	3.079	0.332	0.523	1.921	1.088	0.045	0.226	0.094
30	0.000		0.000	0.000	3.026	0.392	0.481	2.024	0.997	0.053	0.225	0.070
31	0.000		0.000		2.974		0.440	2.095		0.066		0.065
Mean	0.000	0.000	0.000	0.000	0.984	1.144	0.529	0.824	2.196	0.246	0.116	0.121
Flow (MCM)	0.000	0.000	0.000	0.000	2.635	2.965	1.417	2.208	5.692	0.659	0.301	0.323
Maximum	0.000	0.000	0.000	0.000	3.156	2.892	0.713	2.095	2.966	0.863	0.332	0.295
Minimum	0.000	0.000	0.000	0.000	0.000	0.138	0.416	0.281	0.997	0.013	0.006	0.006
Runoff (mm)	0.000	0.000	0.000	0.000	1.881	2.117	1.011	1.576	4.063	0.471	0.215	0.231

Flow (cumecs)

Annual Statistics

Maximum : 3.156 Minimum : 0.000 Mean : 0.513 cumecs

Total : 16.233 MCM Runoff : 11.587 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Station Number : 82245 **Year: 2005**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.049	0.000	0.000	0.000	0.000	0.027	1.333	1.881	2.473	18.218	8.645	3.853
2	0.032	0.000	0.000	0.000	0.000	0.036	1.634	1.854	2.473	24.600	7.818	3.765
3	0.018	0.000	0.000	0.000	0.000	0.058	1.962	1.815	2.473	31.643	7.105	3.748
4	0.008	0.000	0.000	0.000	0.000	0.079	2.312	1.756	2.479	32.705	7.105	3.653
5	0.007	0.000	0.000	0.000	0.000	0.102	2.622	1.693	2.546	32.958	7.750	3.552
6	0.007	0.000	0.000	0.000	0.000	0.127	2.798	1.636	2.553	30.821	7.816	3.452
7	0.006	0.000	0.000	0.000	0.000	0.184	2.892	1.601	2.594	33.893	7.783	3.355
8	0.003	0.000	0.000	0.000	0.000	0.223	2.966	1.566	2.635	34.231	7.423	3.258
9	0.002	0.000	0.000	0.000	0.000	0.244	2.899	1.517	2.649	33.719	7.042	3.164
10	0.000	0.000	0.000	0.000	0.000	0.290	2.848	1.507	2.805	33.207	6.674	2.997
11	0.000	0.000	0.000	0.000	0.000	0.339	2.798	1.459	2.981	33.123	6.319	2.922
12	0.000	0.000	0.000	0.000	0.000	0.344	2.719	1.450	3.220	32.287	6.004	2.805
13	0.000	0.000	0.000	0.000	0.000	0.365	2.635	1.403	3.536	32.121	5.811	2.719
14	0.000	0.000	0.000	0.000	0.000	0.389	2.553	1.399	3.662	29.731	5.333	2.635
15	0.000	0.000	0.000	0.000	0.000	0.425	2.433	1.399	3.853	25.817	5.020	2.553
16	0.000	0.000	0.000	0.000	0.000	0.444	2.323	1.403	3.978	19.408	4.995	2.433
17	0.000	0.000	0.000	0.000	0.000	0.492	2.310	1.455	4.151	16.677	4.749	2.279
18	0.000	0.000	0.000	0.000	0.000	0.551	2.247	1.517	6.290	15.407	4.725	2.131
19	0.000	0.000	0.000	0.000	0.000	0.600	2.241	1.626	6.382	14.298	4.701	2.018
20	0.000	0.000	0.000	0.000	0.000	0.633	2.235	1.693	6.644	14.400	4.464	1.887
21	0.000	0.000	0.000	0.000	0.000	0.669	2.167	1.751	6.319	16.356	4.371	1.730
22	0.000	0.000	0.000	0.000	0.000	0.716	2.101	1.788	6.032	14.858	4.292	1.626
23	0.000	0.000	0.000	0.000	0.000	0.737	2.059	1.826	6.349	13.667	4.245	1.488
24	0.000	0.000	0.000	0.000	0.000	0.759	2.018	1.887	7.270	13.337	4.198	1.372
25	0.000	0.000	0.000	0.000	0.000	0.790	1.960	1.926	8.830	12.558	4.179	1.291
26	0.000	0.000	0.000	0.000	0.000	0.813	1.949	2.048	9.987	12.151	4.087	1.239
27	0.000	0.000	0.000	0.000	0.000	0.832	1.887	2.434	10.995	11.497	4.023	1.189
28	0.000	0.000	0.000	0.000	0.000	0.852	1.821	2.473	12.465	11.202	3.969	1.116
29	0.000		0.000	0.000	0.000	0.883	1.761	2.513	13.914	10.868	3.960	1.023
30	0.000		0.000	0.000	0.003	1.017	1.761	2.553	15.461	10.025	3.871	0.953
31	0.000		0.000		0.015		1.821	2.513		9.487		0.850
Mean	0.004	0.000	0.000	0.000	0.001	0.467	2.260	1.785	5.600	21.783	5.616	2.357
Flow (MCM)	0.011	0.000	0.000	0.000	0.002	1.211	6.054	4.782	14.515	58.343	14.556	6.312
Maximum	0.049	0.000	0.000	0.000	0.015	1.017	2.966	2.553	15.461	34.231	8.645	3.853
Minimum	0.000	0.000	0.000	0.000	0.000	0.027	1.333	1.399	2.473	9.487	3.871	0.850
Runoff (mm)	0.008	0.000	0.000	0.000	0.001	0.865	4.321	3.413	10.361	41.647	10.391	4.506

Flow (cumecs)

Annual Statistics

Maximum : 34.231 Minimum : 0.000 Mean : 3.323 cumecs

Total : 104.787 MCM Runoff : 74.800 mm

Possible data flags

No data stored "-" Estimated values "e"

Station Number : 82245 **Year: 2006**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.743	0.040	0.000	0.000	0.000	0.003	0.000	0.000	10.686	9.561	9.304	13.185
2	0.719	0.037	0.000	0.000	0.000	0.003	0.000	0.000	14.606	9.754	8.258	18.928
3	0.666	0.034	0.000	0.000	0.001	0.002	0.000	0.000	15.980	9.946	7.589	28.589
4	0.616	0.027	0.000	0.000	0.001	0.002	0.000	0.000	16.621	9.561	6.705	35.212
5	0.581	0.017	0.000	0.000	0.002	0.002	0.000	0.000	17.117	9.715	6.348	38.628
6	0.509	0.011	0.000	0.000	0.002	0.002	0.000	0.000	18.587	9.638	6.408	41.779
7	0.442	0.008	0.000	0.000	0.002	0.002	0.000	0.000	18.761	10.381	7.076	43.262
8	0.414	0.007	0.000	0.000	0.003	0.001	0.000	0.000	19.413	10.500	6.378	45.607
9	0.389	0.006	0.000	0.000	0.003	0.001	0.000	0.001	20.202	10.909	6.290	47.921
10	0.365	0.006	0.000	0.000	0.003	0.002	0.000	0.009	21.581	11.202	5.976	48.027
11	0.343	0.004	0.000	0.000	0.003	0.001	0.000	0.172	22.823	11.454	5.646	46.755
12	0.321	0.003	0.000	0.000	0.002	0.001	0.000	0.261	23.763	11.454	5.302	44.576
13	0.301	0.002	0.000	0.000	0.001	0.001	0.000	0.300	20.966	11.454	4.632	44.270
14	0.288	0.001	0.000	0.000	0.001	0.001	0.000	0.343	18.705	11.411	4.441	41.228
15	0.261	0.001	0.000	0.000	0.002	0.001	0.000	0.385	17.391	10.910	4.427	36.435
16	0.242	0.001	0.000	0.000	0.002	0.001	0.000	0.389	16.675	9.759	4.334	34.405
17	0.225	0.000	0.000	0.000	0.002	0.000	0.000	0.391	15.771	8.437	4.611	34.231
18	0.208	0.000	0.000	0.000	0.002	0.000	0.000	0.412	14.753	7.456	6.366	34.146
19	0.186	0.000	0.000	0.000	0.002	0.000	0.000	0.427	13.863	7.073	7.359	33.208
20	0.176	0.000	0.000	0.000	0.002	0.000	0.000	0.453	15.825	7.042	7.455	32.287
21	0.163	0.000	0.000	0.000	0.001	0.000	0.000	0.480	15.718	7.232	7.816	32.203
22	0.143	0.000	0.000	0.000	0.001	0.000	0.000	0.509	15.353	7.619	8.223	30.380
23	0.125	0.000	0.000	0.000	0.001	0.000	0.000	0.538	14.745	7.849	8.643	14.423
24	0.113	0.000	0.000	0.000	0.002	0.000	0.000	0.556	13.668	8.188	9.077	12.736
25	0.103	0.000	0.000	0.000	0.002	0.000	0.000	0.584	12.783	8.222	9.486	12.017
26	0.089	0.000	0.000	0.000	0.003	0.000	0.000	0.633	11.973	8.432	9.523	11.973
27	0.082	0.000	0.000	0.000	0.003	0.000	0.000	0.690	11.413	9.083	9.523	11.929
28	0.064	0.000	0.000	0.000	0.003	0.000	0.000	0.787	10.542	9.600	9.561	11.454
29	0.052		0.000	0.000	0.002	0.000	0.000	0.899	10.222	10.421	9.985	10.707
30	0.046		0.000	0.000	0.002	0.000	0.000	1.574	9.946	10.867	10.586	9.985
31	0.045		0.000		0.003		0.000	3.959		10.421		9.301
Mean	0.291	0.007	0.000	0.000	0.002	0.001	0.000	0.476	16.015	9.534	7.244	29.348
Flow (MCM)	0.779	0.018	0.000	0.000	0.005	0.002	0.000	1.275	41.511	25.536	18.777	78.606
Maximum	0.743	0.040	0.000	0.000	0.003	0.003	0.000	3.959	23.763	11.454	10.586	48.027
Minimum	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.946	7.042	4.334	9.301
Runoff (mm)	0.556	0.013	0.000	0.000	0.004	0.002	0.000	0.910	29.632	18.228	13.404	56.111

Flow (cumecs)

Annual Statistics

Maximum : 48.027 Minimum : 0.000 Mean : 5.243 cumecs

Total : 165.349 MCM Runoff : 118.031 mm

Possible data flags

No data stored "-" Estimated values "e"

Station Number : 82245

Year: 2007

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	[illegible]	1.821	0.075	[illegible]	0.467	0.084	0.619	13.056	45.502	121.225	6.285	1.921
2	[illegible]	[illegible]	[illegible]	[illegible]	0.389	0.085	0.696	13.961	47.391	119.101	5.700	1.821
3	[illegible]	[illegible]	0.067	[illegible]	0.385	0.070	0.942	15.407	48.783	116.811	5.618	1.756
4	8.019	1.508	0.059	0.000	0.414	0.053	1.325	16.733	49.432	114.364	5.353	1.698
5	7.783	1.301	0.050	0.000	0.440	0.046	1.583	19.006	49.542	110.295	5.327	1.657
6	7.423	1.231	0.043	0.000	0.467	0.041	1.945	20.821	50.866	107.420	5.275	1.576
7	7.042	1.140	0.039	0.000	0.490	0.045	2.167	21.842	53.466	118.551	4.750	1.566
8	6.527	1.046	0.035	0.000	0.467	0.047	2.330	24.806	56.146	114.385	4.464	1.517
9	6.290	0.960	0.030	0.000	0.440	0.059	2.629	27.180	57.576	105.984	4.427	1.507
10	5.976	0.873	0.027	0.000	0.414	0.078	2.885	26.588	58.692	100.537	4.302	1.459
11	[illegible]	0.755	0.023	0.000	0.377	0.094	3.298	25.718	69.381	96.800	4.198	1.450
12	5.018	0.655	0.016	[illegible]	0.343	0.136	4.034	24.521	71.301	85.240	4.170	1.399
13	5.355	0.544	0.012	0.000	0.323	0.182	4.236	23.898	69.275	74.256	3.987	1.344
14	5.275	0.494	0.011	0.000	0.310	0.276	4.371	22.490	119.717	65.131	3.915	1.287
15	4.774	0.469	0.008	0.000	0.301	0.454	4.559	21.581	-	57.596	3.853	1.161
16	4.701	0.458	0.007	0.000	0.321	0.603	4.606	20.324	-	49.485	3.714	0.983
17	4.464	0.364	0.006	0.000	0.337	0.584	4.799	20.947	-	41.035	3.645	0.856
18	4.427	0.360	0.005	0.000	0.273	0.538	5.650	22.359	-	34.879	3.552	0.753
19	[illegible]	0.321	0.003	0.001	0.215	0.494	6.586	23.220	-	30.198	3.452	0.649
20	[illegible]	[illegible]	[illegible]	[illegible]	0.177	0.467	6.644	24.035	-	25.331	3.323	0.587
21	[illegible]	[illegible]	[illegible]	[illegible]	0.144	0.440	6.348	24.939	-	20.966	3.058	0.551
22	[illegible]	0.151	0.002	[illegible]	0.119	0.414	6.319	26.516	-	18.879	3.072	0.519
23	3.544	0.120	0.001	0.000	0.103	0.377	6.348	27.476	-	18.204	2.937	0.698
24	3.363	0.112	0.001	0.000	0.093	0.348	6.674	28.461	-	15.421	2.805	0.403
25	3.212	0.098	0.001	0.000	0.083	0.389	7.011	30.661	-	13.388	2.719	0.341
26	3.019	0.084	0.000	0.000	0.110	0.458	7.073	32.794	-	12.463	2.635	0.292
27	2.812	0.083	0.000	0.000	0.119	0.471	7.587	35.279	-	11.375	2.547	0.261
28	2.719	0.075	0.000	0.000	0.131	0.497	8.229	37.335	-	9.568	2.394	0.242
29	2.629		0.000	0.006	0.135	0.538	9.551	38.720	-	8.092	2.205	0.225
30	[illegible]		[illegible]	[illegible]	0.114	0.584	11.000	41.779	-	7.240	2.030	0.208
31	[illegible]		[illegible]		[illegible]		12.241	43.262		6.675		0.191
Mean	5.059	0.675	0.019	0.004	0.264	0.298	4.977	25.668	60.505e	59.061	3.857	0.996
Flow (MCM)	13.550	1.627	0.052	0.009	0.708	0.773	13.330	68.750	156.829e	158.189	9.998	2.668
Maximum	8.678	1.821	0.075	0.099	0.490	0.603	12.241	43.262	119.717e	121.225	6.285	1.921
Minimum	1.968	0.075	0.000	0.000	0.083	0.041	0.619	13.056	45.502e	6.675	2.030	0.191
Runoff (mm)	[illegible]	1.161	0.037	0.007	0.506	0.552	9.515	49.075	111.949e	112.920	7.137	1.904

Flow (cumecs)

Annual Statistics

Maximum : 121.225e Minimum : 0.000e Mean : 13.448e cumecs

Total : 424.111e MCM Runoff : 302.742e mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 2008**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

[illegible] Longitude : [illegible] Elevation : 1042.1 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.161	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.548	3.915	4.725	7.073
2	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.633	3.969	4.725	7.390
3	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.716	3.951	4.725	7.422
4	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.771	3.766	5.052	7.422
5	0.059	0.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.796	3.679	5.618	7.422
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.836	3.844	5.673	7.422
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.914	3.871	5.976	7.422
8	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	1.001	3.960	6.651	7.422
9	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.092	3.978	7.011	7.422
10	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.304	4.069	6.704	7.422
11	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.621	4.133	6.704	7.422
12	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.800	4.189	7.011	7.390
13	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.157	4.189	7.042	7.073
14	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.394	4.189	7.042	7.042
15	[illegible]	0.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.560	4.189	7.011	6.858
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.769	4.198	6.704	6.674
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.822	4.292	6.674	6.644
18	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.034	4.302	6.674	6.348
19	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.156	4.302	6.674	6.290
20	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.172	4.311	6.674	5.976
21	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.251	4.427	6.496	5.673
22	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.003	3.306	4.441	6.319	5.486
23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	3.363	4.441	6.319	5.275
24	0.000	0.000	0.000	[illegible]	0.000	0.000	0.000	0.014	3.444	4.464	6.290	4.774
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.031	3.502	4.701	6.004	4.701
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.060	3.560	4.725	6.147	4.451
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.109	3.653	4.701	6.348	4.311
28	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.178	3.757	4.464	6.674	4.245
29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.263	3.853	4.441	7.011	4.179
30	0.000		0.000	0.000	0.000	0.000	0.000	0.382	3.862	4.464	7.042	4.078
31	0.000		0.000		0.000		0.000	0.445		4.701		3.969
Mean	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.048	2.322	4.234	6.324	6.216
[illegible]	[illegible]	0.000	[illegible]	[illegible]	0.000	0.000	0.000	0.129	6.018	11.341	16.391	16.649
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.445	3.862	4.725	7.042	7.422
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.548	3.679	4.725	3.969
Runoff (mm)	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.092	4.296	8.096	11.701	11.885

Flow (cumecs)

Annual Statistics

Maximum : [illegible] Minimum : 0.000 Mean : 1.597 cumecs

[illegible] Runoff : 36.058 mm

[illegible] data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 2009**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1 51 50 N   Longitude : 33 51 35 E   Elevation : 1042.4 metres   Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.053	0.000	0.000	0.001	0.000	0.000
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.052	0.000	0.000	0.000	0.000	0.000
3	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.046	0.000	0.000	0.000	0.000	0.000
4	3.452	0.341	0.000	0.000	0.000	0.000	0.045	0.000	0.000	0.000	0.000	0.000
5	3.299	0.300	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000
6	3.034	0.262	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.000	0.000
7	2.892	0.234	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000
8	2.798	0.208	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000
9	2.636	0.185	0.000	0.000	0.000	0.000	0.008	0.000	0.005	0.001	0.000	0.000
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.003	0.004	0.000	0.064	0.001	0.000	0.000
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.004	0.003	0.000	0.132	0.001	0.000	0.000
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.017	0.003	0.000	0.160	0.001	0.000	0.000
13	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.041	0.002	0.000	0.136	0.001	0.000	0.000
14	1.95?	0.099	0.000	0.000	0.000	0.073	0.002	0.000	0.103	0.001	0.000	0.000
15	1.816	0.087	0.000	0.000	0.000	0.089	0.001	0.000	0.079	0.002	0.000	0.000
16	1.631	0.075	0.000	0.000	0.000	0.128	0.000	0.000	0.060	0.002	0.000	0.000
17	1.512	0.058	0.000	0.000	0.000	0.189	0.000	0.000	0.052	0.002	0.000	0.000
18	1.399	0.035	0.000	0.000	0.000	0.208	0.000	0.000	0.046	0.002	0.000	0.000
19	[illegible]	0.029	0.000	0.000	0.000	0.221	0.000	0.000	0.039	0.003	0.000	0.000
20	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.194	0.000	0.000	0.028	0.003	0.000	0.000
21	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.177	0.000	0.000	0.025	0.003	0.000	0.000
22	[illegible]	0.012	0.000	0.000	0.000	0.163	0.000	0.000	0.016	0.002	0.000	0.000
23	0.816	0.009	0.000	0.000	0.000	0.149	0.000	0.000	0.008	0.002	0.000	0.000
24	0.759	0.007	0.000	0.000	0.000	0.131	0.000	0.000	0.006	0.001	0.000	0.000
25	0.759	0.006	0.000	0.000	0.000	0.113	0.000	0.000	0.003	0.001	0.000	0.000
26	0.787	0.003	0.000	0.000	0.000	0.103	0.000	0.000	0.003	0.001	0.000	0.000
27	0.756	0.001	0.000	0.000	0.000	0.092	0.000	0.000	0.002	0.001	0.000	0.000
28	0.716	0.000	0.000	0.000	0.000	0.077	0.000	0.000	0.002	0.001	0.000	0.000
29	[illegible]		[illegible]	[illegible]	0.000	0.082	0.000	0.000	0.002	0.000	0.000	0.000
30	[illegible]		[illegible]	[illegible]	[illegible]	0.070	0.000	0.000	0.001	0.000	0.000	0.000
31			[illegible]		[illegible]		0.000	0.000		0.000		0.000
Mean	1.836	0.135	0.000	0.000	0.000	0.077	0.010	0.000	0.032	0.001	0.000	0.000
Flow (MCM)	4.972	0.326	0.000	0.000	0.000	0.201	0.028	0.000	0.084	0.003	0.000	0.000
Maximum	3.853	0.467	0.000	0.000	0.000	0.221	0.053	0.000	0.160	0.003	0.000	0.000
Minimum	0.523	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Runoff (mm)	3.549	0.233	0.000	0.000	0.000	0.143	0.020	0.000	0.060	0.002	0.000	0.000

Flow (cumecs)

Annual Statistics

Maximum : 3.853   Minimum : 0.000   Mean : 0.176   cumecs
Total : 5.551 MCM   Runoff : 3.962 mm

Possible data flags

No data stored "-"   Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Station Number : 82245 **Year: 2010**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

[illegible] [illegible] Elevation : [illegible] metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.093	4.198	12.506	5.673	5.645	28.459	23.219	4.427
2	0.000	0.000	0.000	0.000	0.093	4.292	12.552	5.645	5.673	29.310	23.219	4.302
3	0.000	0.000	0.000	0.003	0.092	4.311	13.009	5.645	5.948	30.822	23.219	4.180
4	0.000	0.000	0.000	0.003	0.084	4.451	13.055	5.645	6.147	33.125	23.219	3.978
5	0.000	0.000	0.000	0.007	0.083	4.701	12.781	5.645	6.378	34.232	23.086	3.862
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.725	12.462	5.645	7.012	35.188	21.710	3.705
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.725	11.930	5.645	7.558	35.275	20.945	3.552
8	0.000	0.000	0.000	0.027	0.227	4.701	10.993	5.645	9.267	35.188	19.734	3.444
9	0.000	0.000	0.000	0.034	0.256	4.464	10.500	5.645	8.715	34.318	18.011	3.267
10	0.000	0.000	0.000	0.035	0.316	4.441	10.381	5.618	9.353	34.146	17.280	3.118
11	0.000	0.000	0.000	0.039	0.424	4.441	9.526	5.353	10.586	33.292	15.932	2.981
12	0.000	0.000	0.000	0.040	0.567	4.464	8.715	5.327	12.422	32.958	13.721	2.892
13	0.000	0.000	0.000	0.046	0.741	4.677	8.572	5.327	13.622	30.417	12.029	2.805
14	0.000	0.000	0.000	0.059	0.823	4.464	7.850	5.327	14.695	29.310	10.950	2.719
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.427	7.423	5.327	15.099	27.785	10.224	2.635
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.311	[illegible]	5.327	15.405	24.124	9.301	2.547
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.302	[illegible]	5.327	15.405	21.710	8.643	2.388
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.396	6.319	5.327	15.718	20.821	8.189	2.174
19	0.000	0.000	0.000	0.102	2.634	5.710	5.976	5.275	16.085	19.415	7.456	2.030
20	0.000	0.000	0.000	0.094	2.805	6.319	5.673	4.774	16.786	18.125	7.042	1.921
21	0.000	0.000	0.000	0.093	2.885	6.644	5.486	4.725	18.709	17.897	6.704	1.783
22	0.000	0.000	0.000	0.093	2.899	7.080	5.327	4.725	21.208	16.731	6.644	1.572
23	0.000	0.000	0.000	0.095	2.974	7.920	5.435	4.701	23.222	16.138	6.319	1.403
[illegible]	[illegible]	0.000	0.000	[illegible]	[illegible]	9.376	6.557	4.464	24.870	16.675	6.004	1.344
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.561	6.644	4.441	26.442	17.625	5.948	1.291
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.985	[illegible]	4.537	27.485	21.401	5.673	1.239
[illegible]	[illegible]	0.000	0.000	[illegible]	3.552	10.461	6.319	5.541	28.383	23.154	5.618	1.164
28	0.000	0.000	0.000	0.102	3.552	10.950	6.147	5.645	28.383	23.897	5.302	1.092
29	0.000		0.000	0.094	3.586	11.498	5.976	5.645	28.383	23.287	4.750	1.046
30	0.000		0.000	0.093	3.952	12.417	5.976	5.645	28.383	23.219	4.464	0.997
31	0.000		0.000		4.170		5.948	5.645		23.219		0.921
Mean	[illegible]	[illegible]	[illegible]	[illegible]	1.703	6.280	8.396	5.318	15.766	26.170	12.485	2.477
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.279	[illegible]	11.244	40.866	70.093	32.362	6.634
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.417	[illegible]	5.673	28.383	35.275	23.219	4.427
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.198	[illegible]	4.441	5.645	16.138	4.464	0.921
Runoff (mm)	0.000	0.000	0.000	[illegible]	[illegible]	11.620	16.053	10.167	29.171	50.034	23.161	4.735

Flow (cumecs)

Annual Statistics

Maximum : 35.275 Minimum : 0.000 Mean : 6.555 cumecs

Total : [illegible] MCM Runoff : 147.558 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 2011**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33 51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.910	0.012	0.000	0.000	0.000	0.000	0.003	0.003	2.569	58.684	7.011	24.103
2	0.852	0.009	0.000	0.000	0.000	0.000	0.003	0.003	4.373	51.216	7.011	23.966
3	0.769	0.007	0.000	0.000	0.000	0.000	0.003	0.003	14.770	48.243	6.704	23.287
4	0.655	0.006	0.000	0.000	0.000	0.000	0.003	0.003	22.894	43.801	6.496	23.152
5	0.616	0.005	0.000	0.000	0.000	0.000	0.003	0.002	25.718	29.232	6.348	22.423
6	0.584	0.003	0.000	0.000	0.000	0.000	0.003	0.002	26.662	24.879	6.674	21.644
7	0.553	0.003	0.000	0.000	0.000	0.000	0.003	0.003	28.386	21.033	7.042	20.883
8	0.509	0.002	0.000	0.000	0.000	0.000	0.007	0.026	30.018	18.306	7.423	20.200
9	0.453	0.002	0.000	0.000	0.000	0.000	0.009	0.030	29.310	16.089	7.850	20.078
10	0.414	0.001	0.000	0.000	0.000	0.000	0.012	0.036	28.308	14.748	8.645	19.413
11	0.389	0.001	0.000	0.000	0.000	0.000	0.014	0.067	26.662	13.151	9.526	18.761
12	0.365	0.001	0.000	0.000	0.000	0.000	0.012	0.113	25.294	12.507	10.421	18.644
13	0.343	0.001	0.000	0.000	0.000	0.000	0.009	0.161	23.900	11.973	11.247	18.011
14	0.321	0.000	0.000	0.000	0.000	0.000	0.006	0.216	21.713	11.454	12.463	17.335
15	0.290	0.000	0.000	0.000	0.000	0.000	0.003	0.444	20.202	10.950	13.056	16.675
16	0.251	0.000	0.000	0.000	0.000	0.000	0.003	0.492	19.413	10.461	13.620	16.032
17	0.216	0.000	0.000	0.000	0.000	0.000	0.003	0.509	18.879	9.985	14.549	15.052
18	0.191	0.000	0.000	0.000	0.000	0.000	0.003	0.664	22.046	9.524	16.034	13.668
19	0.164	0.000	0.000	0.000	0.000	0.000	0.002	0.649	32.216	9.077	17.337	12.739
20	0.143	0.000	0.000	0.000	0.000	0.001	0.002	0.616	41.917	8.643	18.646	10.964
21	0.125	0.000	0.000	0.000	0.000	0.001	0.002	0.587	49.705	8.223	19.413	9.340
22	0.113	0.000	0.000	0.000	0.000	0.002	0.002	0.587	59.429	7.816	20.139	8.643
23	0.098	0.000	0.000	0.000	0.000	0.003	0.002	0.616	66.466	7.423	20.883	8.223
24	0.079	0.000	0.000	0.000	0.000	0.002	0.002	0.646	76.067	7.042	21.969	7.816
25	0.063	0.000	0.000	0.000	0.000	0.002	0.001	0.666	77.361	6.674	22.555	7.423
26	0.049	0.000	0.000	0.000	0.000	0.002	0.001	0.701	74.350	6.348	24.037	7.042
27	0.040	0.000	0.000	0.000	0.000	0.003	0.002	0.722	70.855	6.290	25.576	6.674
28	0.035	0.000	0.000	0.000	0.000	0.003	0.002	0.756	68.269	6.004	25.646	6.319
29	0.027		0.000	0.000	0.000	0.003	0.003	0.793	65.227	6.004	24.937	5.976
30	0.020		0.000	0.000	0.000	0.003	0.003	0.850	62.145	6.319	24.797	5.646
31	0.015		0.000		0.000		0.003	1.169		6.674		5.302
Mean	0.311	0.002	0.000	0.000	0.000	0.001	0.004	0.391	37.837	16.412	14.602	14.691
Flow (MCM)	0.834	0.005	0.000	0.000	0.000	0.002	0.011	1.049	98.075	43.958	37.848	39.349
Maximum	0.910	0.012	0.000	0.000	0.000	0.003	0.014	1.169	77.361	58.684	25.646	24.103
Minimum	0.015	0.000	0.000	0.000	0.000	0.000	0.001	0.002	2.569	6.004	6.348	5.302
Runoff (mm)	0.595	0.003	0.000	0.000	0.000	0.002	0.008	0.749	70.008	31.378	27.017	28.089

Flow (cumecs)

Annual Statistics

Maximum : 77.361 Minimum : 0.000 Mean : 7.021 cumecs

Total : 221.4[illegible] MCM Runoff : 158.052 mm

Possible data flags

No data stored "-" Estimated values "e"

Station Number : 82245 **Year: 2012**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude : 1:51.50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4.750	0.800	0.113	0.000	0.925	16.950	5.202	23.154	42.565	45.607	3.757	4.464
2	4.451	0.756	0.112	0.000	1.124	16.032	5.327	24.035	41.387	43.164	3.757	4.427
3	4.245	0.719	0.104	0.000	1.189	15.151	5.327	24.867	40.803	40.901	3.857	4.302
4	4.078	0.684	0.102	0.000	1.239	14.744	5.327	25.791	40.707	39.188	5.735	4.189
5	3.969	0.646	0.093	0.000	1.305	14.199	5.353	27.403	39.751	37.886	6.319	4.078
6	3.862	0.587	0.083	0.000	1.539	13.620	5.618	28.383	39.656	36.252	6.705	3.978
7	3.765	0.553	0.074	0.000	2.056	13.056	5.673	29.310	39.561	32.259	7.391	3.960
8	3.697	0.523	0.059	0.000	2.229	12.507	5.948	30.175	38.623	25.693	7.816	3.871
9	3.552	0.392	0.046	0.000	2.260	11.930	6.004	30.334	38.437	19.443	8.258	3.809
10	3.444	0.416	0.035	0.000	2.376	10.834	6.290	31.138	37.516	14.995	9.041	3.748
11	3.254	0.394	0.030	0.000	3.971	8.757	6.348	31.301	37.333	13.056	9.716	3.653
12	2.989	0.365	0.025	0.000	4.949	7.818	6.644	32.121	36.430	12.463	10.064	3.552
13	2.805	0.341	0.021	0.000	8.431	7.014	6.704	32.287	36.250	11.498	10.952	3.452
14	2.642	0.300	0.018	0.001	10.385	6.034	7.011	33.208	35.364	10.950	11.843	3.355
15	2.547	0.262	0.015	0.004	11.327	5.673	7.042	34.320	35.725	10.461	11.454	3.258
16	2.388	0.242	0.012	0.043	11.118	5.645	7.073	36.435	40.526	9.947	10.950	3.164
17	2.180	0.225	0.009	0.082	12.419	5.618	7.390	39.471	43.164	9.078	10.461	3.064
18	2.095	0.208	0.008	0.112	13.056	5.353	7.422	40.901	45.398	8.258	9.985	2.892
19	2.024	0.192	0.007	0.125	13.620	5.327	7.455	43.578	45.707	7.816	9.487	2.726
20	1.955	0.177	0.006	0.144	14.249	5.327	7.783	50.670	46.753	7.233	8.645	2.629
21	1.876	0.164	0.005	0.176	15.569	5.327	7.849	57.596	46.964	6.645	7.818	2.479
22	1.703	0.156	0.003	0.194	18.782	5.327	8.188	63.164	47.920	5.841	7.044	2.318
23	1.626	0.148	0.002	0.236	22.697	5.327	8.257	63.542	46.859	5.302	6.321	2.137
24	1.512	0.138	0.001	0.451	21.710	5.275	8.831	62.142	45.604	4.774	5.700	2.019
25	1.403	0.131	0.001	0.799	20.573	4.774	11.969	59.898	44.575	4.701	5.618	1.816
26	1.344	0.125	0.000	0.829	19.716	4.701	15.260	57.697	45.500	4.451	5.353	1.525
27	1.291	0.124	0.000	0.790	18.703	4.451	16.677	55.559	45.707	4.302	5.327	1.413
28	1.239	0.114	0.000	0.728	18.067	4.311	17.955	52.112	46.753	4.189	5.275	1.628
29	1.189	0.113	0.000	0.759	17.672	4.292	18.763	48.786	46.964	4.024	4.774	1.843
30	1.116		0.000	0.832	17.534	4.264	20.141	45.619	47.814	3.862	4.701	1.892
31	0.973		0.000		17.334		21.647	43.261		3.765		1.955
Mean	2.579	0.349	0.032	0.210	10.585	8.321	9.112	40.589	42.211	15.742	7.471	3.019
Flow (MCM)	6.909	0.874	0.085	0.545	28.350	21.569	24.406	108.713	109.410	42.163	19.364	8.087
Maximum	4.750	0.800	0.113	0.832	22.697	16.950	21.647	63.542	47.920	45.607	11.843	4.464
Minimum	0.973	0.113	0.000	0.000	0.925	4.264	5.202	23.154	35.364	3.765	3.757	1.413
Runoff (mm)	4.932	0.624	0.061	0.389	20.237	15.396	17.422	77.603	78.100	30.097	13.823	5.773

Flow (cumecs)

Annual Statistics

Maximum : 63.542 Minimum : 0.000 Mean : 11.685 cumecs

Total : 369.507 MCM Runoff : 263.764 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 2013**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.047	0.836	0.790	0.300	1.137	3.552	0.525	0.225	5.650	10.421	9.985	9.040
2	2.036	0.829	0.756	0.341	1.566	3.544	0.563	0.225	6.647	9.831	9.985	8.643
3	2.095	0.793	0.719	0.364	1.631	3.452	0.587	0.226	8.005	9.946	9.985	8.257
4	2.167	0.756	0.684	0.364	1.698	3.355	0.616	0.241	9.077	9.561	9.985	8.257
5	2.241	[illegible]	0.646	0.343	1.815	3.258	0.644	0.244	9.524	9.486	9.946	8.607
6	2.310	0.684	0.582	0.321	1.893	3.164	0.616	0.259	9.985	9.077	9.561	8.432
7	2.355	0.658	0.490	0.303	2.024	3.072	0.584	0.262	10.502	8.678	9.523	8.222
8	2.387	0.716	0.374	0.323	2.167	2.974	0.538	0.278	11.413	8.642	9.523	8.222
9	2.317	0.759	0.343	0.364	2.304	2.805	0.494	0.281	11.973	8.642	9.523	8.188
10	2.241	0.854	0.321	0.391	-	2.636	0.467	0.300	12.507	8.607	9.486	7.816
11	2.167	1.162	0.300	0.440	-	2.479	0.440	0.323	13.009	8.257	9.113	7.423
12	2.089	1.239	0.278	0.499	-	2.362	0.416	0.366	13.055	8.188	9.076	7.042
13	1.960	1.287	0.244	0.617	-	2.317	0.412	0.414	13.102	7.849	9.076	6.674
14	1.881	1.295	0.225	0.743	-	2.310	0.391	0.494	13.572	7.816	9.040	6.319
15	1.761	[illegible]	0.208	0.752	-	2.247	0.389	0.708	13.619	8.019	8.678	5.976
16	1.662	[illegible]	0.194	0.719	-	2.235	0.387	0.854	13.667	8.257	8.642	5.646
17	1.571	1.244	0.192	0.684	-	2.137	0.367	1.322	14.498	8.607	8.642	5.353
18	1.512	1.189	0.192	0.646	-	2.048	0.365	1.855	15.720	8.678	8.789	5.002
19	1.455	1.140	0.192	0.589	-	1.893	0.364	2.018	16.621	9.040	10.344	4.432
20	1.394	1.092	0.191	0.587	-	1.815	0.344	2.101	16.621	9.040	10.909	4.088
21	1.291	1.046	0.177	0.613	-	1.698	0.341	2.235	16.032	8.678	10.991	3.862
22	1.193	1.000	0.164	0.619	-	1.626	0.323	2.317	15.457	8.642	11.369	3.662
23	1.140	0.956	0.162	0.646	2.899	1.512	0.319	2.394	15.049	8.678	10.991	3.511
24	1.092	[illegible]	0.151	0.652	2.981	1.399	0.301	2.479	14.199	9.040	10.909	3.444
25	1.049	[illegible]	0.151	0.642	3.064	1.291	0.298	2.636	13.620	9.076	10.461	3.355
26	1.042	0.869	0.163	0.710	3.079	1.189	0.281	2.874	13.056	9.076	9.985	3.258
27	1.000	0.832	0.177	0.756	3.164	1.096	0.280	3.787	12.463	9.076	9.561	3.157
28	0.956	0.796	0.194	0.800	3.251	1.038	0.278	4.078	11.498	9.113	9.486	2.989
29	0.917		0.223	0.922	3.274	0.918	0.262	4.306	10.991	9.486	9.113	2.885
30	0.910		0.242	1.145	3.444	0.808	0.257	4.677	10.909	9.754	9.076	2.726
31	0.872		0.262		3.544		0.228	4.799		9.985		2.635
Mean	[illegible]	[illegible]	0.322	[illegible]	[illegible]	2.208	0.409	1.599	12.401	8.943	9.725	5.714
Flow (MCM)	[illegible]	[illegible]	0.863	1.486	[illegible]	5.722	1.095	4.283	32.144	23.954	25.207	15.303
Maximum	2.387	[illegible]	0.790	1.145	3.544e	3.552	0.644	4.799	16.621	10.421	11.369	9.040
Minimum	0.872	0.658	0.151	0.300	1.137e	0.808	0.228	0.225	5.650	7.816	8.642	2.635
Runoff (mm)	3.152	1.678	0.616	1.060	4.805e	4.085	0.782	3.058	22.945	17.099	17.994	10.924

Flow (cumecs)

Annual Statistics

Maximum : 16.621e Minimum : 0.151e Mean : 3.919e cumecs

Total : 123.591e MCM Runoff : 88.222e mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Station Number : 82245 | **Year: 2014**

Station Name : R. Akokorio at Soroti - Katakwi Road

Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N | Longitude : 33:51:15 E | Elevation : 1042.4 metres | Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.547	0.613	0.075	0.003	0.000	0.000	1.961	2.024	2.516	38.161	9.076	3.979
2	2.401	0.553	0.067	0.003	0.000	0.000	2.095	2.030	3.312	36.431	9.076	3.801
3	2.317	0.497	0.063	0.003	0.000	0.000	2.161	2.089	3.749	35.276	9.040	3.653
4	2.241	0.455	0.058	0.002	0.000	0.000	2.167	2.095	3.960	33.556	8.678	3.544
5	2.167	0.414	0.053	0.002	0.000	0.000	2.167	2.095	4.078	29.410	8.642	3.363
6	2.089	0.387	0.052	0.002	0.000	0.000	2.173	2.131	4.189	26.662	8.607	3.258
7	1.927	0.367	0.046	0.002	0.000	0.000	2.247	2.167	4.315	25.790	8.257	3.157
8	1.821	0.364	0.045	0.001	0.000	0.001	2.388	2.167	4.677	25.222	8.222	2.996
9	1.761	0.343	0.040	0.001	0.000	0.001	2.453	2.167	4.725	23.497	8.222	2.879
10	1.724	0.321	0.039	0.001	0.000	0.001	2.329	2.167	4.701	20.279	8.222	2.636
11	1.682	0.280	0.035	0.001	0.000	0.001	2.304	2.167	4.451	18.217	7.986	2.473
12	1.571	0.241	0.034	0.000	0.000	0.004	2.167	2.167	4.311	15.475	7.455	2.323
13	1.460	0.209	0.030	0.000	0.000	0.027	2.024	2.173	4.292	13.342	7.422	2.247
14	1.399	0.192	0.029	0.000	0.000	0.042	1.893	2.235	4.198	11.975	7.232	2.235
15	1.318	0.178	0.026	0.000	0.000	0.049	1.826	2.241	4.189	11.034	7.011	2.173
16	1.239	0.177	0.025	0.000	0.003	0.094	1.815	2.241	4.189	10.909	6.527	2.161
17	1.185	0.176	0.021	0.000	0.003	0.164	1.761	2.211	4.189	10.500	6.298	2.095
18	1.096	0.164	0.018	0.000	0.003	0.258	1.751	2.204	4.189	10.420	6.004	2.024
19	1.046	0.163	0.017	0.000	0.002	0.343	1.698	2.167	4.217	10.024	5.976	1.926
20	1.000	0.156	0.015	0.000	0.002	0.436	1.688	2.161	4.664	9.946	5.811	1.881
21	0.956	0.149	0.014	0.000	0.002	0.515	1.626	2.095	5.020	9.561	5.618	1.821
22	0.910	0.149	0.012	0.000	0.001	0.805	1.542	2.024	9.445	9.486	5.353	1.756
23	0.839	0.143	0.012	0.000	0.001	0.876	1.746	1.938	14.034	9.077	5.148	1.693
24	0.829	0.131	0.012	0.000	0.001	0.960	1.887	1.714	18.929	8.678	4.749	1.626
25	0.796	0.118	0.011	0.000	0.001	1.092	2.012	1.574	24.041	8.607	4.701	1.517
26	0.790	0.103	0.009	0.000	0.000	1.240	2.018	1.459	26.519	8.327	4.464	1.455
27	0.759	0.093	0.008	0.000	0.000	1.390	1.955	1.512	28.786	9.004	4.427	1.405
28	0.752	0.083	0.007	0.000	0.000	1.548	1.892	1.581	34.681	9.076	4.311	1.394
29	0.719		0.008	0.000	0.000	1.756	1.887	1.751	35.364	9.076	4.292	1.344
30	0.684		0.009	0.000	0.000	1.876	1.898	1.904	36.431	9.076	4.189	1.291
31	0.649		0.006		0.000		2.012	2.230		9.076		1.239
Mean	1.377	0.258	0.029	0.001	0.001	0.449	1.985	2.029	10.545	16.619	6.700	2.301
Flow (MCM)	3.687	0.624	0.078	0.002	0.002	1.165	5.317	5.435	27.333	44.513	17.367	6.164
Maximum	2.547	0.613	0.075	0.003	0.003	1.876	2.453	2.241	36.431	38.161	9.076	3.979
Minimum	0.649	0.083	0.006	0.000	0.000	0.000	1.542	1.459	2.516	8.327	4.189	1.239
Runoff (mm)	2.632	0.445	0.055	0.001	0.001	0.832	3.796	3.880	19.511	31.775	12.397	4.400

Flow (cumecs)

Annual Statistics

Maximum : 38.161 | Minimum : 0.000 | Mean : 3.525 | cumecs

Total : 111.152 MCM | Runoff : 79.343 mm

Possible data flags

No data stored "-" | Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Annual Report of Daily Data: Daily Flow

Station Number : 82245 **Year: 2015**
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1:51:50 N Longitude : 33:51:15 E Elevation : 1042.4 metres Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.189	0.228	0.005	0.000	0.006	0.015	1.455	0.339	0.223	0.191	2.330	3.942
2	1.160	0.216	0.003	0.000	0.007	0.038	1.450	0.343	0.225	0.161	2.601	3.871
3	1.092	0.200	0.003	0.000	0.009	0.112	1.390	0.343	0.226	0.115	2.553	3.915
4	1.004	0.192	0.003	0.000	0.012	0.193	1.248	0.354	0.241	0.093	2.493	3.978
5	0.956	0.191	0.003	0.000	0.015	0.292	1.193	0.367	0.244	0.075	2.622	4.078
6	0.917	0.177	0.003	0.000	0.033	0.321	1.185	0.387	0.256	0.067	2.628	4.179
7	0.910	0.163	0.003	0.000	0.087	0.343	1.124	0.385	0.228	0.066	2.533	4.189
8	0.876	0.151	0.003	0.000	0.103	0.365	0.925	0.346	0.225	0.060	2.721	4.143
9	0.869	0.142	0.003	0.000	0.116	0.387	0.832	0.330	0.223	0.060	2.981	4.179
10	0.836	0.126	0.003	0.000	0.161	0.389	0.756	0.300	0.209	0.065	3.205	4.189
11	0.829	0.124	0.002	0.000	0.191	0.389	0.684	0.280	0.207	0.078	3.802	4.179
12	0.793	0.114	0.001	0.001	0.208	0.389	0.611	0.262	0.194	0.333	3.880	4.096
13	0.756	0.108	0.001	0.001	0.223	0.407	0.499	0.259	0.194	0.367	4.078	4.179
14	0.719	0.102	0.001	0.001	0.222	0.601	0.442	0.244	0.205	0.385	4.273	4.189
15	0.684	0.094	0.001	0.001	0.194	0.681	0.414	0.242	0.194	0.367	4.189	4.189
16	0.646	0.092	0.001	0.002	0.175	0.716	0.389	0.241	0.192	0.365	4.087	4.179
17	0.571	0.084	0.001	0.002	0.140	0.719	0.365	0.225	0.191	0.369	4.078	4.143
18	0.509	0.083	0.000	0.002	0.136	0.719	0.341	0.209	0.178	0.414	4.069	4.245
19	0.453	0.083	0.000	0.003	0.125	0.722	0.303	0.209	0.177	0.476	3.960	4.311
20	0.414	0.075	0.000	0.003	0.113	0.756	0.301	0.226	0.183	0.645	3.757	4.427
21	0.389	0.075	0.000	0.003	0.103	0.797	0.328	0.256	0.178	0.768	3.569	4.371
22	0.365	0.075	0.000	0.003	0.092	0.866	0.319	0.242	0.177	0.867	3.541	4.302
23	0.344	0.071	0.000	0.003	0.072	0.876	0.281	0.228	0.177	0.921	3.453	4.292
24	0.341	0.067	0.000	0.003	0.037	0.925	0.261	0.238	0.177	1.001	3.403	4.198
25	0.323	0.062	0.000	0.002	0.024	1.085	0.242	0.208	0.185	1.120	3.347	4.189
26	0.319	0.052	0.000	0.002	0.007	1.189	0.226	0.180	0.194	1.305	3.228	4.179
27	0.301	0.045	0.000	0.002	0.003	1.336	0.225	0.178	0.207	1.627	3.706	4.033
28	0.298	0.032	0.000	0.003	0.003	1.399	0.226	0.191	0.207	2.012	3.757	3.969
29	0.281		0.000	0.003	0.003	1.403	0.242	0.194	0.195	2.030	3.748	3.915
30	0.278		0.000	0.003	0.003	1.450	0.262	0.207	0.205	2.089	3.731	3.862
31	0.259		0.000		0.004		0.300	0.209		2.143		3.853
Mean	0.635	0.115	0.001	0.001	0.085	0.663	0.607	0.265	0.204	0.666	3.411	4.128
Flow (MCM)	1.701	0.278	0.004	0.004	0.227	1.717	1.626	0.710	0.528	1.783	8.841	11.056
Maximum	1.189	0.228	0.005	0.003	0.223	1.450	1.455	0.387	0.256	2.143	4.273	4.427
Minimum	0.259	0.032	0.000	0.000	0.003	0.015	0.225	0.178	0.177	0.060	2.330	3.853
Runoff (mm)	1.214	0.199	0.003	0.003	0.162	1.226	1.161	0.507	0.377	1.273	6.311	7.892

Flow (cumecs)

Annual Statistics

Maximum : 4.427 Minimum : 0.000 Mean : 0.898 cumecs
Total : 28.332 MCM Runoff : 20.224 mm

Possible data flags

No data stored "-" Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

Year: 2016

Station Number : 82245
Station Name : R. Akokorio at Soroti - Katakwi Road
Time-Series Type : Flow (cumecs)

Latitude : 1.51.50 N | Longitude : 33.51.15 E | Elevation : 1042.4 metres | Area : 1400.9 sq km

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3.765	0.872	0.066	0.001	0.261	4.189	1.120	1.120	1.571	-	-	-
2	3.757	0.836	0.059	0.002	0.318	4.198	1.112	1.235	1.576	-	-	-
3	3.757	0.813	0.053	0.003	0.343	4.283	1.088	1.189	1.626	-	-	-
4	3.739	0.730	0.052	0.006	0.389	4.198	1.049	1.140	1.636	-	-	-
5	3.569	0.587	0.046	0.005	0.445	4.179	1.034	1.120	1.693	-	-	-
6	3.552	0.523	0.040	0.003	0.580	4.087	0.911	1.377	1.751	-	-	-
7	3.494	0.480	0.035	0.003	0.678	4.078	0.762	1.464	1.767	-	-	-
8	3.363	0.442	0.035	0.003	0.824	4.078	0.684	1.616	1.887	-	-	-
9	3.346	0.404	0.035	0.002	1.000	4.006	0.619	1.631	2.024	-	-	-
10	3.258	0.375	0.039	0.002	1.053	3.757	0.584	1.631	2.167	-	-	-
11	3.164	0.343	0.033	0.003	1.252	3.552	0.553	1.631	2.291	-	-	-
12	3.079	0.319	0.029	0.005	1.349	3.355	0.523	1.641	2.167	-	-	-
13	3.049	0.278	0.026	0.006	1.460	3.172	0.494	1.756	2.036	-	-	-
14	2.812	0.226	0.023	0.007	1.621	3.072	0.462	1.854	2.030	-	-	-
15	2.642	0.195	0.017	0.012	1.714	2.974	0.392	1.647	2.089	-	-	-
16	2.507	0.192	0.012	0.018	2.084	2.798	0.345	1.576	2.101	-	-	-
17	2.317	0.191	0.010	0.026	3.078	2.554	0.323	1.571	2.161	-	-	-
18	2.173	0.176	0.010	0.044	3.338	2.323	0.321	1.566	2.161	-	-	-
19	2.167	0.150	0.012	0.060	3.379	2.161	0.323	1.527	2.101	-	-	-
20	2.161	0.126	0.012	0.096	3.637	1.955	0.332	1.626	2.089	-	-	-
21	2.167	0.114	0.012	0.139	3.757	1.767	0.343	1.693	2.030	-	-	-
22	2.078	0.112	0.012	0.185	3.853	1.688	0.364	1.751	2.018	-	-	-
23	1.832	0.104	0.010	0.163	3.880	1.571	0.365	1.788	1.966	-	-	-
24	1.756	0.102	0.009	0.138	4.033	1.455	0.364	1.821	2.006	-	-	-
25	1.632	0.093	0.008	0.126	3.944	1.349	0.343	1.826	1.898	-	-	-
26	1.517	0.084	0.007	0.126	4.078	1.291	0.336	1.881	1.887	-	-	-
27	1.483	0.083	0.007	0.138	4.133	1.239	0.494	1.892	1.892	-	-	-
28	1.364	0.071	0.006	0.162	4.245	1.189	0.667	1.943	1.949	-	-	-
29	1.141	0.067	0.005	0.177	4.245	1.144	0.722	1.881	1.955	-	-	-
30	1.004		0.003	0.196	4.189	1.140	1.087	1.751	1.955	-	-	-
31	0.935		0.002		4.189		1.198	1.586		-		-
Mean	2.533	0.313	0.023	0.062	2.365	2.760	0.623	1.604	1.949	-	-	-
Flow (MCM)	6.784	0.785	0.063	0.160	6.336	7.154	1.668	4.297	5.052	-	-	-
Maximum	3.765	0.872	0.066	0.196	4.245	4.283	1.198	1.943	2.291	-	-	-
Minimum	0.935	0.067	0.002	0.001	0.261	1.140	0.321	1.120	1.571	-	-	-
Runoff (mm)	4.843	0.560	0.045	0.114	4.522	5.107	1.191	3.067	3.607	-	-	-

Flow (cumecs)

Annual Statistics

Maximum : - | Minimum : - | Mean : - | cumecs

Total : - | Runoff : - mm

Possible data flags

No data stored "-" | Estimated values "e"

MINISTRY OF WATER & ENVIRONMENT
DIRECTORATE OF WATER RESOURCES MANAGEMENT

APPENDIX 7: Drainage Improvement for Kapujan-Kokorio Road

DESIGN DRAWINGS

DRAINAGE IMPROVEMENT ON KAPUJAN -KOKORIO ROAD

Prepared By: ECHATU ANDREW

GENERAL NOTES

GENERAL NOTES:

1) THE DESIGN IS PREPARED USING METRIC SYSTEM
2) ALL COORDINATES ARE IN METRES
3) ALL ELEVATIONS ARE IN METRES ABOVE MEAN SEA LEVEL

ABBREVATIONS:

N.T.S – NOT TO SCALE
E.G.L – EXISTING GROUND LEVEL
F.G.L – FINISHED GROUND LEVEL
L.H.S – LEFT HAND SIDE
R.H.S – RIGHT HAND SIDE
N.A – NOT APPLICABLE

LEGEND FOR LONGITUDINAL PROFILE DRAWINGS:

G. – VERTICAL GRADE / SLOPE
Lz – HORIZONTAL CURVE LENGTH
Lvc – VERTICAL CURVE LENGTH
Rz – HORIZONTAL CURVE RADIUS
e – RATE OF SUPERELEVATION
K–VALUE= $\frac{\text{VERTICAL CURVE LENGTH}}{\text{ALGEBRAIC DIFF. IN GRADIENT}}$

St. – STATION
BP – BEGINNING OF PAVEMENT
EP – END OF PAVEMENT
PC – POINT OF CURVATURE
PT – POINT OF TANGENT
STRAIGHT = TANGENT

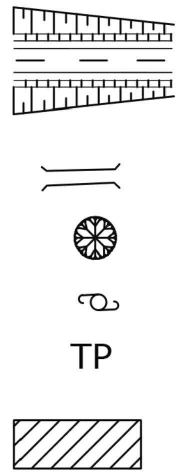
LEGEND FOR LONGITUDINAL ALIGNMENT DATA:

PC–POINT OF CURVATURE (END OF TANGENT AND BEGINNING OF CURVE)
CC–CENTRE OF CURVATURE
PT–POINT OF TANGENCY (END OF CURVE AND BEGINNING OF TANGENT)
ETW–EDGE OF TRAVEL WAY / PAVEMENT

LEGEND FOR VERTICAL ALIGNMENT DATA:

TP–TANGENT TO PARABOLA (END OF TANGENT AND BEGINNING OF PARABOLA POINT)
PT–PARABOLA TO TANGENT (END OF PARABOLA AND BEGINNING OF TANGENT POINT))

LEGEND FOR PLAN DRAWINGS:



PROPOSED ROAD SHOWING STATIONING, ROAD MARKING,CARRIAGEWAY AND SHOULDER EDGES.
CULVERT.
TREE.
ELECTRIC POLE
TP TELEPHONE POLE
BUILDING/HOUSE

E -EASTING
N -NORTHING
Z -ELEVATION

DESIGN STANDARD:

ROAD NAME	LENGTH (M)	ROAD CLASS	DESIGN SPEED (KM/H)
ALL ROADS DESIGNED			

PROFILE

Profile Start	BVP
Profile End	EVP
Point of Vertical Intersection	PVI
Grade Break	Break
Vertical Tangent–Curve Intersect	BVC
Vertical Tangent–curve Intersect Station	BVCS
Vertical Tangent–curve Intersect Elevation	BVCE
Vertical Tangent–Tangent Intersect	BVC
Vertical Tangent–Tangent Intersect Station	EVCS
Vertical Tangent–Tangent Intersect Elevation	EVCE
Vertical Compound curve Intersect	VCC
Vertical Compound curve Intersect Station	VCCS
Vertical Compound curve Intersect Elevation	VCCE
Vertical Reverse Curve Intersect	VRC
Vertical Reverse Curve Intersect Station	VRCE
Vertical Reverse Curve Intersect Elevation	VRCE
High Point	HP
Low Point	LP
Curve coefficient	K
Grade Change	A
Overall High Point	Overall HP
Overall Low Point	Overall LP

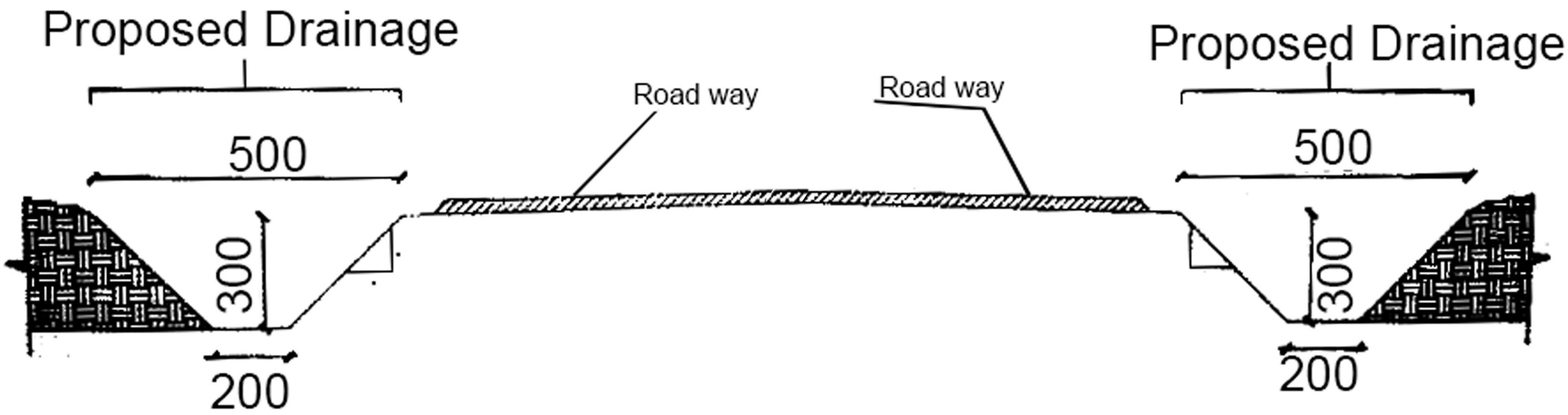
SUPER ELEVATION:

Manual	MAN
Shoulder Break Over	SBO
Reserve crown	RC
Low Shoulder Match	LSM
Level crown	LC
End normal shoulder	ENS
Begin normal shoulder	BNS
End full super	EFS
Begin full super	BFS
Begin normal crown	BNC
End of alignment	EOA
Begin of alignment	BOA
End normal crown	ENC

ALIGNMENT GEOMETRY POINT TEXT

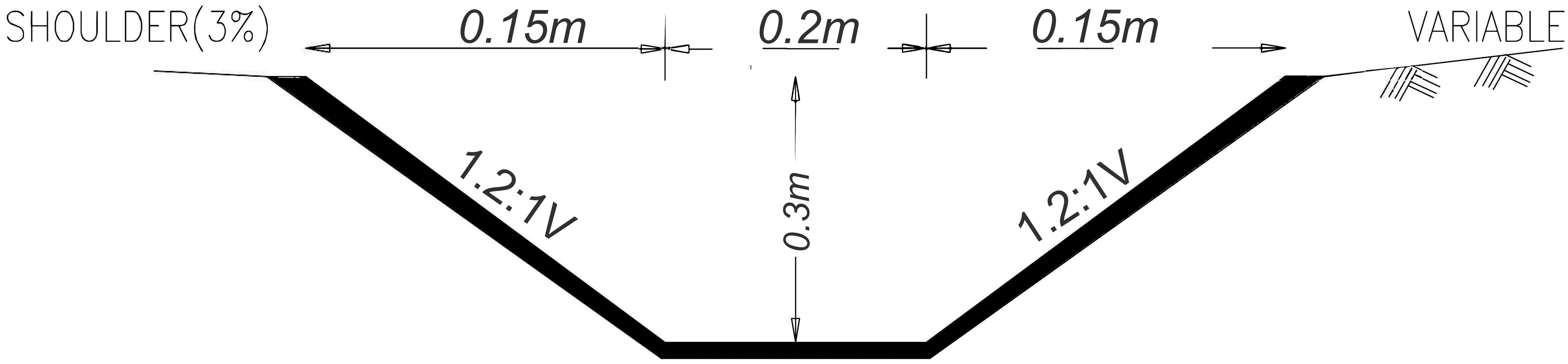
Station Equation Increasing	Increasing
Station Equation Increasing	Decreasing
Alignment Begining	BP
Alignment End	EP
Reverse Curve-Curve Intersect	PRC
Reverse Spiral Intersect	SPI
Spiral-Spiral Intersect	SS
Spiral-Curve Intersect	SC
Curve-Spiral Intersect	CS
Spiral-Tangent Intersect	ST
Tangent-Spiral Intersect	TS
Compound Curve-Curve Intersect	PCC
Curve-Tangent Intersect	PT
Tangent-Curve Intersect	PC
Tangent-Tangent Intersect	PI

PROJECT NAME:	CLIENT:	KATAKWI DISTRICT LOCAL GOVERNMENT		CONSULTANT:	STORM WATER DRAIN DETAILS	Dwg. No	TD/KAP/SD-01
Drainage improvement on kapujan -Kokorio Road	Checked by:		Date:	Designed by: Eng. Echatu Andrew		Scale	NTS
	Approved by:		Date:			Date	March, 2021



Proposed Side Drain Cross Section

PROJECT NAME:	CLIENT:	KATAKWI DISTRICT LOCAL GOVERNMENT	CONSULTANT:	STORM WATER DRAIN DETAILS	Dwg. No	TD/KAP/SD-03
Drainage improvement on kapujan -Kokorio Road	Checked by:	Date:	Designed by:		Scale	NTS
	Approved by:	Date:	Eng. Echatu Andrew		Date	March, 2021



SIDE DRAIN DETAL

PROJECT NAME:	CLIENT:	KATAKWI DISTRICT LOCAL GOVERNMENT	CONSULTANT:	STORM WATER DRAIN DETAILS	Dwg. No	TD/KAP/SD-04
Drainage improvement on kapujan -Kokorio Road	Checked by:	Date:	Designed by: Eng. Echatu Andrew		Scale	NTS
	Approved by:	Date:			Date	March, 2021

PLAN

STATION	FINISHED ROAD LEVEL	EXISTING ROAD LEVEL
0+690		1078.31
		1078.31
0+740		1078.22
		1078.13
0+790		1078.06
		1078.04
0+840		1078.02
		1078.01
0+890		1078.00
		1077.99
0+940		1077.99
		1078.02
0+990		1078.05
		1078.08
1+040		1078.11
		1078.00
1+090		1077.90
		1077.81
1+140		1077.84
		1077.88
1+190		1077.92
		1077.91
1+240		1077.88
		1077.84
1+290		1077.81
		1077.78
1+340		1077.79
		1077.76
1+390		1077.66
		1077.56
1+440		1077.48
		1077.41
1+490		1077.34
		1077.28
1+540		1077.23
		1077.13
1+590		1077.02
		1076.97
1+640		1076.92
		1076.88
1+690		1076.83
		1076.78
1+740		1076.68
		1076.59
1+790		1076.42
		1076.25
1+840		1076.16
		1076.16
1+890		1076.99
		1079.77
1+940		1082.56
		1082.82
1+990		1082.72
		1082.62
2+040		1082.51
		1078.31
2+090		1078.31
		1078.22
2+140		1078.13
		1078.06
2+190		1078.04
		1078.02
2+240		1078.01
		1078.00
2+290		1077.99
		1077.99
2+340		1078.02
		1078.05
2+390		1078.08
		1078.11
2+440		1078.00
		1077.90
2+490		1077.81
		1077.84
2+540		1077.88
		1077.92
2+590		1077.91
		1077.88
2+640		1077.84
		1077.81
2+690		1077.78
		1077.79
2+740		1077.76
		1077.66
2+790		1077.56
		1077.48
2+840		1077.41
		1077.34
2+890		1077.28
		1077.23
2+940		1077.13
		1077.02
2+990		1076.97
		1076.92
3+040		1076.88
		1076.83
3+090		1076.78
		1076.68
3+140		1076.59
		1076.42
3+190		1076.25
		1076.16
3+240		1076.16
		1076.99
3+290		1079.77
		1082.56
3+340		1082.82
		1082.72
3+390		1082.62
		1082.51
3+440		1078.31
		1078.31
3+490		1078.22
		1078.13
3+540		1078.06
		1078.04
3+590		1078.02
		1078.01
3+640		1078.00
		1077.99
3+690		1077.99
		1078.02
3+740		1078.05
		1078.08
3+790		1078.11
		1078.00
3+840		1077.90
		1077.81
3+890		1077.84
		1077.88
3+940		1077.92
		1077.91
3+990		1077.88
		1077.84
4+040		1077.81
		1077.78
4+090		1077.79
		1077.76
4+140		1077.66
		1077.56
4+190		1077.48
		1077.41
4+240		1077.34
		1077.28
4+290		1077.23
		1077.13
4+340		1077.02
		1076.97
4+390		1076.92
		1076.88
4+440		1076.83
		1076.78

Vertical Geometry

Horizontal Geometry

PLAN AND LONGTUDINAL PROFILE ALONG KAPUJAN -KOKORIO ROAD (CH.0+690 - CH. 4+440)

GENERAL NOTES

1 DIMENSION:
- ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE INDICATED

2 ELEVATION:
- ALL ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL

3 LEGEND:

- CONTOURS (INTERVAL 0.5M)
- EP/TP - ELECTRIC/TELEPHONE POLE
- BENCH MARK
- EXISTING ROADS
- CULVERT
- BUILDING
- HUTS
- TREES
- GROUND LEVEL LINE

PROJECT:
Drainage Improvement on Kapujan-Kokorio Road

CONSULTANT:

SCALE: H.S 1:5000 V.S 1:500

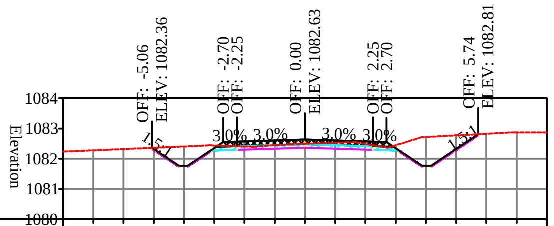
DATE: MARCH 2023

DRAWING NO.

TECHNO DESIGN /SOROTI 002A

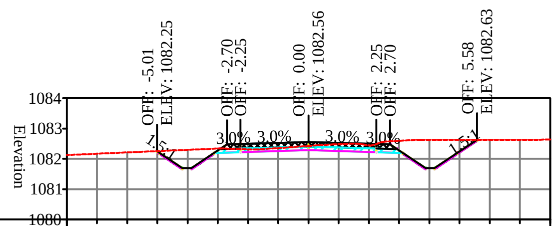
DRAWN BY: ANDREW ECHATU

CH. 0+690



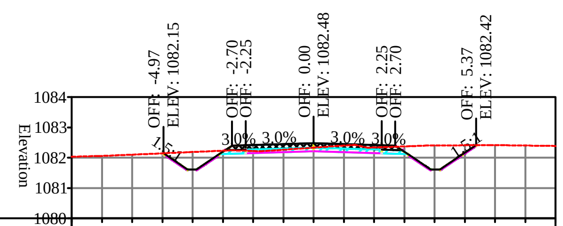
PROPOSED ELEVATIONS				1082.32	1081.77	1082.35	1082.57	1082.60	1082.63	1082.60	1082.57	1082.35	1081.77	1082.32			
EXISTING ELEVATIONS	1082.23	1082.28	1082.32	1082.36	1082.41	1082.44	1082.41	1082.45	1082.50	1082.53	1082.49	1082.44	1082.72	1082.77	1082.83	1082.88	1082.88
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 0+740



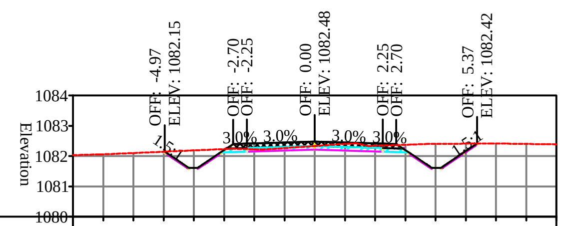
PROPOSED ELEVATIONS				1082.24	1081.69	1082.28	1082.50	1082.53	1082.56	1082.53	1082.50	1082.28	1081.69	1082.24			
EXISTING ELEVATIONS	1082.13	1082.17	1082.21	1082.25	1082.30	1082.34	1082.31	1082.36	1082.42	1082.49	1082.44	1082.60	1082.63	1082.63	1082.63	1082.63	1082.63
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 0+790



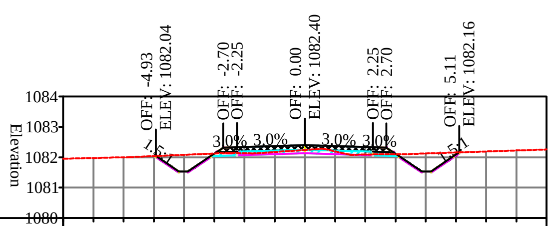
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 0+840



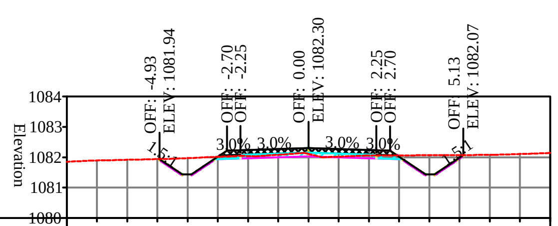
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 0+890



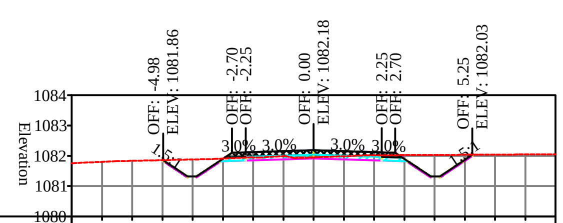
PROPOSED ELEVATIONS					1081.53	1082.12	1082.34	1082.37	1082.40	1082.37	1082.34	1082.12	1081.53	1082.08			
EXISTING ELEVATIONS	1081.95	1081.98	1082.00	1082.04	1082.08	1082.12	1082.13	1082.17	1082.24	1082.19	1082.09	1082.10	1082.12	1082.16	1082.19	1082.22	1082.26
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 0+940



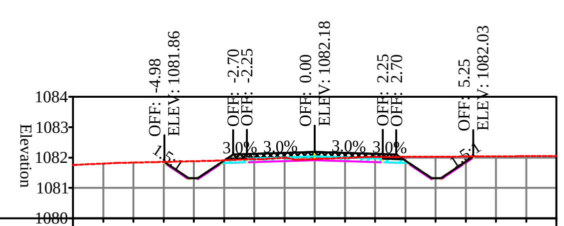
PROPOSED ELEVATIONS					1081.44	1082.02	1082.24	1082.27	1082.30	1082.27	1082.24	1082.02	1081.44	1081.99			
EXISTING ELEVATIONS	1081.85	1081.89	1081.92	1081.94	1081.97	1082.01	1082.04	1082.08	1082.11	1082.02	1082.06	1082.06	1082.07	1082.07	1082.08	1082.11	1082.14
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 0+990



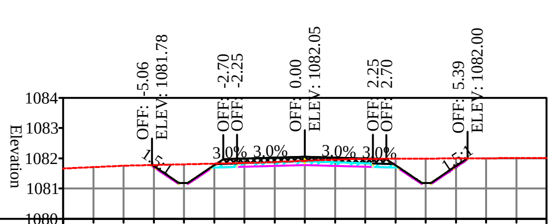
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+040



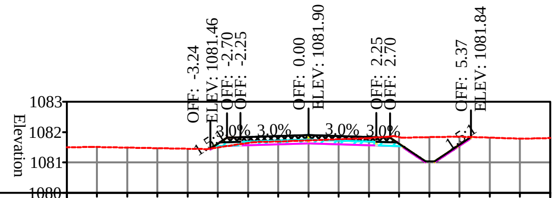
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+040



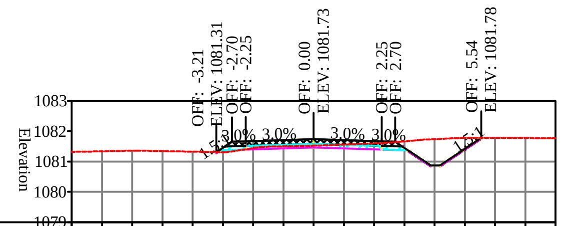
PROPOSED ELEVATIONS				1081.74	1081.19	1081.77	1081.99	1082.02	1082.05	1082.02	1081.99	1081.77	1081.19	1081.74			
EXISTING ELEVATIONS	1081.66	1081.71	1081.75	1081.78	1081.80	1081.82	1081.85	1081.88	1081.92	1081.95	1081.98	1081.98	1081.99	1082.00	1082.00	1082.01	1082.01
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+090



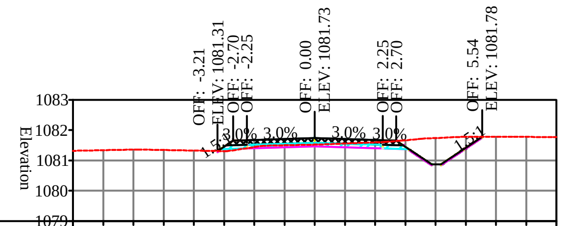
PROPOSED ELEVATIONS						1081.62	1081.84	1081.87	1081.90	1081.87	1081.84	1081.62	1081.04	1081.59			
EXISTING ELEVATIONS	1081.50	1081.51	1081.49	1081.47	1081.45	1081.49	1081.64	1081.69	1081.73	1081.76	1081.80	1081.83	1081.83	1081.85	1081.82	1081.79	1081.80
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+140



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

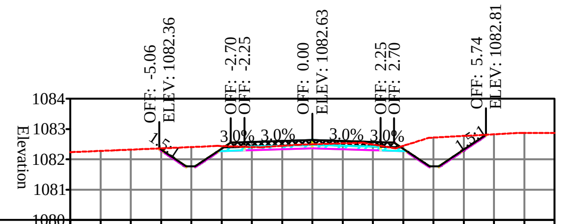
CH. 1+190



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

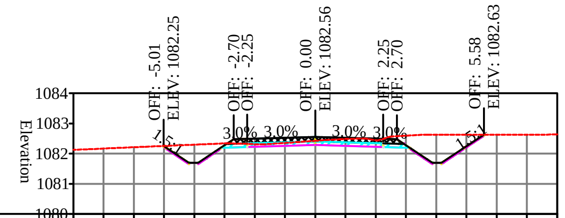
PROJECT NAME:	**CLIENT:** KATAKWI DISTRICT LOCAL GOVERNMENT	**CONSULTANT:**	**Dwg. No**	TD/KAP/SD-04
Drainage improvement on Kapujan -Kokorio Road	**Checked by:** **Date:**	**Designed by:** Echatu Andrew	**Scale:**	1:250 Hz 1:250 VI (A3)
	Approved by: **Date:**	**CROSS SECTION DRAWINGS**	**Date:**	

CH. 1+240



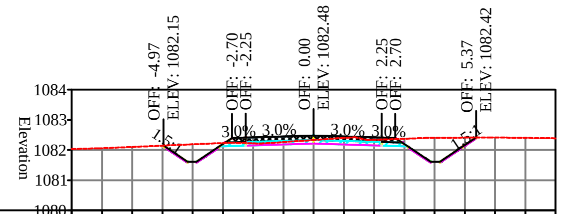
PROPOSED ELEVATIONS	1082.32	1081.77	1082.35	1082.57	1082.60	1082.63	1082.60	1082.57	1082.35	1081.77	1082.32						
EXISTING ELEVATIONS	1082.23	1082.28	1082.32	1082.36	1082.41	1082.44	1082.41	1082.45	1082.50	1082.53	1082.49	1082.44	1082.72	1082.77	1082.83	1082.88	1082.88
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+290



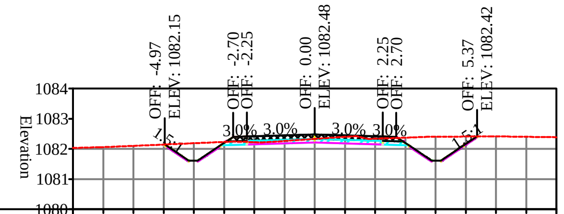
PROPOSED ELEVATIONS	1082.24	1081.69	1082.28	1082.50	1082.53	1082.56	1082.53	1082.50	1082.28	1081.69	1082.24						
EXISTING ELEVATIONS	1082.13	1082.17	1082.21	1082.25	1082.30	1082.34	1082.31	1082.36	1082.42	1082.49	1082.44	1082.60	1082.63	1082.63	1082.63	1082.63	1082.63
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+340



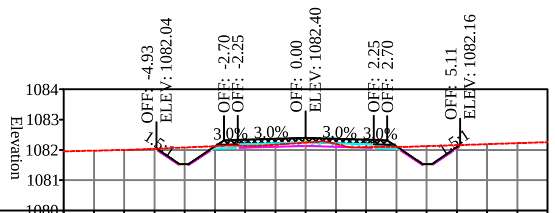
PROPOSED ELEVATIONS	1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17							
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+390



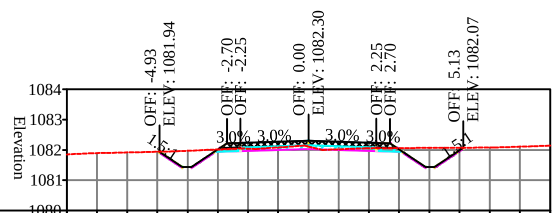
PROPOSED ELEVATIONS	1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17							
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+440



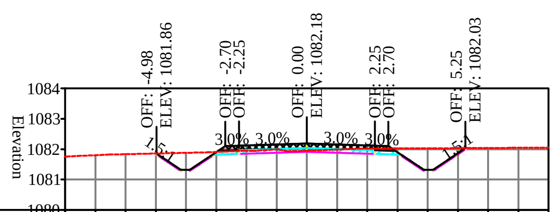
PROPOSED ELEVATIONS	1081.53	1082.12	1082.34	1082.37	1082.40	1082.37	1082.34	1082.12	1081.53	1082.08							
EXISTING ELEVATIONS	1081.95	1081.98	1082.00	1082.04	1082.08	1082.12	1082.13	1082.17	1082.24	1082.19	1082.09	1082.10	1082.12	1082.16	1082.19	1082.22	1082.26
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+490



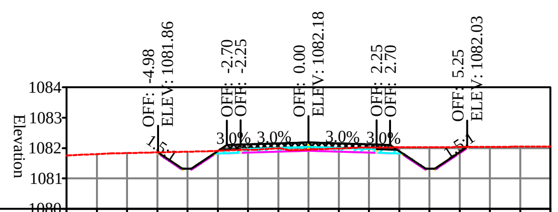
PROPOSED ELEVATIONS	1081.44	1082.02	1082.24	1082.27	1082.30	1082.27	1082.24	1082.02	1081.44	1081.99							
EXISTING ELEVATIONS	1081.85	1081.89	1081.92	1081.94	1081.97	1082.01	1082.04	1082.08	1082.11	1082.02	1082.06	1082.06	1082.07	1082.07	1082.08	1082.11	1082.14
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+540



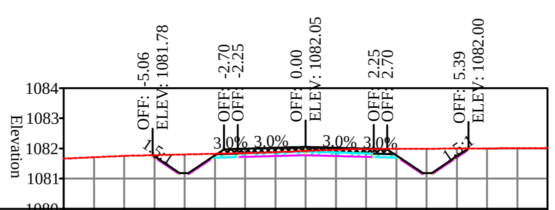
PROPOSED ELEVATIONS	1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87							
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.03	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+590



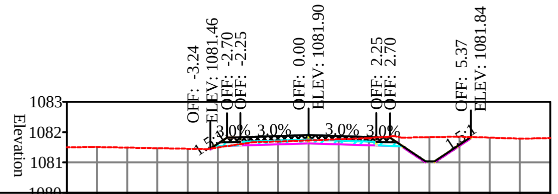
PROPOSED ELEVATIONS	1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87							
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.03	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+640



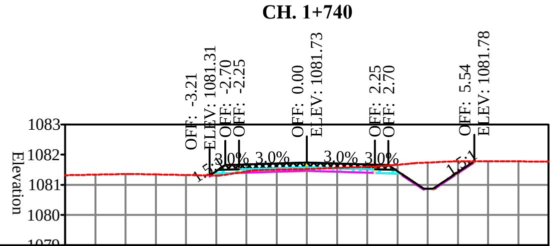
PROPOSED ELEVATIONS	1081.74	1081.19	1081.77	1081.99	1082.02	1082.05	1082.02	1081.99	1081.77	1081.19	1081.74						
EXISTING ELEVATIONS	1081.66	1081.71	1081.75	1081.78	1081.80	1081.82	1081.85	1081.88	1081.92	1081.95	1081.98	1081.98	1081.99	1082.00	1082.00	1082.01	1082.01
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+690



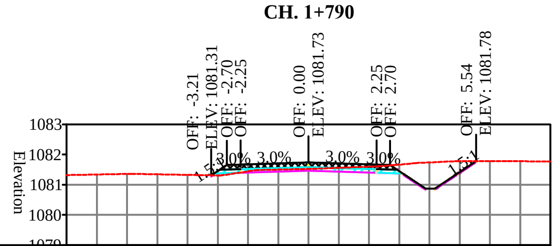
PROPOSED ELEVATIONS	1081.62	1081.84	1081.87	1081.90	1081.87	1081.84	1081.62	1081.04	1081.59								
EXISTING ELEVATIONS	1081.50	1081.51	1081.49	1081.47	1081.45	1081.49	1081.64	1081.69	1081.73	1081.76	1081.80	1081.83	1081.83	1081.85	1081.82	1081.79	1081.80
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+740



PROPOSED ELEVATIONS	1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42								
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

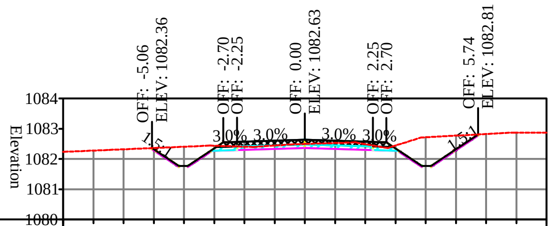
CH. 1+790



PROPOSED ELEVATIONS	1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42								
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

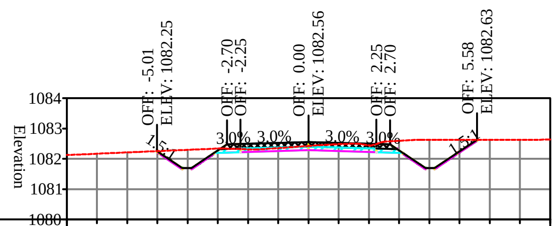
PROJECT NAME:	**CLIENT:** KATAKWI DISTRICT LOCAL GOVERNMENT	**CONSULTANT:**	**CROSS SECTION DRAWINGS**	**Dwg. No**	TD/KAP/SD-05
Drainage improvement on Kapujan -Kokorio Road	**Checked by:**	**Date:**	**Designed by:** Echatu Andrew	**Scale:**	1:250 Hz 1:250 VI (A3)
	Approved by:	**Date:**		**Date:**	

CH. 1+840



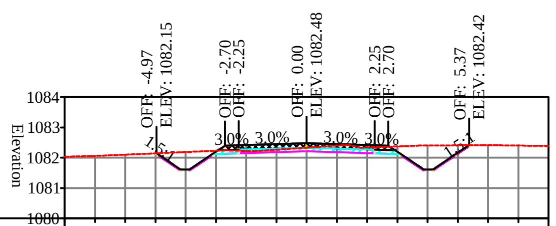
PROPOSED ELEVATIONS				1082.32	1081.77	1082.35	1082.57	1082.60	1082.63	1082.60	1082.57	1082.35	1081.77	1082.32			
EXISTING ELEVATIONS	1082.23	1082.28	1082.32	1082.36	1082.41	1082.44	1082.41	1082.45	1082.50	1082.53	1082.49	1082.44	1082.72	1082.77	1082.83	1082.88	1082.88
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+890



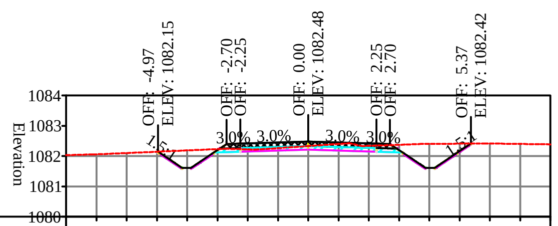
PROPOSED ELEVATIONS				1082.24	1081.69	1082.28	1082.50	1082.53	1082.56	1082.53	1082.50	1082.28	1081.69	1082.24			
EXISTING ELEVATIONS	1082.13	1082.17	1082.21	1082.25	1082.30	1082.34	1082.31	1082.36	1082.42	1082.49	1082.44	1082.60	1082.63	1082.63	1082.63	1082.63	1082.63
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+940



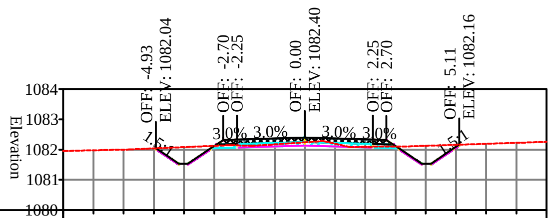
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 1+990



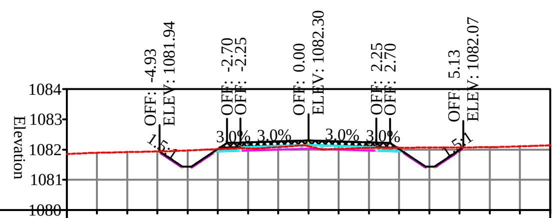
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+040



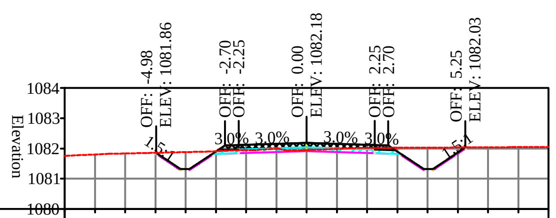
PROPOSED ELEVATIONS					1081.53	1082.12	1082.34	1082.37	1082.40	1082.37	1082.34	1082.12	1081.53	1082.08			
EXISTING ELEVATIONS	1081.95	1081.98	1082.00	1082.04	1082.08	1082.12	1082.13	1082.17	1082.24	1082.19	1082.09	1082.10	1082.12	1082.16	1082.19	1082.22	1082.26
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+090



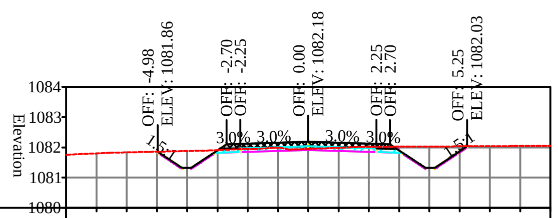
PROPOSED ELEVATIONS					1081.44	1082.02	1082.24	1082.27	1082.30	1082.27	1082.24	1082.02	1081.44	1081.99			
EXISTING ELEVATIONS	1081.85	1081.89	1081.92	1081.94	1081.97	1082.01	1082.04	1082.08	1082.11	1082.02	1082.06	1082.06	1082.07	1082.07	1082.08	1082.11	1082.14
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+140



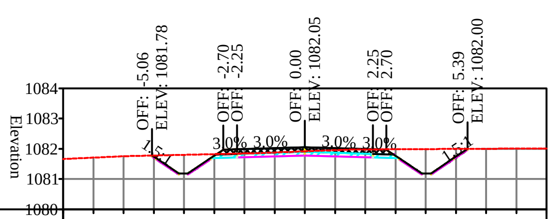
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+190



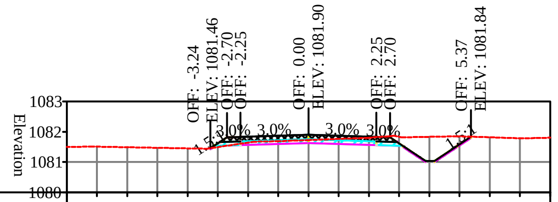
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+240



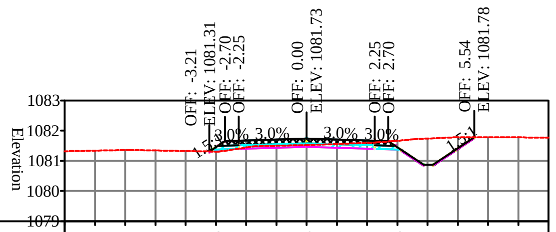
PROPOSED ELEVATIONS				1081.74	1081.19	1081.77	1081.99	1082.02	1082.05	1082.02	1081.99	1081.77	1081.19	1081.74			
EXISTING ELEVATIONS	1081.66	1081.71	1081.75	1081.78	1081.80	1081.82	1081.85	1081.88	1081.92	1081.95	1081.98	1081.98	1081.99	1082.00	1082.00	1082.01	1082.01
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+290



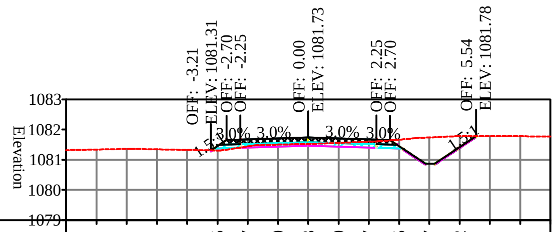
PROPOSED ELEVATIONS						1081.62	1081.84	1081.87	1081.90	1081.87	1081.84	1081.62	1081.04	1081.59			
EXISTING ELEVATIONS	1081.50	1081.51	1081.49	1081.47	1081.45	1081.49	1081.64	1081.69	1081.73	1081.76	1081.80	1081.83	1081.83	1081.85	1081.82	1081.79	1081.80
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+340



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

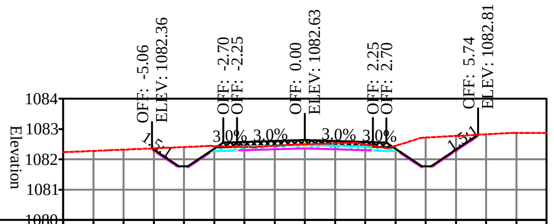
CH. 2+390



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

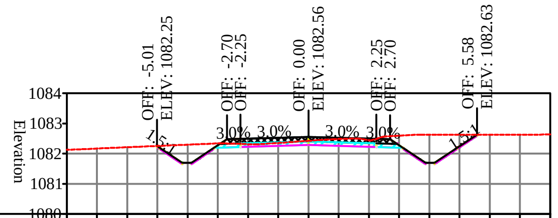
PROJECT NAME:	**CLIENT:**	KATAKWI DISTRICT LOCAL GOVERNMENT	**CONSULTANT:**	**CROSS SECTION DRAWINGS**	**Dwg. No** TD/KAP/SD-06
Drainage improvement on Kapujan -Kokorio Road	**Checked by:**	**Date:**	**Designed by:** Echatu Andrew		**Scale:** 1:250 Hz 1:250 VI (A3)
	Approved by:	**Date:**			**Date:**

CH. 2+440



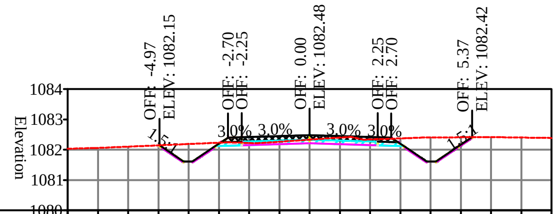
PROPOSED ELEVATIONS				1082.32	1081.77	1082.35	1082.57	1082.60	1082.63	1082.60	1082.57	1082.35	1081.77	1082.32			
EXISTING ELEVATIONS	1082.23	1082.28	1082.32	1082.36	1082.41	1082.44	1082.41	1082.45	1082.50	1082.53	1082.49	1082.44	1082.72	1082.77	1082.83	1082.88	1082.88
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+590



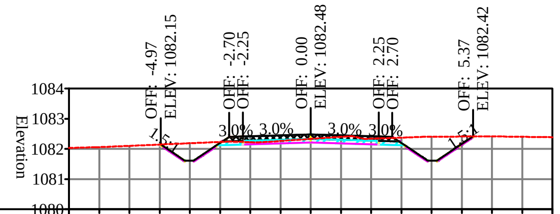
PROPOSED ELEVATIONS				1082.24	1081.69	1082.28	1082.50	1082.53	1082.56	1082.53	1082.50	1082.28	1081.69	1082.24			
EXISTING ELEVATIONS	1082.13	1082.17	1082.21	1082.25	1082.30	1082.34	1082.31	1082.36	1082.42	1082.49	1082.44	1082.60	1082.63	1082.63	1082.63	1082.63	1082.63
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+640



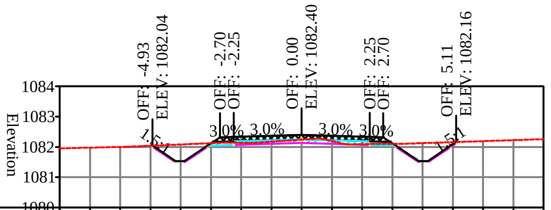
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+690



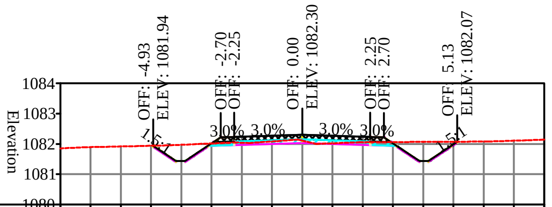
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+740



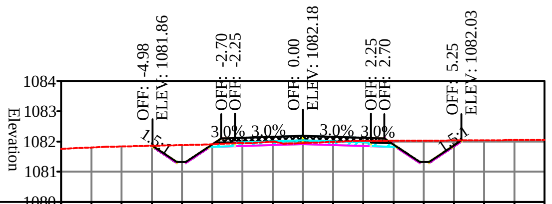
PROPOSED ELEVATIONS					1081.53	1082.12	1082.34	1082.37	1082.40	1082.37	1082.34	1082.12	1081.53	1082.08			
EXISTING ELEVATIONS	1081.95	1081.98	1082.00	1082.04	1082.08	1082.12	1082.13	1082.17	1082.24	1082.19	1082.09	1082.10	1082.12	1082.16	1082.19	1082.22	1082.26
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+790



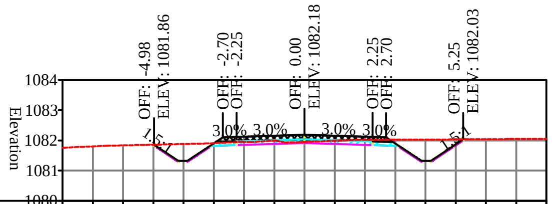
PROPOSED ELEVATIONS					1081.44	1082.02	1082.24	1082.27	1082.30	1082.27	1082.24	1082.02	1081.44	1081.99			
EXISTING ELEVATIONS	1081.85	1081.89	1081.92	1081.94	1081.97	1082.01	1082.04	1082.08	1082.11	1082.02	1082.06	1082.06	1082.07	1082.07	1082.08	1082.11	1082.14
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+840



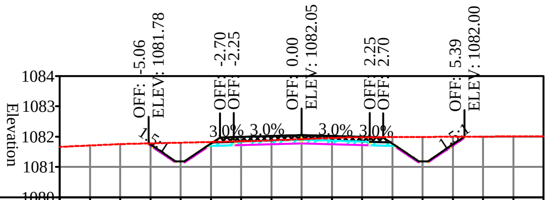
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+890



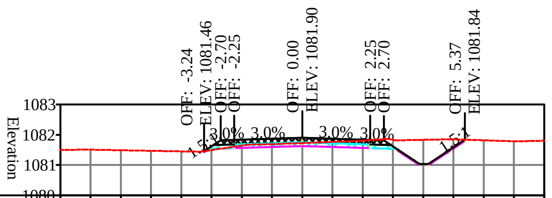
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+940



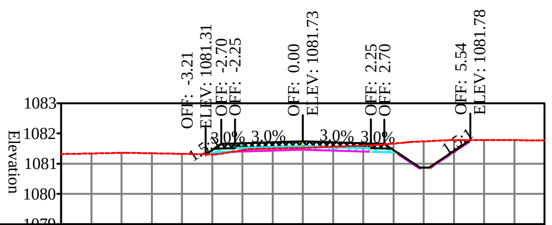
PROPOSED ELEVATIONS				1081.74	1081.19	1081.77	1081.99	1082.02	1082.05	1082.02	1081.99	1081.77	1081.19	1081.74			
EXISTING ELEVATIONS	1081.66	1081.71	1081.75	1081.78	1081.80	1081.82	1081.85	1081.88	1081.92	1081.95	1081.98	1081.98	1081.99	1082.00	1082.00	1082.01	1082.01
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 2+990



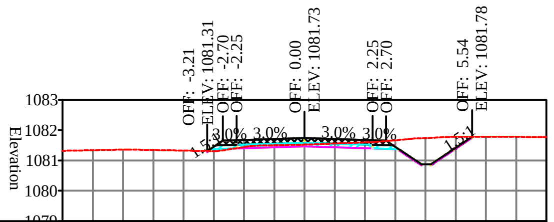
PROPOSED ELEVATIONS						1081.62	1081.84	1081.87	1081.90	1081.87	1081.84	1081.62	1081.04	1081.59			
EXISTING ELEVATIONS	1081.50	1081.51	1081.49	1081.47	1081.45	1081.49	1081.64	1081.69	1081.73	1081.76	1081.80	1081.83	1081.83	1081.85	1081.82	1081.79	1081.80
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+040



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

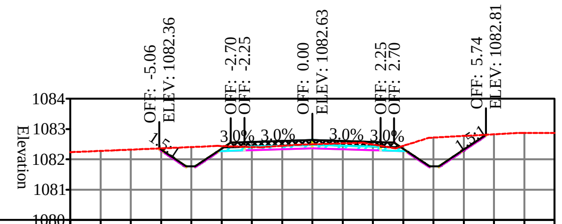
CH. 3+090



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

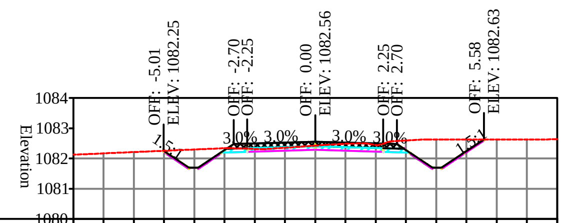
PROJECT NAME:	**CLIENT:**	KATAKWI DISTRICT LOCAL GOVERNMENT	**CONSULTANT:**		**Dwg. No**	TD/KAP/SD-07
Drainage improvement on Kapujan -Kokorio Road	**Checked by:**	**Date:**	**Designed by:** Echatu Andrew	**CROSS SECTION DRAWINGS**	**Scale:**	1:250 Hz 1:250 VI (A3)
	Approved by:	**Date:**			**Date:**	

CH. 3+140



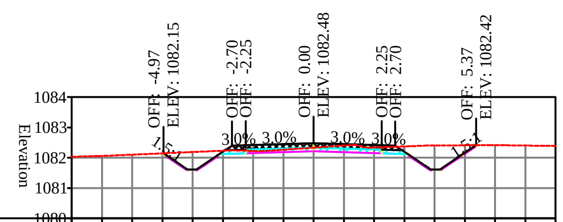
PROPOSED ELEVATIONS				1082.32	1081.77	1082.35	1082.57	1082.60	1082.63	1082.60	1082.57	1082.35	1081.77	1082.32			
EXISTING ELEVATIONS	1082.23	1082.28	1082.32	1082.36	1082.41	1082.44	1082.41	1082.45	1082.50	1082.53	1082.49	1082.44	1082.72	1082.77	1082.83	1082.88	1082.88
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+190



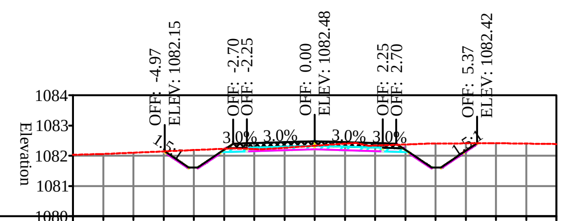
PROPOSED ELEVATIONS				1082.24	1081.69	1082.28	1082.50	1082.53	1082.56	1082.53	1082.50	1082.28	1081.69	1082.24			
EXISTING ELEVATIONS	1082.13	1082.17	1082.21	1082.25	1082.30	1082.34	1082.31	1082.36	1082.42	1082.49	1082.44	1082.60	1082.63	1082.63	1082.63	1082.63	1082.63
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+240



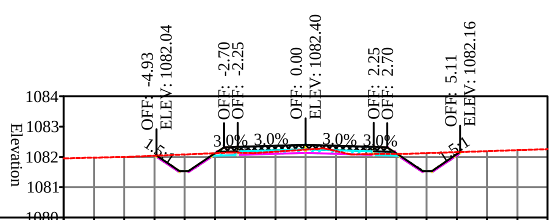
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+290



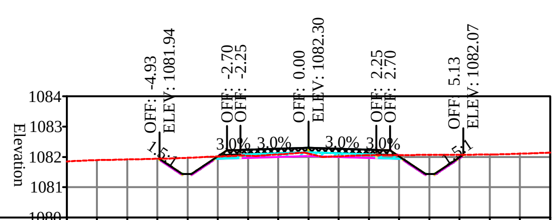
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+340



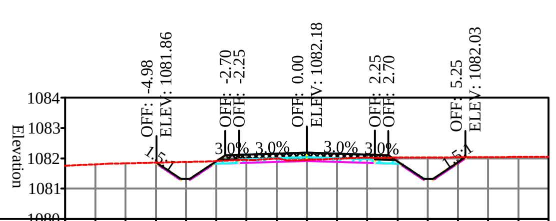
PROPOSED ELEVATIONS					1081.53	1082.12	1082.34	1082.37	1082.40	1082.37	1082.34	1082.12	1081.53	1082.08			
EXISTING ELEVATIONS	1081.95	1081.98	1082.00	1082.04	1082.08	1082.12	1082.13	1082.17	1082.24	1082.19	1082.09	1082.10	1082.12	1082.16	1082.19	1082.22	1082.26
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+390



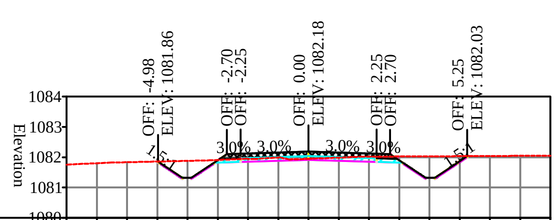
PROPOSED ELEVATIONS					1081.44	1082.02	1082.24	1082.27	1082.30	1082.27	1082.24	1082.02	1081.44	1081.99			
EXISTING ELEVATIONS	1081.85	1081.89	1081.92	1081.94	1081.97	1082.01	1082.04	1082.08	1082.11	1082.02	1082.06	1082.06	1082.07	1082.07	1082.08	1082.11	1082.14
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+440



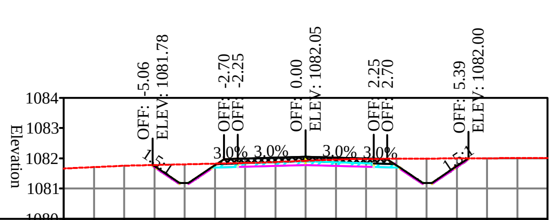
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+490



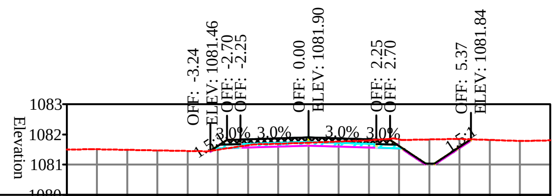
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+540



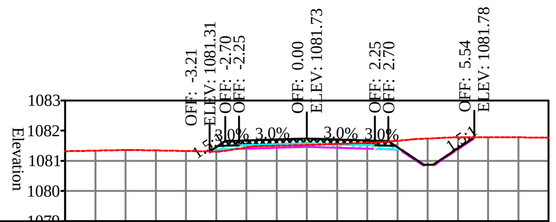
PROPOSED ELEVATIONS				1081.74	1081.19	1081.77	1081.99	1082.02	1082.05	1082.02	1081.99	1081.77	1081.19	1081.74			
EXISTING ELEVATIONS	1081.66	1081.71	1081.75	1081.78	1081.80	1081.82	1081.85	1081.88	1081.92	1081.95	1081.98	1081.98	1081.99	1082.00	1082.00	1082.01	1082.01
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+590



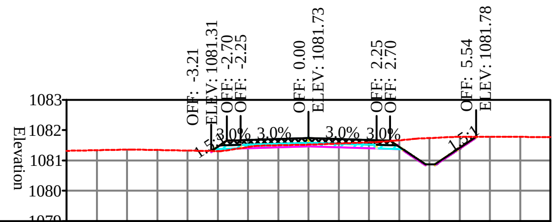
PROPOSED ELEVATIONS						1081.62	1081.84	1081.87	1081.90	1081.87	1081.84	1081.62	1081.04	1081.59			
EXISTING ELEVATIONS	1081.50	1081.51	1081.49	1081.47	1081.45	1081.49	1081.64	1081.69	1081.73	1081.76	1081.80	1081.83	1081.83	1081.85	1081.82	1081.79	1081.80
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

CH. 3+640



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

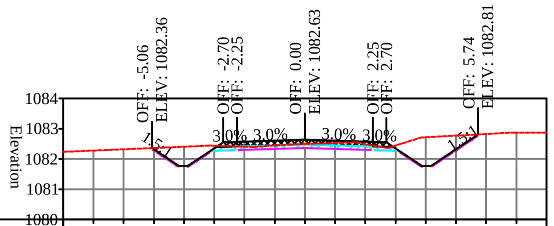
CH. 3+690



PROPOSED ELEVATIONS						1081.45	1081.67	1081.70	1081.73	1081.70	1081.67	1081.45	1080.87	1081.42			
EXISTING ELEVATIONS	1081.32	1081.34	1081.36	1081.34	1081.33	1081.31	1081.44	1081.50	1081.52	1081.56	1081.60	1081.66	1081.74	1081.78	1081.78	1081.78	1081.77
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

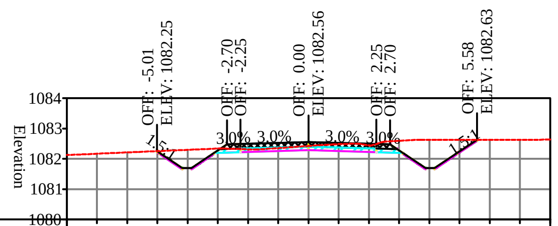
PROJECT NAME:	**CLIENT:**	KATAKWI DISTRICT LOCAL GOVERNMENT	**CONSULTANT:**	**CROSS SECTION DRAWINGS**	**Dwg. No**	TD/KAP/SD-08
Drainage improvement on Kapujan -Kokorio Road	**Checked by:**	**Date:**	**Designed by:** Echatu Andrew		**Scale:**	1:250 Hz 1:250 VI (A3)
	Approved by:	**Date:**			**Date:**	

CH. 3+740



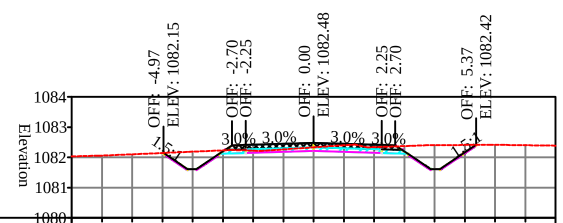
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS				1082.32	1081.77	1082.35	1082.57	1082.60	1082.63	1082.60	1082.57	1082.35	1081.77	1082.32			
EXISTING ELEVATIONS	1082.23	1082.28	1082.32	1082.36	1082.41	1082.44	1082.41	1082.45	1082.50	1082.53	1082.49	1082.44	1082.72	1082.77	1082.83	1082.88	1082.88

CH. 3+790



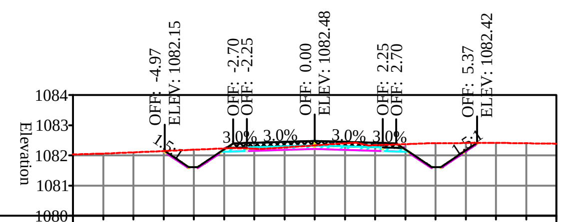
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS				1082.24	1081.69	1082.28	1082.50	1082.53	1082.56	1082.53	1082.50	1082.28	1081.69	1082.24			
EXISTING ELEVATIONS	1082.13	1082.17	1082.21	1082.25	1082.30	1082.34	1082.31	1082.36	1082.42	1082.49	1082.44	1082.60	1082.63	1082.63	1082.63	1082.63	1082.63

CH. 3+840



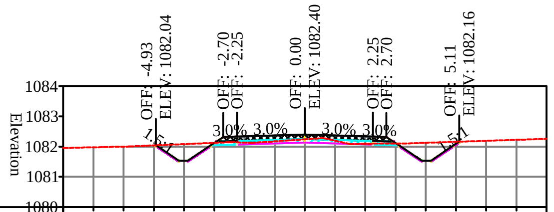
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39

CH. 3+890



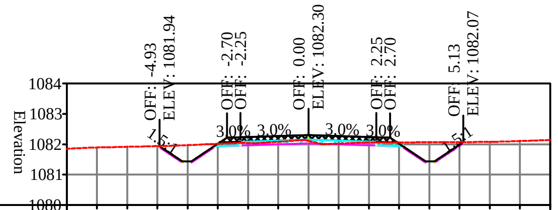
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS					1081.62	1082.20	1082.42	1082.45	1082.48	1082.45	1082.42	1082.20	1081.62	1082.17			
EXISTING ELEVATIONS	1082.04	1082.06	1082.10	1082.15	1082.19	1082.23	1082.22	1082.26	1082.33	1082.40	1082.34	1082.37	1082.40	1082.41	1082.42	1082.40	1082.39

CH. 3+940



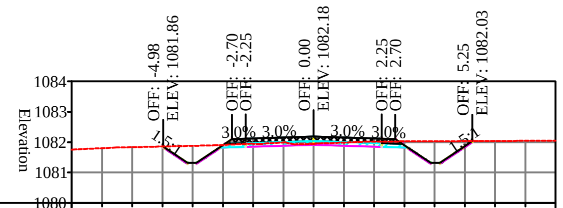
OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS					1081.53	1082.12	1082.34	1082.37	1082.40	1082.37	1082.34	1082.12	1081.53	1082.08			
EXISTING ELEVATIONS	1081.95	1081.98	1082.00	1082.04	1082.08	1082.12	1082.13	1082.17	1082.24	1082.19	1082.09	1082.10	1082.12	1082.16	1082.19	1082.22	1082.26

CH. 3+990



OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS					1081.44	1082.02	1082.24	1082.27	1082.30	1082.27	1082.24	1082.02	1081.44	1081.99			
EXISTING ELEVATIONS	1081.85	1081.89	1081.92	1081.94	1081.97	1082.01	1082.04	1082.08	1082.11	1082.02	1082.06	1082.06	1082.07	1082.07	1082.08	1082.11	1082.14

CH. 4+440



OFFSET	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
PROPOSED ELEVATIONS					1081.32	1081.90	1082.12	1082.15	1082.18	1082.15	1082.12	1081.90	1081.32	1081.87			
EXISTING ELEVATIONS	1081.76	1081.80	1081.83	1081.86	1081.88	1081.91	1081.95	1081.99	1081.95	1081.99	1082.02	1082.02	1082.03	1082.03	1082.04	1082.04	1082.05

PROJECT NAME:	**CLIENT:** KATAKWI DISTRICT LOCAL GOVERNMENT	**CONSULTANT:**	**Dwg. No** TD/KAP/SD-09
Drainage improvement on Kapujan -Kokorio Road	**Checked by:** **Date:**	**Designed by:** Echatu Andrew	**Scale:** 1:250 Hz 1:250 VI (A3)
	Approved by: **Date:**	**CROSS SECTION DRAWINGS**	**Date:**

APPENDIX 8: Plagiarism Report

THE PERFORMANCE OF RURAL ROAD DRAINAGE SYSTEMS IN UGANDA

by Andrew Echatu

Submission date: 29-Mar-2023 03:19PM (UTC+0100)
Submission ID: 2049984440
File name: Echatu_Submission.docx (2.08M)
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THE PERFORMANCE OF RURAL ROAD DRAINAGE SYSTEMS IN UGANDA

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