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TIME ANALYSIS WITH CRITICAL PATH METHOD
(Case Study on Jakarta Sewerage Development Project Zone 1, Package 2: Sewer Construction in Area 1-1)

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Abstract
Preparatory work in a construction project generally includes the fulfillment of work facilities, field investigations, and licensing, and is typically non-structural. The implementation of the Jakarta Sewerage Development Project Zone 1, Package 2: Construction of Sewers in Area 1-1, which is currently still in the preparatory work stage, is experiencing significant issues. Specifically, the project is facing a very complex licensing process, resulting in minimal work progress. This is due to the project planning phase not adequately considering the timeframe required for obtaining an implementation permit. Therefore, this paper analyzes the project timeline to identify project performance during the preparation period before the main project work implementation stage. In this study, the Critical Path Method (CPM) scheduling method was applied to the project to determine the activities on the critical path, utilizing the Microsoft Project application. The analysis identified that the activities on this critical path include Document Submission Work, Shaft Location C-8.1 Work, 8-span Pipe Jacking Work, Diversion Chamber Work, and Contract Closing. The analysis of the relationship between the licensing process and the critical path of the Master Schedule, as determined by the CPM method, revealed a delay in the start time of Shaft work from the planned June 3, 2024, to June 21, 2024, representing a 17-day delay from the original plan.

Keywords: *Preparatory Work, Construction Project, Licensing Process, Critical Path Method (CPM), Project Timeline*

1. INTRODUCTION

The reason why the city of Jakarta needs to build a Sewerage System is because of limited residential land, many houses build septic tanks less than 10 meters from the nearest groundwater well (homeowner or nearest neighbor), and septic tanks that are built are not standard / impermeable (potential leaks). Unsealed septic tanks close to groundwater wells can cause groundwater contamination by pathogenic bacteria from human feces that can cause disease. Therefore, the Government of Indonesia through the Ministry of Public Works and Public Housing held a construction project called Jakarta Sewerage Development Project Zone 1, Package 2: Construction of Sewers in Area 1-1.

The project can be defined as an organized effort to achieve important goals, objectives and expectations using the available budget and resources, which must be completed within a certain period of time (Dipohusodo, 1996). The more advanced human civilization becomes, the larger and more complex projects are undertaken involving the use of materials, manpower, and increasingly sophisticated technology. Projects generally have a deadline, meaning that the project must be completed before or exactly at the specified time. In connection with this project problem, the successful

implementation of a project on time is an important goal for both the project owner and the contractor. The implementation of the work of a project requires various supporting aspects in order to be carried out properly. Reliable human resources, and good management are supporting the implementation of the project so that it can be carried out and completed at the specified time. The process of planning to project control during the implementation of construction work is an important activity of a project.

Planning is a process that tries to lay the foundation of goals and objectives including preparing all the resources to achieve them. Planning provides a guide for implementation regarding the allocation of resources to carry out activities (Soeharto, 1997). Project activity planning is the basis of a project so that the project is carried out properly and directed, so that it can be completed with optimal time. At the project planning stage, it is necessary to estimate the duration of the project implementation time. The reality in the field shows that the completion time of a project varies, as a result the estimated completion time of a project cannot be ensured to be kept. The level of accuracy of the estimated project completion time is determined by the level of accuracy of the estimated duration of each activity in the project. In addition to the accuracy of time estimates, confirmation of the relationship between project activities is also needed for project planning.

For the smooth running of a project, management is needed that will manage the project from the beginning until the project ends, namely project management. The field of project management grows and develops because of the need in the modern industrial world to coordinate and control various activities that are increasingly complex. According to Alawiyah et al (2022), Project management is the management of the entire construction process starting from the process of preparing the project initiative, namely the stage of formulating project needs or ideas, preparing budgets and overall development schedules until the completion of the construction implementation process including the maintenance period and procurement of 'procurement' of equipment and building supplies. Rapid changes in conditions require every leader involved in the project to be able to anticipate the situation, and formulate the necessary forms of action (Dannyanti & Sudaryanto, 2011). This can be done when there is a well-thought-out planning concept that is based on data, information, skills, and experience. Time management is included in the process required to ensure project completion time (Triono, 2020). The time management system is centered on whether or not the project planning and scheduling is running. Where in the planning and scheduling, specific guidelines have been provided to complete project activities more quickly and efficiently (Yudhagama, 2020). Project management work time is limited by the specified schedule so that the leaders involved in the project must be able to anticipate changes in conditions that occur (Dannyanti & Sudaryanto, 2011).

In this research, the general description of the project can be slightly explained as follows, the Service User is PPK Sanitasi I of the Jakarta Metropolitan Region II Settlement Infrastructure Implementation Work Unit, Jakarta Metropolitan Region Settlement Infrastructure Center, Directorate General of Cipta Karya, Ministry of Public Works and Public Housing, with the Supervisory Consultant is Oriental Consultans Global - CTI Engineering International - PT Multi Karadiguna Jasa - PT Yodya Karya Joint Operation (OCMY JO) and the Contractor is Kumagai Gumi Co., LTD. - PT. Wijaya

Karya (Persero) Tbk. - PT. Jaya Konstruksi Manggala Pratama Tbk. JV (KG-WIKA-JAKON JV). The project site is located in Central Jakarta, Jl Purworejo (Menteng) - Thamrin - Kebon Kacang - Tanah Abang - Jl Abdul Muis - Cideng. The project implementation period is 1460 days starting on November 14, 2023 until November 12, 2027, with a maintenance period of 365 days.

The construction of a project is generally divided into 3 periods: planning period, implementation period, and maintenance period. The implementation period of the construction project itself can be divided into 3 stages of work, namely: preparatory work, main structural work, and finishing work. The initial stage in the implementation of a construction project is the preparatory work stage where at this stage the work executor carries out resource mobilization work, investigation work, project facility construction work, and licensing. Planning, control is part of the overall construction project management (Ervianto, Wulfram, 2005). The implementation of work on the Jakarta Sewerage Development Project Zone 1, Package 2: Construction of Sewers in Area 1-1 which is currently still in the preparatory work stage is experiencing problems, namely a very complex licensing process which results in minimal work progress. The licensing process in this project involves many institutions and authorities involved, resulting in the implementation of work not in accordance with the initial plan.

At the beginning of the project planning, it did not consider the timeframe for obtaining an implementation permit from the DKI Jakarta Agency which has authority in the area affected by the project, so the project needs to map and carry out administration to obtain permits for smooth project implementation. This project is located on an active public road used by the general public so that if the implementation of this activity begins it will have an impact on the mobility of the community around the project, therefore it is necessary to accommodate the licensing administration process for affected stakeholders. In a development project, planning activities is a very important aspect to avoid delays (Efendi et al., 2022). In planning activities, several methods have been developed, one of which is network planning. Using the network planning method is very helpful in planning complex work such as the wastewater network development project. For this reason, careful planning and scheduling are needed so that project work can be carried out as efficiently and effectively as possible. In planning project work activities, accelerating the project duration in the initial planning is also an important aspect to avoid delays. In scheduling network planning there are many methods. In this study, the authors used the critical path method (CPM) scheduling method with Microsoft Project application tools to examine the Jakarta Sewerage Development Project, Package 2: Construction of Sewers in Area 1-1.

This study aims to analyze activities that are critical paths in the Jakarta Sewerage Development Project Zone 1, Package 2 project: Construction of Sewers in Area 1-1 analyzed using Critical Path Method (CPM). And analyze the relationship of the licensing process to the critical trajectory of the Jakarta Sewerage Development Project Zone 1, Package 2: Construction of Sewers in Area 1-1.

2. RESEARCH METHODS

2.1. Research Flow Chart

This research is depicted with a flowchart as follows:

Figure 1. Research Flowchart

2.2. Research Procedure

The procedure and steps of this research are explained as follows:

a. Literature Study

To assist in writing this thesis, a lot of literature and related references are needed which serve to facilitate the steps of the author in doing the final project and add related knowledge for the author to work on the thesis. The necessary literature studies are as follows:

a) Study on the construction of Sewerage project
b) Studies on project management
c) Study of the Critical Path Method

b. Data Collection

Data collection was carried out by the author at Kumagai Gumi - Wika - Jakon Joint Venture as the implementing contractor on the Jakarta Sewerage Development Project Zone 1, Package 2: Construction of Sewers in Area 1-1 project and also by studying literature related to journals. The data taken by the author is divided into 2 types, namely:

a) Primary Data

Primary data was collected by the author directly at Kumagai Gumi - Wika - Jakon Joint Venture.

b) Secondary Data

Secondary data is supporting data in the form of data taken from the project, namely project schedule data, S curves and other data related to the author's research.

c. Data Analysis

a) Project Activity Analysis

From the list of quantities and prices and S-curves obtained from the project data, a breakdown of project activities and their duration is carried out.

b) Critical Path Method Analysis

CPM analysis is a method used to control and plan project work time by knowing the activities that are on the critical trajectory (Yaqin, H.N., 2023). Critical paths have been identified using data entered into Microsoft Project.

c) Analysis of the Permit Process for Preparatory Work

In this final project, the author gets an estimate of the project licensing process time from the research and survey process carried out by researchers at the Kumagai Gumi - Wika - Jakon Joint Venture project.

d) Analysis of the Relationship between Permitting Process and Project Critical Trajectory

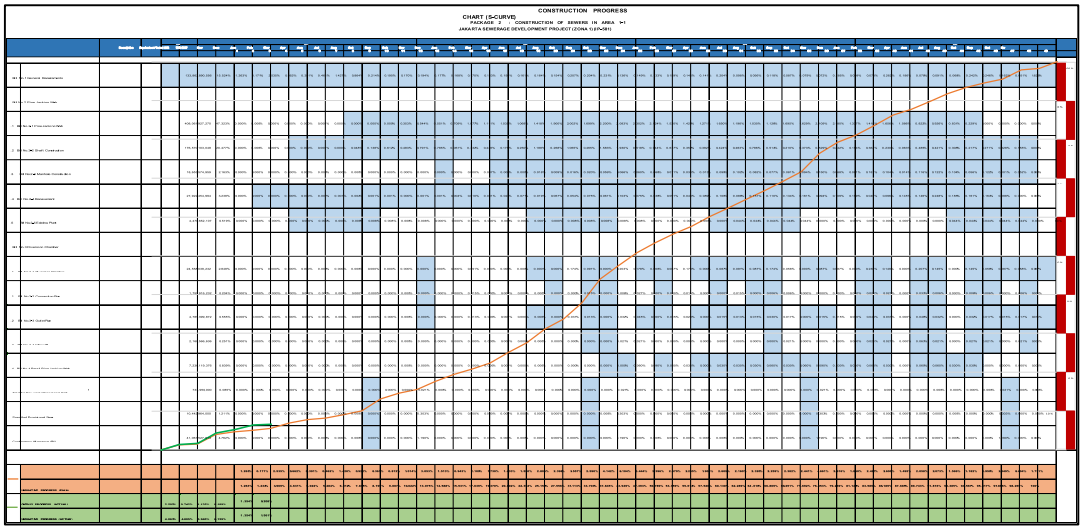
The author analyzes the results of the licensing process and then links it to the critical trajectory of the project and analyzes the impact of the licensing process on the master schedule.

3. RESULT AND DISCUSSION

3.1. Research Result

a. Project S-curve

In carrying out project scheduling, project scheduling data must be as detailed as possible to make it easier to determine the period of time the project activities must be completed.



Source: Kumagai Gumi - Wika - Jakon JV Project Data, 2023

Figure 2. Employment S-curve

The project implementation period is 1460 calendar days starting from November 14 to November 12, 2027. The project progress to date, which has entered the 6th month, is ± 6.13%. The current project activities are still at the stage of implementing preparatory work with the main activities:

a. Permitting process for stakeholders (Government Authorities and Institutions, Utility Owners, and Neighboring Communities) affected by project implementation.
b. Works of the Board of Directors Keet and Project Facilities
c. Survey and MC-0 work,
d. Existing Soil and Utility Investigation Works (Test Pit and Soil Investigation)
e. Preparation of technical documents and design review.

b. Project Activity Analysis

Based on data obtained from Kumagai Gumi - Wika - Jakon JV as the executing contractor, this project has a sequence of work in accordance with the Job Flowchart explanation, the following is a table of project activities along with the implementation period planned by the company according to the curve:

Table 1. Project Activities and Implementation Timeframe

No.	Job Description	Durasi (Hari)
1	Bill No.1 General Requirements	1460
2	Bill No.2 Pipe Jacking Work	
2.1	Bill No.2-1 Pipe Jacking Work	1125
2.2	Bill No.2-2 Shaft Construction	1218
2.3	Bill No.2-3 Manhole Construction	975
2.4	Bill No.2-4 Repavement	1278
2.5	Bill No.2-5 Existing Plant	1218
3	Bill No.3 Diversion Chamber	822
4	Bill No.4 Persil Pipe Jacking Work	638

Source: Kumagai Gumi - Wika - Jakon JV Project Data, 2023

The explanation of each type of work in table 1. can be described as follows:

a) General Requirement

This work is a preparatory work stage to facilitate the implementing contractor to work on this project properly. The following is a list of preparatory work on this project:

Table 2. List of Preparatory Work

No.	Description
Bill No-1 General Requirements	
1	Mobilisation and Demobilisation
2	Provision of Stockyard, Project Office and Facility

No.	Description
3	Provision of Project Signboard
4	Provision of Traffic Control on Public Road and Site Management
5	Exploratory and Testing Works
5.1	Test Pit
5.2	Soil Boring
5.3	Topography Survey
5.4	Underground Penetrating Radar Survey
6	Analysis of Environmental Impact
7	Quality Control
8	Protection of Existing Utility for Vertical Shaft
9	Protection River for Crossing Sewer
10	Safety and Healthy

Source: Kumagai Gumi - Wika - Jakon JV Project Data, 2023

b) Pipe Jacking Work

This work is the main work of this project, which is the work of supplying and installing concrete pipes ranging from 400 mm to 1200 mm in diameter, which will be installed underground with a total volume length of ± 14.32 km connecting 109 manhole structures.

c) Shaft Construction

Shaft work is the main work, namely temporary underground facilities to carry out Pipe Jacking work under the ground with a total of 109 location points, Shaft work is divided into 2 types of soil retaining structures, namely Steel Sheet Pile (80 pieces) and Liner Plate (29 pieces).

d) Manhole Construction

This work is the main structural work. This structure is in the same location as the Shaft work with a total location of 109 points. After the concrete pipe is installed, the Manhole structure is carried out which is a reinforced concrete structure which is a means for future pipe maintenance.

e) Repavement

This work is the final / finishing work stage, namely road demolition work and also the work of returning the road to its original condition after the manhole work is carried out.

f) Existing Plant

This work is the final stage of work / finishing, namely the work of returning plants to their original condition at locations where there are tree cuts or garden demolition after the manhole work is carried out.

g) Diversion Chamber

This work is a supporting structure for this wastewater pipeline project that connects the pipeline network with river water, with a total work volume of ± 36 location points.

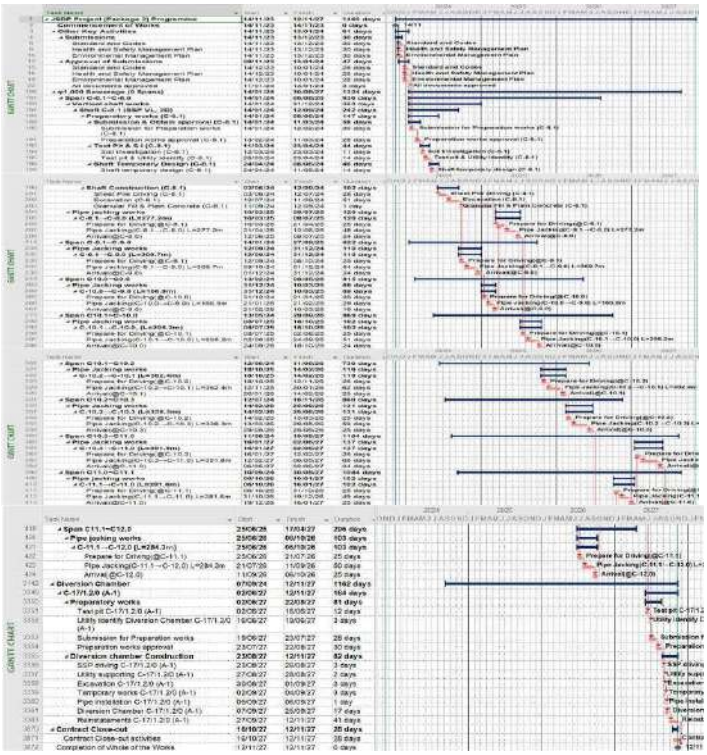
h) Persil Pipe

This work is a supporting structure for this wastewater pipe network project that connects the main pipe network with the tertiary pipe network from customers / buildings that want to connect their wastewater disposal to the project's wastewater pipe network, the total volume of this work is ± 28 location points.

From the explanation of each work on this project, it can be seen that the typical work on this project is repetitive work starting from preparatory work, main work, to finishing work as many as 109 times activities with different but connected locations, according to the design plan.

c. Critical Path Method Analysis

CPM analysis is a method used to control and plan project work time by knowing the activities that are on the critical trajectory (Rakasyiwi et al., 2022). Here is the critical trajectory of the project with microsoft project.



Source: Author's Processed Data, 2024

Figure 3. Project Critical Trajectory

Based on the critical path from Microsoft Project above, it can be seen which is the list and duration of each activity on the critical path of this project in the following report:

ID	Name	Start	Finish	Duration	Predecessors
2	Commencement of Works	14/11/23	14/11/23	0 days	
6	Standard and Codes	14/11/23	13/12/23	30 days	2
9	Health and Safety Management Plan	14/11/23	13/12/23	30 days	2
10	Environmental Management Plan	14/11/23	13/12/23	30 days	2
15	Standard and Codes	14/12/23	10/01/24	28 days	6
18	Health and Safety Management Plan	14/12/23	10/01/24	28 days	9
19	Environmental Management Plan	14/12/23	10/01/24	28 days	10
22	All documents approved	11/01/24	13/01/24	3 days	14;15;16;17;18;19;20;21
190	Submission for Preparation works (C-8.1)	14/01/24	12/02/24	30 days	22
191	Preparation works approval (C-8.1)	13/02/24	11/03/24	28 days	190
194	Soil Investigation (C-8.1)	12/03/24	23/03/24	11 days	191
195	Test pit & Utility Identify (C-8.1)	25/03/24	23/04/24	14 days	194
197	Shaft temporary design (C-8.1)	24/04/24	11/05/24	14 days	195
201	Sheet Pile Driving (C-8.1)	03/06/24	12/07/24	28 days	197FS+15 days
202	Excavation (C-8.1)	12/07/24	11/09/24	51 days	201
203	Granular Fill & Plain Concrete (C-8.1)	11/09/24	12/09/24	1 day	202
206	Prepare for Driving(@C-8.1)	10/03/25	21/04/25	25 days	267;203;185
207	Pipe Jacking(C-8.1→C-8.0) L=277.2m	21/04/25	12/06/25	48 days	206
208	Arrival(@C-8.0)	12/06/25	08/07/25	24 days	207

Source: Author's Processed Data, 2024

Figure 4. Critical Trajectory Report on Microsoft Project

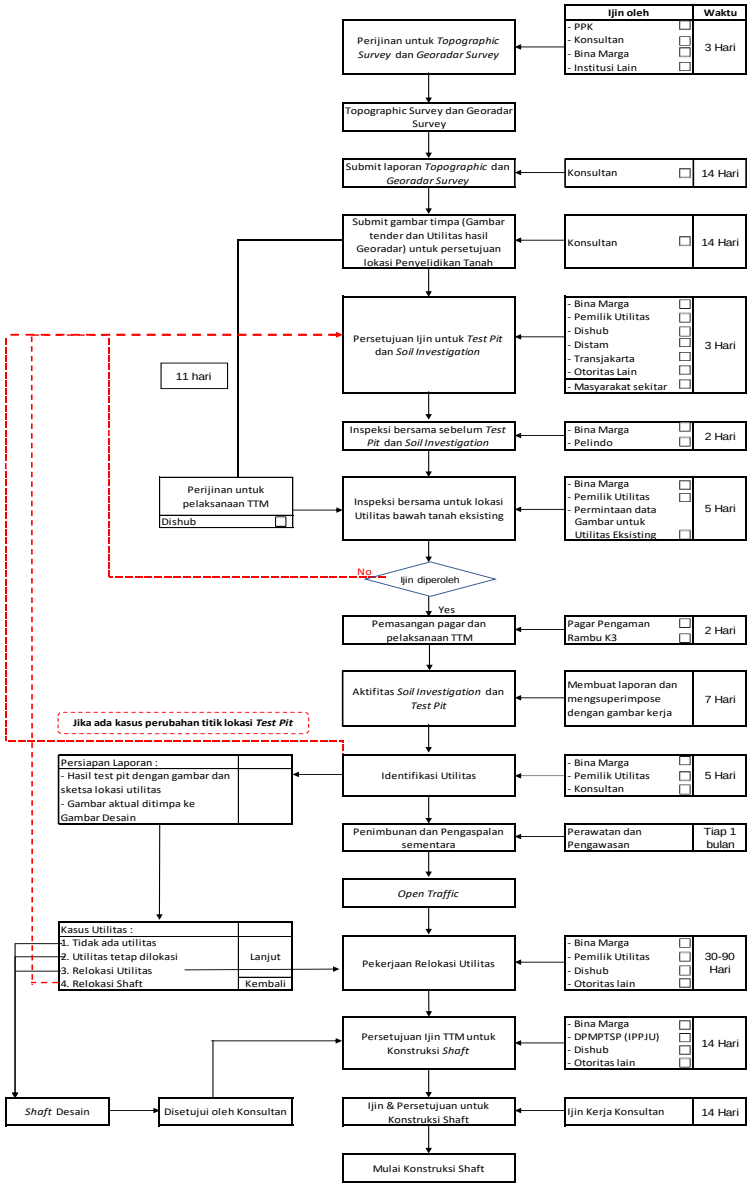
ID	Name	Start	Finish	Duration	Predecessors
236	Prepare for Driving(@C-8.1)	12/09/24	08/10/24	25 days	203;232
237	Pipe Jacking(C-8.1→C-9.0) L=309.7m	08/10/24	01/12/24	54 days	236
238	Arrival(@C-9.0)	01/12/24	31/12/24	24 days	237
265	Prepare for Driving(@C-10.0)	31/12/24	21/01/25	20 days	238;262;232
266	Pipe Jacking(C-10.0→C-9.0) L=166.9m	21/01/25	21/02/25	29 days	265
267	Arrival(@C-9.0)	21/02/25	10/03/25	16 days	266
294	Prepare for Driving(@C-10.1)	08/07/25	02/08/25	25 days	208;291;262
295	Pipe Jacking(C-10.1→C-10.0) L=295.2m	02/08/25	24/09/25	51 days	294
296	Arrival(@C-10.0)	24/09/25	18/10/25	24 days	295
323	Prepare for Driving(@C-10.2)	18/10/25	12/11/25	25 days	296;320;291
324	Pipe Jacking(C-10.2→C-10.1) L=362.4m	12/11/25	20/01/26	62 days	323
325	Arrival(@C-10.1)	20/01/26	14/02/26	25 days	324
352	Prepare for Driving(@C-10.2)	14/02/26	13/03/26	25 days	325;349;320
353	Pipe Jacking(C-10.2→C-10.3) L=338.3m	13/03/26	29/05/26	59 days	352
354	Arrival(@C-10.3)	29/05/26	25/06/26	25 days	353
382	Prepare for Driving(@C-10.3)	16/01/27	12/02/27	25 days	413;378;349
383	Pipe Jacking(C-10.3→C-11.0) L=391.8m	12/02/27	06/05/27	68 days	382
384	Arrival(@C-11.0)	06/05/27	02/06/27	24 days	383
411	Prepare for Driving(@C-11.1)	06/10/26	31/10/26	25 days	424;408;47
412	Pipe Jacking(C-11.1→C-11.0) L=281.6m	31/10/26	19/12/26	49 days	411
413	Arrival(@C-11.0)	19/12/26	16/01/27	25 days	412
422	Prepare for Driving(@C-11.1)	25/06/26	21/07/26	25 days	354;378;408
423	Pipe Jacking(C-11.1→C-12.0) L=284.3m	21/07/26	11/09/26	50 days	422
424	Arrival(@C-12.0)	11/09/26	06/10/26	25 days	423
3351	Test pit C-17/1.2/0 (A-1)	02/06/27	16/06/27	12 days	384
3352	Utility Identify Diversion Chamber C-17/1.2/0 (A-1)	16/06/27	19/06/27	3 days	3351
3353	Submission for Preparation works	19/06/27	23/07/27	28 days	3352
3354	Preparation works approval	23/07/27	22/08/27	30 days	3353
3356	SSP driving C-17/1.2/0 (A-1)	23/08/27	26/08/27	3 days	3354
3357	Utility supporting C-17/1.2/0 (A-1)	27/08/27	28/08/27	2 days	3356
3358	Excavation C-17/1.2/0 (A-1)	30/08/27	01/09/27	3 days	3357
3359	Temporary works C-17/1.2/0 (A-1)	02/09/27	04/09/27	3 days	3358
3360	Pipe installation C-17/1.2/0 (A-1)	06/09/27	06/09/27	1 day	3359
3361	Diversion Chamber C-17/1.2/0 (A-1)	07/09/27	25/09/27	17 days	3360
3363	Reinstatements C-17/1.2/0 (A-1)	27/09/27	12/11/27	41 days	3361
3871	Contract Close-out activities	16/10/27	12/11/27	28 days	387;1228;1216;1830;2582;3099;3363FF
3872	Completion of Whole of the Works	12/11/27	12/11/27	0 days	3871;389;477;1230;3170;3391;3750;505;1832;3363;3524

Source: Author's Processed Data, 2024

Figure 5. Critical Trajectory Report on Microsoft Project

d. Analysis of the Permit Process for Preparatory Work

This project is currently still in the early implementation stage, namely preparatory work. As explained earlier in the research background, at this time the project is experiencing obstacles in the licensing process which takes quite a long time. The following is an explanation of the licensing process in this project for preparatory work:



Source: Author's Processed Data, 2024

Figure 6. Flow of the Preparatory Work Permit Process

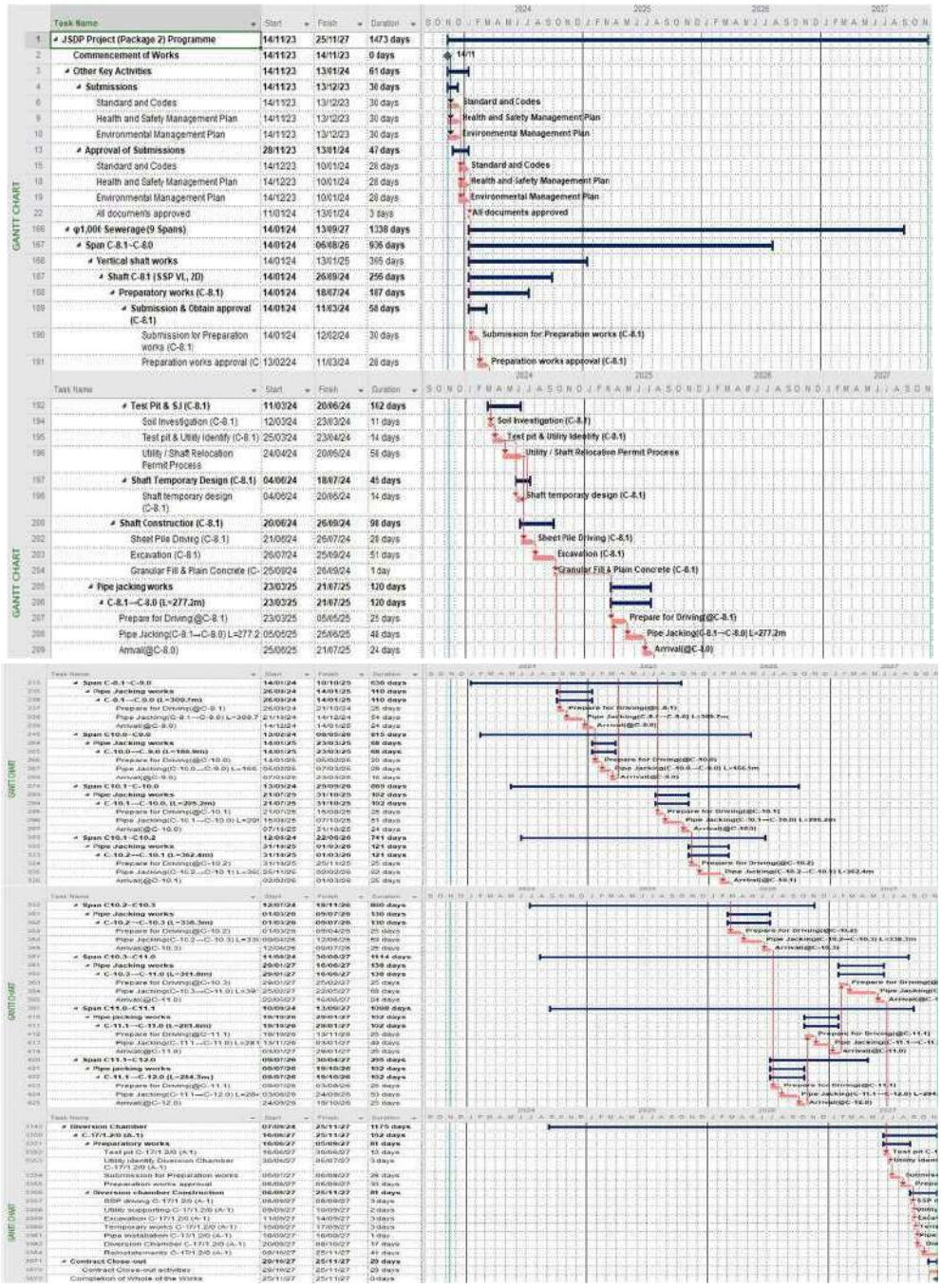
Currently, the implementation work in the project has carried out test pit work and because utilities are found, it is necessary to carry out the utility transfer licensing process,

and also from the flow chart above it can be seen that if test pit work is carried out and existing utilities are found that have been installed, the case that takes the most time in the licensing process is if the existing utilities are relocated, or also found existing utilities that cannot be relocated so that the Shaft Manhole location point in the project must be relocated. For implementation in the project at the time this research was made is when the test pit work has been carried out and waiting for the utility removal process. Based on this, the estimated period of the preparatory work process plus the licensing process for utility relocation until the Shaft structure work is ready to start is calculated, with the following details:

1) Utility Relocation Work : 30 Day
2) TTM Permit Approval : 14 Day
3) Shaft Construction Permit : 14 Day
   Total Licensing Process : 58 Day

e. Analysis of the Relationship between Permitting Process and Project Critical Trajectory

From the critical trajectory analysis of the project master schedule, it is known that the initial target start of the main work, namely Shaft work, began on June 03, 2024. While the master schedule has not taken into account the timeframe of the entire licensing process, therefore the author connects the licensing process to the critical trajectory of this project. When this research was made the implementation process in the project had carried out test pit work and was still carrying out the licensing process for utility relocation, while from the calculation of the licensing process from utility relocation to the start of shaft work took ± 58 days, therefore the researcher combined this process into the critical trajectory of the project master schedule right after the test pit work, namely on April 24, 2024. The following are the results of incorporating the licensing process into the critical trajectory of this project master schedule:



Source: Author's Processed Data, 2024

Figure 7. Relationship between Permitting Process and Project Critical Trajectory

ID	Name	Start	Finish	Duration	Predecessors
2	Commencement of Works	14/11/23	14/11/23	0 days	
6	Standard and Codes	14/11/23	13/12/23	30 days	2
9	Health and Safety Management Plan	14/11/23	13/12/23	30 days	2
10	Environmental Management Plan	14/11/23	13/12/23	30 days	2
15	Standard and Codes	14/12/23	10/01/24	28 days	6
18	Health and Safety Management Plan	14/12/23	10/01/24	28 days	9
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194	Soil Investigation (C-8.1)	12/03/24	23/03/24	11 days	191
195	Test pit & Utility Identify (C-8.1)	25/03/24	23/04/24	14 days	194
196	Utility / Shaft Relocation Permit Process	24/04/24	20/06/24	58 days	195
198	Shaft temporary design (C-8.1)	04/06/24	20/06/24	14 days	195;196FF
202	Sheet Pile Driving (C-8.1)	21/06/24	26/07/24	28 days	198;196
203	Excavation (C-8.1)	26/07/24	25/09/24	51 days	202
204	Granular Fill & Plain Concrete (C-8.1)	25/09/24	26/09/24	1 day	203
207	Prepare for Driving(@C-8.1)	23/03/25	05/05/25	25 days	268;204;185
208	Pipe Jacking(C-8.1→C-8.0) L=277.2m	05/05/25	25/06/25	48 days	207
209	Arrival(@C-8.0)	25/06/25	21/07/25	24 days	208
237	Prepare for Driving(@C-8.1)	26/09/24	21/10/24	25 days	204;233
238	Pipe Jacking(C-8.1→C-9.0) L=309.7m	21/10/24	14/12/24	54 days	237
239	Arrival(@C-9.0)	14/12/24	14/01/25	24 days	238
266	Prepare for Driving(@C-10.0)	14/01/25	05/02/25	20 days	239;263;233
267	Pipe Jacking(C-10.0→C-9.0) L=166.9m	05/02/25	07/03/25	29 days	266
268	Arrival(@C-9.0)	07/03/25	23/03/25	16 days	267
295	Prepare for Driving(@C-10.1)	21/07/25	15/08/25	25 days	209;292;263
296	Pipe Jacking(C-10.1→C-10.0) L=295.2m	15/08/25	07/10/25	51 days	295
297	Arrival(@C-10.0)	07/10/25	31/10/25	24 days	296
324	Prepare for Driving(@C-10.2)	31/10/25	25/11/25	25 days	297;321;292
325	Pipe Jacking(C-10.2→C-10.1) L=362.4m	25/11/25	02/02/26	62 days	324
326	Arrival(@C-10.1)	02/02/26	01/03/26	25 days	325
353	Prepare for Driving(@C-10.2)	01/03/26	09/04/26	25 days	326;350;321
354	Pipe Jacking(C-10.2→C-10.3) L=338.3m	09/04/26	12/06/26	59 days	353
355	Arrival(@C-10.3)	12/06/26	09/07/26	25 days	354
383	Prepare for Driving(@C-10.3)	29/01/27	25/02/27	25 days	414;379;350
384	Pipe Jacking(C-10.3→C-11.0) L=391.8m	25/02/27	22/05/27	68 days	383
385	Arrival(@C-11.0)	22/05/27	16/06/27	24 days	384
412	Prepare for Driving(@C-11.1)	19/10/26	13/11/26	25 days	425;409;47
413	Pipe Jacking(C-11.1→C-11.0) L=281.6m	13/11/26	03/01/27	49 days	412
414	Arrival(@C-11.0)	03/01/27	29/01/27	25 days	413
423	Prepare for Driving(@C-11.1)	09/07/26	03/08/26	25 days	355;379;409
424	Pipe Jacking(C-11.1→C-12.0) L=284.3m	03/08/26	24/09/26	50 days	423
425	Arrival(@C-12.0)	24/09/26	19/10/26	25 days	424
3352	Test pit C-17/1.2/0 (A-1)	16/06/27	30/06/27	12 days	385
3353	Utility identify Diversion Chamber C-17/1.2/0 (A-1)	30/06/27	05/07/27	3 days	3352
3354	Submission for Preparation works	05/07/27	06/08/27	28 days	3353
3355	Preparation works approval	06/08/27	05/09/27	30 days	3354
3357	SSP driving C-17/1.2/0 (A-1)	06/09/27	08/09/27	3 days	3355
3358	Utility supporting C-17/1.2/0 (A-1)	09/09/27	10/09/27	2 days	3357
3359	Excavation C-17/1.2/0 (A-1)	11/09/27	14/09/27	3 days	3358
3360	Temporary works C-17/1.2/0 (A-1)	15/09/27	17/09/27	3 days	3359
3361	Pipe installation C-17/1.2/0 (A-1)	18/09/27	18/09/27	1 day	3360
3362	Diversion Chamber C-17/1.2/0 (A-1)	20/09/27	08/10/27	17 days	3361
3364	Reinstatements C-17/1.2/0 (A-1)	09/10/27	25/11/27	41 days	3362
3872	Contract Close-out activities	29/10/27	25/11/27	28 days	388;1229;1217;1831;2583;3100;3364FF
3873	Completion of Whole of the Works	25/11/27	25/11/27	0 days	3872;390;478;1231;3171;3392;3751;506;1833;3364;3525

Source: Author's Processed Data, 2024

Figure 8. Report on the Relationship between Licensing Process and Critical Trajectory

Based on the results of the report on Microsoft Project, the relationship between the licensing process and the critical trajectory of the master schedule results in the start time of Shaft C-8.1 work shifting from June 3, 2024 to June 21, 2024 or 17 days back.

4. CONCLUSION

From the results of the analysis of project acceleration with the CPM method on the Jakarta Sewerage Development Project (Zone 1) Package 2 construction project: Construction Of Sewers In Area 1-1, it is concluded that the activities included in the critical trajectory of this project are Document Submission Work, Shaft Work location C-8.1, Pipe Jacking Work 8 spans (C-8. 1~C-8.0 ; C-8.1~C-9.0 ; C-10.0~C-.9.0 ; C- 10.1~C-10.0 ; C-10.1~C-10.2 ; C-10.2~10.3 ; C-10.3~C-11.0 ; C- 11.0~C-11.1 ; C-11.1~C-12.0), Diversion Chamber Work C-17/1.2/0 (A-1), and finally Contract Closing.

The results of the analysis of the relationship between the licensing process and the critical trajectory of the project analyzed by the CPM method resulted in a delay in the start time of Shaft C-8.1 work which previously started on June 3, 2024 to June 21, 2024 or 17 days back from the original plan. Scheduling on the Jakarta Sewerage Development Project Zone 1, Package 2: Construction of Sewers in Area 1-1. project can be done with the help of the Microsoft Project application because it shows the relationship between jobs and a more detailed critical trajectory.

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