

Appendix 8 Environmental and Social Considerations

(1) IEE Report

(2) Environmental Checklist

(3) Minutes of the Stakeholder Meeting



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List of Abbreviation

Abbreviation	Description
JICA	Japan International Cooperation Agency
the Project	the Project for Improvement of Water Supply in Jenin Municipality
PA	Palestinian Authority
Team	the Consultant members of the JICA Preparatory Survey Team
EMP	Environmental Management Plan
IEE	Initial Environmental Examination
EMoP	Environmental Monitoring Plan
GHG	Green House Gas
EIA	Environmental Impact Assessment
EQA	Environmental Quality Authority
EA	Environmental Assessment
WB	World Bank
OP	Operational Policy on Environmental assessment
SEA	Social Environmental Assessment
RAP	Resettlement Action Plan
SEIA	Social Environmental Impact Assessment
WHO	World health organisation
JSC	Joint service council
ZF Landfill	Zahrat al-Finjan landfill
SW	Solid waste
MOLG	Ministry of Local Government
UNFCCC	United Nations Framework Convention on Climate Change
MoA	Ministry of Agriculture
PWA	Palestinian Water Authority
PCBS	Palestinian Central Bureau of Statistics
WBWD	West Bank Water Department
CAC	Joint Civil Affairs Coordination and Cooperation Committee

1. EXECUTIVE SUMMARY

With an estimated population of 65,487 in 2021, Jenin city and its camp "Jenin Camp" located in the northern part of the West Bank with a total area of 583 km², and a semi-arid and Mediterranean (dry to sub-humid) climate, with an average annual rainfall of 468 mm.

Groundwater (Municipal and private wells) is the main source of water supply in Jenin area, in addition to a bulk water supply from Israel, and since water supply and distribution system in Jenin suffers from many deficiencies (insufficient water resources, leakage, and an old or no distribution network in some parts of the city).

JICA decided to conduct a preparatory survey to determine the viability of a project for Improvement of Water Supply in Jenin Municipality, to be implemented under the Japanese Grant Aid scheme.

The Preparatory Survey on the Project for Improvement of Water Supply in Jenin Municipality (hereinafter referred as "the Project") was signed on March, 2021 between Japan International Cooperation Agency and the Palestinian Water Authority (As the representative of the Palestinian Authority)

The Project aims to Improve the Water Supply System in Jenin Municipality through the followings:

- (i) To replace and upgrade the portions of existing water transmission and distribution facilities to reduce water leakage and optimize water pressure.
- (ii) To rehabilitate the existing water intake facilities to increase water production capacity.
- (iii) To construct a new distribution network to increase the rate of population served. Consequently, the Project will improve the water supply services by implementing the identified priority project and help achieve the priority policies of Palestine.

Screening: Based on JICA's Guidelines for Environmental and Social Considerations (2010), the Project is categorized as Category B, as significant negative impacts are not expected by the Project and as their potential adverse impacts on the environment and society are less adverse than those of Category A projects, site-specific, and few if any are irreversible, and in most cases, normal mitigation measures can be designed more readily.

Fourteen types of major development projects for which an Environmental Impact Assessment (EIA) shall be conducted are listed in the Palestinian Environmental Assessment Policy, Water Supply projects aren't included in the list and so the Project was subjected to a screening criterion (Annex II of the same policy), and as a result EQA surely will not ask for EIA and may or may not ask for an IEE study (which will be determined later, after the submission of an Environmental approval request to EQA by PWA and/or Jenin municipality).

The components of the project are (i) Rehabilitation of existing municipality wells, (ii) Rehabilitation of the transmission pumps (replacement of pumps, pipes and fittings), (iii) Rehabilitation of existing reservoirs and/or new construction of reservoir, (iv) Construction and rehabilitation of the transmission pipes, (v) Replacement of distribution mains and distribution network pipes, (vi) Construction of DMAs (District Metered Areas), (vii) Introduction of distribution monitoring system.

Legal framework: To ensure that the project is done according to the relevant laws applied in Palestine, Laws, Regulations and Guidelines related to the preparation of the project, were viewed, and the main related laws and regulations were:

- JICA Guidelines for Environmental and Social Considerations (2010)
- Palestinian Environmental law 7, 1999
- Palestinian Environmental Assessment Policy, 2000
- Palestinian Water Law (2002)
- Land Expropriation Law 2/1953
- Palestinian Labour Law 7/2000
- World Bank Safeguard Policies and Guidelines
- World Bank Environmental and Social Framework
- Jordanian Law No. 51 on Antiquities of 1966
- Decree-Law No. 14 of 2018 amending Agriculture Law No. 2 of 2003 and its amendments
- Oslo II Accord (Article 12, and Article 40)

Then a gap analysis was done between JICA E&S GL & Legal Frameworks of Palestine and a gap filling measure was suggested.

Institutional framework: Regarding institutional framework, the two main institutions that have the major role in this project are Palestinian Water Authority (PWA) and Environment Quality Authority (EQA).

Palestinian Water Authority has been given the mandate through By-Law No. 2 (1996) and has been stressed on in its amendments Law no.3 for 2002 to manage the water resources, execute the water policy, establish supervise and monitor water projects, and to initiate coordination and co-operation between the parties affected by water management.

Environment Quality Authority is the central authoritative body for all environmental issues in Palestine, its core mission is to protect the environment in all its elements, and it is the umbrella for all activities and studies related to environmental planning, protection and control.

IEE Report: This IEE report covers the overall environmental profile of improvement of water supply and includes an overview of the potential environmental impacts of construction management activities and their magnitude on physical, environmental, economic, social, and cultural resources within a project's area of influence during the construction and operational phases. An Indicative Environmental Management and Monitoring Plan, which includes measures to mitigate significant environmental impacts during project implementation, the Environmental Monitoring Program, and those responsible for mitigation and monitoring.

Baseline conditions: An Assessment of the baseline environmental conditions based on secondary data collection, consultation with competent authorities and relevant experts, internet data collection, and primary data collection was prepared and the results were within the Palestinian and international standards, except one reading for noise pollution were exceeding the standards and that was due to traffic noise in a busy street.

There are no protected areas within the project implementation area, however a small forest does exist within the project area (classified as forests on the national spatial plan map – ministry of local government), and according to Decree-Law No. 14 of 2018 amending Agriculture Law No. 2 of 2003 and its amendments, water reservoirs may be established and established in government forest land, and based on the spatial information system map in Palestine, and after reviewing the project maps, a clear view was obtained that there will not be any involuntary resettlements, since all the project facilities are in a public land.

Environmental and Social Impacts: In order to determine the extent of the environmental impacts of the project to be undertaken, a scoping matrix was prepared for the assumed project impacts for the proposed project design based on the baseline survey results, and a management and monitoring plan was prepared.

Environmental and Social impacts of this Project where insignificant and can be (somehow) easily mitigated. The main environmental impacts were during the construction phase and mainly on air quality and noise and the main social impacts were unequal distribution of benefit and damage and local conflicts of interests. A mitigation measures were set to deal with these impacts and the responsibility was assigned for implementation and monitoring.

GHG Reduction: Projects that lead to climate-change mitigation are targeted to the quantification of GHG emissions reductions (removals) at the planning stage in order to grasp the project effects on climate-change mitigation, however this Project has negligible GHG changes; because comparing the baseline condition with the project, the project components will have a little increase of electricity consumption that will not cause a considerable change in GHG emissions.

Climate Change Adaptation: The Climate Change Adaptation Strategy and Program of Action for the Palestinian Authority has previously identified water as a most vulnerable issue in the State of Palestine. Historic trends in climate in relation to the State of Palestine were assessed to aid consideration of climate sensitivities of potential vulnerabilities. Ground water supply ranked as 'highly vulnerable' and were one of the important issues to focus for identifying and prioritizing adaptation options.

Adaptation options were identified that seek to reduce vulnerabilities by reducing climate sensitivity or increasing adaptive capacity and that are relevant to all the future-climate scenarios.

Climate-FIT has greater focus on the common concept of climate risk assessment and adaptation as well as implementation approaches to be applied in various JICA projects, and so Climate Risk assessment for the Project was done:

The impacts (climate risks) that may be significant in the future were:

1. Rainfall decrease and water supply (wells) are considered to be significant climate risks in the future since it is almost impossible to drill new wells, while the bulk water supply and private wells will not be enough to solve the problem. Thus, decrease in water supply-demand balance is selected as a future climate risk for the Project.
2. High Temperature and Water supply (from the Connection Points) are considered to be significant climate risk in the future, since lack of alternative source combined with a fragile relationship with Israel surely will lead to a decrease in the amount of water available through the CP and so the decrease in annual water resources available for water supply is selected as a future climate risk for the Project.

3. High Temperature and surrounding people are also considered to be significant climate risk in the future. The demand for water increases with temperature increase and failure to deliver enough water to the surrounding people will cause health problems to the people so the decrease in water supply-demand balance is selected as a future climate risk for the Project.

A climate risk tree was prepared and the two climate risks selected for this project were “decrease in water supply-demand balance” and “decrease in annual water resources available for water supply.”

Six adaptation options were set that addresses the vulnerabilities and reduce climate risk:

- Implement an awareness program for water conservation
- Implement a Water reuse options (such as grey water reuse)
- Emergency response plan
- Alternative water source (New well)
- Improve the existing source (wells)
- Water harvesting
- Peace Agreement

2 INTRODUCTION

2.1 Background

The State of Palestine is situated in the Middle East, a region that generally experiences four months of hot dry summer weather and a short winter with rain from November to March. The country is located in a unique position between different biogeographic regions: the Asian and African continents and the Mediterranean Sea. It is divided into five agro-ecological zones (the Jordan Valley, the Eastern Slopes, the Central Highlands, the Semi-Coastal Plain, and the Coastal Plain), which each have a very different climate.

Jenin is the main city of Jenin district and its administrative centre. The city is located in the north of the West Bank with a total area of 583 km², characterized by gentle slopes and considered. The population of Jenin city with its refugee camp named "Jenin Camp" is estimated to be 65,487 as of 2021, which is forecast to be 71,069 in 2025. The climate in Jenin Area is classified as semi-arid and Mediterranean (dry to sub-humid). The long term annual average rainfall within its boundary is estimated at 468 mm. (JICA, 2021)

The average monthly temperature within the boundary of Jenin during the summer months is about 27.4 °C, while the mean monthly temperature during the winter months is 14.1 °C. The average humidity is 72% (PWA, 2017)

Water is the most important issue on the Palestinian environmental agenda and access to water is among the most contentious points in the negotiations between Israel and the State of Palestine. The Israeli occupation limits access to available water resources and the Palestinian Government's capacities to improve the situation (e.g., constraining development of water storage reservoirs for harvesting rainfall). The State of Palestine relies on groundwater for more than 95% of its water needs, as Israel denies Palestinians right of access to the only permanent river, the Jordan River

Water supply in Jenin depends on groundwater resources (municipality-owned wells, private wells, and bulk water supply through Mekorot, the national water company of Israel). Since development of new water resources in Palestine is practically difficult without monitoring and consent of the Israel Government, the Government of Palestine puts a high priority on the National Policy Agenda (2017-2022), which emphasizes on effective use of groundwater

resources, to development of water supply infrastructure to improve access to safe water.
(PWA, 2017)

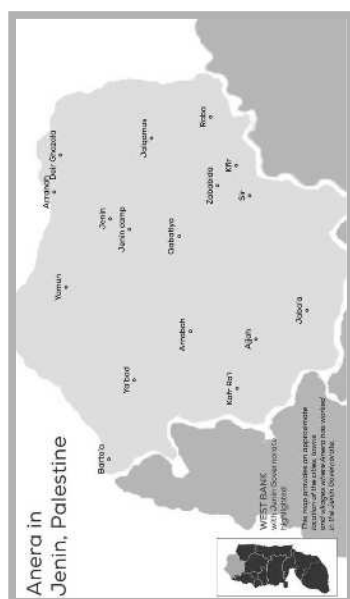


Figure 1 Location of Jenin city

Japan International Cooperation Agency (hereinafter referred as "JICA"), a governmental agency that implements Official Development Assistance (ODA) for the government of Japan, decided to conduct the Preparatory Survey to determine the viability of the Project for Improvement of Water Supply in Jenin Municipality to be implemented under the Japan's Grant Aid scheme.

The Preparatory Survey on the Project For Improvement of Water Supply in Jenin Municipality (hereinafter referred to as **"the Project"**) signed on 29th March, 2021 between Japan International Cooperation Agency (hereinafter referred to as **"JICA"**) and Palestinian Water Authority of the Palestinian Authority (hereinafter referred to as **"PA"**), the Consultant members of the JICA Preparatory Survey Team (hereinafter referred to as the "Team") had a series of discussions and conducted field surveys from 2nd September 2021.

JICA and the Team confirmed the technical conditions described in technical notes (1) "the Preparatory Survey on the Project for Improvement of Water Supply in Jenin Municipality" see appendix No (2). This Technical Note does not make a commitment of the project scope, project implementation, design and method to be implemented. The final project scope, project implementation, designs, etc. will be decided by JICA after the Preparatory Survey.

This report was prepared by Engineers –Consultant and project managers office at the request of Mr. Naoto Tohda (Chief Consultant of the Preparatory Survey Team).

2.2 Aims of the Project

To Improve the Water Supply System in Jenin Municipality (hereinafter referred as “the Project”) this will be as follows:

- (i) To replace and upgrade the portions of existing water transmission and distribution facilities to reduce water leakage and optimize water pressure.
 - (ii) To rehabilitate the existing water intake facilities to increase water production capacity.
 - (iii) To construct new distribution networks to increase the rate of population served.
- Consequently, the Project will improve the water supply services by implementing the identified priority project and help achieve the priority policies of Palestine.

2.3 Purpose of the Initial Environmental Examination (IEE)

While the project aims to improve the water supply system in Jenin city, the proposed improvement to the water supply facilities may have some negative effects on the environment. The project construction process may cause environmental impacts starting from construction and operation phases. This IEE report covers the overall environmental profile of improvement of water supply and includes an overview of the potential environmental impacts of construction management activities and their magnitude on physical, environmental, economic, social, and cultural resources within a project's area of influence during the construction and operational phases. An indicative Environmental Management Plan (EMP), which includes measures to mitigate significant environmental impacts during project implementation, the Environmental Monitoring Program, and those responsible for mitigation and monitoring.

This purpose of the IEE report as follows:

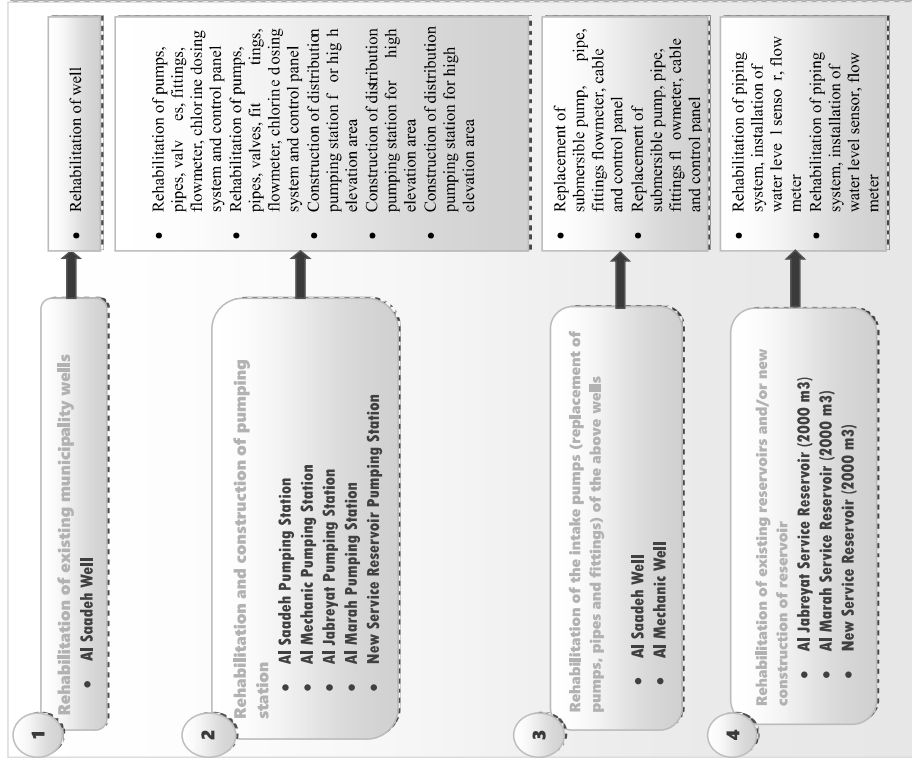
1. Confirmation of Legal and Institutional Frameworks.
2. To assess of the baseline environmental conditions based on secondary data collection, consultation with competent authorities and relevant experts, internet data collection, and primary data collection

3. Preparation of assumed project impacts for proposed project design based on the baseline survey results in 2 with scoping matrix and JICA Env. Guidelines
4. Comparative Analysis of Alternatives, EMP, and EMoP
5. To collect the data required for the quantitative evaluation of Green House Gas (GHG) emission reductions by the project, according to the application of the JICA-Climate-FIT1 (Mitigation)
6. To collect the data required for the climate risk assessment and adaptation of the project according to JICA-Climate-FIT (Adaptation).

2.4 Project phases and Alternative's design

2.4.1 Project components

The project to be implemented will include the following components as follows



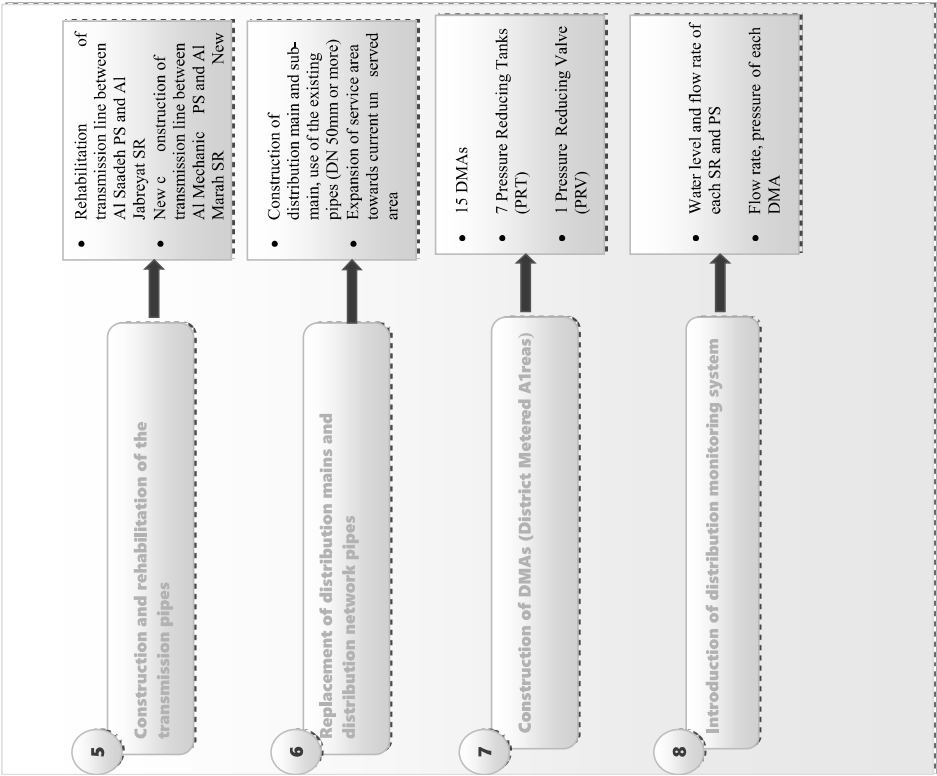


Figure 2 Project components

2.4.2 Project Area

While the Project Area is Jenin Municipality, it is identified that administrative boundary of the Municipality is not consistent with the area of the census units. Accordingly, the census area is composed of the entire Jenin Municipality, Jenin Camp and four (4) expansion areas as shown in fig (3).

Ministry of Local Governorate instructed include those expansion areas into the Municipality administrative area. The Municipality are discussing on this issue. Taking into account that some parts of those four expansion areas are currently supplied with the public water supply from Jenin Municipality and to be supplied in future, the Parties (PWA, Municipality and JICA) agreed to consider those service areas into the facility design.

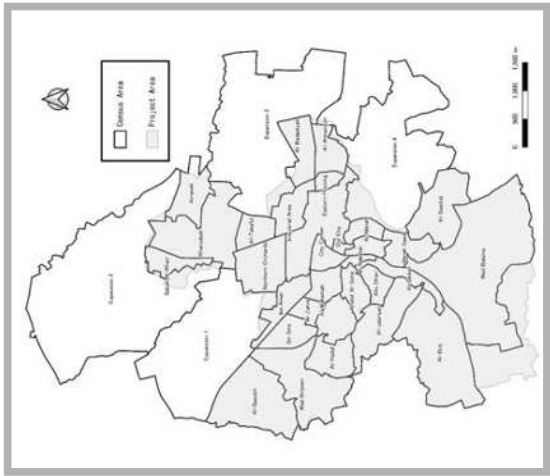


Figure 3 Project Area and Census Area

2.4.3 Existing and proposed water supply in Jenin city

The existing water supply facilities of Jenin have become old and deteriorated that water supply capacity is insufficient compared to water demand. As a result, water is rationed and distributed intermittently by zoning distribution areas. Consequently, most people have limited

Access to public water, only one or two days in a week and only once a week in summer. Average water consumption is estimated as 69 litres per capita per day (1/c/d).



Figure 4 Water Sources in Jenin City

Based on the technical note (1) report that was prepared regarding the project, which contained a full description and plans for the current and proposed situations of the water supply for Lenin city (see appendix 2), these descriptions and plans as the following items:

a) **Water demand forecast**

The Parties agreed through the technical note report (1), that the water demand forecast. Accordingly, maximum daily water demand of **18,000 m³/day** will be considered for facility planning.

Table 1: water demand forecast

[1]	Population Served (Year 2030)	73,894 persons	Estimated by Municipality population (Census 2017, PCBS) excluding population in expansion areas, Annual growth rate +2.07%
[2]	Rate of population served	100 %	
[3]	Average domestic water consumption per person per day	120 l/c/day	National Water Policy
[4]	Industrial Demand per person per day	12 l/c/day	10% of [3] domestic consumption
[5]	Water consumption per person per day	132 l/c/day	[5] = [3] + [4]
[6]	Daily Average Water Consumption	9,754 m ³ /day	[6] = [1] x [2] x [5]
[7]	Physical Loss	3,251 m ³ /dav	[7] = ([6] / 75%) x [Leakage ratio (25%)]

b) Existing wells

Table 2: Plan of the Existing Municipality Wells

Name	Current	After the Project
Al Saadch Well	Production capacity (2020): 2,437 m ³ /day	The well will be rehabilitated by acid cleaning and air lifting to produce 3,500 m ³ /day (150 m ³ /hr)
Al Mechanic Well	Production capacity (2020): 350 m ³ /day to network and 23 m ³ /day to water tanker trucks	The well will be used as it is to produce 500 m ³ /day (20m ³ /hr). Replacement of submersible pumps, pipes, valves, fittings, electrical equipment
Balama Well	Production capacity (2020): 30 m ³ /day	To be abolished.

c) Private Wells

Farraheen, Alwneh, Turkamm, Abu Alsameer, Ala' Alsadi, Jarrar, Ashraf Hussam, Qasrawi, Abu Hatab 1 and Abu Hatab 2. See fig (5)

d) Current Bulk Water Supply

Table 3 :Current Situation of the Bulk Water Supply

Name	Supplying Entity	Purchasing Volume
Al Jalameh Connection	Mekorot (Israel)	Ave. 933 m³/day (2020)
Al Swetat Connection	Mekorot (Israel)	Ave. 1,800 m³/day (2020)
Abu Arab Well	WBWD (PWA)	Ave. 921 m³/day (2020)

e) Connection point project

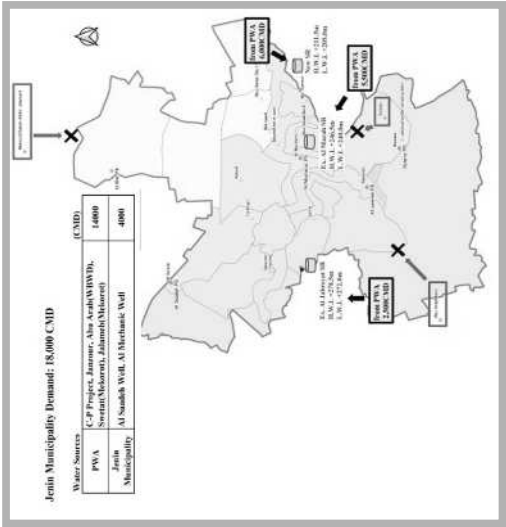


Figure 5 PWA suggested technical alternatives

PWA explained that 400m³/hr will be supplied from Salem Point and 500m³/hr will be supplied from Al Jalameh Point after the Connection Point Project will complete. As the C-P project originally planned to install a new transmission pipeline from the Salem Point to Main Pumping Station around Sabah Al Khir through the Al Saadeh Pumping Station (Figure 6), PWA suggested technical alternatives as shown in Figure 4.3 and 4.4 where water from Salem Point will be supplied at the Al Saadeh PS as and the rest amount will be supplied from the Al Jalameh Point. The Parties agreed to continue further technical discussions among the relevant parties of PWA, Jenin Municipality, the Team and the design consultant of C-P project in order to find the optimum solution. In addition to the original proposal, three alternatives for connection of water intakes and distribution are considered as follows.

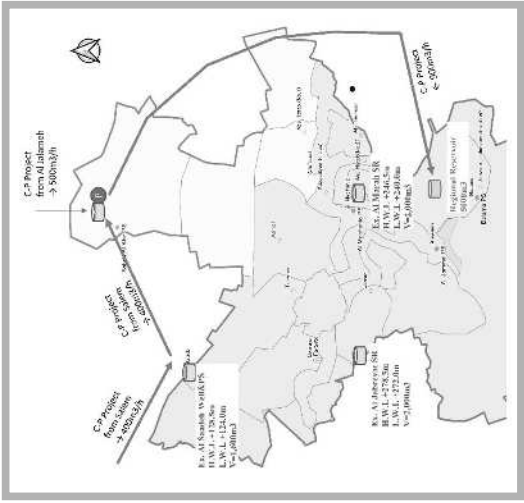


Figure 6 C-P Project (Original, April 2021)

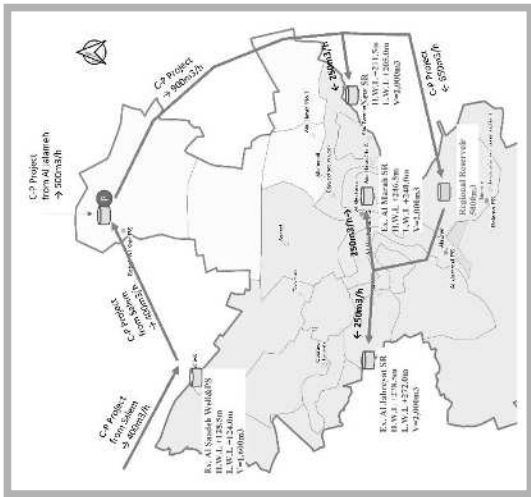


Figure 7 Alternative 1 (Proposal by the Team), based on Original Plan

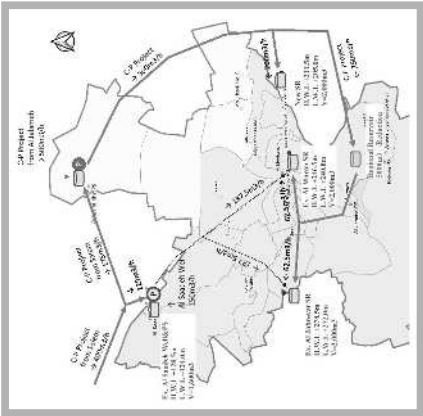
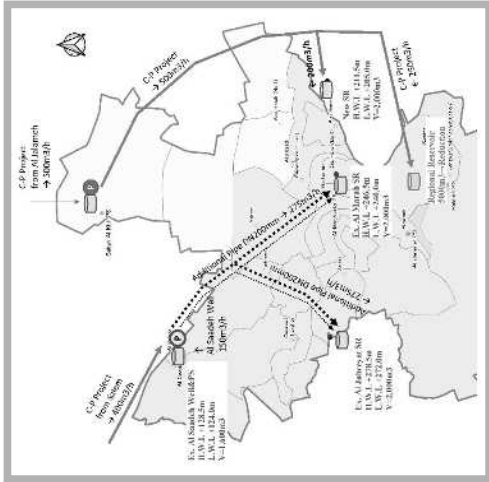


Figure 8 Alternative 2 (Receive 225 m³/hr from Salem Point at Al Saadeh to use existing transmission line)



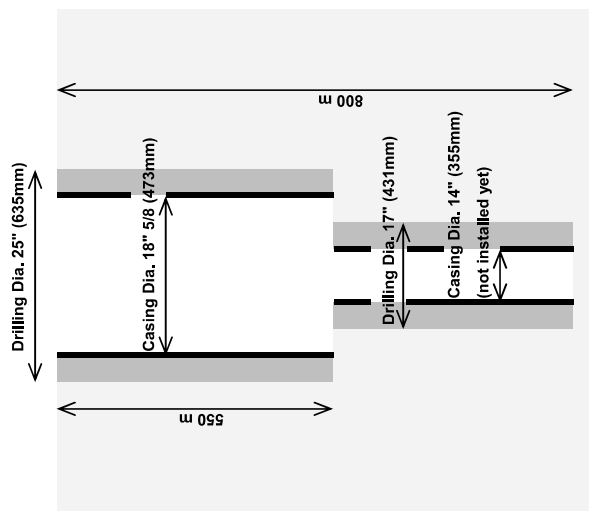


Figure 10 Progress of Janzour Well Construction

2.5 Report methodology

The project requires the preparation of an Initial Environmental Examination (IEE) for improvement of water supply services in Jenin municipality, and this requirement comes to fulfil the JICA Guidelines for Environmental and Social Considerations (2010), and the relevant local and international laws and regulations.

In order to cover all objectives of the assignment, the study team shall conduct the survey/analysis and review the available relevant documents including environmental studies, design reports, quality tests as well as state standards, policies and regulations. Also, they will collect all the necessary data and information needed to assess the project components and their impacts, Positive and negative, reversible and irreversible, temporary and permanent.

In this study we will assemble, evaluate and present relevant baseline data on the environmental characteristics of the project and the study area. The baseline environmental conditions will contain the following: Air quality, Waste, Noise and Vibration, Protected Area, Ecosystem, Resettlement, Heritage, and Climate change. We will assess the project components impact on the baseline environment, provide recommendations where necessary to mitigate potential negative impacts. Later on, a scoping matrix of the project impacts will be prepared for the proposed project design based on these baseline survey results.

For the project alternatives proposed by the designer, we will study and analyse the environmental and social impact of each alternative individually. The study team will focus on each alternative and its impact (positive or negative), based on the base line environmental status and then a comparison will be done between these alternatives according to the following:

- Impact on natural environment,
- Technical advantages/ disadvantages,
- Impact on social environment and
- Project Cost.

One alternative will be selected based on a ranking system: A, B, C, or D (A: The highest evaluation, B: Good, C: Other options can be desirable, and D: Shall be avoided)

Once the best alternative was selected, we will start the preparation of an Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) based on the assumed project impacts, and common practices in Palestine from approved EIA by EQA or other good practices for international donor projects.

Greenhouse gases will be evaluated according to JICA Climate-FIT (mitigation) -Climate Finance Impact Tool for mitigation.

Greenhouse gas emissions reductions are estimated by comparing project emissions with baseline emissions (emissions of greenhouse gases in the without a project baseline scenario), using the calculation sheet based on the estimation methodology sheet which is provided by JICA.

Climate risk assessment and adaptation will be carried out based on the JICA Climate-FIT adaptation tool. Four factors involved in the corresponding climate risk assessment which are:

Exposure, Vulnerability, hazard, and impact. Using the Climate Risk Matrix, and based on the final selection of impacts (climate risks) that are likely to be significant in the future for the project, a climate risk tree will be created, and measures that contribute to reducing vulnerabilities to climate change and maintaining and increasing adaptability and resistance will be appropriately incorporated into the project.

Methodology

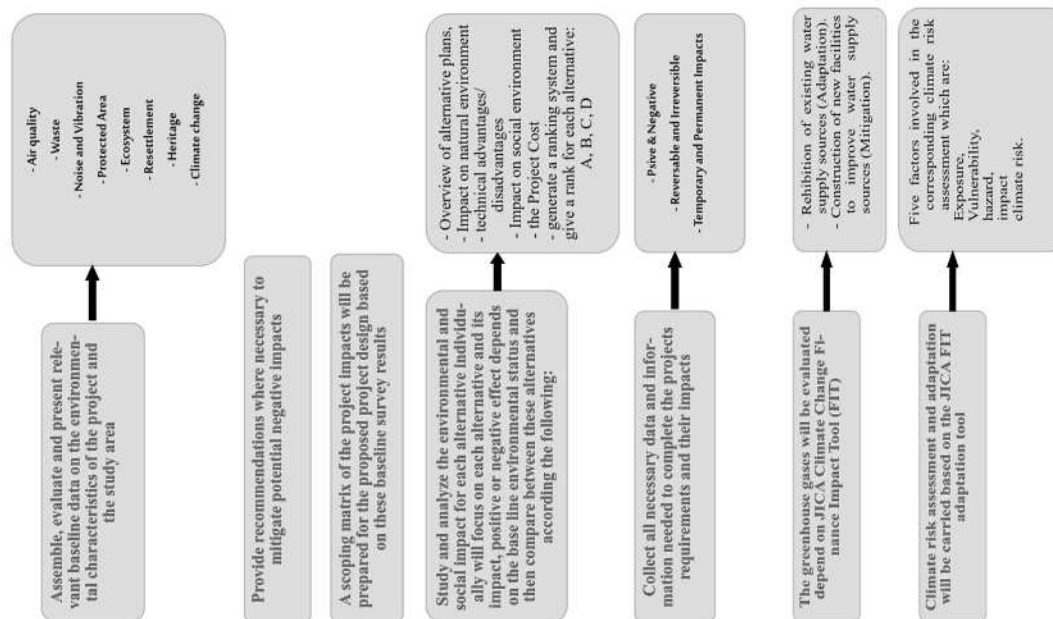
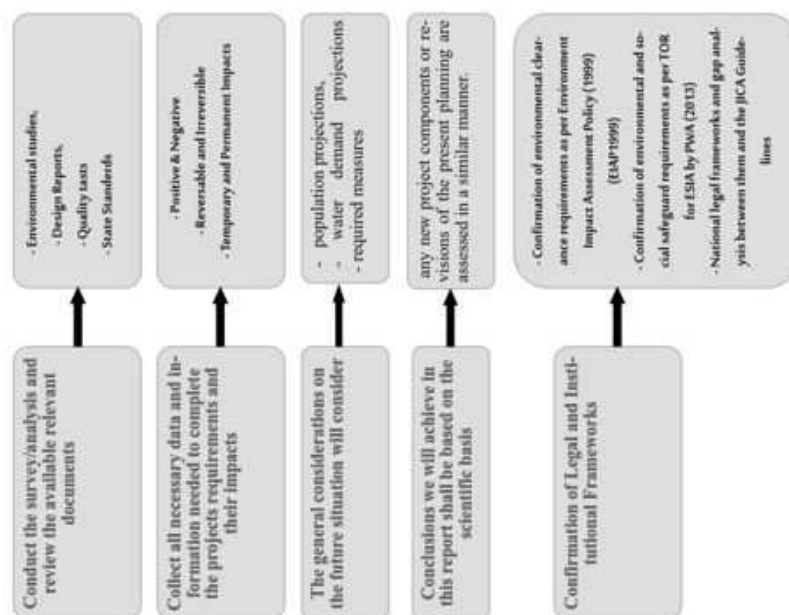


Figure 11 Methodology Chart

3 LEGAL INSTITUTIONAL FRAMEWORKS

Legal Framework includes the laws, regulations and guidelines related to the preparation of the project, so the related laws, regulations and guidelines were viewed to ensure that the project is done according to the relevant laws applied in Palestine.

The following laws, guidelines and regulations will be discussed:

- JICA Guidelines for Environmental and Social Considerations (2010)
- Palestinian Environmental law 7, 1999
- Palestinian Environmental Assessment Policy, 2000
- Palestinian Water Law (2002)
- Land Expropriation Law 2/1953
- Palestinian Labour Law 7/2000
- World Bank Safeguard Policies and Guidelines
- World Bank Environmental and Social Framework
- Jordanian Law No. 51 on Antiquities of 1966
- Decree-Law No. 14 of 2018 amending Agriculture Law No. 2 of 2003 and its amendments
- Oslo II Accord (Article 12, and Article 40)

i. JICA Guidelines for Environmental and Social Considerations (2010)

According to these guidelines, JICA confirms that projects meet the requirements for environmental and social considerations in the following ways:

- JICA confirms that projects comply with the laws or standards related to the environment and local communities in the central and local governments of host countries; it also confirms that projects conform to those governments' policies and plans on the environment and local communities.
- JICA confirms that projects do not deviate significantly from the World Bank's safeguard policies and refers as a benchmark to standards stipulated by international financial organizations, other internationally recognized standards, and international

standards/ treaties/ declarations as well as good practices of developed nations including Japan, when appropriate.

- JICA takes note of the importance of good governance surrounding projects in order to ensure that measures for appropriate environmental and social considerations are implemented.
- JICA discloses information with reference to the relevant laws of project proponents etc. and of the government of Japan.

Categoryization:

JICA classifies projects into four categories (A, B, C and FI) according to the extent of environmental and social impacts, considering an outline of project, scale, site condition, etc:

- a) JICA conducts environmental and social surveys at the EIA level for Category A projects (Projects that are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts). These impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas

- b) For Category B projects and Master Plan Studies (The potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily). An IEE level is required for this category (The Improvement of Water Supply in Jenin Municipality Project falls into this category).

- c) Category C: Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.

- d) Category FI: Proposed projects are classified as Category FI if they satisfy all of the following requirements: JICA's funding of projects is provided to a financial intermediary or executing agency; the selection and appraisal of the sub-projects is substantially undertaken by such an institution only after JICA's approval of the

funding, so that the sub-projects cannot be specified prior to JICA's approval of funding (or project appraisal); and those sub-projects are expected to have a potential impact on the environment.

The following table shows the gaps between JICA E&S GL & Legal Frameworks of Palestine
Palestine

Table 4 Gaps between JICA E&S GL & Legal Frameworks of Palestine (EIAP1999) and PWA's TOR for ESIA (2013)

Item	JICA E&S GL20210	National Laws and Regulations, i.e., EIAP1999, PWA ESIA TOR (2013), etc.	Gaps or gap filling measures
Underlying Principles	1. Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. 2. Such examinations must be endeavoured to include an analysis of environmental and social costs and benefits in the most quantitative terms possible, as well as a qualitative analysis; these must be conducted in close harmony with the economic, financial, institutional, social, and technical analyses of projects. 3. The findings of the examination of environmental and social considerations must include alternatives and mitigation measures, and must be recorded as	1. Environmental assessment should begin as early as possible since it is a means for both planning and evaluating development activities through all stages including decommisioning. 2. Environmental assessment should specify measures for mitigating potential impacts, and for environmental monitoring and management, throughout the life of a development activity 3. Proposed projects and extensions to existing projects for which an Environmental Impact Assessment must be conducted are listed in Annex 1. 4. Depending on the complexity and scope of the project, an independent consultant may be retained to review the report and advise EQA.	Alternative analysis is not stipulated in the national laws and regulations. In this IEE study, analysis of alternative plans will be conducted among several options including the "without project" scenario.

separate documents or as a part of other documents. EIA reports must be produced for projects in which there is a reasonable expectation of particularly large adverse environmental impacts. 4. For projects that have a particularly high potential for adverse impacts or that are highly contentious, a committee of experts may be formed so that JICA may seek their opinions, in order to increase accountability.	5. The consultant will evaluate all socio-economic costs. 6. Wherever possible, the consultant will describe impacts quantitatively. In terms of environmental costs and benefits, and assign economic values when feasible. 7. Predicted adverse environmental and social impacts for which mitigation is necessary should be identified and summarized. Effective measures to prevent or reduce significant negative impacts to acceptable levels during (i) construction and (ii) operation. Estimate the impacts and costs of those measures.	1. Any individual has the right to Obtain the official information which is necessary for coming to know the environmental effects of any industrial, agricultural or constructional activity or other development programs according to the Law. 2. The consultant will facilitate dissemination of information to relevant authorities and interested and affected parties (IAPs) concerning the proposed project NGOs and government departments and agencies that may have a stake in the Project and its effects should be consulted.	- In national laws and regulation, it obligates information disclosure if required by anyone and doesn't obligate the proponent to disclose information in case no one asked for it. - Nationally EIA reports aren't available for local residents and only to the related ministries and institutions, and copying is not permitted.
Information Disclosure	1. In principle, project proponents etc. disclose information about the environmental and social considerations of their projects. Project proponents etc. disclose information well in advance when they have meetings with local stakeholders in an official or widely used language and in a form understandable by local people. 2. EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local	1. Any individual has the right to Obtain the official information which is necessary for coming to know the environmental effects of any industrial, agricultural or constructional activity or other development programs according to the Law. 2. The consultant will facilitate dissemination of information to relevant authorities and interested and affected parties (IAPs) concerning the proposed project NGOs and government departments and agencies that may have a stake in the Project and its effects should be consulted.	- In national laws and regulation, it obligates information disclosure if required by anyone and doesn't obligate the proponent to disclose information in case no one asked for it. - Nationally EIA reports aren't available for local residents and only to the related ministries and institutions, and copying is not permitted.

Consultation with stakeholders and Social Acceptability	residents and copying must be permitted.	1. Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.	2. In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared;	3. Consultations with relevant stakeholders, such as local residents, should take place, if necessary, throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared	1. Stakeholder consultation is an essential component of the EA Policy	2. EA Committee shall ensure adequate scoping of environmental assessment studies to consult stakeholders during the scoping and conduct of Environmental Impact Assessments.	3. Proponents are required to consult stakeholders during the scoping and conduct of Environmental Impact Assessments.	4. The consultant will Prepare a Stakeholder Consultation Plan, providing an opportunity for the relevant authorities and IAPs to raise issues and concern pertaining to the proposed project and allow the identification of the additional alternatives and recommendations.	5. Stakeholder consultation is optional when undertaking an IEE. In consultation with the proponent and the EA Committee as required, the Ministry determines whether stakeholder consultation is required and, if so, what the minimum requirements should be. It may be required during scoping and terms-of-reference preparation, and during the conduct of the IEE.	Stakeholder consultation during the implementation phase is not stipulated in the national laws and regulations. This project would be considered as Category B and IEE study is required according to the JICA Guidelines. Stakeholder consultation at the scoping level and/or at preparation draft final report, if necessary.
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In feasibility survey or master plan study for a project, for Category B studies, project proponents etc. consult with local stakeholders after the disclosure of scoping drafts when necessary. For Category B studies, consultations with local stakeholders after the disclosure of draft final reports are also conducted when necessary.	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,	1. Terms-of-reference (TOR) for an Initial Environmental Evaluation (IEE) are prepared by the Ministry on the advice of the EA Committee	2. The TOR specify the minimum scope of any study. The proponent is responsible for defining the full scope of the study and for justifying it in the IEE Report	3. Strategic Environmental Assessment (SEA) is designed to address the cumulative and synergistic impacts of many projects in the same area.	4. The Consultant shall analyse and describe all significant changes brought about by each facility/activity. These would encompass environmental, ecological and social impacts, both positive and negative, as a result of each facility/activity intervention that are likely to bring about changes in the	Impacts to be assessed specified in the JICA Guidelines in more details than those in the national laws and regulations. The JICA Guidelines are applied.
Scope of Impacts to be assessed	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including transboundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process,

gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.	baseline environmental and social conditions. 5. The Consultant shall analyse and describe all occupational health and safety concerns brought about by activities during all the phases of the project. The Consultant shall make recommendations on corrective and remedial measures to be implemented under the environmental management plan.	- National laws and regulations don't require that the results of the monitoring process be available to local project stakeholders, it is just to PWA and or EQA.
2. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	1. After projects begin, project proponents etc. monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring.	1. Environmental assessment should specify measures for mitigating potential impacts, and for environmental monitoring and management, throughout the life of a development activity. 2. EIA or IEE Report should include proposals for monitoring and managing likely impacts, especially those which affect local people 3. Environmental Approval may specify Monitoring and reporting duties of the proponent. 4. PWA shall have the right to inspect water resources and systems of supply, and any place where pollution is suspected and to enter any private or public
Monitoring and GRM	1. After projects begin, project proponents etc. monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring. 2. In cases where sufficient monitoring is deemed essential for appropriate environmental and social considerations, such as projects for which mitigation measures should be implemented while monitoring their effectiveness, project	1. Environmental assessment should specify measures for mitigating potential impacts, and for environmental monitoring and management, throughout the life of a development activity. 2. EIA or IEE Report should include proposals for monitoring and managing likely impacts, especially those which affect local people 3. Environmental Approval may specify Monitoring and reporting duties of the proponent. 4. PWA shall have the right to inspect water resources and systems of supply, and any place where pollution is suspected and to enter any private or public

proponents etc. must ensure that project plans include feasible monitoring plans. 3. Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. 4. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. 5. In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	property or building to accomplish this purpose in accordance with proper procedures. 5. Any individual has the right to: Submit and follow up any complaint or judicial proceedings without looking into the private interest conditions against any natural or corporate person who causes a damage to the environment. 6. The Consultant is required to give a specific description, and technical details, of monitoring measures for both ESMP and RAP, including the parameters to be measured, methods to be Final TOR for SEIA and RAP used, sampling locations, frequency of measurements, definition of thresholds that will signal the need for corrective actions as well as deliver a monitoring and reporting procedure.	undertaken or not. The JICA Guidelines are applied.
Ecosystem and Biota	1. Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.	1. It shall be prohibited for anyone to carry out any works, acts or activities which would lead to damaging the natural reserves, forest areas, public parks, archaeological and historical sites or touch on the aesthetic level of such areas. 2. Identification of any species of special concern, namely species with

Indigenous Peoples	1. Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. 2. When projects may have adverse impacts on indigenous peoples, all of their rights in relation to land and resources must be respected in accordance with the spirit of relevant international declarations and treaties, including the United Nations Declaration on the Rights of Indigenous Peoples. Efforts must be made to obtain the consent of indigenous peoples in a process of free, prior, and informed consultation. 3. Measures for the affected indigenous peoples must be prepared as an indigenous people's	conservation status or endemic to the area; commentary on conservation status of specific species; compilation of a broad scale vegetation or habitat map of the area indicating the extent to which the project would affect each vegetation or habitat type 3. The Consultant will analyse Impacts in critical and non-critical habitats.	1. Identify all affected people (e.g., people affected by construction activities and during operation) and will facilitate dissemination of information to relevant authorities and interested and affected parties (IAPs) concerning the proposed project NGOs and government departments and agencies that may have a stake in the Project and its effects should be consulted. 2. Ensuring an adequate standard of life in all its aspects, and not negatively affecting the basic needs, and the social, cultural and historical values of people as a result of development activities. 3. EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and transboundary and global environmental aspects. Indicates the need for any resettlement plan or	JICA Guidelines discusses and emphasises indigenous people rights in details since the very beginning of the project idea, and states the compensation right for them, while national laws and regulation don't cover this issue in details. The JICA Guidelines are applied.
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plan (which may constitute a part of other documents for environmental and social consideration) and must be made public in compliance with the relevant laws and ordinances of the host country. In preparing the indigenous peoples plan, consultations must be made with the affected indigenous peoples based on sufficient information made available to them in advance. When consultations are held, it is desirable that explanations be given in a form, manner, and language that are understandable to the people concerned. It is desirable that the indigenous peoples plan include the elements laid out in the World Bank Safeguard Policy, OP4.10, Annex B.	indigenous people's development plan.
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ii. Palestinian Environmental law 7, 1999

Palestinian Environmental law mainly aims to Protect the environment from all forms of pollution, Protect the public health and social welfare and to Introduce the basis of environment protection in the economic and social development plans and encourage durable development of the bio-sources so as to observe the right of the coming generations.

In order to achieve this, articles 45,46 and 47 of the law are the basis for the EIA and license process in Palestine:

Article [45] states that the Ministry (replaced to "EQA" by a presidential decree in 2002) shall, in coordination with the competent authorities, formulate the criteria for determining the projects and fields which are subject to the studies for the environmental impact assessment

and preparing lists of these projects as well as formulate regulations and proceedings for environmental impact assessment.

Article [46] states that the competent authorities shall, upon licensing any installations, endeavour to avoid the environmental hazards by encouraging the transformation into the projects which use the less harmful materials or operations on the environment and give priority to such projects according to the basis of economic development.

Article [47] states that the Ministry (EQA) shall, in coordination with the competent authorities, determine the activities and projects which should obtain an advance environmental approval for obtaining a license as well as the projects which are permitted to be erected in the restricted areas. Article [48] states that it shall be prohibited for the competent authorities to issue licenses for the establishment of projects, installations or any activities which are specified under article (47) of this law or renew same except after obtaining an environmental approval from the Ministry (EQA).

iii. Palestinian Environmental Assessment Policy, 2000

In accordance with article [45] of law no. 7 for the year 1999, the Ministerial Council approves the Palestinian Environmental Assessment Policy, through resolution No. 27-23/4/2000 on the 23 of April 2000.

Proposed public- and private-sector projects, and proposed extensions or additions to existing projects, are subject to this policy, which states in Annex no. 1 the projects or project extensions for which an environmental impact assessment is mandatory, and if the project is not listed in Annex 1, as the case of this project (Improvement of water supply), the proponent submits the Application for Environmental Approval which will be used in the screening process which will be based on requirements of relevant land use plans, and on whether the project is likely to:

- Use a natural resource in a way that pre-empt other uses of that resource,
- Displace people or communities,
- Be located in or near environmentally sensitive areas such as natural reserves, wetlands, or registered archaeological and cultural sites,

- Generate unacceptable levels of environmental impact,
- Create a state of public concern, or
- Require further, related development activities that may cause significant environmental impacts.

EQA then determines whether or not an IEE Report or an EIA Report is required. If an IEE Report or EIA Report is not required, the Ministry will determine, in coordination with the relevant permitting authorities or the EA Committee as required, whether or not Environmental Approval will be granted and, if so, under what conditions.

iv. Palestinian Water Law (2002):

This project is considered as one of the projects that will contribute to achieve water law aims; to develop and manage the water resources, increasing their capacity, improving their quality, and preserving and protecting them from pollution and depletion.

According to article [7] of this law, The Water Authority is the responsible authority for

- Licensing the exploitation of water resources including the construction of public and private wells, regulating them, water exploration, drilling exploratory, testing and production wells, and any other matters or activities relating to water or wastewater, in cooperation and coordination with the relevant parties.
- Studying water and wastewater projects, and projects that integrate them, and setting design standards, and quality assurance, and technical specifications, and to control its implementation.
- Working towards achieving a fair distribution and optimal utilization in order to ensure the sustainability of ground and surface water resources through cooperation and coordination with the relevant parties and finding solutions and suitable alternatives in case of emergencies.

In chapter eight of the law (Protection of the Environment), article no. (29) states that Without contravention of the provisions of the Environmental Law and the regulations and directives issued under it, and in cooperation and coordination with the relevant authorities for the

protection of water resources and the prevention of its pollution, the Authority shall carry out the following actions:

1. Participate in regulating the use of agricultural and industrial materials, which may cause pollution to the water resources or its supply systems.
2. Participate in preparing special guidelines for the environmental impact assessment for any activity relating to water resources or their supply systems.
3. Participate in preparing special mechanisms for crisis management when there is a draught or flooding or a plague that is spread through water, or general pollution.
4. Participate in preparing a list of the names of pollutants, which require licensing, and compensation for damages resulting therefrom.

Article (32) in the same chapter states that anyone who causes pollution in any water resource or its supply system must remove the pollution to that source or system at his own expense, and in case he refuses or fails to do so, the Authority must remove the pollution and carry out the cleaning operations on the expense of party causing the pollution after notifying him of this regardless of the costs, which shall be levied from him in accordance with the Law for Collecting Public Monies.

Chapter nine, article (34) states that without contradiction from the provisions of this Law, the Authority may ask for requisite of land and property or enter the property of others in order to carry out its activities.

In final provision (chapter eleven) of the law, article (39) states that the owner of land or real estates which is being damaged as a result of the entry of the employees of the Authority shall have the right to reasonable compensation either for the denial of his ability to use the land, or any damage occurring to water or crops or the deprivation of the water resource.

v. Land Expropriation Law 2/1953

No land expropriation is needed in this project, since according to the National spatial plan map, the whole area of the New Service Reservoir proposed by Jenin Municipality lies in a governmental land classified as a forest as shown in fig. no. (12) below, and so PWA will do

the necessary procedures for land allocation according to the Palestinian Land Authority Procedures Manual for State Properties.



Figure 12 The NR-location in the forest
vi. Palestinian Labour Law 7/2000 and supplementary bylaws:

This law governs the whole labour activities and arranges the relation between laborers and employers.

- Chapter 2 Article 34 indicates the importance of applying health and safety procedures
- Chapter 4: health and safety. Article 90 indicates the importance of using protective clothes to rescue the workers from any danger. Health and safety inside work place. Needed medical supplies inside work. Periodical examine for all of the workers.
- Chapter 4 Article 91 discuss the regulations according to which the organization can set its own health and safety procedures and penalties that should be indorsed by the Ministry and disclosed in a visible place
- Chapter 4 Article 92 indicated that the worker should not pay for health and safety arrangement
- Chapter 4 Article 93 banned any employment for the children less than 15 years old.

vii. World Bank Safeguard Policies and Guidelines:

Based on JICA Guidelines for Environmental and Social Considerations (2010), JICA confirms that projects do not deviate significantly from the World Bank's Safeguard policies, and refers as a benchmark to standards stipulated by international financial organizations, other internationally recognized standards, and international standards/treaties/declarations as well as good practices of developed nations including Japan, when appropriate.

The environmental and social policies of the world Bank, known as the "Safeguard Policies" are the mechanism for addressing environmental and social issues in WB project design, implementation and operation, and they provide a framework for consultation with communities and for public disclosure. Examples of these requirements include conducting environmental and social impact assessments, consulting with affected communities about potential project impacts, and restoring the livelihoods of displaced people.

In August 2016, the World Bank adopted a new set of environment and social policies called the Environmental and Social Framework (ESF). As of October 1, 2018, the ESF applies to all new World Bank investment project financing. With existing projects continuing to apply the Safeguard Policies, the two systems will run in parallel for an estimated seven years.

The World Bank (WB) has eleven environmental and social policies referred to as the Bank's "Safeguard Policies". Among these eleven operational policies of the WB, four are considered by the Consultant to be relevant to The Improvement of Water Supply in Jenin Municipality Project and are listed and discussed below,

1. OP 4.01 - Environmental Assessment

As according to the WB Operational Policy on Environmental assessment (OP 4.01), an environmental and social category is assigned to an investment project after appraisal and before public disclosure during the International Finance Corporation project/investment cycle.

Categorisation:

The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts:

(a) Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, normally an EIA is required.

(b) Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA.

(c) Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

(d) Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

The Improvement of water supply in Jenin municipality Project falls under the environmental Category B; since its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.

2. OP 4.04 - Natural Habitats:

The World Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the

conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats.

The Bank does not support projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats.

Wherever feasible, Bank-financed projects are sited on lands already converted (excluding any lands that in the Bank's opinion were converted in anticipation of the project). The Bank does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs.

3. OP 4.36 - Forests

The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical natural habitats. If a project involves the significant conversion or degradation of natural forests or related natural habitats that the Bank determines are not critical, and the Bank determines that there are no feasible alternatives to the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs, the Bank may finance the project provided that it incorporates appropriate mitigation measures.

In accordance with this policy, the intended new reservoir will not cause any critical degradation to the forest, and by implementing the mitigation measures the new reservoir will be in harmony with the forest area.

4. Public Disclosure (BP 17.50)

The World Bank's Policy on Disclosure of Information is to be open about its activities and to welcome and seek out opportunities to explain its work to the widest possible audience. The Bank has broadened the scope of information about its activities that it makes publicly available. The Bank has established the Info Shop at headquarters, plus regional Public Information Centres (PICs), to serve individuals seeking to obtain Bank information. In addition, Country Offices are encouraged to establish modest PIC services for their country clientele. This policy is triggered for sub-projects categorized as A and B. The developer consults project affected groups and local NGOs:

- a) during scoping and before TORs are prepared;
- b) when the draft EA is available; and
- c) throughout project implementation as necessary.

The developer provides relevant information in a timely manner prior to consultation and in a form and language accessible to the groups being consulted.

The Borrower makes the draft EA (for category A projects) or any separate EA report (for category B projects) available in country in a local language and at a public place accessible to project-affected groups and local NGOs prior to appraisal. It is good practice to disclose the draft EA report at the InfoShop.

viii. World Bank Environmental and Social Framework (ESF):

The World Bank ESF became effective on October 1, 2018 and applies to all Investment Policy Financing (IPF) projects initiated after this date. It makes important advances in areas such as labour, non-discrimination, climate change mitigation and adaptation, biodiversity, community health and safety, and stakeholder engagement – including expanding the role of public participation and grievance mechanisms. The ESF comprises of a Vision for Sustainable Development (which sets out the Bank's aspirations regarding environmental and social sustainability), the World Bank Environmental and Social Policy for Investment Project Financing (which sets out the mandatory requirements that apply to the Bank), and the Environmental and Social Standards (which set out the mandatory requirements that apply to the Borrower and projects).

The ESF enhances the World Bank's commitment to sustainable development through ten Environmental and Social Standards (ESS) that are designed to support Borrowers' environmental and social (E&S) risk management; : Labour and Working Conditions, Resource Efficiency and Pollution Prevention, Community Health and Safety, Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, Biodiversity Conservation and Sustainable Management of Living Natural Resources, Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, Cultural Heritage, Financial Intermediaries, and Stakeholder Engagement and Information Disclosure. .

The ESF uses a risk-based approach that applies increased oversight and resources to complex projects and promotes increased responsiveness to changes in project circumstances through adaptive risk management and stakeholder engagement.

Among other things, the ESF has enabled the Bank and Borrowers to address a broader scope of environmental and social risks and potential impacts to be assessed and managed by Borrowers, for example on climate change, biodiversity, community health, road traffic safety, disability, occupational health and safety, and ways to make sure that disadvantaged or vulnerable individuals and groups have access to project benefits.

ix. Jordanian Law No. 51 on Antiquities of 1966

Article no. 19 in chapter no. 6 of this law states that no person except those mentioned in article (8) may clean the ground or dig or excavate in order to discover ancient traces unless he has obtained written permission from the minister.

The Palestinian Ministry of Tourism and Antiquity through the department of Antiquity within the ministry is responsible for this issue. The department drafted a Palestinian Law of Antiquity which is in the PLC since 1996. The department modifies a system now to deal with any antiquity issue with regard to any project as follows: The proponent or concern agency should apply in written about the project with all data needed. Then the Department will ask the inspection section to carry a survey at that area of the project and reply in written about their finding and opinion.

x. Decree-Law No. 14 of 2018 amending Agriculture Law No. 2 of 2003 and its amendments:

Point no. 4 in article no. 5 of this Decree states that underground wells, collection wells and water reservoirs may be established and established in government forest lands by the relevant official institutions in accordance with the law.

xi. Oslo II Accord:

The Oslo II Accord, also known as the Interim Agreement on the West Bank and Gaza Strip or more simply Oslo II, established provisions and policies on the environment in six distinct articles within the first appendix of Annex III, "Protocol Concerning Civil Affairs." The key areas addressed are agriculture, environmental protection, forests, nature reserves, parks, and water and sewage.

The most related articles to the project are Article 12 (Environmental Protection), and Article 40 (Water and sewage) are discussed below:

ARTICLE 12

Environmental Protection

The Palestinian side and Israel, recognizing the need to protect the environment and to utilize natural resources on a sustainable basis, agreed upon the following:

- This sphere includes, inter alia, licensing for crafts and industry, and environmental aspects of the following: sewage, solid waste, water, pest control (including anti-malaria activities), pesticides and hazardous substances, planning and zoning, noise control, air pollution, public health, mining and quarrying, landscape preservation and food production.
- Both sides will strive to utilize and exploit the natural resources, pursuant to their own environmental and developmental policies, in a manner which shall prevent damage to the environment, and shall take all necessary measures to ensure that activities in their respective areas do not cause damage to the environment of the other side.
- Each side shall act for the protection of the environment and the prevention of environmental risks, hazards and nuisances including all kinds of soil, water and air pollution.
- Both sides shall respectively adopt, apply and ensure compliance with internationally recognized standards.
- Each side shall take the necessary and appropriate measures to prevent the uncontrolled discharge of wastewater and/or effluents to water sources, water systems and water bodies, including groundwater, surface water and rivers which may affect the other side, and to promote the proper treatment of domestic and industrial wastewater, as well as solid and hazardous wastes.
- Both sides shall ensure that a comprehensive Environmental Impact Assessment (EIA) shall be conducted for major development programs, including those related to industrial parks and other programs.

- Both sides recognize the importance of taking all necessary precautions to prevent water and soil pollution, as well as other safety hazards in their respective areas.
- Israel and the Palestinian side shall cooperate in implementing principles and standards, which shall conform with internationally accepted principles and standards, concerning the protection of endangered species and of wild fauna and flora, including restriction of trade, conservation of migratory species of wildlife and preservation of existing forests and nature reserves.

ARTICLE 40

Water and Sewage

On the basis of good-will both sides have reached the following agreement in the sphere of Water and Sewage (Only the points that are related to the project are listed below):

Principles:

- Israel recognizes the Palestinian water rights in the West Bank. These will be negotiated in the permanent status negotiations and settled in the Permanent Status Agreement relating to the various water resources.
- Both sides recognize the necessity to develop additional water for various uses.
- While respecting each side's powers and responsibilities in the sphere of water and sewage in their respective areas, both sides agree to coordinate the management of water and sewage resources and systems in the West Bank during the interim period, in accordance with the following principles:
 - a. Maintaining existing quantities of utilization from the resources, taking into consideration the quantities of additional water for the Palestinians from the Eastern Aquifer and other agreed sources in the West Bank as detailed in this Article.
 - b. Preventing the deterioration of water quality in water resources.
 - c. Using the water resources in a manner which will ensure sustainable use in the future, in quantity and quality.

- d. Adjusting the utilization of the resources according to variable climatological and hydrological conditions.
- e. Taking all necessary measures to prevent any harm to water resources, including those utilized by the other side.
- f. Treating, reusing or properly disposing of all domestic, urban, industrial, and agricultural sewage.
- g. Existing water and sewage systems shall be operated, maintained and developed in a coordinated manner, as set out in this Article.
- h. Each side shall take all necessary measures to prevent any harm to the water and sewage systems in their respective areas.
- i. Each side shall ensure that the provisions of this Article are applied to all resources and systems, including those privately owned or operated, in their respective areas.

Transfer of Authority:

- The Israeli side shall transfer to the Palestinian side, and the Palestinian side shall assume, powers and responsibilities in the sphere of water and sewage in the West Bank related solely to Palestinians, except for the issues that will be negotiated in the permanent status negotiations, in accordance with the provisions of this Article.
- The issue of ownership of water and sewage related infrastructure in the West Bank will be addressed in the permanent status negotiations.

Additional Water:

- Both sides have agreed that the future needs of the Palestinians in the West Bank are estimated to be between 70 - 80 mcm/year.
- In this framework, and in order to meet the immediate needs of the Palestinians in fresh water for domestic use, both sides recognize the necessity to make available to the Palestinians during the interim period a total quantity of 28.6 mcm/year, as detailed below:
 - a) Israeli Commitment (points related only to the project area listed below):

- The drilling of an additional well in the Jenin area - 1.4 mcm/year.
- The capital cost of the above shall be borne by Israel.
- b) b. Palestinian Responsibility:
 - The connection of the additional well in the Jenin area to the consumers.
 - The remainder of the estimated quantity of the Palestinian needs mentioned earlier above, over the quantities mentioned in this paragraph (41.4 - 51.4 mcm/year), shall be developed by the Palestinians from the Eastern Aquifer and other agreed sources in the West Bank. The Palestinians will have the right to utilize this amount for their needs (domestic and agricultural).
- Israel shall assist the Council in the implementation of the provisions above, including the following:
 - Making available all relevant data.
 - Determining the appropriate locations for drilling of wells.

The Joint Water Committee:

In order to implement their undertakings under this Article, the two sides will establish, upon the signing of this Agreement, a permanent Joint Water Committee (JWC) for the interim period, under the auspices of the CAC.

- The function of the JWC shall be to deal with all water and sewage related issues in the West Bank including, inter alia:
 - a. Coordinated management of water resources.
 - b. Coordinated management of water and sewage systems.
 - c. Protection of water resources and water and sewage systems.
 - d. Exchange of information relating to water and sewage laws and regulations.
 - e. Overseeing the operation of the joint supervision and enforcement mechanism.
 - f. Resolution of water and sewage related disputes.

- g. Cooperation in the field of water and sewage, as detailed in this Article.
- h. Arrangements for water supply from one side to the other.
- i. Monitoring systems. The existing regulations concerning measurement and monitoring shall remain in force until the JWC decides otherwise.
- j. other issues of mutual interest in the sphere of water and sewage.
 - The JWC shall be comprised of an equal number of representatives from each side.
 - All decisions of the JWC shall be reached by consensus, including the agenda, its procedures and other matters.
 - Both sides recognize the necessity to establish a joint mechanism for supervision over and enforcement of their agreements in the field of water and sewage, in the West Bank.
 - For this purpose, both sides shall establish, upon the signing of this Agreement, Joint Supervision and Enforcement Teams (JSET).
 - Both sides have agreed that in the case of purchase of water by one side from the other, the purchaser shall pay the full real cost incurred by the supplier, including the cost of production at the source and the conveyance all the way to the point of delivery. Relevant provisions will be included in the Protocol referred to in the next point below.
 - The JWC will develop a Protocol relating to all aspects of the supply of water from one side to the other, including, inter alia, reliability of supply, quality of supplied water, schedule of delivery and off-set of debts.
 - Both sides will cooperate in the field of water and sewage, including, inter alia:
 - a. Cooperation in the framework of the Israeli-Palestinian Continuing Committee for Economic Cooperation.
 - b. Cooperation concerning regional development programs.
 - c. Cooperation, within the framework of the joint Israeli-Palestinian-American Committee, on water production and development related projects agreed upon by the JWC.

- d. Cooperation in the promotion and development of other agreed water related and sewage-related joint projects, in existing or future multi-lateral forums.
- e. Cooperation in water-related technology transfer, research and development, training, and setting of standards.
- f. Cooperation in the development of mechanisms for dealing with water-related and sewage related natural and man-made emergencies and extreme conditions.
- g. Cooperation in the exchange of available relevant water and sewage data, including:
 1. Measurements and maps related to water resources and uses.
 2. Reports, plans, studies, researches and project documents related to water and sewage.
 3. Data concerning the existing extractions, utilization and estimated potential of the Eastern, North-Eastern and Western Aquifers.

Protection of Water Resources and Water and Sewage Systems:

- Each side shall take all necessary measures to prevent any harm, pollution, or deterioration of water quality of the water resources.
- Each side shall take all necessary measures for the physical protection of the water and sewage systems in their respective areas.
- Each side shall take all necessary measures to prevent any pollution or contamination of the water and sewage systems, including those of the other side.
- Each side shall reimburse the other for any unauthorized use of or sabotage to water and sewage systems situated in the areas under its responsibility which serve the other side.

xii. Institutional arrangements:

Based on the nature of this project and based on JICA guidelines that required an IEE preparation, the two main institutions that have the major role in this project are Palestinian Water Authority (PWA) and Environment Quality Authority (EQA).

Palestinian Water Authority has been given the mandate through By-Law No. 2 (1996) and has been stressed on in its amendments Law no.3 for 2002 to manage the water resources, execute the water policy, establish supervise and monitor water projects, and to initiate co-ordination and co-operation between the parties affected by water management.

According to The National Water Policy for Palestine (2013-2032), Other line ministries and agencies have leadership on specific issues:

- Ministry of Agriculture (MoA): Policy and regulation of irrigation and promotion and organization of farmers' associations.
- Environment Quality Authority: defining environmental regulations, including standards for the discharge of treated wastewater into natural water courses, carbon footprint and water footprint regulations.
- Palestinian Standards Institute (PSI): standardization of rules for water facilities, sewerage, on-site sanitation.
- Ministry of Planning: lead national development plans (taking availability of water resources into account, to be assessed by the ministry of public works) in coordination with relevant Stakeholders.
- Ministry of Local Government: implementing and supporting Joint Service Councils (JSCs).
- The PWA is in charge of the overall regulation of water producers and service providers and manage water resources, including:
 - Allocation of water abstraction rights;
 - Regulation of the right of use of the resources;
 - Develop service providers;
 - Develop Tariff setting and endorse prices;
 - Providing support to PSI for the definition of standards;

- Resolving conflicts between service providers and users (including National bulk water utility versus service providers).

Environment Quality Authority is the central authoritative body for all environmental issues in Palestine, its core mission is to protect the environment in all its elements, and it is the umbrella for all activities and studies related to environmental planning, protection and control.

Article 45 of the Palestinian Environment Law (PEL) stipulates: The Ministry (EQA), in coordination with the competent agencies, shall set standards to determine which projects and fields shall be subject to the environmental impact assessment studies. Article 47 of the PEL states that The Ministry (EQA), in coordination with the competent agencies, shall determine the activities and projects that have to obtain an environmental approval before being licensed. This includes the projects that are allowed to be established in the restricted areas". According to the PEL and the Palestinian Environmental Assessment Policy, the project proponent must first obtain an initial approval from the appropriate ministry or local planning committee. The proponent then submits an application for environmental approval to the EQA. Then EQA notifies the appropriate permitting authorities that an application for environmental approval has been received, and the project must not be licensed by the appropriate ministry, as stipulated in article (48) of PEL: the Specialized Agencies are not allowed to issue licenses for establishing projects or facilities, or licenses for any other activities specified in article (47) in this Law, or to renew them unless an environmental approval is obtained from the Ministry.

xiii.Screening Result

Based on JICA's Guidelines for Environmental and Social Considerations (2010), and based on the screening according to the World bank Environmental Operational Policy the Project is categorized as Category B as significant negative impacts are not expected by the Project and as their potential adverse impacts on the environment and society (including human populations and environmentally important areas-- wetlands, forests, grasslands, and other natural habitats) are less adverse than those of Category A projects, site-specific, and few if any are irreversible, and in most cases, normal mitigation measures can be designed more readily.

Palestinian Environmental Law No.7 (1999) stipulate that the Ministry of Environmental Affairs shall set standards and norms for collecting, treating, reusing, or disposing waste and storm water in a sound manner, along with the preservation of the environment and public health (Article 29).

Article 45 of the same law stipulates that the Ministry shall set norms to determine which projects and domains shall be subject to the environmental impact assessment studies. It shall also prepare lists of these projects and set the rules and procedures of the environmental impact assessment, accordance with this article, the Ministerial Council approves the Palestinian Environmental Assessment Policy which lists in Annex I, fourteen types of major development projects for which an Environmental Impact Assessment (EIA) shall be conducted. Water Supply projects aren't included in the list and so it is subjected to the screening criteria (AnnexII of the same policy):

The Project doesn't use a natural resource in a way that pre-emptis other uses of that resource, doesn't cause people displacement, aren't located in or near environmentally sensitive areas such as natural reserves, wetlands, or registered archaeological and cultural sites, doesn't generate unacceptable levels of environmental impact, no state of public concern will be created, and doesn't require further, related development activities that may cause significant environmental impacts, so EQA surely will not ask for EIA and may or may not ask for an IEE study (which will be determined later, after the submission of an Environmental approval request to EQA by PWA and/or Jenin municipality).

4 ASSESSMENT OF THE BASE LINE ENVIRONMENTAL CONDITION

4.1 Air Quality (secondary data)

The Palestinian Environmental Law 1999 defines air pollution as 'any change in the characteristics or components of the natural air, which may cause harm to the environment'. Air pollution is characterized by the presence of harmful levels of particulate matter or gases in the air, and it originates from both natural and man-made sources.

The pollutants with the strongest evidence of health effects are particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂) and sulphur dioxide (SO₂) (WHO, 2019b). Trends in current levels and concentration of major pollutants in ambient air have been increasing due to growing emissions and number of pollution sources particularly from within and around urban areas. Key sources of pollutants include industries, transport, transboundary air pollutants, cooking fires, open burning of solid waste and charcoal kilns (PCBS, 2016); (EEA, 2014).

The indoor and outdoor particle concentration distributions of PM₁₀, PM_{5.0}, PM_{2.5}, and PM_{1.0} were measured between 2014 and 2015 along four roadsides and four urban homes in Nablus- about 50 km to the south of Jenin- (Jodeh, et al., 2018). Human and industrial activities in Nablus were identified as the drivers causing the differences in the results between both the roadside and the urban areas. Concentrations of PMs peak during the summer months of June and July, along the roadside areas, this could be attributed to heavy industrial activities during these summer months.

Similar patterns were observed for urban areas with PM that were higher during the summer, with annual averages of PM₁₀ and PM_{2.5} more than five times higher than the WHO Air Quality Guideline (WHO, 2006) values for both indoor and outdoor situations.

Average annual concentration of PM₁₀ and PM_{2.5} measured between December 2014 to November 2015 for roadside and urban houses, indoors and outdoors in the study area (Nablus), compared to WHO Guideline values (Jodeh, et al., 2018) are shown in table 5 below.

Table 5 Average annual concentration of PM₁₀ and PM_{2.5} compared to WHO Guideline values (Jodeh, et al., 2018)

Housing	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
Roadside houses		
i) Outdoor	175.75±44.78	130.17 ± 50.41
ii) Indoor	156.25±53.33	107.67 ± 36.87
Urban Houses		
i) Outdoor	142.83 ± 43.89	92.50 ± 21.96
ii) Indoor	129.92 ± 38.86	84.17 ± 23.81
WHO Air Quality Guideline values	20	10

Unfortunately, in Jenin area, there is a lack of information regarding air pollution, however a recent study in 2020 was done to compare air pollution rates in Jenin, Tulkarm and Nablus city centres, which suffer from a noticeable increase in air pollution rates, and perhaps the most prominent thing that affects the air quality in them is the high traffic congestion, as well as the population increase and its increase in movement and activities that negatively affect the air quality.

Perhaps the most prominent of these pollutants that affect air quality is PM_{2.5}; these are a very small particles circulating in the air, with a diameter of 2.5 micrometers or less, and have noticeable effects on human health, as they cause respiratory diseases that may lead to death in some cases.

After measuring PM_{2.5} values over 24 continuous days, using the AirU sensor, which measures the PM_{2.5}, and after analysing the results, it became clear that the Jenin region is the most polluted area with PM_{2.5} particles, where the average percentage of these particles during the study period was 40.05, followed by Nablus at a rate of 32.28, followed by Tulkarm at a rate of 29.87.

4.2 Water Pollution

As shown in the figure and table below, water samples from nine existing wells in Jenin City were analysed. They almost met the WHO drinking water standards in most of the parameters, while six samples have slightly higher level of calcium and one has slightly higher nitrogen level.

Table 6 Result of Water Quality Analysis of samples from the 9 existing wells with reference of WHO Guidelines for Drinking-water Quality

AL Saadah Well

Physical Tests			
Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	1107	---
Solids (total dissolved)	mg/L	642	1000
Turbidity	NTU	0.32	5
PH	---	7.45	6.5-8.5
Bacterial Tests			
Parameter	Unit	Result	WHO Guideline Value
Fecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

Chemical Tests			
Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	1.2	2
Fluoride	mg/L	0.39	1.5
Magnesium	mg/L	47.52	100
Sulfate	mg/L	35.7	400
Sulfide	mg/L	0.0	---
Chloride	mg/L	123	250
Hardness	mg/L as CaCO ₃	499	500
Nitrate	mg/L as (NO ₃)	13.8	50
Nitrite	mg/L as (NO ₂)	0	3
Calcium	mg/L as (ca)	121.6	100
Sodium	mg/L as (Na)	62.99	200
potassium	mg/L as (k)	3.418	10
Ammonia	mg/L	0	---



Figure 13 Locations of existing wells for water quality analysis

Al Qasrawi Well

١. مياه بئر القسراوي:

Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	770	---
Solids (total dissolved)	mg/L	380	1000
Turbidity	NTU	0.32	5
PH	---	7.13	6.5-8.5

٢. القدر صحت البئر الجيد:

Parameter	Unit	Result	WHO Guideline Value
Faecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

٣. القدر صحت الكيمياء:

Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	2	2
Flouride	mg/L	0.57	1.5
Magnesium	mg/L	32.7	100
Sulfate	mg/L	15	400
Sulfide	mg/L	0	---
Chloride	mg/L	100	250
Hardness	mg/L as CaCO ₃	250	500
Nitrate	mg/L as (NO ₃)	4.2	50
Nitrite	mg/L as (NO ₂)	0	---
Calcium	mg/L as (Ca)	98.6	100
Sodium	mg/L as (Na)	52.9	200
potassium	mg/L as (K)	0.4	10
Ammonia	mg/L	0	---

Waled Turokann Well

١. بئر وابد تلف تركمان :

Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	957	---
Solids (total dissolved)	mg/L	478	1000
Turbidity	NTU	0.16	5
PH	---	7.03	6.5-8.5

٢. القدر صحت البئر الجيد:

Parameter	Unit	Result	WHO Guideline Value
Faecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

٣. القدر صحت الكيمياء:

Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	1.01	2
Flouride	mg/L	0.28	1.5
Magnesium	mg/L	43.98	100
Sulfate	mg/L	32.4	400
Sulfide	mg/L	0.0	---
Chloride	mg/L	112	250
Hardness	mg/L as CaCO ₃	395	500
Nitrate	mg/L as (NO ₃)	12.4	50
Nitrite	mg/L as (NO ₂)	0	0
Calcium	mg/L as (Ca)	105	100
Sodium	mg/L as (Na)	59.3	200
potassium	mg/L as (K)	2.9	10
Ammonia	mg/L	0	---

Sabah al-Khair Station

١. ملحق صياح الفحوصات الجيدة :

Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	1122	---
Solids (total dissolved)	mg/L	562	1000
Turbidity	NTU	1.3	5
PH	---	7.4	6.5-8.5

Parameter	Unit	Result	WHO Guideline Value
Faecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	1.25	2
Fluoride	mg/L	0.49	1.5
Magnesium	mg/L	52.7	100
Sulfate	mg/L	44.1	400
Sulfide	mg/L	0.0	---
Chloride	mg/L	146	250
Hardness	mg/L as CaCO ₃	510	500
Nitrate	mg/L as (NO ₃)	27.5	50
Nitrite	mg/L as (NO ₂)	0	0
Calcium	mg/L as (Ca)	150.3	100
Sodium	mg/L as (Na)	75.6	200
potassium	mg/L as (K)	4.287	10
Ammonia	mg/L	0	---

Abo Hattab Well

٢. ملحق أبو حطب (أبو حبيب):

Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	884	---
Solids (total dissolved)	mg/L	455	1000
Turbidity	NTU	0.97	5
PH	---	7.02	6.5-8.5

Parameter	Unit	Result	WHO Guideline Value
Faecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	0.96	2
Fluoride	mg/L	0.34	1.5
Magnesium	mg/L	39.77	100
Sulfate	mg/L	25.33	400
Sulfide	mg/L	0	---
Chloride	mg/L	97	250
Hardness	mg/L as CaCO ₃	399	500
Nitrate	mg/L as (NO ₃)	15.3	50
Nitrite	mg/L as (NO ₂)	0	---
Calcium	mg/L as (Ca)	97.6	100
Sodium	mg/L as (Na)	78.6	200
potassium	mg/L as (K)	0.42	10
Ammonia	mg/L	0	---

Abo Hattab Well #2»

٣. نمر ابو حطب (د عر العين):

القيمات القياسية:

Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	961	---
Solids (total dissolved)	mg/L	470	1000
Turbidity	NTU	0.61	5
PH	---	7.2	6.5-8.5

القيمات البيولوجية:

Parameter	Unit	Result	WHO Guideline Value
Fecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

القيمات الكيميائية:

Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	1.3	2
Flouride	mg/L	0.511	1.5
Magnesium	mg/L	44.63	100
Sulfate	mg/L	34.12	400
Sulfide	mg/L	0	---
Chloride	mg/L	147	250
Hardness	mg/L as CaCO ₃	486	500
Nitrate	mg/L as (NO ₃)	16.8	50
Nitrite	mg/L as (NO ₂)	0	---
Calcium	mg/L as (ca)	99.32	100
Sodium	mg/L as (Na)	34.78	200
potassium	mg/L as (k)	3.31	10
Ammonia	mg/L	0	---

Mechanic Well

١. نمر جيتار (١):

القيمات القياسية:

Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	1228	---
Solids (total dissolved)	mg/L	711	1000
Turbidity	NTU	0.34	5
PH	---	7.42	6.5-8.5

القيمات البيولوجية:

Parameter	Unit	Result	WHO Guideline Value
Fecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

القيمات الكيميائية:

Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	1.3	2
Flouride	mg/L	0.34	1.5
Magnesium	mg/L	27.09	100
Sulfate	mg/L	52.9	400
Sulfide	mg/L	0	---
Chloride	mg/L	152.6	250
Hardness	mg/L as CaCO ₃	470	500
Nitrate	mg/L as (NO ₃)	67.2	50
Nitrite	mg/L as (NO ₂)	0	0
Calcium	mg/L as (ca)	143.8	100
Sodium	mg/L as (Na)	90.32	200
potassium	mg/L as (k)	5.129	10
Ammonia	mg/L	0	---

Abo Sameer Well

١. بنر أحمد سمير السطري:

البيانات الفيزيائية:			
Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	920	---
Solids (total dissolved)	mg/L	460	1000
Turbidity	NTU	0.11	5
PH	---	7.11	6.5-8.5
البيانات البيولوجية:			
Parameter	Unit	Result	WHO Guideline Value
Fecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

البيانات الكيميائية:			
Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	0.98	2
Fluoride	mg/L	0.388	1.5
Magnesium	mg/L	39.11	100
Sulfate	mg/L	29.7	400
Sulfide	mg/L	0	---
Chloride	mg/L	90.7	250
Hardness	mg/L as CaCO ₃	413	500
Nitrate	mg/L as (NO ₃)	14.6	50
Nitrite	mg/L as (NO ₂)	0	0
Calcium	mg/L as (Ca)	104	100
Sodium	mg/L as (Na)	49.39	200
potassium	mg/L as (K)	2.7	10
Ammonia	mg/L	0	---

Swaitat Point

٢. خط سوايت النويجات:

البيانات الفيزيائية:			
Parameter	Unit	Result	WHO Guideline Value
Electrical conductivity	µs	995	---
Solids (total dissolved)	mg/L	485	1000
Turbidity	NTU	1.5	5
PH	---	7.33	6.5-8.5
البيانات البيولوجية:			
Parameter	Unit	Result	WHO Guideline Value
Fecal coliform	Number/100 ml	0	0
Total coliform	Number/100 ml	0	0

البيانات الكيميائية:			
Parameter	Unit	Result	WHO Guideline Value
Barium	mg/L	1.2	2
Fluoride	mg/L	0.41	1.5
Magnesium	mg/L	43.25	100
Sulfate	mg/L	30.7	400
Sulfide	mg/L	0.0	---
Chloride	mg/L	98	250
Hardness	mg/L as CaCO ₃	420	500
Nitrate	mg/L as (NO ₃)	17.5	50
Nitrite	mg/L as (NO ₂)	0	0
Calcium	mg/L as (Ca)	121.6	100
Sodium	mg/L as (Na)	66.4	200
potassium	mg/L as (K)	3.4	10
Ammonia	mg/L	0	---

4.3 Noise and Vibration

Noise pollution has not yet been studied in the Palestinian territory and there are no data available. Casual observations point to traffic as its main cause, as well as noise from construction works and industry.

Palestinian standard for outdoor noise (PS-840-2205), issued by Palestine Standards Institution, 2005, identifies the maximum permissible sound level for different categories as follows:

Table 7 Palestinian standard for outdoor noise (PS-840-2205)

No.	Category	Max. level (dB) 7:00 – 20:00	Max. level (dB) 20:00 – 07:00
1	Rural residential areas, recreational areas, schools, hospitals	40	30
2	Urban residential areas	50	40
3	Residential areas along highways or with commercial works	55	45
4	Commercial areas	65	50
5	Industrial areas	75	65

The project areas lie under categories no. 2, and no.3.

4.4 Primary data for Air and Noise pollution measurements

- **HAZ-DUST for particulate matter**
- **MultirAE lite for gases**
- **A Sound Level Meter**



Figure 14 Measuring Devices for Air and Noise Pollution

The required measurements were taken at the ten locations instantly according to ToR. an average time 15- 30 minutes for each point, these measurements were on Tuesday (14/December/2021), when the weather was sunny to partly cloudy with an average temperature of 23C° to 16 C°, with winds that do not exceed speed 13 km/hour. figure (13) shows the weather forecast for the city of Jenin on the day of taking measurements of air and noise pollutants, on Tuesday 12/14/2021 (<https://www.worldweatheronline.com/jenin-weather-history/ps.aspx>)

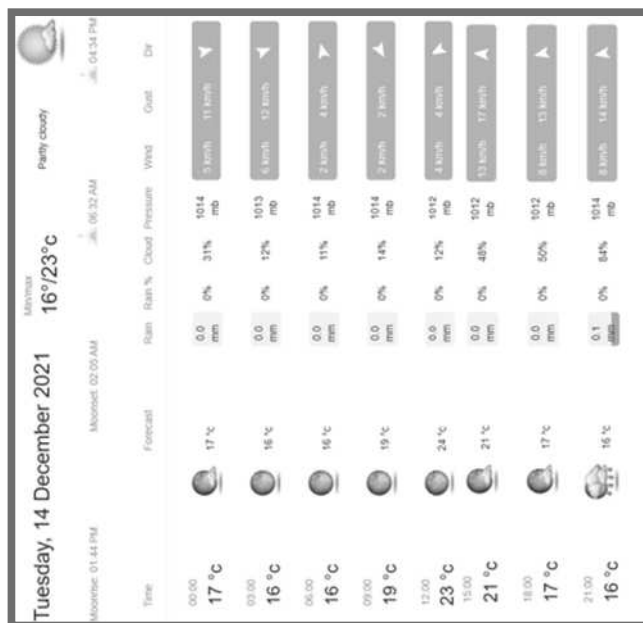


Figure 15 Weather forecast in Jenin city on 14/12/2021

Table (7) shows the results of these measurements for both air and noise, it was noted that all readings for SO₂ were zero in all the ten locations, and only four readings out of the ten were recorded for NO₂ (locations 3,5,6, and 9) which is within the Palestinian Standards for Ambient Air Quality (for SO₂ it is 0.13ppm and for NO₂ it is 0.21 ppm)

Palestinian Standards for Ambient Air Quality sets a value of 150ug/m³ for PM₁₀, and that means that all the readings were satisfying this value, however Palestinian Standards doesn't state a value for PM_{2.5}, and so comparing the measurement results with an international standard like The American National Ambient Air Quality Standards (EPA sets a value of 35ug/m³ for PM_{2.5}), it is obvious that all the readings were satisfying this value for PM_{2.5}.

Sound level measurements shows that all the location are within the Palestinian standard for outdoor noise, except for one location (Almekanik), and that's mainly because of the heavy traffic in the area.

Table 8 Results of measurements for both air and noise

Location #	Coordinates (East, North)	Area description	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	NO ₂ (ppm)	SO ₂ (ppm)	Sound level (dB)
10	E: 178822.95 N: 206839.99	At Al Marah Reservoir	9	13	0	0	41
7	E: 178764.25 N: 206997.26	Old Marah Reservoir	11	14	0	0	42
1	E: 180126.92 N: 206964.27	New reservoir	11	38	0	0	45
8	E: 178639.44 N: 207123.2	280m to the northwest of Al Marah Reservoir	32	46	0	0	46
9	E: 178475.26 N: 206957.19	Almekanik	18	46	0.2	0	66
2	E: 176366.62 N: 209173.56	AL Saadeh Well, near Haifa Street and Al Sadeh Forest	13	30	0	0	51
4	E: 176628.0 N: 207120.07	200m to the north of Al Jabriyyat reservoir	22	29	0	0	38
6	E: 176751.17 N: 207341.75	Alhadaf PRT+200	4	18	0.1	0	42
5	E: 176770.53 N: 207381.74	Alhadaf PRT+180	13	27	0.2	0	43
3	E: 1766002.43 N: 206931.21	Al Jabriyyat reservoir	9	26	0.2	0	42

4.5 Solid Waste

The Jenin Municipality and the Joint Services Council for Solid waste management (Jenin JSC) are responsible for collecting municipal waste from the city of Jenin, and transporting it to the Zahra landfill for treatment, which is far from the center of the city 17Km.

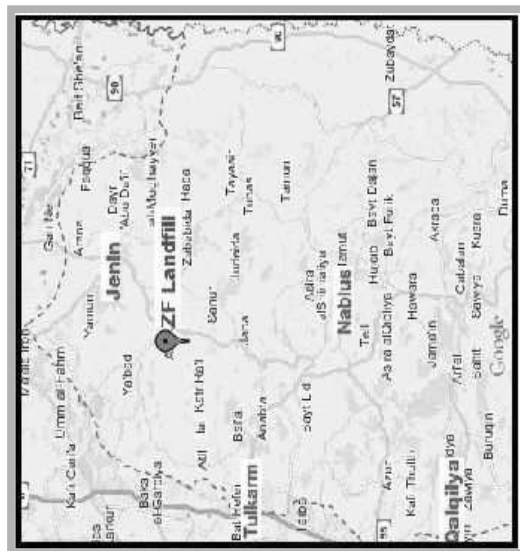


Figure 17 Zahra landfill location

The SW collection is divided into two main parts: primary collection and secondary collection.

Primary SW collection: Where the Jenin municipality is responsible for the primary SW collection by sweeping the main streets and collect the waste from the neighborhoods with narrow roads, and puts it in containers and collection points on a daily basis. These tasks are done by trained laborers who use simple equipment such as manual brooms, hand trolley, and others. The number of laborers is about 70 laborers distributed in the neighborhoods of the city.

Secondary collection: (from containers and collection points to the landfill)



Figure 16 Location for Air and Noise pollution measurements

Jenin-JSC is responsible of secondary collection. Undertakes this task by SW collection vehicles (Compactors) distributed in ten micro routes based on an effective program that takes into account the amount of waste, the number of residents and the type of waste, roads, nature of each neighbourhood, collection time and working times (morning and evening shifts). The average daily amount of waste collected and transferred to Zahrat al-Finjan landfill (ZF Landfill) is 87 tons/day. Based on the population of Jenin city (65,487) in 2021, the per capita production rate is 1.328 kg/day.c, and this rate is considered a relatively high rate and does not truly reflect the production of the individual living in the city. The high rate is due to many reasons, the most important of which is the apparent expansion of the Jenin commercial market, after allowing Palestinians living in Israel to enter the city and shop there, and this led to several investors in the city or from other governorates building commercial projects. Therefore, the monthly waste production rate increased.

The following table shows the waste collection routes, compactor types, sizes, capacities and the amount of waste collected by each compactor.

Table 9 SW collection routes in Jenin City

No.	Vehicle Type	Capacity	Vehicle track	Quantity ton/day
R1	Volvo 2008	21	Eastern Area	12
R2	Volvo 2008	21	Cartoon and papers only	5
R3	Volvo 2011	21	Commercial Square district	11
R4	Scania 2008	21	AL zahra' & Western zone	11
R5	DaF 2011	21	Al allmania & Sabah el khair zone	11
R6	DaF 2008	21	Commercial Square district & Large containers from all districts	12
R7	Iveco 2021	21	Kharoubeh & Industrial district	8
R8	Iveco 2021	21	Jabal Abu Dhehair & Jabriat & Al hadaf	8
R9	Iveco 2021	8	Kharoubeh & Eastern roads	5
R10	Volvo 2011	8	Haifa street & Al hadaf roads	(2.5*2)=5
total				87

Jenin-JSC adopts more than one method in monitoring and following-up on the daily SW collection programs and solving all the various complaints. This is through foremen who follows the collection vehicles daily, meeting the municipality staff. In addition to that, JSC has a computerized system "Autorun program" that is connected with the internet. This program is used to follow up and monitoring the movement of each compactor by a trained person working with the JSC to Provide the technical department with daily and monthly reports that contain: start and end of daily works, compactor route, speed, total SW collection time.

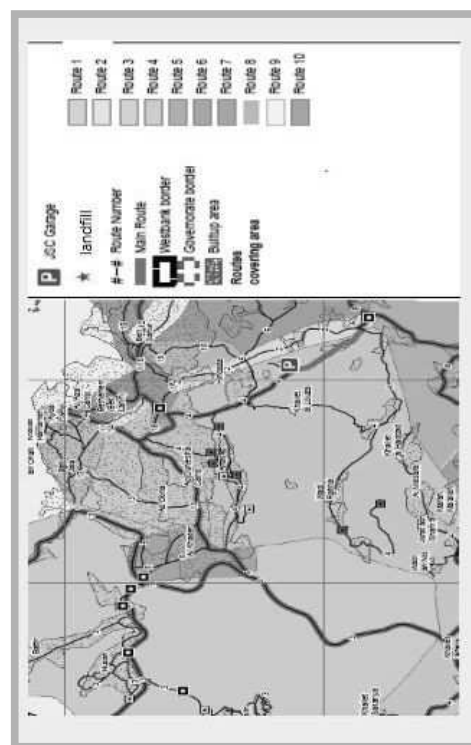


Figure 18 SW collection route map

The most important problems and challenges

1. Depreciation of some SW compactors, which leads to stopping the work from time to time for maintenance purposes, and this is reflected negative in the quality of the service provided and the accumulation of waste in the collection points and around the containers. Through the above table No. (8), Jenin-JSC has provided the city by four new compactors model 2021 (21m³, 12 m³ and 8 m³) through the Japanese grant, which will increase the quality of the secondary daily collection from the city.

2. A shortage of number of containers, which it is considered as the first disposal point for the citizen, but due to its insufficiency, the residents dispose their waste around the container in case it is full, or on the ground in the absence of any container, this will lead to negative environmental effects due to odours, insects, stray dogs and rodents, in addition to the ugly sights. Therefore, the solution is to provide a sufficient number of containers of different sizes and types and distribute them in all areas of the city.
3. Accumulation of special municipal waste such as (vehicle scrap, Bulky waste, demolition and construction waste) in backyard sites of the city, besides the roads and in the open area. Jenin JSC provides equipment (wheel loader, tractor, skid steer loader) to help the municipality to collect these wastes.
- Construction and demolition waste, where the municipality is disposing it sometimes in subbase layers to construct new roads.
- Vehicle scrap is collected by scrap dealers.
- White waste (refrigerators and washing machines) and electronic waste are limited quantities. Scrap dealers extract the valuable components (steel, copper and aluminium) and send the remaining material to the landfill.
- Medical waste generated from hospitals, health centres and private clinics. Currently, it is mixed with municipal waste and sent to ZF landfill. But Jenin-JSC, through the Japanese grant, is currently working on building a central unit for treating medical waste by applying a microwave system at the site of the ZF landfill. The project also includes a complete management system (separation, storage, collection and transport).

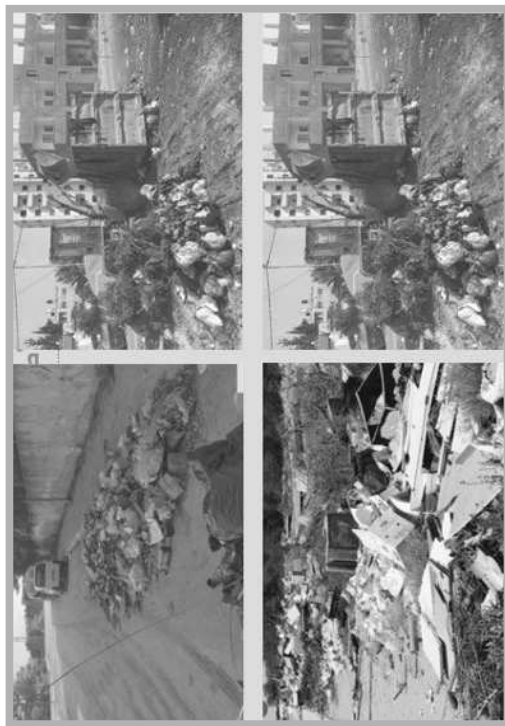


Figure 19 SW cumulation in Jenin City

4.6 Protected Area

There are no protected areas within the project implementation area, as shown below in the map of protected areas and Key Biodiversity Areas around Jenin generated by IBAT based on WDPA data, etc.

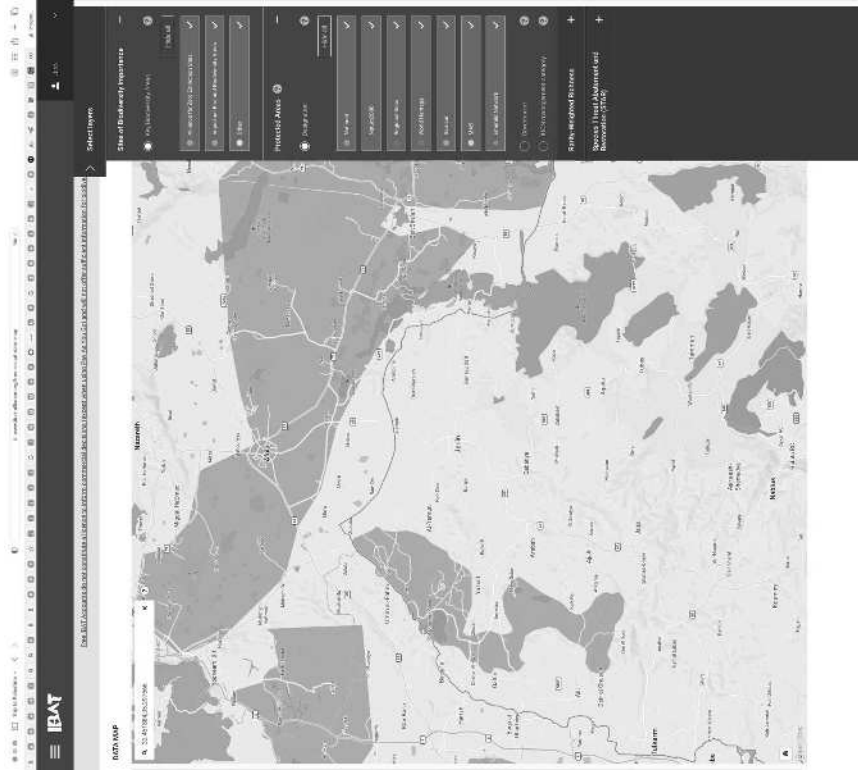


Figure 20 Protected areas and Key Biodiversity Areas around Jenin city

There is a small patches of forest (which have no significant ecological values and are small patches near inhabited areas, and sometimes used as a recreational place by the neighbours) do exist within the project area (classified as forests on the national spatial plan map – ministry of local government):

- The New Reservoir location lies in a land classified a forest as shown in fig. (19).

- AL Saadeh well location is near AL Saadeh forest (about 200m to the southwest) as shown in fig. (20).



Figure 21 Land classification for the new Reservoir location.



Figure 22 AL Saadeh well nearby forest

4.7 Ecosystem

Flora and Fauna:

Due to its location, where the Mediterranean, Irano-Turanian, Sudanian and Saharo-Arabian phytogeographic zones intermingle in an area of varying climates and soil types. Based on plant species numbers mentioned by several publications, it has been concluded that the

records of Palestinian flora reach over than 2000 plant species and endemic flora species recorded as 54 species in state of Palestine.

According to IUCN global Red List, in Palestine, in the types habitats where we can find in the project affected sites (forest, artificial/terrestrial, savanna, shrubland, grassland, rocky area and desert), 35 species were listed as globally threatened (classified as VU, CR and EN by IUCN) as shown in the below table. In the 35 species, 11 plants, 15 birds, 4 reptiles, and 5 mammals are included. However, according to the field survey by the international and local experts for JICA Study Team at the project sites and surrounding ecosystems, and reference survey of observations of threatened species in naturalist, important habitat within the project affected area for any threatened species was not identified.

Table 10 Threatened species in Palestine according to the IUCN Redlist

[illegible]

Near but outside of the sites where the project is going to be implemented, we can find some types of plants like *Silphium marianum*, *Gynandrium sisyrinchium*, *Crocus hyemalis* fig (21), hibernicus and Pinus (Some of them are protected by Environment law no. 7).

A very few animals can be found in project area since it is an inhabited area, and the Rock Hyrax (status according to IUCN and local: least concern) can be found in the nearby area of the new reservoir location, however in Jenin governorate Iris haynei, Allium carmeli and Armenian gull, are considered threatened according to iNaturalist (IUCN classifies Allium carmeli as near threatened and Armenian gull as least concern), and all these species found far enough from the project area.



Figure 23 *Crocus hyemalis* in the project area, (Dec.2021)

4.8 Resettlement

Based on observations of the project sites by the international expert and local expert of JICA Study Team in November 2021, the maps available on the spatial information system in Palestine, and after reviewing the project maps, it was concluded that there will not be any

involuntary resettlements. No PAPs (Project-Affected Persons), such as title-holder resident, non title-holder residents, agricultural labour, temporary shop/KIOSK holder, etc. have been found to require involuntary resettlement. All the project facilities are located on public land (as discussed in previous section).

4.9 Heritage

Jenin city Located about 43 kilometres north of Nablus, on the ancient trade route from Nablus through Wadi Bal'ama and across the plain of Marj Ibn Amer and Lajjun to Haifa, Jenin sits at an altitude of about 100 to 250 meters above sea level. The name was derived from Ein Ganim meaning the spring of Ganim, referring to the region's plentiful spring. Jenin was known as Gina in the Amarna letters in the fourteenth century BC, and as Gina in the Roman period. During the Crusader period the city was named Grand Grin.

- Many archaeological sites and features are located within Jenin area, and they are protected by Jordanian Law No. 51 on Antiquities of 1966 and by Palestinian decree-law no. (11) of 2018 regarding the tangible cultural heritage. In Jenin city the following sites exist (None of them in the project area as shown in the map below, fig 22):
- Tell Jenin: The ancient city of Jenin was situated on a Tell right in the middle of the present city and next to the central bus station.
- Khirbet Bal'ama: located in the southern part of the city The site was a fortified Canaanite city that occupied a strategic position along the historical route of Wadi Bal'ama that linked the Arraba Plain with Marj Ibn Amer. The site is identified with ancient Ibleam, which was mentioned in the Egyptian Royal Archive in the fifteenth century BC. During the classical period it was known as Belmont, and in the medieval period as Castellum Beisrimum. Excavations at Khirbet Bal'ama led to the recovery of the ancient water system, the means by which the inhabitants of ancient Belameh accessed the Bir as-Sinjil Spring at the base of the mound. It was designed to be used primarily in times of war and siege.
- Al Saraya (Fatma Khatoun School): located in the opposite side of the Grand Mosque is a historic landmark from the ottoman period. The building was constructed in 1882 as an administrative center and governor headquarter, and was used as such during the Ottoman and British mandate period. Nowadays it's an elementary girl's school.

- Al-Sibat (The old market): The oldest commercial centre in Jenin, it was built during the Ottoman period.
- The German Memorial: During the first world war, German troops stationed nearby and constructed an airport north of Jenin to support their Turkish allies. A memorial was built – on the western side of the city at that time, in city centre nowadays- honoring the German pilots killed during the war in 1917.



Figure 24 Archaeological sites in Jenin City

Climate Change

The State of Palestine submitted the instrument of accession to the United Nations Framework Convention on Climate Change (UNFCCC) on 12 December 2015 at the annual Conference of Parties in Paris (COP 21). This accession entered into force and consequently the State of Palestine became a party on 17 March 2016 and marks the end of Palestine being an “Observer State” to the Convention. The State of Palestine will benefit greatly from becoming a party to the Convention and it will mean that the country can cooperate efficiently in achieving the Convention’s goals.

The Climate Change Adaptation Strategy and Program of Action for the Palestinian Authority (EQA, Palestinian Adaptation strategy, UNDP/PAPP, 2010) has previously identified water and food security as the most vulnerable issues in the State of Palestine with knock-on implications for all sectors. Israeli occupation substantially reduces the State of Palestine’s adaptive capacities in relation to many issues thereby compounding climate vulnerabilities. For example, Israeli occupation of the State of Palestine restricts availability of land and resources, freedom of movement, import and export of raw materials and products, and the development of domestic and industrial infrastructure. These limitations on the State of Palestine’s adaptive capacities are most prevalent in Area C, which covers 61% of the West Bank.

The World Bank report in November 2012 on the impact of human induced climate change on the Arab world revealed unsustainable trends. Over the past 20 years, climate monitoring stations across the Arab world have already shown an increase in average annual temperature. Computer models predict that in the next two to three decades’ annual rainfall will decrease in our area by nearly 25% and average annual temperatures will climb by 4-5 degrees. (State of Palestine’s Fifth National Report on Biodiversity, 2015)

Historic trends in climate in relation to the State of Palestine were assessed to aid consideration of climate sensitivities of potential vulnerabilities. The summary in Table (9) uses the terminology for confidence from the IPCC’s Fifth Assessment Report (IPCC AR5).

Table 11 Historic trends in climate in the State of Palestine

Parameter	From the perspective of change
Average Temperatures	Very high confidence that temperatures have risen over the past 100 years but less confidence in quantitative rates of change, due to spatial and temporal dependencies and data quality.
Temperature extremes	High confidence that warm days/nights and cold days/nights have increased/decreased respectively in frequency
Rainfall totals	Very low confidence that annual and seasonal rainfall totals have changed in either direction over the past 50 years or so but also very low confidence that there has been no change in annual and seasonal rainfall totals
Rainfall extremes	Only very low confidence can be ascribed to changes in rainfall extremes because of the limited evidence combined with the relative rarity of such events.

Reference: State of Palestine's Initial National Communication Report (INCR) to the United Nations Framework Convention on Climate Change (UNFCCC), 2016

Ground water supply ranked as 'Highly vulnerable' and were one of the important issues to focus for identifying and prioritizing adaptation options.

Future-climate scenarios for the State of Palestine were developed from detailed assessment of IPCC AR5 projections to aid identification and prioritization of adaptation options (Table 10)

Table 12 future climate scenarios

Scenario 1	
Temperature	Increases by ~1°C by 2025, by ~1.5°C by 2055, by ~2°C by 2090.
Temperature-related	Reduced cold periods and warmer periods, both becoming more prominent in time.
Rainfall	Does not change, or perhaps increases slightly in the period to about 2035.
Rainfall-related	A slight possibility of more flooding. A small possibility of increased periods of drought but, in general, limited change overall to rainfall characteristics.
Scenario 2	
Temperature	Increases by ~1°C by 2025, by ~2°C by 2055, by ~3°C by 2090.
Temperature-related	Reduced cold periods and warmer periods, both becoming more prominent in time; more so than under Scenario 1
Rainfall	Decreases by ~10% by 2025, by ~15% by 2055, by ~20% by 2090.
Rainfall-related	Little, probably no, possibility of increased flooding risk. High likelihood of more frequent droughts. Perhaps overall less rainfall per day of rain on average.
Scenario 3	
Temperature	Increases by ~1.5°C by 2025, by ~2.5°C by 2055, by ~4.5°C by 2090.
Temperature-related	Reduced cold periods and warmer periods, both becoming more prominent in time; perhaps moderated slightly in the Gaza Strip.
Rainfall	Decreases by ~20% throughout until 2055, and to ~30% by 2090.
Rainfall-related	In general, a pattern of reductions in average daily rainfall and in contributions to total rainfall by heavier rainfall days, extended dry periods and reduced wet periods; thus, an increase in drought risk throughout. However, an indication that the rare wettest days might become more frequent, especially in the West Bank, thus, raising a possibility of an increased flood risk.

Reference: Palestinian National Adaptation Plan (NAP) to Climate change, 2016.

Adaptation options were identified that seek to reduce vulnerabilities by reducing climate sensitivity or increasing adaptive capacity and that are relevant to all three future-climate scenarios. They were prioritized in relation to a number of criteria (Impact; Efficacy; Timing/urgency for action; Social acceptance; Technology; Knowledge and skills; Costs for Years 1-5 and 5-10; Co-benefits for adaptation in other themes/sectors; Co-benefits for mitigation).

The Palestinian National Adaptation Plan (NAP) to Climate change, includes all adaptation options identified in relation to 'Highly vulnerable' issues, irrespective of their ranking.

5 SCOPING MATRIX

Scoping is the process for determining the extent of the environmental impacts of the project to be undertaken, herein a draft scoping matrix was prepared for the assumed project impacts for the proposed project design based on the baseline survey results.

Environmental Scoping Matrix

Note:

“✓”: some extent or unknown positive or negative impacts are assumed during the scoping stage.

Blank cell: no or negligible impacts are assumed.”

Table 13 Scoping Analysis of the Anticipated Environmental Impacts

Item	Scoping Analysis of the Anticipated Environmental Impacts			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	
Pollution				
Air Pollution	✓			P: No impact is expected. C: Some negative impacts are expected due to asphalt cutting, excavations and backfilling, roadside paving, new reservoir construction works and vehicle emissions. O: No or negligible impact is expected.
Offensive Odor				P/C/O: No impact is expected.
Water Pollution	✓	✓		P: No impact is expected. C: Turbid water during the replacement of distribution mains and distribution network pipes. O: If the harvest of groundwater exceeds the allowable limit there will be a possibility for the sewage or agricultural wastewater to intrude into the aquifer and pollute the ground water. P/C/O: No impact is expected.
Bottom Sediment Contamination				P: No impact is expected
Soil Contamination				P: No impact is expected C: Little risk is expected. Soil in and nearby the

				construction areas might be contaminated by different materials used in the construction phase such as cement, concrete, bitumen, oil/grease, etc. O: No impact expected.
Ground Subsidence				P/C/O: No impact is expected. (The land nature will not cause ground subsidence; groundwater harvest is within the allowable range)
Noise and Vibration	✓			P: No impact is expected. C: Due to asphalt cutting, excavation works, construction, paving and vehicle movement. O: the operation of pumps and other machines will cause some noise and vibration; it will be of no significant impact since the low humming noises from pumps are often completely normal.
Sunshine Obstruction				P/C/O: No impact is expected.
Wastes/ Hazardous Materials	✓			P: No impact is expected C: Construction work of the facilities will generate surplus soil and construction debris. O: No significant impact
Natural Environment				
Climate/ Meteorological Phenomena	✓			P: No impact is expected. C/O: negligible scale.
Topography				P/C/O: No impact is expected.
Geology				P/C/O: No impact is expected.
Soil Erosion				P/C/O: No impact is expected.
Hydrology				P/C/O: No impact is expected.
Groundwater	✓			P/C: No impact is expected. O: The operation of the improved facilities by the project will increase harvest of groundwater in Jenin and would have an impact on ground water level/ capacity of aquifer in and around Jenin.
Ecosystem, Flora, Fauna and Biodiversity	✓			P/C/O: Virtually no impact expected. Endangered/rare species is not observed in the project area.
Protected Area/ Forest Reserve	✓			P: No impact expected C/O: About 1500 sq. meter classified as a forest will be deforested for the new reservoir. Removal of some trees in the other parts of the project area.
Coastal Zone				P/C/O: No coastal zones in the project area.
Landscape	✓			P: No impact is expected C: During excavation, however it is for short periods only. O: The new reservoir causes a slight landscape change since it is nearby a few buildings in the area and a small number of trees will be removed.
Natural Disaster				P/C/O: No impact is expected.

Social Scoping Matrix

Table 14 Scoping Analysis of the Social Scoping Matrix

Item	Scoping Analysis of the Social Scoping Matrix			Rational of the Impact Assessment
	Pre-construction	Construction	Operation Stage	
Involuntary Resettlement and Land Use	✓	✓	✓	P/C/O: No impact expected, since the project implementation area is a public area. P: No impact expected. C/O: About 1500 sq. meter classified as a forest will be deforested for the new reservoir. P: No impact expected. C: Relatively small amounts of resources are used such as sand and quarrying for the construction of the facilities. O: Negligible effect on groundwater level
Utilization of Local Resources				P: No impact expected. C: No impact expected. O: Reduce the overexploitation of private wells P/C/O: No impact expected
General, Regional/City Plans			✓	P: No impact expected. C: No impact expected. O: Negligible effect on groundwater level
Social Institutions and Local Decision-making Institutions				P/C/O: No impact expected
Social Infrastructure and Services				P/C/O: No impact expected
Local Economy and Livelihood				P/C/O: No negative impact expected
Unequal Distribution of Benefit and Damage		✓	✓	P: No impact expected C: While some people will suffer some nuisance during project implementation- though it is temporal and tolerable- others will get benefits only. O: People living nearby the new reservoir will suffer from landscape distortion by the new reservoir. While Some residents who live near Al Saadeh well will not benefit from the improvement of water supply (no distribution network), other residents who live far from water source will receive the improved water supply service.
Local Conflicts of Interests			✓	P: No impact expected. C: No impact expected. O: Unequal distribution of cost and benefit

					concerning the new reservoir and improvement of Al Saadeh well may cause conflict.
Water Usage, Water Rights and Communal Rights					P/C/: No impact expected. O: People's water right will be fulfilled for some areas, and water usage will be more versatile
Cultural and Historical Heritage					P/C/: No impact expected O: More water will be available for cultural and historical sites
Religious Facilities					P/C/O: No negative impact expected
Sensitive Facilities (ex. Hospital, school, precision machine factory)					P/C/O: No negative impact expected
Poor People			✓		P: No impact expected. C: May get temporal job O: Some people will benefit from water availability with lower cost (instead of buying higher cost water by tanks)
Ethnic Minorities/ Indigenous People					There are no indigenous people or ethnic minority in the project area
Gender					P/C/O: No impact expected
Children's Rights					P/C/O: No impact expected
Public Health (sanitation and infectious diseases)		✓			P: No impact expected. C: Covid 19 infection possibility among workers. O: Water supply improvement will improve public health
Occupational Health and Safety (OHS)		✓			P: No impact expected C: Accidents and injuries associated with, or occurring during the course of the construction phase. O: Accidents and injuries associated with operation and maintenance work
Others					
Accidents		✓			P: No impact expected. C: Accidents associated with construction work. O: Accidents associated with operation and maintenance work
Climate Change			✓		P: No impact expected. C: Negligible effect due to vehicle emissions. O: Negligible effect due to clearing of vegetation especially trees which acts as a sink for CO2, since just a few trees were cleared in the new reservoir location.

		(b) Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?		
	(2) Water Quality	(a) Do pollutants, such as SS, BOD, COD contained in effluents discharged by the facility operations comply with the country's effluent standards?	(a) Y	(a) According to a periodic sampling and testing of the existing water supply facilities by PWA and PMOH, the results comply with the standards.
	(3) Wastes	a) Are wastes, such as sludge generated by the facility operations properly treated and disposed in accordance with the country's regulations?	(a) Y	(a) Wastes (mainly excavation remains which are unsuitable for backfilling will be disposed of at places designated by Jenin municipality.
	(4) Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	(a) Y	(a) The low humming noises from pumps during the operation would comply with the Palestinian standards for noise.
	5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The land nature will not cause ground subsidence, and groundwater harvest is within the allowable range.
3 Natural Environment	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) No protected areas within the project area
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(a) N (b) N (c) N (d) N	(a) The project area doesn't encompass such areas. About 1500 sq. meter classified as a forest will be deforested for the new reservoir, but it is not prime forest with high conservation value. (b) No endangered species observed in the project area. (c) No significant ecological impacts are anticipated; just a small area of a forest will be used for the new reservoir construction and this

Table 15 JICA Environmental Checklist form # 14 (for water supply project)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) IEE and Environmental Permits	(a) Have IEE reports been already prepared in official process? (b) Have IEE reports been approved by authorities of the host country's government? (c) Have IEE reports been unconditionally approved? If conditions are imposed on the approval of IEE reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) The IEE study (this report) is completed as a part of JICA preparatory study. (b)-(d) EIA is not requested in the Environmental legislations of Palestine, since this is a water supply project. When the project scope will be finalized, PWA will submit application to EQA (Environmental Quality Authority) for determination on necessity of IEE in the Project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) Explanations were done only to some stakeholders such as EQA. (b) Comments regarding the environmental approval procedure and requirements were discussed and will be done by PWA.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) A Comparative Analysis of Alternatives, will be done as part of the IEE report.
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Are any mitigating measures taken?	(a)N/A (b)N/A	(a) Construction of chlorine storage facilities is not fixed in the plan. (b) ditto

	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) A temporary negligible landscape effect caused by excavation and construction works, and a slight permanent effect on the forest where the new reservoir will be located, however these effects can be mitigated by following the best practices for excavation and construction works, and by planting trees around the new reservoir.
	(5) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	(a) Y (b) Y (c) Y	(a) By complying with chapter no.5 of the Palestinian Labor Law No. (7) of 2000. (b) By complying with articles in section four (chapter no.5) of the Palestinian Labor Law No. (7) of 2000. (c) They will be planned and implemented by the contractor.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y (d) Y	(a) (b) (c) and (d) - Avoid working at night or early morning as possible, use of mufflers and/or noise dampers, use noise barrier and The Contractor shall confirm that all Construction equipment used in construction shall strictly conform to the Palestinian noise standards, and where possible,

		(d) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?		will be mitigated by tree planting (even more than the removed trees) and the location will be in full harmony with the nearby environment. (d) No aquatic environments in the project area.
	(3) Hydrology	(a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows?	(a) Y	(a) The project will increase amount of harvest from the groundwater in Jenin, the groundwater level/ capacity of aquifer would be affected by the project.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	(a) N	(a) No involuntary resettlement, since the project implementation area is a public area.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?	(a) Y (b) N	(a) There will be a slight nuisance during the construction phase, and can be mitigated by: - wetting of soil to arrest dust generation. - disposal of the unsuitable material of Road pavement Structure at designated source - Provide barricading/security personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone. - Choose a suitable working time to be in harmony with the nearby activities. (b) This project is planned to improve existing water use. There will be no adverse impact.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archaeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There are many archaeological sites in and around Jenin. However, the working locations are far enough to cause any effect on archaeological, historical, cultural, and religious heritage.

		equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?		
6 Note	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) Y	(a) Mitigation measures to climate change were Planned applying JICA Climate-FIT.

		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?		ensure non mechanized construction to reduce the use of machinery. - Provide workers with adequate and appropriate personal protective equipment like helmets and dust masks. - Provide adequate warning and directional signs. - Provide temporary access to houses and businesses during construction, if and when required. - Scheduling construction to minimize soil exposure during the wet season. - watering the site, and proper transporting and storage of construction materials. - Covering of stored spoil material and vehicles removing waste. - Using relatively new construction and transportation vehicles with lower emissions. - Collect all garbage and waste construction materials from the sites, and dispose in specially designated places. - Plan itineraries for site traffic on a daily basis and avoid peak traffic periods
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel,	(a) Y (b) N/A (c) Y (d) N/A	(a) An environmental monitoring plan will be developed and the contractor is obliged to implement it. (b), (c) included in the monitoring plan. (d) Will be requested by EQA in the project approval if necessary.

			- Poor people will not find low-cost water and cultural sites will not benefit from more water availability.
Environmental and social impacts	C: - The negative impact is minor which could be mitigated - Transfer of land from the government agency and deforestation is required for construction of the water reservoir is required. - Negative impacts during construction mainly in the centre of the city.	C: - The negative impact is minor which could be mitigated - Negative impacts during construction mainly in the centre of the city.	A: There will be no deforestation, and no works in city centre, with this option
Technical advantages/disadvantages	A:	A:	C: Without any improvement of the facilities, operation of water supply in Jenin will face various and serious technical problems.
Construction cost	C Most expensive with the construction of the water reservoir.	B Construction cost is less than Alternative 1 as there is no construction of the water reservoir even with the additional pumping facilities	A No construction cost for improvement
Operation cost	A	A	C Without the major improvement, maintenance cost for repair and waste of electricity would rise.
Total Evaluation (Ranking)	A	A	C

6 COMPARITIVE ANALYSIS OF ALTERNATIVES, EMP, AND EMOP

6.1 comparative analysis of alternatives

Alternative 1: A plan including improvement of the wells, replacement of the pumping facilities, etc., replacement of the water mains, construction of the new water reservoir, and construction of the distribution pipe network

Alternative 2: A plan without the construction of the new water reservoir, including improvement of the wells, replacement of the pumping facilities, etc., replacement of the water mains, and construction of the distribution pipe network

Alternative 3: Zero option. Status without any project.

Table 16 Comparison among the three alternatives

	Alternative 1	Alternative 2	Alternative 3 (Without a project)
Overview of alternative plans	A plan including improvement of the wells, replacement of the pumping facilities, etc., replacement of the water mains, <u>construction of the new water reservoir</u> , and construction of the distribution pipe network	A plan without the construction of the new water reservoir, including improvement of the wells, replacement of the pumping facilities, etc., replacement of the water mains, and construction of the distribution pipe network	
Improvement of water supply in Jenin and its benefit to the economies and society	A	A	C: No water supply improvement will be achieved and current environmental and health problems continue to exist and exacerbate by time.

	backfilling, and construction works	- Separation of stockpiles areas with workers/vehicle movement paths to avoid disturbing the stockpiled material. - Covering of stored spoil material and vehicles removing waste. - Choose a relatively new construction and transportation vehicles with lower emissions. - Avoid windy days. - Identification of disposal sites for unsuitable excavated material		Department), EQA	
Water Pollution	Turbidity	Best management practices during the construction or repair of water mains	Contractor	Jenin Municipality (Health and env. Department)	Daily
Water pollution (groundwater) during operation phase	Sewage and agricultural based pollution	- Control of harvest of groundwater and its amount according to monitoring result of pollution	Jenin Municipality	Jenin Municipality	Following Jenin municipality's regular water quality monitoring.
Noise and vibration	- asphalt cutting, excavation works, construction, paving and vehicle movement.	Proper activity scheduling and working hours and days and limit the activities to day times and prevent any construction activities at weekends.	Contractor	Jenin Municipality (Health and env. Department), EQA	Daily
Wastes/ Hazardous Materials	- surplus soil and construction debris. - oil spills.	- Identification of disposal sites. - substitution, or elimination of hazardous substances.	- Jenin municipality - Contractor	Jenin Municipality	weekly

(Note) A: The highest evaluation, B: Moderate, C: the lowest evaluation

6.2 Environmental Management Plan (EMP) and Environmental Monitoring

Plan (EMoP)

Pre-Construction Phase:

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Schedule
Air Quality	Gas and Particulate matter emissions	Laws and regulations review	Jenin municipality	NA	NA
Land Use	Tree cutting	Obtain a permit from ministry of Agriculture	Jenin municipality	NA	NA

Construction and operation Phase:

Subject	Potential Impact / Issue	Mitigation Measure	Responsibilities	Monitoring	Monitoring Schedule
Air Quality	Emissions from vehicles	- Implement the manufacturer recommended engine maintenance programs - Drive within safe speed limits and choose appropriate route and time.	Contractor	Jenin Municipality (Health and env. Department), EQA	Daily
	Dust caused by asphalt cutting, excavations and	- Dust suppressants, watering the site, and proper transporting and storage of excavation materials.	Contractor Jenin Municipality	Jenin Municipality (Health and env.	Daily

	water supply (no distribution network), other residents who live far from water source will receive the improved water supply service.				
Public Health (sanitation and infectious diseases)	Covid 19 infection possibility among workers	- Provide Masks for workers. - Healthcare education for workers and inhabitants.	- Contractor - Jenin municipality and ministry of health	Jenin Municipality (Health and env. Department), Ministry of health	- Daily - weekly
Occupational Health and Safety (OHS)	Accidents and injuries associated with, or occurring during the course of the construction and operation phase.	- Providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. - Providing appropriate equipment to minimize risks - Provide first aid facilities in all the work sites. - Provide safe drinking water, clean eating and resting areas.	Contractor	Jenin Municipality (Health and env. Department)	Daily
Accidents	Accidents associated with construction, operation and maintenance work	- Providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. - Provide first aid facilities in all the work sites.	Contractor	Jenin Municipality (Health and env. Department)	Daily

				(Health and env. Department)	
Groundwater level during operation phase	Lowering groundwater level	- Control of harvest of groundwater and its amount according to monitoring result	Jenin Municipality	Jenin Municipality	Following Jenin municipality's regular groundwater level monitoring.
Protected Area/ Forest Reserve	- A 1500m2 of the forest will be used to construct a new reservoir	- Planting of trees around the reservoir and in the nearby area.	Jenin municipality	Ministry of Agriculture	During planting time
Landscape	- the new reservoir location in the forest - excavation and construction work	- Planting of trees around the reservoir and in the nearby area. - Following all mitigation measures that minimize and/or control the dust, and aesthetic features.	- Jenin municipality - Contractor	Jenin Municipality (Health and env. Department), Ministry of Agriculture	Daily
Unequal Distribution of Benefit and Damage	- Nuisance for some people during project implementation - People living nearby the new reservoir will suffer from Landscape distortion by the new reservoir	Compensate by ensuring service improvement in water and other issues.	Jenin municipality	Jenin Municipality (Health and env. Department)	NA
Local Conflicts of Interests	while Some residents who live near AlSaadeh well will not benefit from the Improvement of	Put this area on top priority to provide it with a distribution network.	Jenin municipality	Jenin Municipality (Water department)	NA

7 QUANTITATIVE EVALUATION OF GHG EMISSIONS REDUCTION APPLYING JICA CLIMATE-FIT

The Paris Agreement on climate change is an international treaty signed by almost all countries in the world at COP21 in Paris in 2015.

Its aims are to keep the rise in the global average temperature to 'well below' 2 degrees above pre-industrial levels, ideally 1.5 degrees; strengthen the ability to adapt to climate change and build resilience; and align all finance flows with a pathway towards low greenhouse gas emissions and climate-resilient development.

Prior to this, in November 2015, the Japanese Government announced "Action for Cool Earth 2.0 (ACE2.0)," which included support for climate-change measures for developing countries to reach approximately 1.3 trillion yen in total by the public and private sectors in 2020, in order to contribute to the above-mentioned international goals. For this reason, ODA will continue to be actively utilized as part of support for developing countries in the field of climate change.

the "Cancun Agreement" at the 16th Conference of the Parties (COP16) requires the implementation of MRVs (measurement/reporting/verification) for quantitative assessment of greenhouse gas (GHG) emissions reductions (removals).

JICA, as an organization to execute ODA, needs to take measures to implement MRV from the stage of considering cooperation policies for developing countries and formulation of projects in order to ensure the MRV of GHG emissions reductions (removals) for climate-change mitigation projects to be implemented in the future.

Projects that lead to climate-change mitigation are targeted to the quantification of GHG emissions reductions (removals) at the planning stage in order to grasp the project effects on climate-change mitigation, however this Project has negligible GHG changes; because comparing the baseline condition with the project, the project components will have a little increase of electricity consumption that will not cause a considerable change in GHG emissions (a rough estimation), and so there is no need to go in detail calculations to determine the exact GHG emission changes.

8 CLIMATE RISK ASSESSMENT AND ADAPTATION APPLYING JICA CLIMATE FIT

Climate-FIT (Adaptation) aims to promote development that is resilient to climate risks, taking into account the operational practices employed thus far and recent trends related to climate change.

Climate-FIT (Adaptation) developed in 2011, has been revised in 2019 based on the concept of adaptation established by the Intergovernmental Panel on Climate Change (IPCC). The revised Climate-FIT has greater focus on the common concept of climate risk assessment and adaptation as well as implementation approaches to be applied in various JICA projects. This has been done with the goal of considering climate risks in a flexible manner depending on the diverse circumstances of JICA projects.

The objectives of the Climate Risk Assessment in JICA projects (Loan Assistance Projects, Grant Assistance Projects, and Technical Assistance Projects) are as follows:

1. In order to mainstream climate change in each project, climate risks will be identified and assessed during the Preparatory Survey and Detailed Planning Survey, and measures that contribute to reducing vulnerabilities to climate change and maintaining and increasing adaptability and resistance will be appropriately incorporated into the project.
2. Projects that have been confirmed to contribute to adaptation through the use of these tools will be reported to the Secretariat of the UNFCCC Convention and the OECD-DAC as well as on JICA's climate finance report.

As mentioned earlier in this report ground water supply ranked as 'Highly vulnerable', and were one of the important issues to focus for identifying and prioritizing adaptation options in Palestine. The NAP includes all adaptation options identified in relation to 'Highly vulnerable' issues, irrespective of their ranking.

The hereinafter prepared Climate Risk assessment for Improvement of Water Supply in Jenin Project (hereinafter referred as "the Project").

Project goals are:

- i. To replace and upgrade the portions of existing water transmission and distribution facilities to reduce water leakage and optimize water pressure,
- ii. To rehabilitate the existing water intake facilities to increase water production capacity, and
- iii. To construct new distribution networks to increase the rate of population served.

The project area is composed of the entire Jenin Municipality, Jenin Camp and four (4) expansion areas, and the beneficiaries of the project are estimated to be 73,894 persons in 2030.

The objectives of the project are expected to be achieved in 2030 and based on that, the time frame for climate risk assessment was suggested to be 20 years (2030 to 2050).

Climate Risk Implementation:

Using the Climate Risk Matrix, to narrow down the climate risks, Climate risk assessment team made discussions with local organizations and implementing agencies, and then a list of exposures was made to select the components that are considered likely to be affected by climate change during the project planning period in the target area.

According to the State of Palestine's Initial National Communication Report (INCR) to the United Nation Framework Convention on Climate Change (UNFCCC), 2016 and selecting the most pessimistic scenario, assuming that emissions continue unabated. Temperature Increases by ~1.5°C by 2025, by ~2.5°C by 2055. Temperature related Reduced cold periods and more warmer periods, both becoming more prominent in time. Rainfall Decreases by ~20% throughout until 2055. In general, a pattern of reductions in average daily rainfall and in contributions to total rainfall by heavier rainfall days, extended dry periods and reduced wet periods; thus, an increase in drought risk throughout. However, an indication that the rare wettest days might become more frequent, especially in the West Bank.

Based on the above discussion, and after Reviewing the past, current, and future climate forecasts and considering possible climate scenarios - see Climate change section (3.9) - due to climate change during the project period in the project area, the hazards that are likely to be relevant to the project and that are likely to occur during the project planning period in the target area were selected, and the following matrix was prepared.

Table 17 Climate Risk Matrix

		Climatic Hazard				counting
		H1 High Temperature	H2 Rainfall decrease	H3 Shift in rainfall season	H4 Wind storm	
Exposure	Current frequency (Frequency)	++	+	+	+	
	Future	→	→	→	→	
	E1: Water supply (Wells)	2	3	0	0	1
	E2: Water supply (CP)	3	2	1	0	1
	E3: Water Mains and distribution Pipes	0	0	0	1	0
	E4: Electric distribution line	2	0	0	2	0
	E5: Pressure breaking Tanks	1	0	0	0	0
	E6: Service Reservoir	1	0	0	0	0
	E7: Pump Stations	1	0	0	0	0
	E8: Surrounding People	2	2	1	2	0
	E9: District metered areas	1	1	0	0	0

The hazards listed above are described on the scale shown below, after confirming and examining the frequency of occurrence thus far and at present, respectively:

- ++ Frequently occurring thus far or at present
- + Sometimes occurring thus far or at present
- Has hardly occurred thus far or at present

The combination of exposure and hazard was examined for whether or not has caused/occurred, and assessed the degree of impact of what is or has happened. The scale of the evaluation is as shown below:

- 3 Events and impacts that have occurred thus far have been so difficult that they cannot be addressed and handled.
- 2 Events and impacts that have occurred to date have been moderately difficult to manage and deal with.

1 It has not been so difficult to manage the events and impacts that have occurred thus far. The resulting impact was minor and was managed to some extent.

0 The impacts of events that have occurred to date have been negligible.

Direction of future changes in "hazards" (future trends) were examined and described with arrows.

Based on the degree of impact assessed in the table from 0 to 3, the direction of future changes in hazards, and the impact (= risk) that may be significant in the future for the project was selected according to the following viewpoints:

- Among the impacts that have been assessed to be "3" in the current situation, some of these impacts are likely to be more severe in the future.
- Among the impacts that have been assessed to be "3" in the current situation, some of these impacts are likely to continue to be of similar severity in the future.
- Although the degree of impact is "2" at in the current situation, considering the direction of future changes in hazards, it is likely that the some of these impacts will be as significant as "3" in the future.

"vulnerabilities" that contribute to the occurrence of potentially significant impacts in the future:

- The selected "effects (risks) that may be significant in the future for the project" are shown in column (A) in the following table, and the "vulnerabilities" that are likely to contribute to the occurrence are shown in column (B) of the same table.
- Climate risks listed in Column (A) that may be significant in the future, if they are considered to be significant climate risks in the future based on the vulnerabilities to impacts listed in Column B, are selected as future climate risks for the project and listed in column (C)

Table 18 Narrowing down possible future impacts (risks) of the project

A	B	C
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	Impacts (climate risks) that may be significant in the future (Exposure + Hazard)	Vulnerabilities contributing to the development of impacts (Susceptibility to and capacity to cope with impacts)	Impact climate risks (risks ultimately selected) that may be significant in the future for the target project
1	H2 Rainfall decrease + E1 Water supply (Wells) (Rainfall decrease leads to a decrease in groundwater recharge and so less water available in wells)	No control over water resources, however private wells and bulk water provided from outside Jenin compensate some of the required amounts of water	Decrease in water supply-demand balance and water deficiency will increase if Lack of control over water resources continues and as Rainfall continue to decrease in the future, and so even the private wells option will not be available.
2	H1 High Temperature + E2 Water supply (CP) (Higher temperatures leads to more water consumption in both sides of the green line and so less water will be available through the CP to Jenin city)	Lack of other sources, and the relationship status between Palestine and Israel cause the decrease of water flow to Jenin. During summer with high demand of water, water supply is available with time limit in Jenin. Private wells and bulk water compensate some of the required amounts of water.	Water flow reduction to Jenin if the relationship status between Palestine and Israel continues as it is now or deteriorates more, and that leads to a decrease in annual water resources available for water supply. Private wells may not be available in the future.
3	H1 High Temperature + E8 Surrounding People (In hot season people consume more water than the amount provided by Jenin municipality)	Weak or no emergency response plan to deliver enough water to the surrounding people, although Jenin municipality covered some people by water tanks.	

The impacts (climate risks) listed in table 15 (Column A) that may be significant in the future:

1. H2 and E1 are considered to be significant climate risks in the future since no control over water resources and bulk water and private wells will not be enough to solve the problem, so decrease in water supply-demand balance is selected as a future climate risk for the Project.
2. H1 and E2 are considered to be significant climate risk in the future, since lack of another alternative source combined with a fragile relationship with Israel surely will

Creating Climate Risk Tree:

Based on the previous discussion and on the final selection of impacts (climate risks) that are likely to be significant in the future for the project, a climate risk tree was created and organized as shown below:

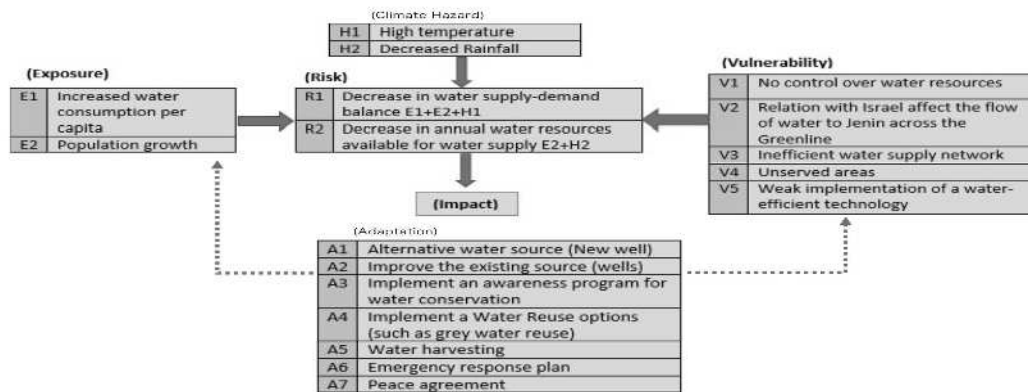


Figure 25 Climate Risk Tree

lead to decrease in annual water resources available for water supply and so the decrease in annual water resources available for water supply is selected as a future climate risk for the Project.

3. H1 and E8 also considered to be significant climate risk in the future, since the demand for water increases with temperature increase and failure to deliver enough water to the surrounding people will cause health problems to the people so as point no.1, the decrease in water supply-demand balance is selected as a future climate risk for the Project.

Creating Climate Risk Tree:

In the following page a Climate risk tree is created as a result of the previous discussions, and it shows that the two Climate risks selected for this project are Decrease in water supply-demand balance and decrease in annual water resources available for water supply, which is a logic result of the Climate Hazards High temperature and decrease in rainfall combined with the population growth and increase of water per capita consumption.

Examination of "adaptation options" for the "impacts (climate risks) that are likely to be significant in the future:

Considering the possible measures (= adaptation options) that addresses the vulnerabilities and reduce the final selection of "climate risks", Table 17 shows the adaptive options and the corresponding addressed vulnerabilities and Table 18 below shows the adaptation options and the corresponding SDGs items

Table 19 Adaptation Options

Adaptive Option	Addressed Vulnerability
A1, A2	V1, V2
A3	V2, V5
A4	V3, V4
A5	V3, V4
A6	V5, V3
A7	V2

Table 20 Adaptation Options

Risk	Impact climate risks (ultimately selected) that are likely to be significant in the future	Adaptation options for climate risk	Corresponding SDGs items
1	Decrease in water supply-demand balance (Insufficient water to cover the increased water demand) E1+E2+H1	Implement an awareness program for water conservation Implement a Water reuse options (such as grey water reuse) Emergency response plan	  
2	Decrease in annual water resources available for water supply. E2+H2	Alternative water source (New well) Improve the existing source (wells) Water harvesting Peace Agreement	   

References:

- PCBS, Palestinian Central Bureau of Statistics website: (<https://www.pcbs.gov.ps/postar.aspx?lang=ar&ItemID=3470>)
- SDG (Sustainable Development Goals), United Nations, 2015 <https://www.undp.org/sustainable-development-goals>
- JICA Guidelines for Environmental and Social Considerations (2010)
- Palestinian Environmental law 7, 1999
- Palestinian Environmental Assessment Policy, 2000
- Palestinian Water Law (2002)
- Land Expropriation Law 2/1953
- Palestinian Labour Law 7/2000
- World Bank's Environmental Safeguard Policies (1999)
- Jordanian Law No. 51 on Antiquities of 1966
- Decree-Law No. 14 of 2018 amending Agriculture Law No. 2 of 2003 and its amendments
- Oslo II Accord (Article 12, and Article 40), 1993
- Palestinian Ministry of Tourism and Antiquities site (<https://tourism.ps>)
- State of Palestine fifth national report (CBD), 2015
- National spatial plan map, Palestinian Ministry of Local Government (<https://geomolg.ps/>)
- National Determined Contributions (NDC) submitted to UNFCCC (State of Palestine), United Nations Framework Convention on Climate Change, 2017
- Palestinian Water Authority PWA, Environmental and Social Management Framework (ESMF) for the Water Security Development Program (WSDP), Prepared by Universal Group for Engineering and Consulting and Eco Conserve Environmental Solutions, 2017
- JICA, preparatory survey on the project for improvement of water supply system in Jenin municipality, inception report, March 2021.
- EQA, Palestinian Adaptation strategy, UNDP/PAPP, 2010
- State of Palestine's Fifth National Report on Biodiversity, 2015
- State of Palestine's Initial National Communication Report (INCR) to the United Nations Framework Convention on Climate Change (UNFCCC), 2016
- Palestinian National Adaptation Plan (NAP) to Climate change, 2016

JICA Environmental Checklist form # 14 (for water supply project)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) IEE and Environmental Permits	(a) Have IEE reports been already prepared in official process? (b) Have IEE reports been approved by authorities of the host country's government? (c) Have IEE reports been unconditionally approved? If conditions are imposed on the approval of IEE reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) The IEE study (this report) is completed as a part of JICA preparatory study. (b)-(d) EIA is not requested in the Environmental legislations of Palestine, since this is a water supply project. When the project scope will be finalized, PWA will submit application to EQA (Environmental Quality Authority) for determination on necessity of IEE in the Project.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) On June 25, 2023, a stakeholder consultation has been organized by the Jenin Municipality where representatives of the affected residents were explained about the Project overview, environmental and social impacts, and mitigation measures. There were some comments from the affected residents and after a question and answer session, agreement was reached on the Project implementation. (b) Comments obtained through the above consultations were reflected into the Project.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) A Comparative Analysis of Alternatives has been done as part of the IEE report.
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Are any mitigating measures taken? (b) Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?	(a) N/A (b) N/A	(a) Construction of chlorine storage facilities is not fixed in the plan. (b) ditto
	(2) Water Quality	(a) Do pollutants, such as SS, BOD, COD, pH contained in effluents discharged by the facility operations comply with the country's effluent standards?	(a) Y	(a) According to a periodic sampling and testing of the existing water supply facilities by PWA and PMOH, the results comply with the standards.
	(3) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed in accordance with the country's regulations?	(a) Y	(a) Wastes (mainly excavation remains which are unsuitable for backfilling will be disposed of at places designated by Jenin municipality.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
3 Natural Environment	(4) Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	(a) Y	(a) The low humming noises from pumps during the operation would comply with the Palestinian standards for noise.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The land nature will not cause land subsidence, and groundwater exploitation is within the allowable range.
	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) No protected areas within the project area
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a) N (b) N (c) N (d) N	(a) The project area doesn't encompass such areas. (b) No endangered species observed in the project area. (c) No significant ecological impacts are anticipated. (d) No aquatic environments in the project area.
	(3) Hydrology	(a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows?	(a) Y	(a) The project will increase amount of exploitation from the groundwater in Jenin, the groundwater level/ capacity of aquifer would be affected by the Project.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by the Project implementation? If so, are efforts made to minimize the impacts of relocation? (b) Are appropriate explanations provided to the residents being relocated regarding compensation and measures for livelihood restoration prior to their relocation? (c) Are investigations conducted for the purpose of resident relocation, and is a relocation plan developed that includes compensation based on the fair market value and restoration of the relocated residents' living infrastructure?	(a) N (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) No involuntary resettlement, since the Project implementation area is a public land.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		(d) Is the payment of compensation made prior to the relocation? (e) Is the compensation policy established in written form? (f) Is a plan implemented that appropriately considers socially vulnerable groups such as women, children, the elderly, the impoverished, ethnic minorities, and indigenous peoples among the relocated residents? (g) Is consent obtained from the relocated residents prior to the relocation? (h) Is a framework established to effectively implement resident relocation? Are sufficient implementation capacity and budgetary measures taken? (i) Is monitoring of the impacts resulting from relocation planned? (j) Is a mechanism for handling grievances established?		
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?	(a) Y (b) Y	(a) There will be a slight nuisance during the construction phase, and can be mitigated by: - wetting of soil to arrest dust generation. - disposal of the unsuitable material of Road pavement Structure at designated source - Provide barricading/security personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone. (b) This project is planned to improve existing water use. There will be no adverse impact.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archaeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There are many archaeological sites in and around Jenin. However, the working locations are far enough to cause any effect on archaeological, historical, cultural, and religious heritage.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) A temporary negligible landscape effect caused by excavation and construction works, and a slight permanent effect on the forest where the new reservoir will be located, however these effects can be mitigated by following the best practices for excavation and construction works, and by planting trees around the new reservoir.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(5) Ethnic minorities, indigenous peoples	(a) Are considerations made to mitigate the impacts on the culture and way of life of ethnic minorities and indigenous peoples in the country? (b) Are the rights concerning land and resources of ethnic minorities and indigenous peoples respected?	(a) N/A (b) N/A	No ethnic minorities or indigenous peoples are identified in the Project area. No involuntary resettlement will occur.
	(6) Working Conditions	(a) Are the relevant labor laws of the country, which should be complied with in the project, being followed? (b) Are measures in place to ensure the physical safety of project personnel, such as the installation of safety equipment and management of hazardous substances, with regards to preventing occupational accidents? (c) Are plans and implementation in place to address the soft aspects of safety for project personnel, such as the development of safety and health plans and the provision of safety education (including traffic safety and public health) for workers? (d) Are appropriate measures taken to ensure that security personnel involved in the project do not compromise the safety of project personnel and local residents?	(a) Y (b) Y (c) Y (d) Y	(a) To comply with chapter No.5 of the Palestinian Labor Law No. (7) of 2000. (b) To comply with section 4 of chapter No.5 of the Palestinian Labor Law No. (7) of 2000. (c) They will be planned and implemented under the responsibility of the Contractor. (d) Appropriate measures are planned and implemented by the Contractor.
	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?	(a) Y (b) Y (c) Y (d) Y	(a) (b) (c) and (d) - Avoid night and early morning work as much as possible, use mufflers and noise dampers, utilize soundproof walls, and ensure that all construction machinery used in the construction strictly adheres to Palestine's noise standards, and verify that noise is not generated whenever possible. Apply construction methods that do not involve the use of machinery to reduce machine usage if feasible. - Provide appropriate and adequate personal protective equipment to workers, such as helmets and dust masks. - Provide appropriate warning and directional signs. - Provide temporary access to residences and businesses as necessary during construction. - Schedule construction to minimize soil exposure during the rainy season.
5 Others				

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
6 Note				- Perform proper watering on the site and ensure appropriate transportation and storage of construction materials. - Cover vehicles involved in the removal of construction soil and waste. - Use relatively new construction vehicles and transport vehicles with low exhaust emissions. - Collect all waste and construction debris from the site and dispose of them in specifically designated areas. - Plan the construction schedule according to the daily traffic volume at the site and avoid peak traffic hours.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) N/A (c) Y (d) N/A	(a) An environmental monitoring plan will be developed and the contractor is obliged to implement it. (b), (c) included in the monitoring plan. (d) Will be requested by EQA in the project approval if necessary.
	Reference to other environmental checklist	(a) If necessary, to evaluate the relevant checklist items related to dams and rivers and include them in the assessment.	(a) N/A	(a) N/A
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) Y	(a) Mitigation measures to climate change were Planned applying JICA Climate-FIT.

Participants Information:

Participant 1 :	1-Name: <u>Eman Silway</u> 2-Gender ☐ Male ☒ Female 3- Position: Press 4-Types Of Groups ☐ socially vulnerable group ☐ stakeholder group ☒ Others 5-Notes: : journalism
Participant 2	1-Name: <u>Ibtisam Jalanneh</u> 2-Gender ☐ Male ☒ Female 3- Position: Volunteer 4-Types Of Groups ☐ socially vulnerable group ☒ stakeholder group ☐ Others 5-Notes: : Head of Eastern Neighborhood Women's Center in Jenin
Participant 3 :	1-Name: <u>Khairia Soquya</u> 2-Gender ☐ Male ☒ Female 3- Position: Water Engineer 4-Types Of Groups ☐ socially vulnerable group ☒ stakeholder group ☐ Others 5-Notes: Jenin Municipality-WWD

Meeting Minutes

Project Name	THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN JENIN MUNICIPALITY
Date	25/06/2023
Time	11:00 am
Location	Child Cultural Center-Jenin



Participant 4 :	1-Name:Haya Fqha 2-Gender 3- Position: Civil Engineer 4-Types Of Groups 5-Notes: Engineers Consultants and Project Managers (ECPM)
Participant 5 :	1-Name:Rana Abbadi 2-Gender 3- Position: Electrical Engineer 4-Types Of Groups 5-Notes: Engineers Consultants and Project Managers (ECPM)
Participant 6 :	1-Name:Lama Jarad 2-Gender 3- Position: Director 4-Types Of Groups 5-Notes: Environment Quality Authority (EQA)
Participant 7 :	1-Name:Serren Rabaya 2-Gender 3- Position: Assistant

	4-Types Of Groups 5-Notes:Environment Quality Authority (EQA)
Participant 8 :	1-Name:Raghib Malhis 2-Gender 3- Position: Engineer 4-Types Of Groups 5-Notes: JET
Participant 9 :	1-Name:Hasan Abahry 2-Gender 3- Position: Council Member 4-Types Of Groups 5-Notes: Citizen from Jenin
Participant 10 :	1-Name:Alaa Turkman 2-Gender 3- Position: Advisor 4-Types Of Groups

Participant 11 :	5-Notes: JICA Advisory Team 1-Name:Amin Nasri 2-Gender 3- Position: Council Member 4-Types Of Groups 5-Notes: Citizen from Jenin	☐ socially vulnerable group ☐ stakeholder group ☐ Others ☐ Male ☐ Female ☐ socially vulnerable group ☐ stakeholder group ☐ Others
Participant 12 :	1-Name:Abed ALrahman Hantouly 2-Gender 3- Position: Council Member 4-Types Of Groups 5-Notes: Jenin Municipality council member	☐ socially vulnerable group ☐ stakeholder group ☐ Others ☐ Male ☐ Female ☐ socially vulnerable group ☐ stakeholder group ☐ Others
Participant 13 :	1-Name:Mohammed Sabaneh 2-Gender 3- Position: Public Relation 4-Types Of Groups 5-Notes: Jenin Municipality council member	☐ socially vulnerable group ☐ stakeholder group ☐ Others ☐ Male ☐ Female ☐ socially vulnerable group ☐ stakeholder group ☐ Others

Participant 14 :	1-Name: Basheer Matahen 2-Gender 3- Position: Public Relation 4-Types Of Groups 5-Notes: Jenin Municipality PR Director	☐ socially vulnerable group ☐ stakeholder group ☐ Others ☐ Male ☐ Female ☐ socially vulnerable group ☐ stakeholder group ☐ Others
Participant 15 :	1-Name: Naser Ghazal 2-Gender 3- Position: Public Relation 4-Types Of Groups 5-Notes: Jenin Municipality	☐ socially vulnerable group ☐ stakeholder group ☐ Others ☐ Male ☐ Female ☐ socially vulnerable group ☐ stakeholder group ☐ Others
Participant 16 :	1-Name: Ahmad Mahmoud 2-Gender 3- Position: Public Relation 4-Types Of Groups 5-Notes: Citizen from Jenin	☐ socially vulnerable group ☐ stakeholder group ☐ Others ☐ Male ☐ Female ☐ socially vulnerable group ☐ stakeholder group ☐ Others
Participant 16 :	1-Name: Heyam Alqerm 2-Gender	☐ Male

	• Female 3- Position: Public Relation Manager 4- Types Of Groups ○ stakeholder group ○ socially vulnerable group 5- Notes: Gardenia Association
Participant 17 :	1- Name: Mayson Dawood 2- Gender ○ Male • Female 3- Position: Manager 4- Types Of Groups ○ socially vulnerable group ○ stakeholder group • Others 5- Notes: Child Cultural Center
Participant 18 :	1- Name: Zahra Alakhras 2- Gender ○ Male • Female 3- Position: Trainee 4- Types Of Groups ○ socially vulnerable group ○ stakeholder group • Others 5- Notes: Citizen from Jenin
Participant 19 :	1- Name: Abdallah Ruziyeh 2- Gender • Male ○ Female 3- Position: Executive Manager 4- Types Of Groups ○ socially vulnerable group • stakeholder group ○ Others 5- Notes: Engineers Consultants and Project Managers (ECPM)

Participant 20 :	1- Name: Mohammed Zoub 2- Gender • Male ○ Female 3- Position: P.R 4- Types Of Groups ○ socially vulnerable group ○ stakeholder group • Others 5- Notes: Jenin Municipality
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Questions:

Question	Answer
1. Is There any Traffic Plan for the project to prevent congestion and apply the safety plan?	There is no project without alternative plans for execution to prevent any emergency and off course there is a plan for switching the streets and the contractors should submitted the traffic plan before start the construction and should be approved by the supervision consultant
2. What is the possible way to apply the safety plan before start the implementation the project?	Traffic signals will be put in place and alternative routes will be found or work during the night hours to achieve the necessary traffic safety
3. The quality of ground water is more better than the quality of Artesian wells how will be balanced?	Water extracted from artesian wells will be treated in appropriate ways to meet approved health and international standards
4. There is a project with Paestinian water authority (PWA) in Jenin Area which is similar to the JICA project (Connection point project) Is there any coordination between two projects?	There is no conflict between the two proposed projects and there is full coordination between them to ensure the necessary coverage of all regions and achieve the objectives of each project.
5. Is there any restrictions on the Jenin Municipality artesian wells ?	The restrictions on artesian wells themselves have not changed from the 1995 Oslo Convention, which we have not reached the maximum permissible quantity as a result of the occupation policy.
6. Should I restricted by the licenses of artesian wells?is there any nessacary liscense?	Yes, there are restrictions governing artesian wells and there is a constant need to obtain the necessary licenses so that we do not reach the stage of unsafe use of underground stock
7. How will be the construction process of the project? In parallel or one by one	The project will be implemented in phases within the necessary time period of 3 years so that it does not affect the day-to-day life and provides alternative plans in case of urgent need for water interruption for maintenance or replacement of necessary lines

8. Has it been take into consideration that the areas will be distributed in the nearest reservoir?	Areas will be distributed according to the spatial map of the area based on its proximity to the target reservoir and pressure breakers will be installed to reduce damage and break lines and floats, reduce loss and compensate for shortages in some areas
9. What is the project implementation schedule ?	The actual time for the execution the project will be 3 years this means at the end of 2027 should the project finish
10. What is the maximum quantity will provide to the areas?	Depend on the study, from 14800-15000 m³ will cover the whole area
11. Have the contractor's working time been taken into consideration to suite the nature of the site and avoid peak hours	The contractor's working times will be approved with the traffic plan so as to take into account alternative routes or convert working hours to night as needed
12. During the construction ,there will be an air pollution and dust in the working area how will you dealing with this problem?	- Implement the manufacturer recommended engine maintenance programs - Drive within safe speed limits and choose appropriate route and time. - Dust suppressants, watering the site, and proper transporting and storage of excavation materials. - Covering of stored spoil material and vehicles removing waste. - Avoid windy days. - Identification of disposal sites for unsuitable excavated material - Wearing PPE - Risk analysis for each task to be performed - Staff training

13. Depend on the preasetation and increase number of customers or services connections, who is the responsible about the new meters? the customer or the mucipility?	Old subscriptions will remain the same. For new subscriptions they will be provided by the municipality
14. Enquiry about the solid waste disposal mechanism and proposed disposal premises	Waste disposal mechanism must be compliant with the environmental and health conditions set by the authority concerned It will be agreed with the stakeholders and provide the contractor with the permitted places for the deportation .of solid waste, drilling product and backfill
15. Private well water is used or not after the project	The goal is to permanently dispense with private wells but they will be connected to the network to be used in future emergency conditions
16. New pipeline from Israel side or existing one?	The new lines will be by the Israeli side and the old will stop working when the new water security project is .fully completed

Discussion :

The discussion was supportive of the project and the attendees showed a great interest in its consequences to achieve the desired goals and look forward to it as the best solution to solve the problem of water scarcity in Jenin and provide it for the future.

Some Photos from the presentation



ENGINEERS

Consultants & Project Managers

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 Palestine - Jenin - Nazareth street
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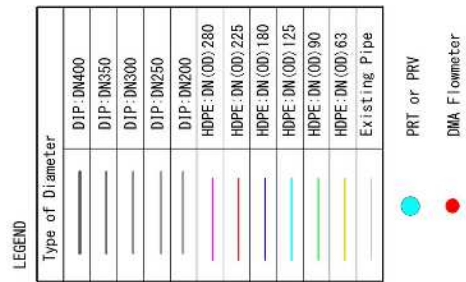


Appendix 9 Outline Design Drawings

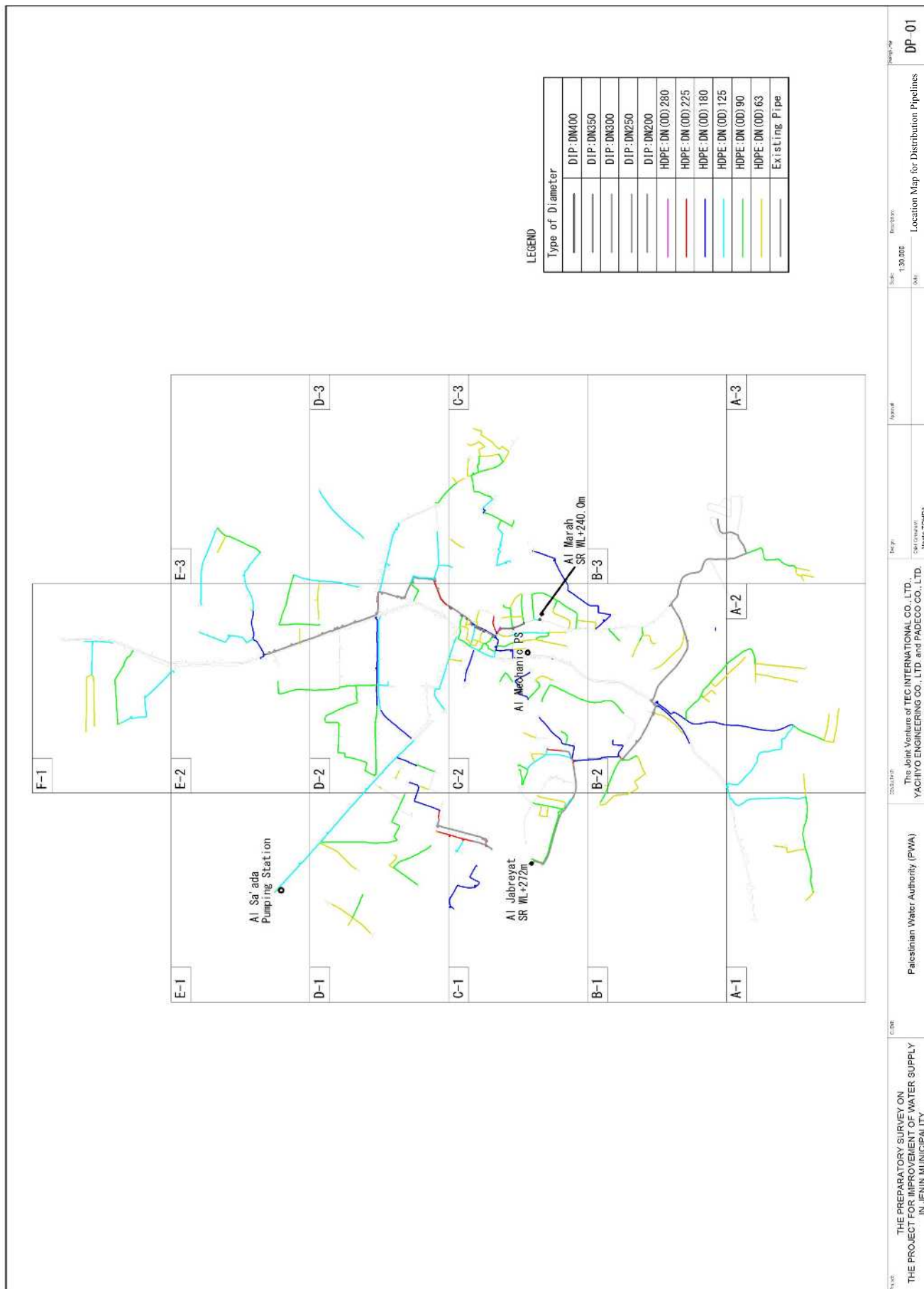
Appendix 9 Outline Design Drawing

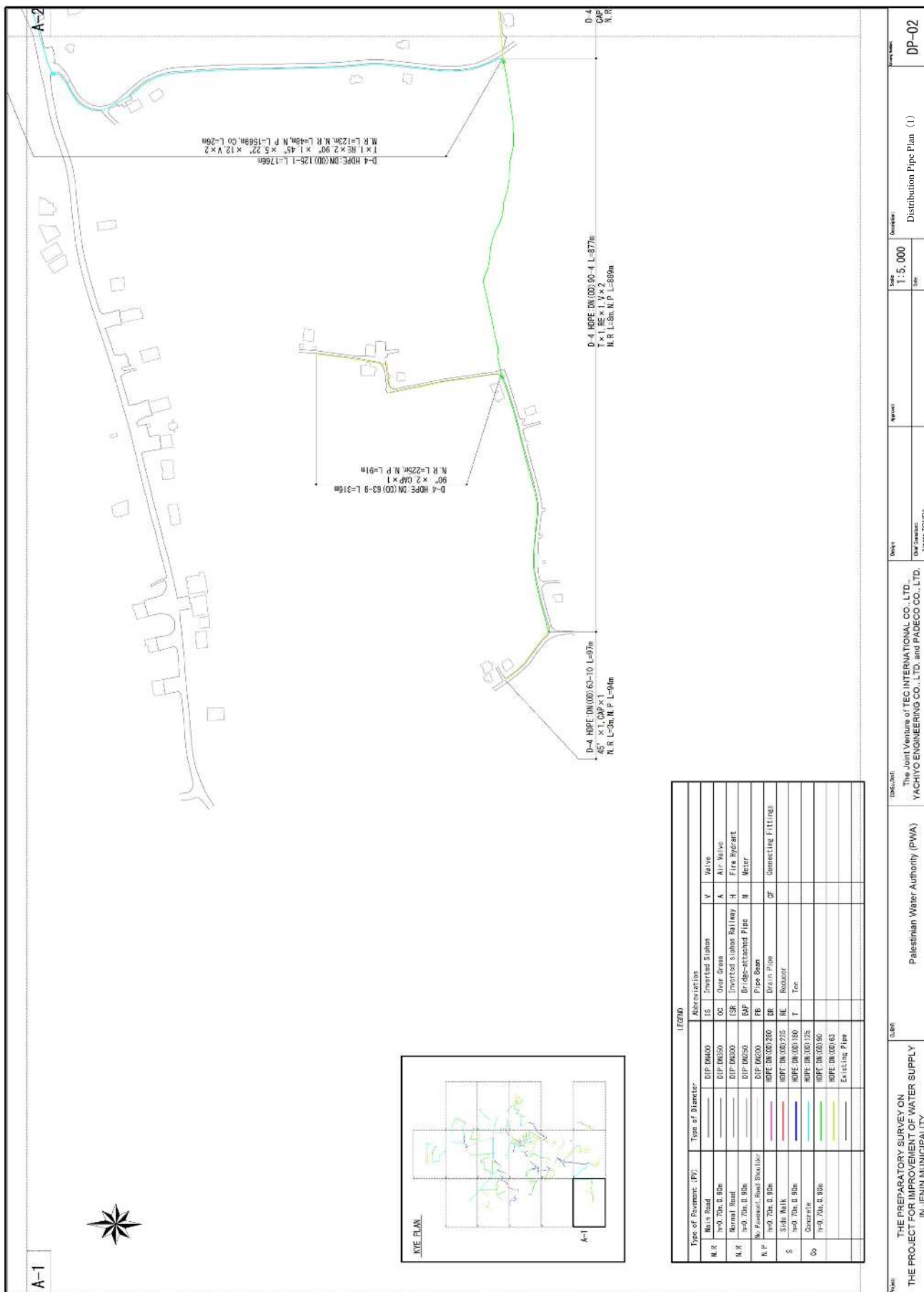
List of Outline Design Drawings

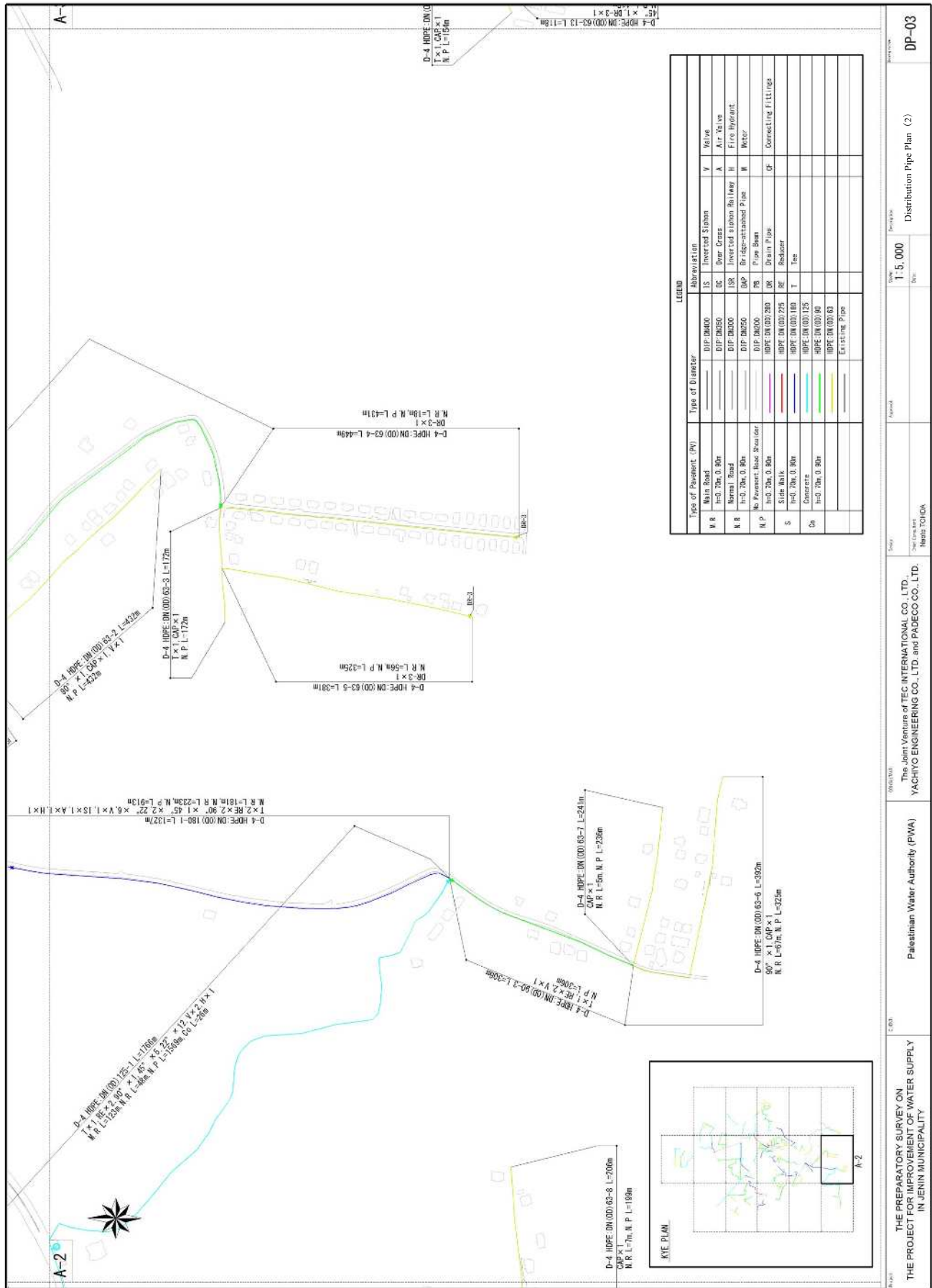
Drawing No.	Drawing Title
G-01	General Layout of Design Facilities
DP-01	Location Map for Distribution Pipelines
DP-02	Distribution Pipe Plan (1)
DP-03	Distribution Pipe Plan (2)
DP-04	Distribution Pipe Plan (3)
DP-05	Distribution Pipe Plan (4)
DP-06	Distribution Pipe Plan (5)
DP-07	Distribution Pipe Plan (6)
DP-08	Distribution Pipe Plan (7)
DP-09	Distribution Pipe Plan (8)
DP-10	Distribution Pipe Plan (9)
DP-11	Distribution Pipe Plan (10)
DP-12	Distribution Pipe Plan (11)
DP-13	Distribution Pipe Plan (12)
DP-14	Distribution Pipe Plan (13)
DP-15	Distribution Pipe Plan (14)
DP-16	Distribution Pipe Plan (15)
DP-17	Existing Distribution Pipe Division Plan (1)
DP-18	Existing Distribution Pipe Division Plan (2)
DP-19	Existing Distribution Pipe Division Plan (3)
DP-20	Existing Distribution Pipe Division Plan (4)
DP-21	Existing Distribution Pipe Division Plan (5)
SD-01	General Earth Work for Pipe Laying
SD-02	Typical Drawing for Pipe Laying (1)
SD-03	Typical Drawing for Pipe Laying (2)
SD-04	Typical Drawing for Pipe Laying (3)
SD-05	Typical Drawing for Installation of Air Valve and Washout
SD-06	Typical Drawing for Installation of Pressure Reducing Valve
SD-07	Typical Drawing for Installation of Flowmeter
PS-01	General plan of Al Saadeh pumping station
PS-02	Renewal Plan of Al Saadeh pumping station
SR-01	General plan of Al Marah Service Reservoir
SR-02	Renewal plan of pipeline around Al Marah Service Reservoir
SR-03	General plan of Al Jabreyat Service Reservoir
SR-04	Renewal plan of pipeline around Al Jabreyat Service Reservoir
SC-01	SCADA System Plan

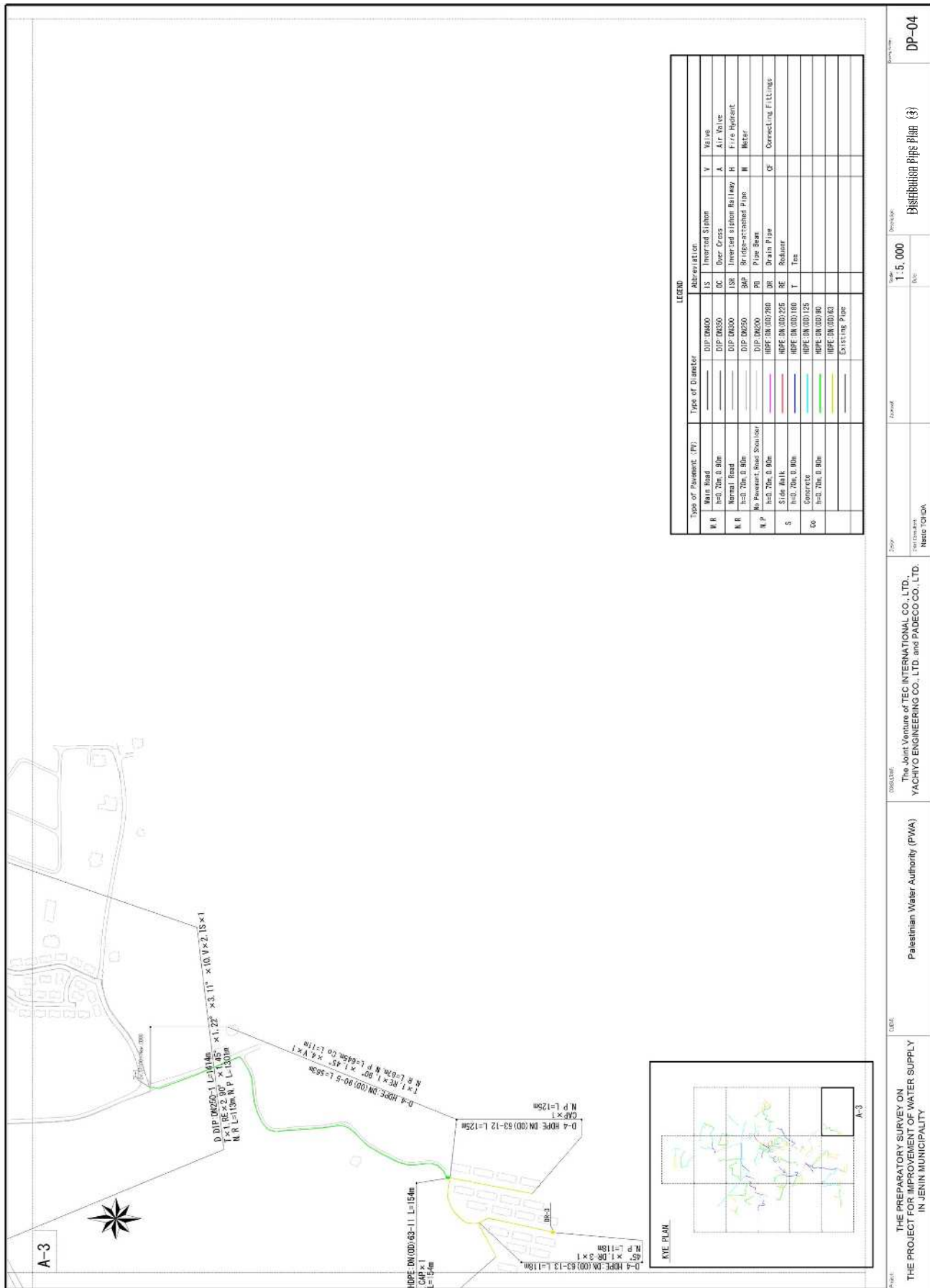


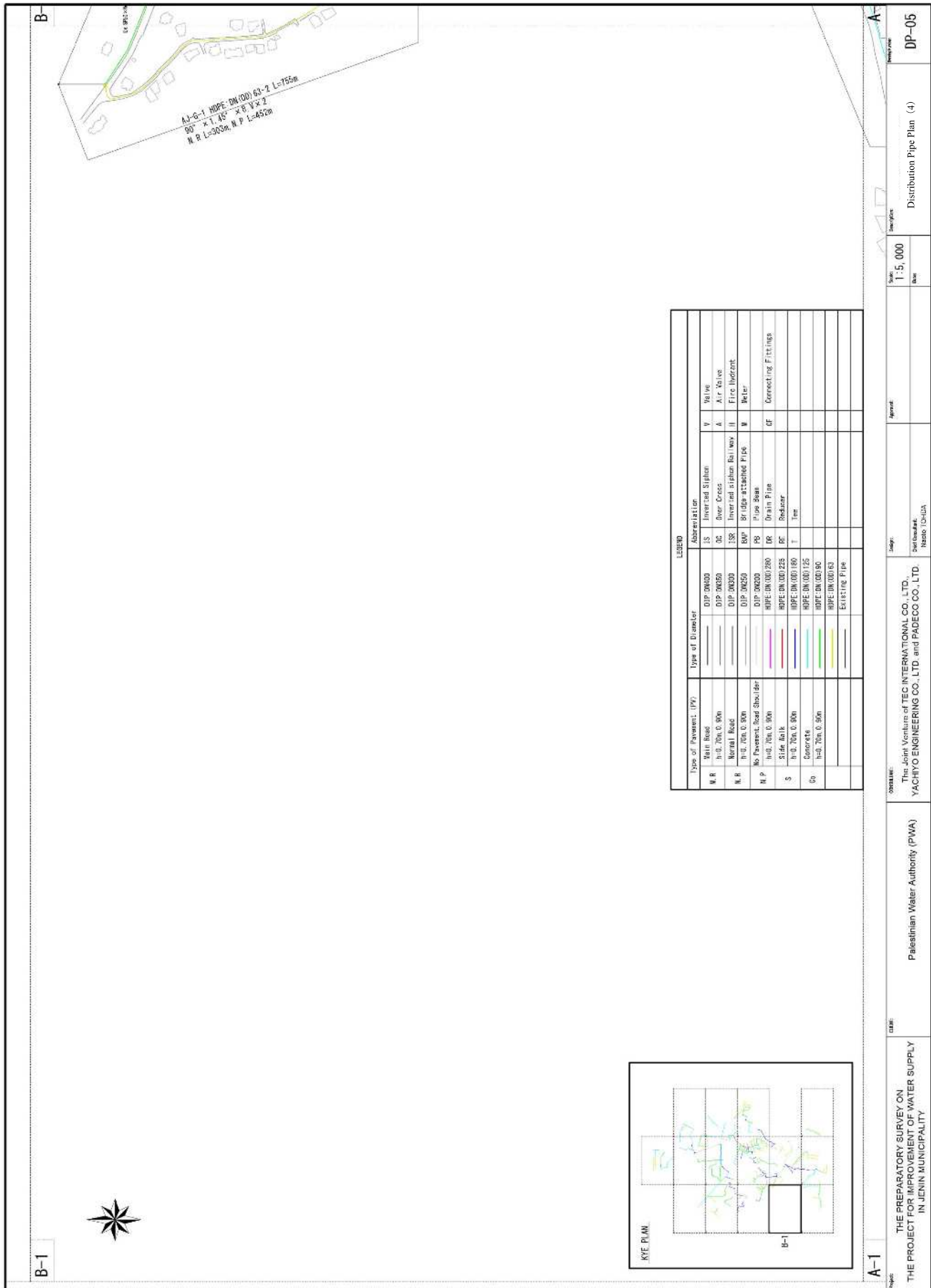
THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN JENIN MUNICIPALITY	C. IND Client Name Palestinian Water Authority (PWA)	Design The Joint Venture of TEC INTERNATIONAL CO., LTD., YACHIYO ENGINEERING CO., LTD. and PADECO CO., LTD. NAKHO TOHOKU	Approval 1.30.2002 Scale 1:500	Drawn by JAC	Project Name General Layout of Design Facilities	Project No. G-01
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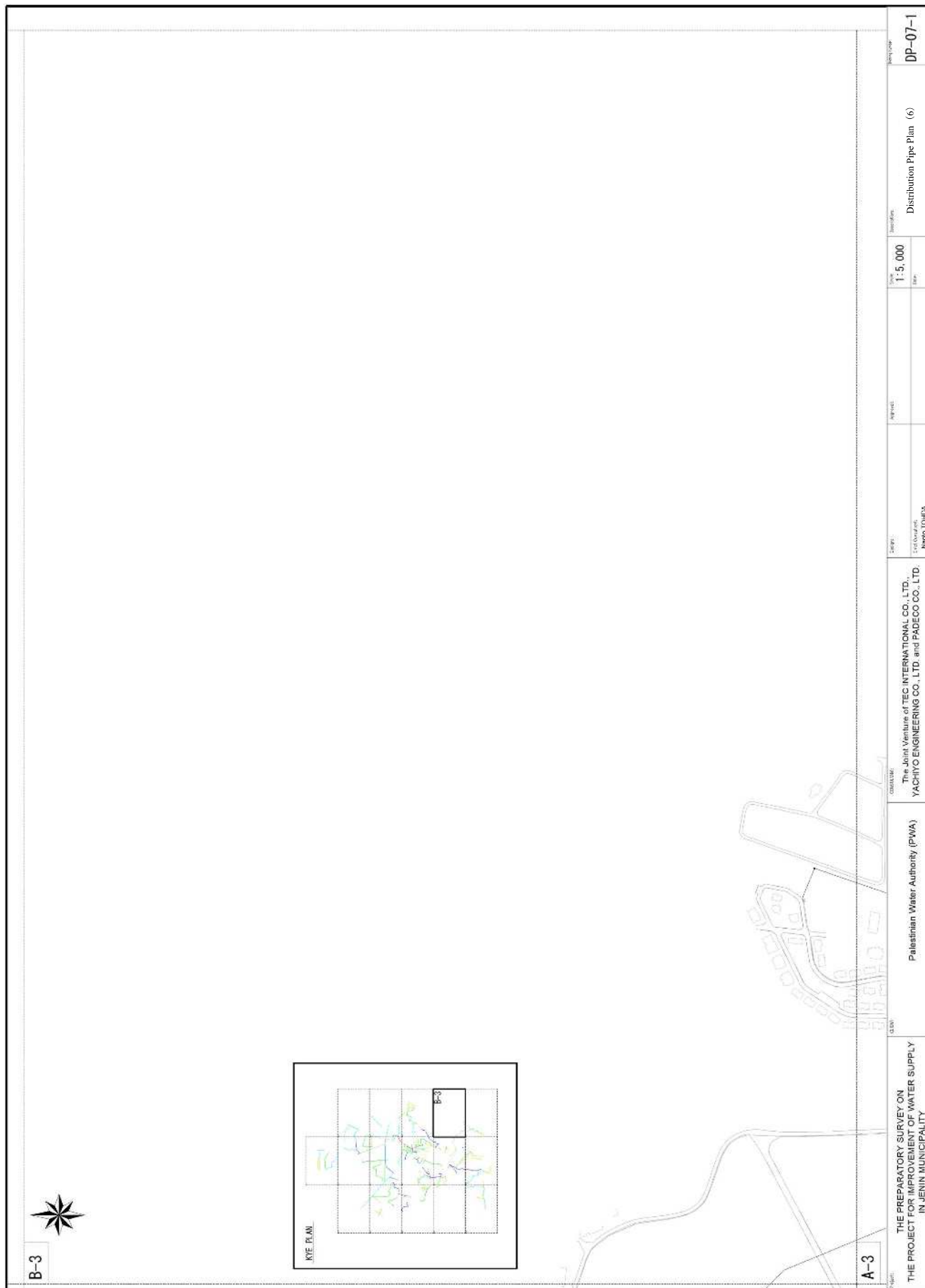


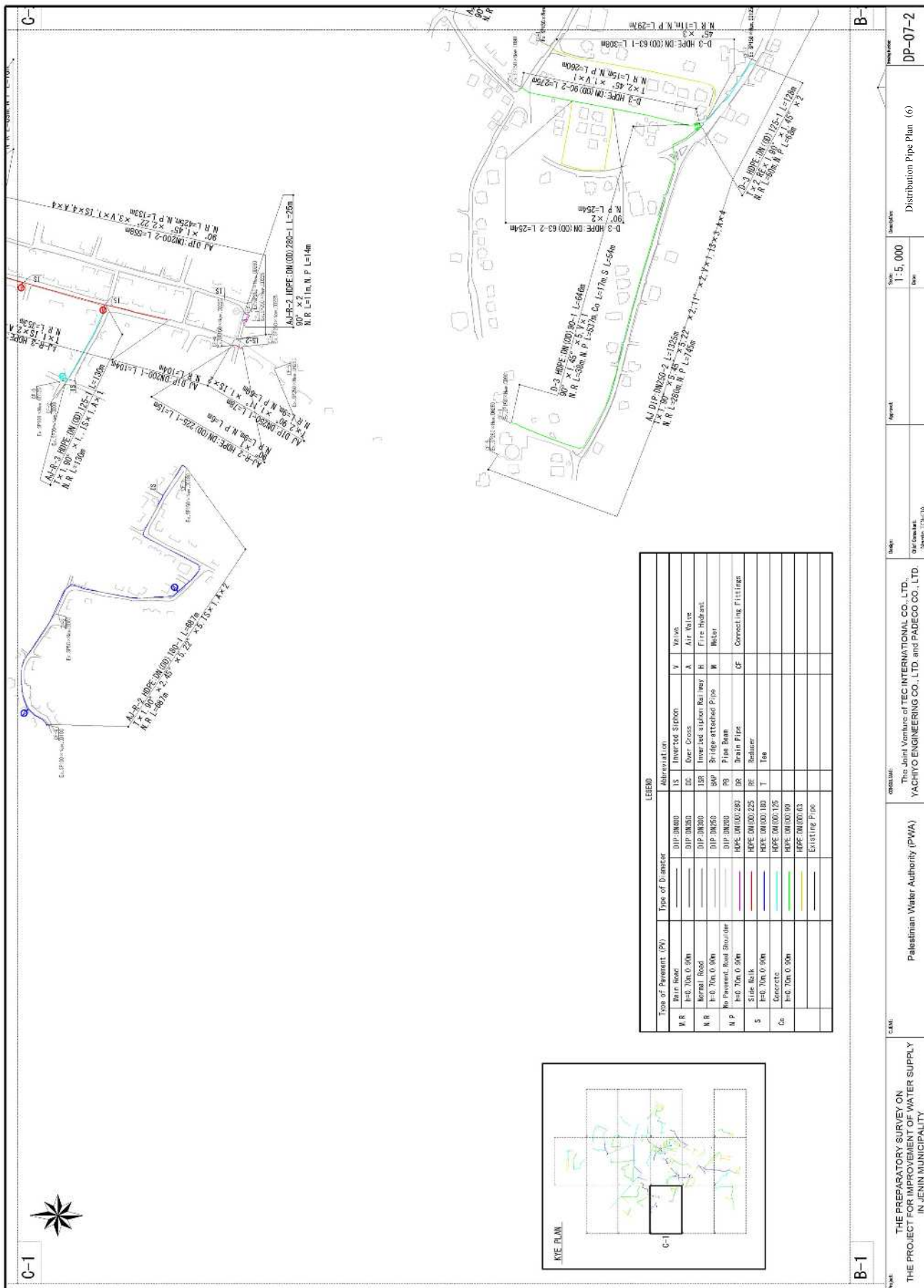


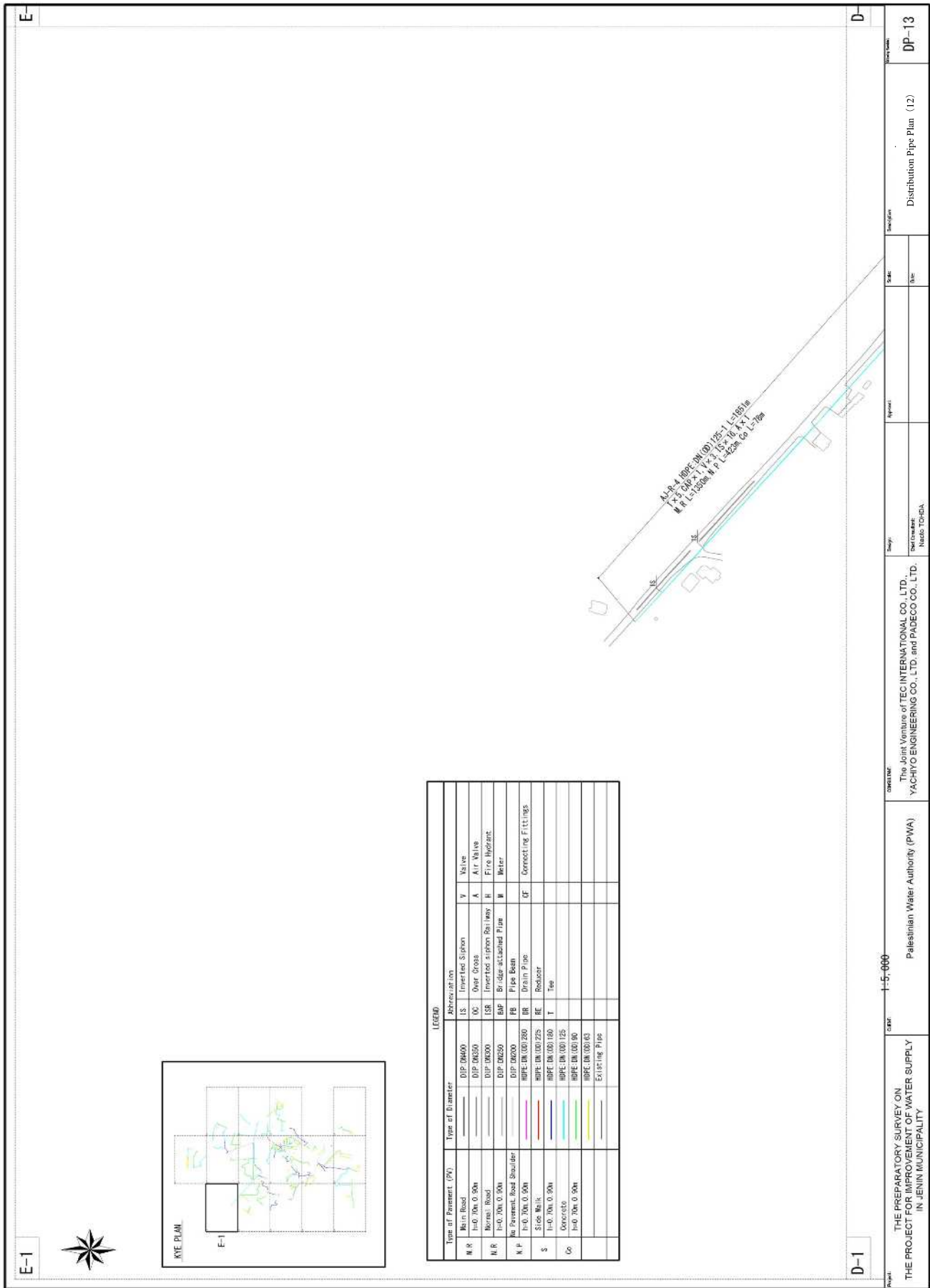


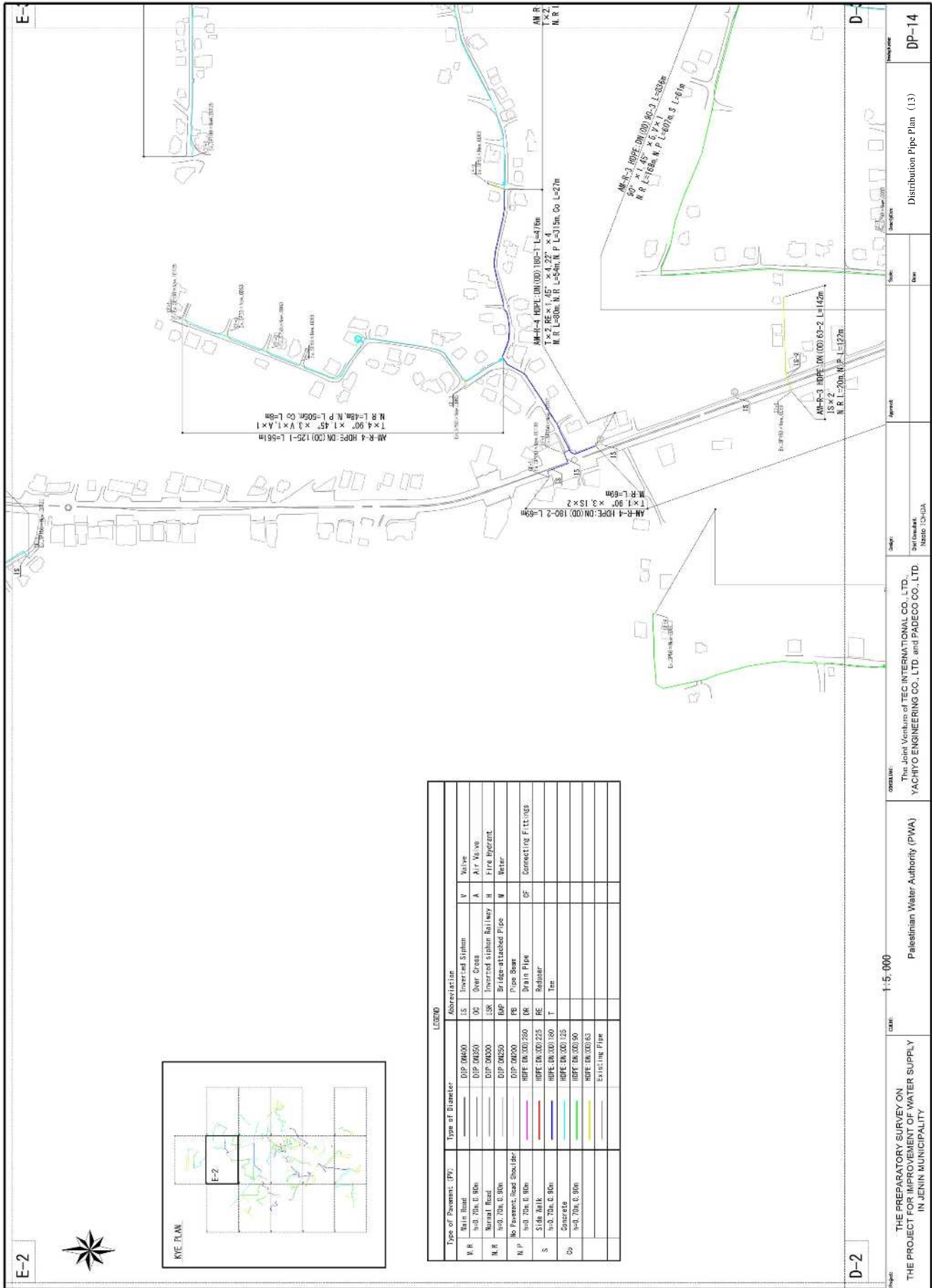


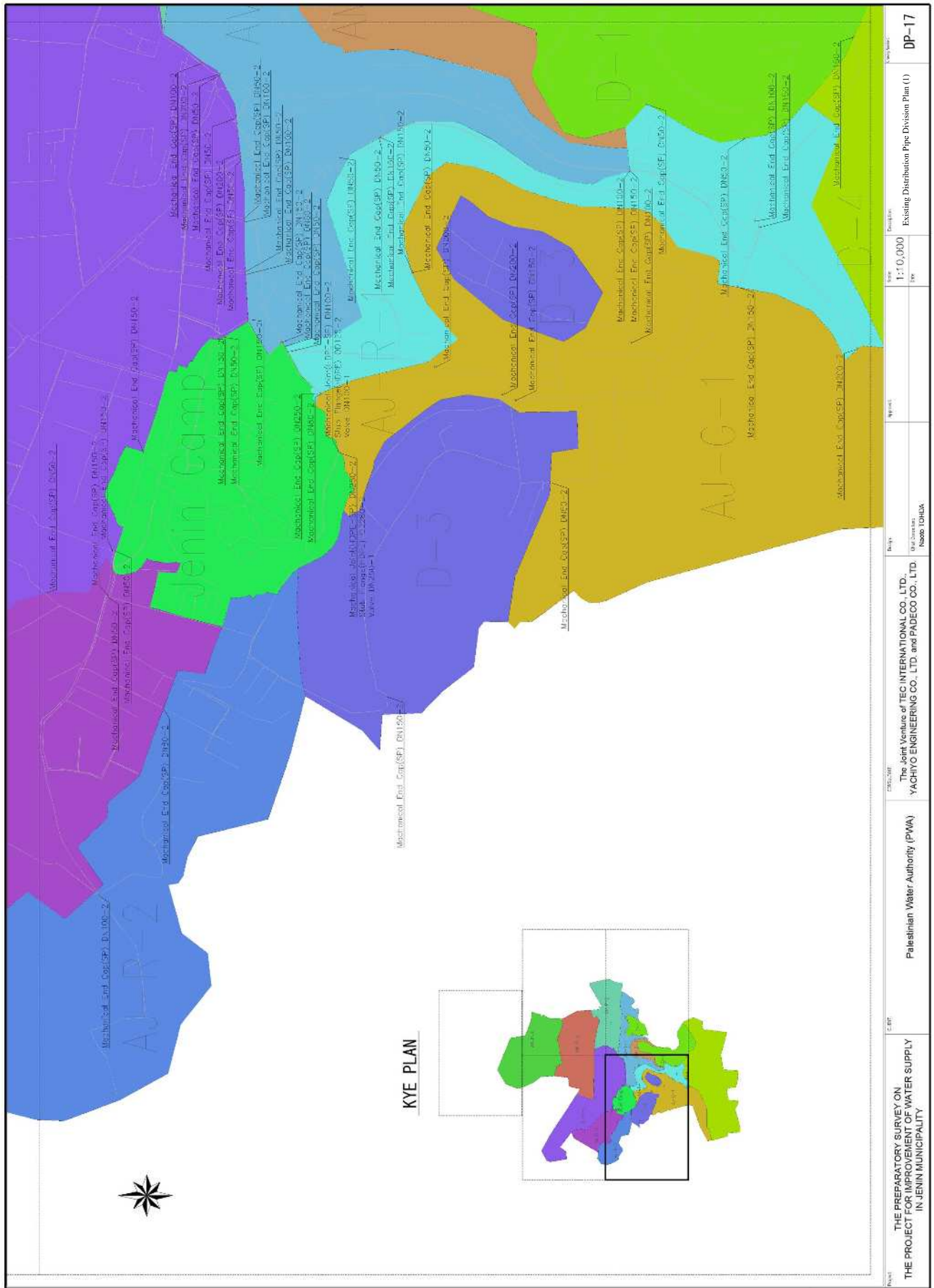


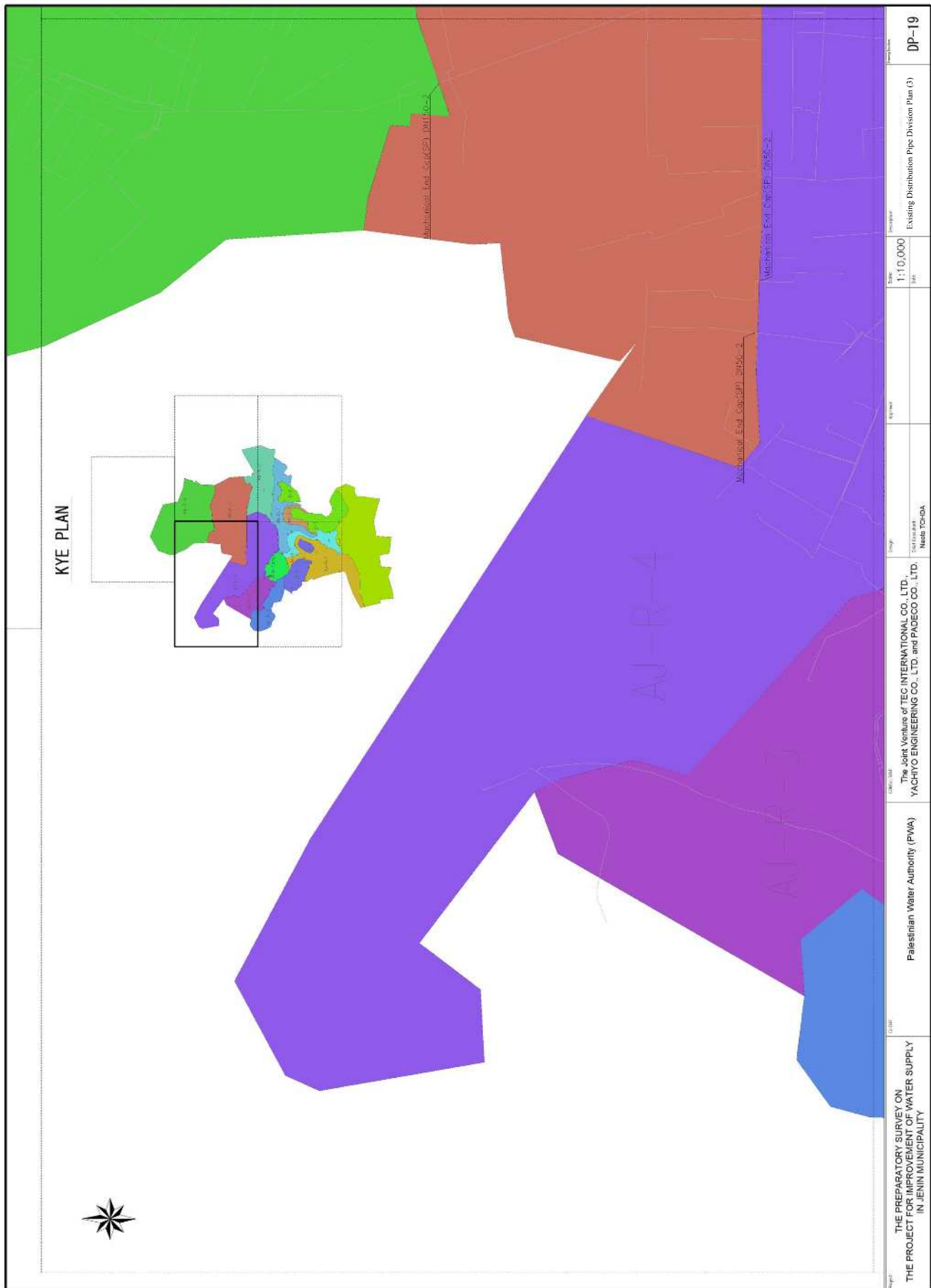


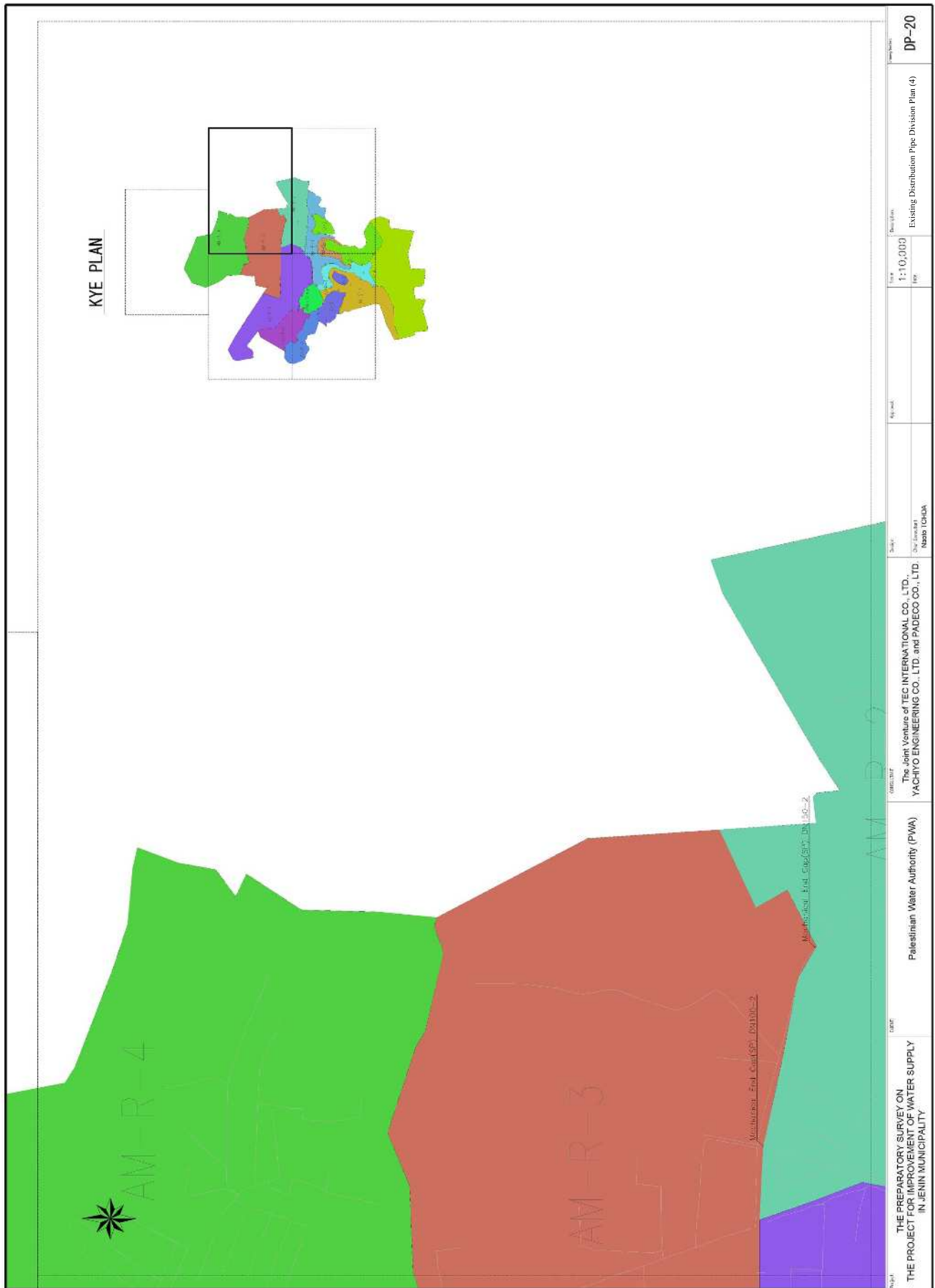


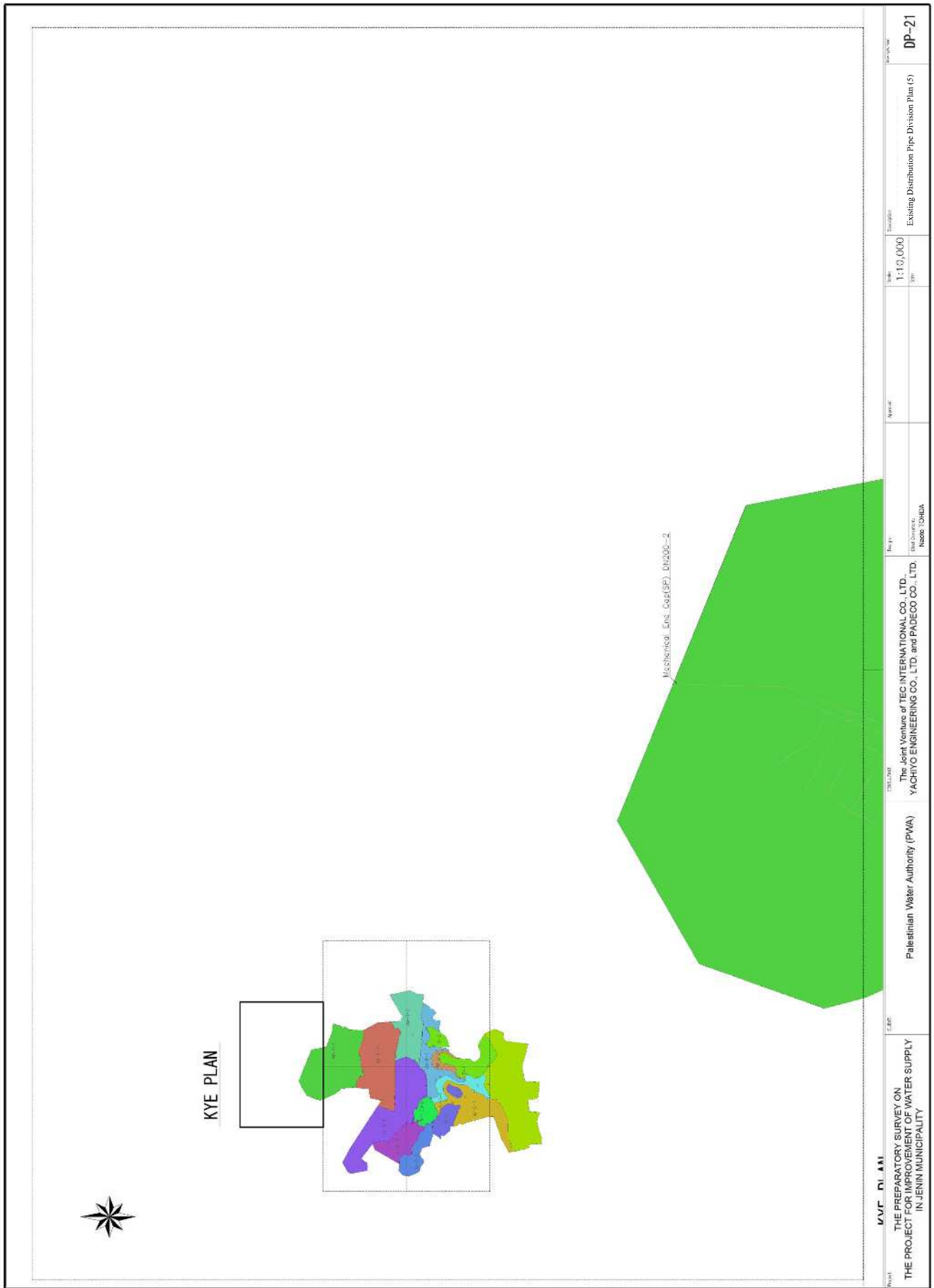






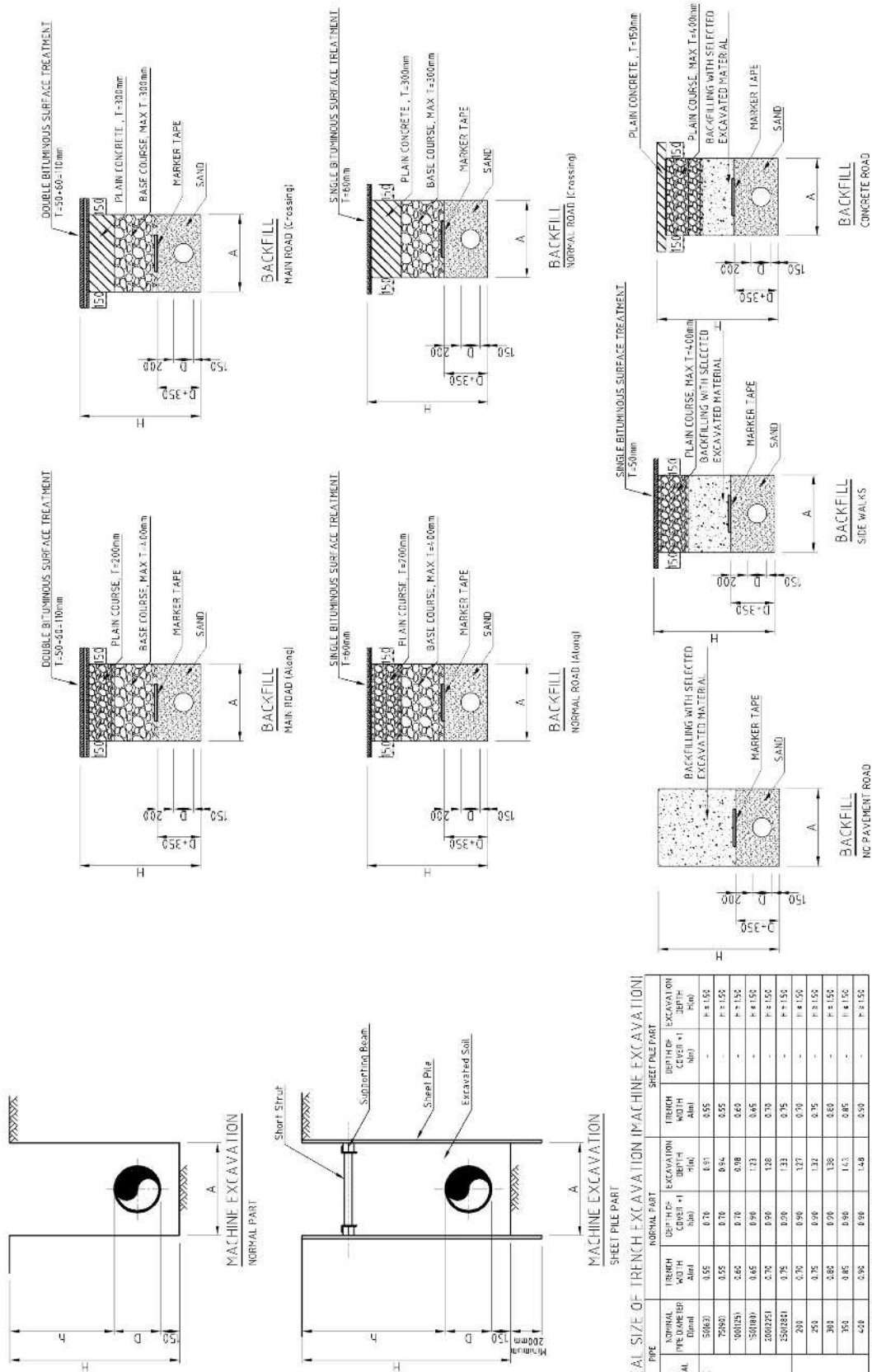






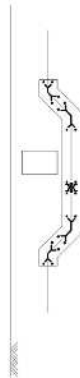
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Typical Drawing for Pipe Laying



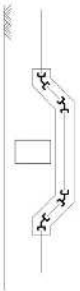
Typical Drawing for Connecting

IS (Inverted siphon)



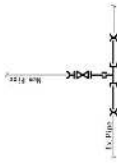
Material	Joint Type	Diameter	Number
Double Socket Blind	HDPE	63~280 x 45	4
Cellar	DIP (T)	200~400	1
Restrained Coupling	DIP (T)	200~400	8
Restrained Coupling	DIP (S)	200~400	2

IS (Inverted siphon)



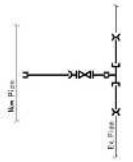
Material	Joint Type	Diameter	Number
Double Socket Blind	HDPE	63~280 x 45	4

CF-1 (Connecting fittings-1)



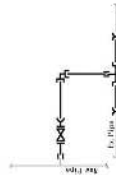
Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~280	n	Ex. Diameter
Double Socket Tee	HDPE	63~280	1	Ex. Diameter
Mechanical Joint Socket	HDPE-SP	63~280	2	Ex. Diameter
Flange Adapter	HDPE	63~280	1	Ex. Diameter
Stub Flange	HDPE	63~280	1	Ex. Diameter
Valve	—	63~280	1	Ex. Diameter
Flange Joint	—	63~280	2	Ex. Diameter

CF-2 (Connecting fittings-2)



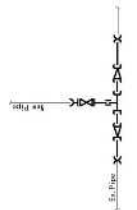
Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~280	n	Ex. Diameter
Double Socket Tee	HDPE	63~280	1	Ex. Diameter
Mechanical Joint Socket	HDPE-SP	63~280	2	Ex. Diameter
Flange Adapter	HDPE	63~280	1	Ex. Diameter
Stub Flange	HDPE	63~280	1	Ex. Diameter
Valve	—	63~280	1	Ex. Diameter
Flange Joint	—	63~280	2	Ex. Diameter

CF-3 (Connecting fittings-3)



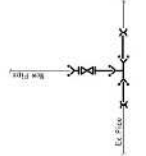
Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~280	n	Ex. Diameter
Double Socket Tee	HDPE	63~280	1	Ex. Diameter
Mechanical Joint Socket	HDPE-SP	63~280	2	Ex. Diameter
Flange Adapter	HDPE	63~280	1	Ex. Diameter
Stub Flange	HDPE	63~280	1	Ex. Diameter
Valve	—	63~280	1	Ex. Diameter
Flange Joint	—	63~280	2	Ex. Diameter

CF-4 (Connecting fittings-4)



Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~280	n	Ex. Diameter
Double Socket Tee	HDPE	63~280	1	Ex. Diameter
Mechanical Joint Socket	HDPE-SP	63~280	2	Ex. Diameter
Flange Adapter	HDPE	63~280	1	Ex. Diameter
Stub Flange	HDPE	63~280	1	Ex. Diameter
Valve	—	63~280	1	Ex. Diameter
Flange Joint	—	63~280	2	Ex. Diameter

CF-5 (Connecting fittings-5)



Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	DIP (T)	250	n	Ex. Diameter
Double Socket Tee	DIP (T)	250 x 250	1	Ex. Diameter
Mechanical Joint Socket	DIP-SP	250	2	Ex. Diameter
Flange Adapter	DIP (T)	250	1	Ex. Diameter
Stub Flange	DIP (T)	250	1	Ex. Diameter
Valve	—	250	1	Ex. Diameter
Restrained Coupling	DIP (T)	250	4	Ex. Diameter
Flange Joint	—	250	2	Ex. Diameter

THE PREPARATORY SURVEY ON
THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY
IN JENN MUNICIPALITY

Palestinian Water Authority (PWA)

THE JOINT VENTURE OF TEC INTERNATIONAL CO., LTD.
YACHTO ENGINEERING CO., LTD. and PADECO CO., LTD.

Head Office
Nasir TOHQA

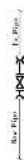
NONE

Typical Drawing for Pipe Laying (1)

SD-02

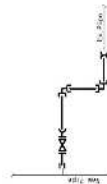
Typical Drawing for Connecting

CF-6(Connecting fittings-6)



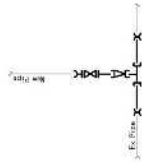
Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE SP	63~200	1	Ex. Diameter
Mechanical Joint	HDPE	63~200	1	Ex. Diameter
Flange Adapter	HDPE	63~200	1	Ex. Diameter
Stub Flange	HDPE	63~200	1	Ex. Diameter
Valve	—	63~200	1	Ex. Diameter
Flange Joint	—	63~200	2	Ex. Diameter

CF-8(Connecting fittings-8)



Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~200	n	Ex. Diameter
Mechanical Joint	HDPE-SP	63~200	1	Ex. Diameter
Double Socket Taper	HDPE-SP	63~200	1	Ex. Diameter
Flange Adapter	HDPE	63~200	1	Ex. Diameter
Stub Flange	HDPE	63~200	1	Ex. Diameter
Valve	—	63~200	1	Ex. Diameter
Flange Joint	—	63~200	2	Ex. Diameter

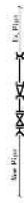
CF-10(Connecting fittings-10)



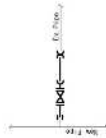
Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~200	n	Ex. Diameter
Mechanical Joint	HDPE-SP	63~200	1	Ex. Diameter
Double Socket Band Socket	HDPE	63~200 x 90°	2	Ex. Diameter
Flange Adapter	HDPE	63~200	1	Ex. Diameter
Stub Flange	HDPE	63~200	1	Ex. Diameter
Valve	—	63~200	1	Ex. Diameter
Flange Joint	—	63~200	2	Ex. Diameter

Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	25	n	Ex. Diameter
Mechanical Joint	HDPE-SP	25	2	Ex. Diameter
Double Socket Taper	HDPE	25 x 25	1	Ex. Diameter
Double Socket Taper	HDPE	63 x 25	2	Ex. Diameter
Flange Adapter	HDPE	63	1	Ex. Diameter
Stub Flange	HDPE	63	1	Ex. Diameter
Valve	—	63	1	Ex. Diameter
Flange Joint	—	63	2	Ex. Diameter

CF-7(Connecting fittings-7)



Material	Joint Type	Diameter	Number	Remarks
Straight Pipe	HDPE	63~200	n	Ex. Diameter
Mechanical Joint	HDPE-SP	63~200	1	Ex. Diameter
Socket	HDPE	63~200	1	Ex. Diameter
Flange Adapter	HDPE	63~200	1	Ex. Diameter
Stub Flange	HDPE	63~200	1	Ex. Diameter
Valve	—	63~200	1	Ex. Diameter
Flange Joint	—	63~200	2	Ex. Diameter



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The Joint Venture of TEC INTERNATIONAL CO. LTD.
YACHIYO ENGINEERING CO. LTD. and PADECO CO. LTD.

Target
No. of
Needs TO-DO

Actual

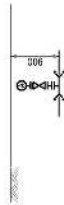
None
LTC

Typical Drawing for Pipe Laying (2)

SD-03

Typical Drawing for Connecting

A-1 (Air Valve-1)



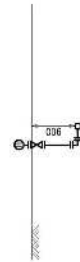
Material	Joint Type	Diameter	Number
Double Socket Flange Tee	DIP(T)	200~400×80	1
Flange Extension Pipe	—	80×150H	1
Ball Valve	—	80	1
Air Valve	—	80	1
Restrained Coupling	DIP(T)	200~400	2
Flange Joint	—	80	3

A-2 (Air Valve-2)



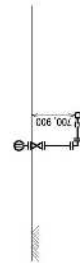
Material	Joint Type	Diameter	Number
Double Socket Flange Tee	HDPE	125~250×80	1
Flange Extension Pipe	—	80×150H	1
Ball Valve	—	80	1
Air Valve	—	80	1
Flange Joint	—	80	3

H-1 (Fire Hydrant-1)



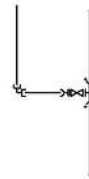
Material	Joint Type	Diameter	Number
Double Socket Flange Tee	DIP(T)	250×80	1
Double Flanged Bend	DIP	80×90°	1
Flange Extension Pipe	DIP	80×150H	1
Ball Valve	—	80×100H	1
Fire Hydrant (Side Mouth)	—	80	1
Flange Joint	—	80	4
Restrained Coupling	DIP(T)	250	2

H-2 (Fire Hydrant-2)



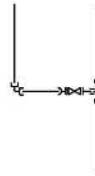
Material	Joint Type	Diameter	Number
Double Socket Tee	HDPE	90~200×90	1
Socket	HDPE	90	1
Stub Flange	HDPE	90	1
Double Flanged Bend	DIP	80×90°	1
Flange Extension Pipe	DIP	80×150H	1
Ball Valve	—	80×100H	1
Fire Hydrant (Side Mouth)	—	80	1
Flange Joint	—	80	4

DR-1 (Drain pipe fittings-1)



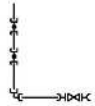
Material	Joint Type	Diameter	Number
Double Socket Flange Tee	DIP(T)	200~400×50~150	1
Restrained Coupling	DIP(T)	200~400	2
Straight Pipe	HDPE	83~160	n
Double Socket Bend	HDPE	83~160×90°	1
Mechanical Adapter	HDPE	63~110	1
Stub Flange	HDPE	63~110	1
Socket	HDPE	63~110	1
Valve	—	50~150	1
Flange Joint	—	50~150	2

DR-2 (Drain pipe fittings-2)



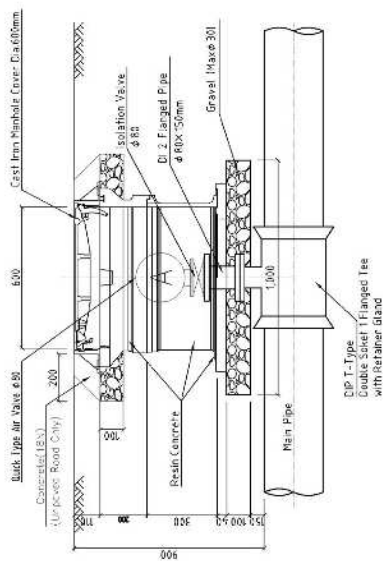
Material	Joint Type	Diameter	Number
Straight Pipe	HDPE	63-110	n
Double Socket Tee	HDPE	63~280×63-110	1
Double Socket Bend	HDPE	63-110×90°	1
Mechanical Adapter	HDPE	63-110	1
Stub Flange	HDPE	63-110	1
Socket	HDPE	63-110	1
Valve	—	63-110	1
Flange Joint	—	63-110	2

DR-3 (Drain pipe fittings-3)

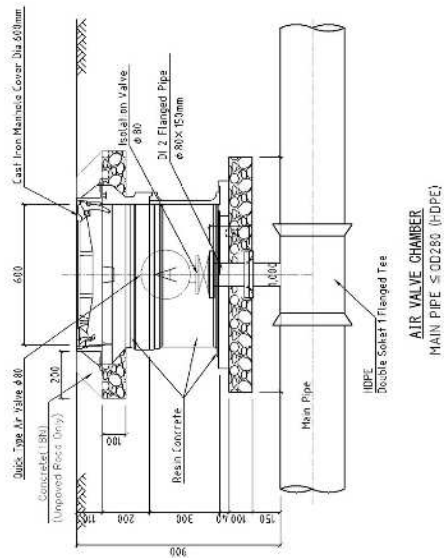


Material	Joint Type	Diameter	Number
Straight Pipe	HDPE	63-90	n
Double Socket Tee	HDPE	63-90×90°	1
Double Socket Bend	HDPE	63-90×45°	2
Mechanical Adapter	HDPE	63-90	2
Valve	—	63-90	1
Flange Joint	—	63-90	2

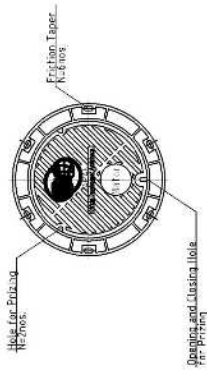
Typical Drawing for Installation of Air Valve and Washout



AIR VALVE CHAMBER
MAIN PIPE DN200~400 (DIP)



AIR VALVE CHAMBER
MAIN PIPE ≤ OD280 (HDPE);

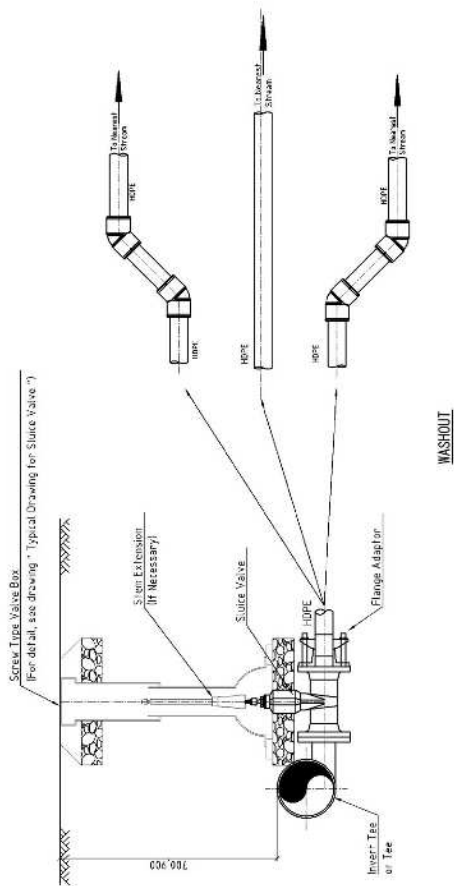


CAST IRON MANHOLE COVER
 ϕ 500 (No. 1 type)

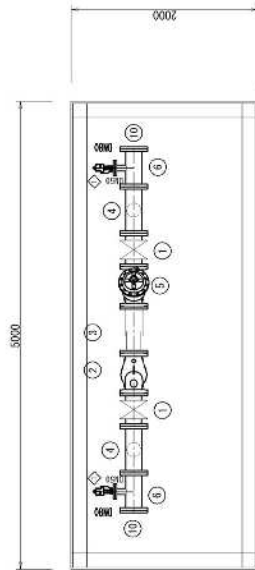
CRITERIA FOR AIR VALVE AND WASH OUT			
MAIN PIPE	MAIN PIPE MATERIAL	BRANCH PIPE for AIR VALVE	BRANCH PIPE for WASH OUT
ø50/63	HDPE	ø 50	ø 50
ø 75/90		ø 80	ø 50
ø 100/125		ø 80	ø 50
ø 150/180		ø 80	ø 50
ø 200/225		ø 80	ø 50
ø 250/280		ø 80	ø 100
ø 300		ø 80	ø 50
ø 350	DIP	ø 80	ø 100
ø 400		ø 80	ø 150
ø 450		ø 80	ø 150

NOTE

1. THE THICKNESS OF THE AIR VALVE CHAMBER SPECIFIED IN THE DRAWING IS FOR NORMAL SOIL TYPES. HOWEVER, IF THE STRUCTURE IS LOCATED ON VERY WEAK SOIL, SUCH AS SEAT, A GROUND STABILIZATION METHOD, AS DIRECTED BY THE ENGINEER, SHALL BE FOLLOWED.
2. THE TOP OF THE AIR VALVE CHAMBER SHOULD BE AT THE SAME LEVEL AS THE ROAD TOP LEVEL.
3. THE VALVE BOXES FOR WADHUT MAY BE ON THE BANK OF THE ROAD.
4. ALL DIMENSIONS ARE IN METERS.

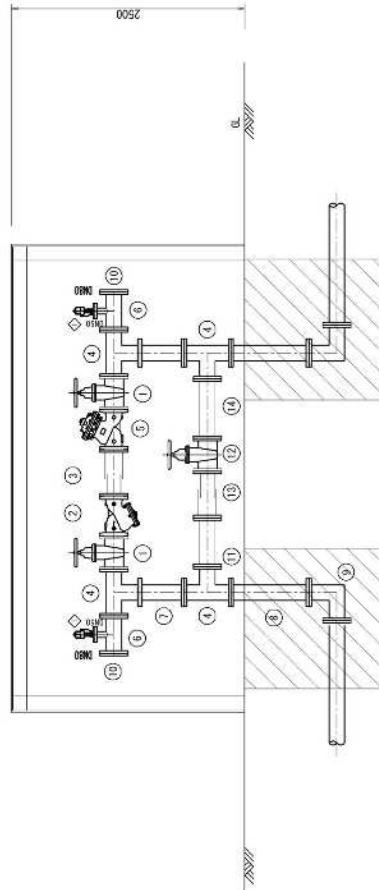


WASHOUT



MAIN PIPE

NO.	NAME	DETAIL	Qty	REMARKS
(1)	Gate Valve	DN150	2	ISO PN16
(2)	Strainer	DN150	1	ISO PN16
(3)	Diamonding Joint	DN150×500	1	ISO PN16
(4)	SP 3 Flanged Tee	DN150×DN150×900L	4	ISO PN16
(5)	Pressure Reducing Valve	DN150	1	ISO PN16
(6)	SP 3 Flanged Tee	DN150×DN50×400L	2	ISO PN16
(7)	SP 2 Flanged Pipe	DN150×470	2	ISO PN16
(8)	SP 2 Flanged Pipe	DN150×830	2	ISO PN16
(9)	SP 2 Flanged Bend	DN150×600	2	ISO PN16
(10)	SP Blank Flange	DN150	2	ISO PN16



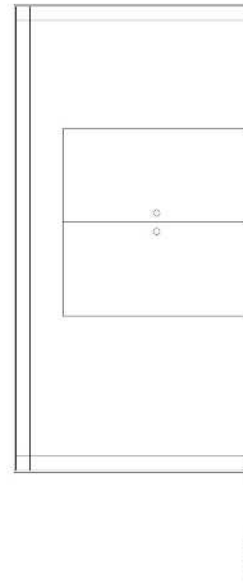
BY-PASS PIPE

NO.	NAME	DETAIL	Qty	REMARKS
(1)	SP 3 Flanged Pipe	DN150×570L	1	ISO PN16
(2)	Gate Valve	DN150	1	ISO PN16
(3)	Diamonding Joint	DN150	1	ISO PN16
(4)	SP 3 Flanged Pipe	DN150×635L	1	ISO PN16

AIR VALVE

NO.	NAME	DETAIL	Qty	REMARKS
(1)	Air Valve	DN50	2	ISO PN16

Piping Material (SP)
: SS400, PN16



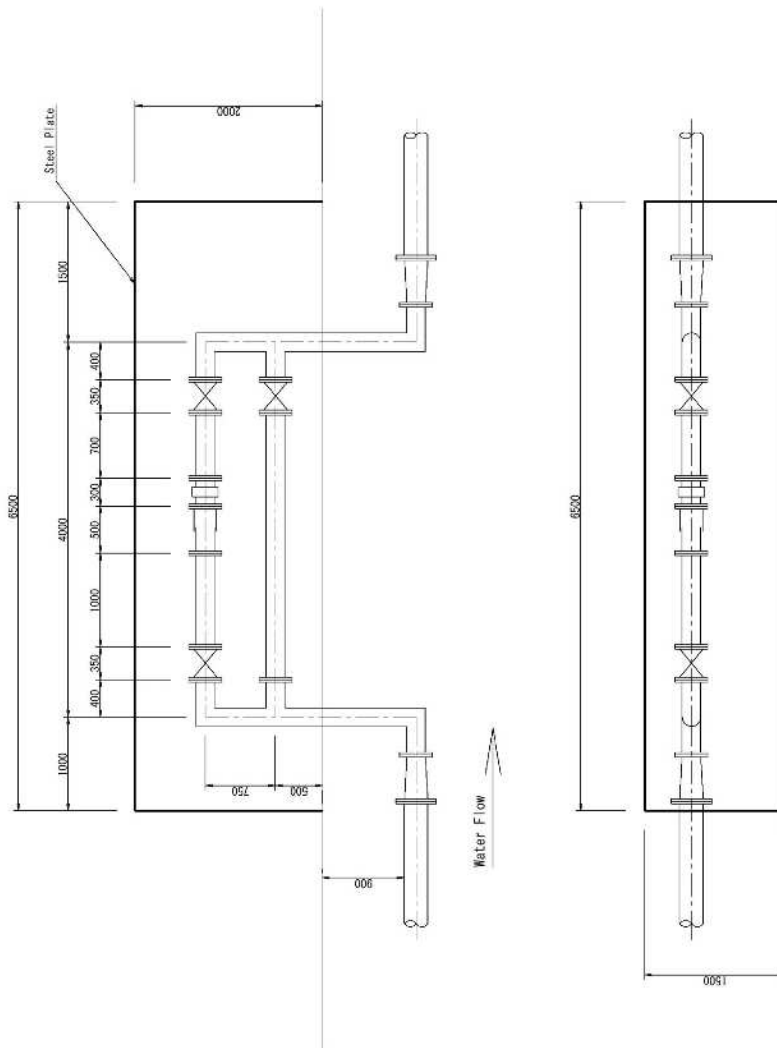
THE PREPARATORY SURVEY ON
THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY
IN JENIN MUNICIPALITY

Palestinian Water Authority (PWA)

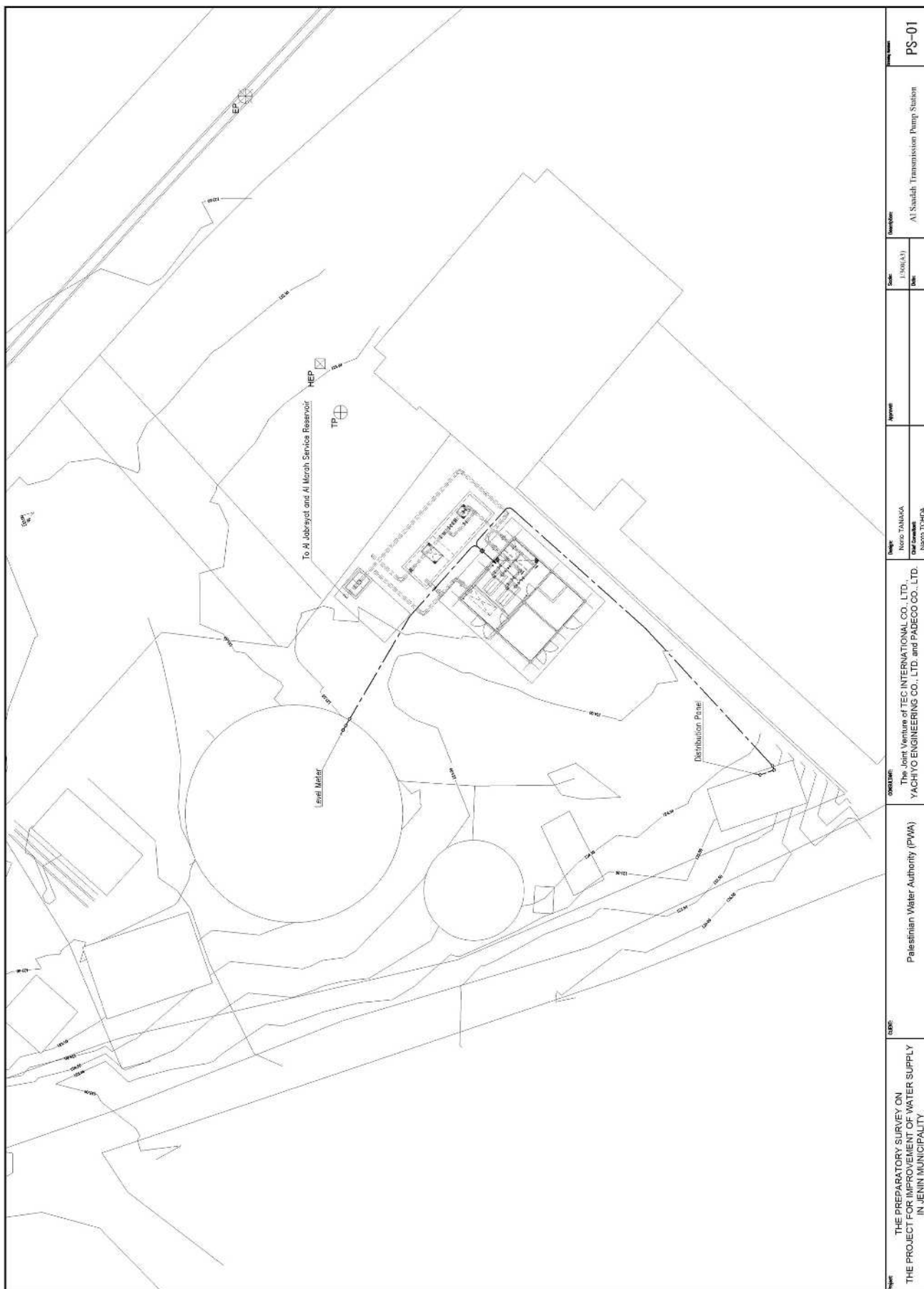
The Joint Venture of TEC INTERNATIONAL CO., LTD.
YACHIYO ENGINEERING CO., LTD. and PADECO CO., LTD.
JENIN TOP-CA

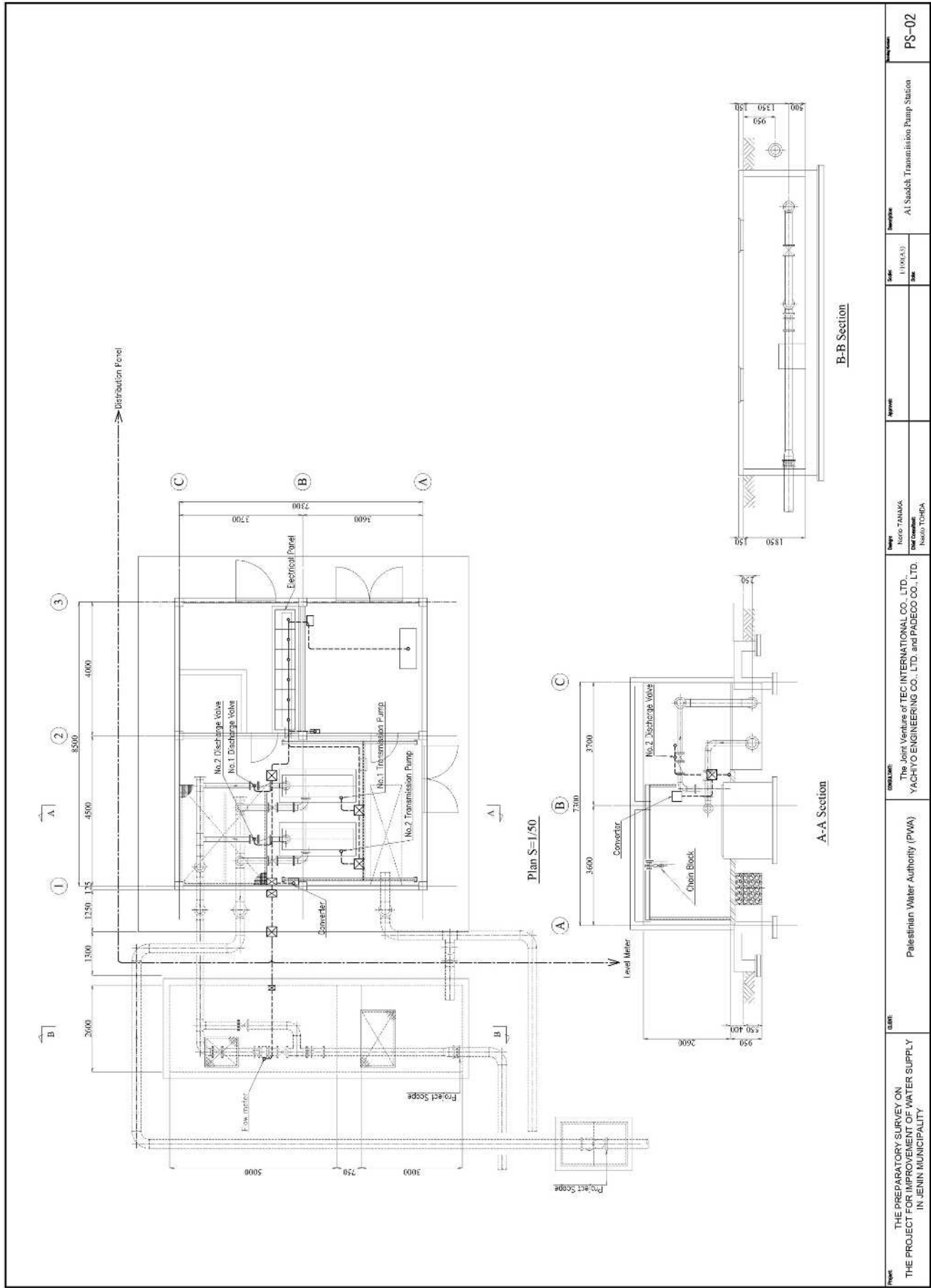
Typical Drawing for Installation of Pressure Reducing Valve

SD-06

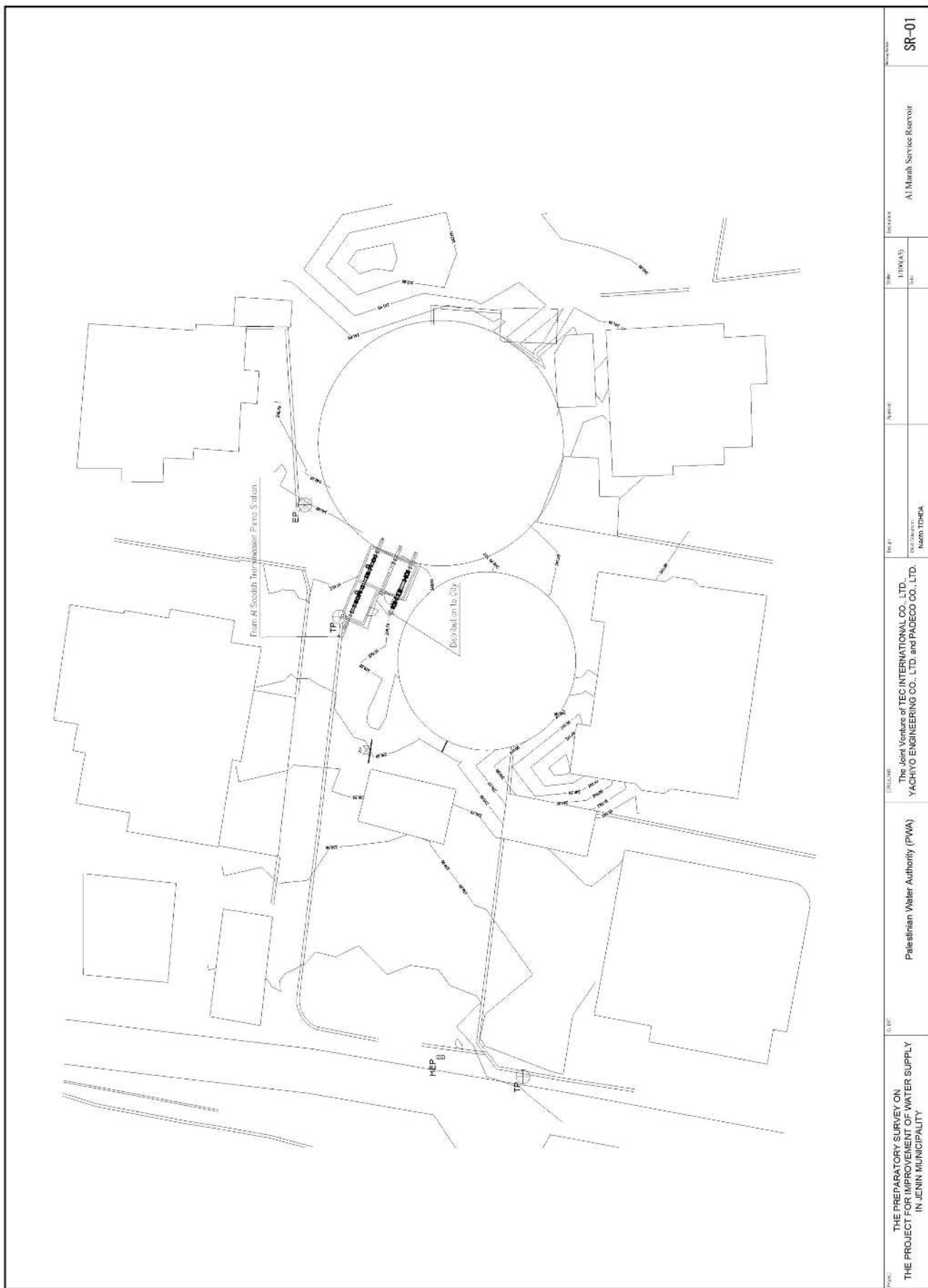


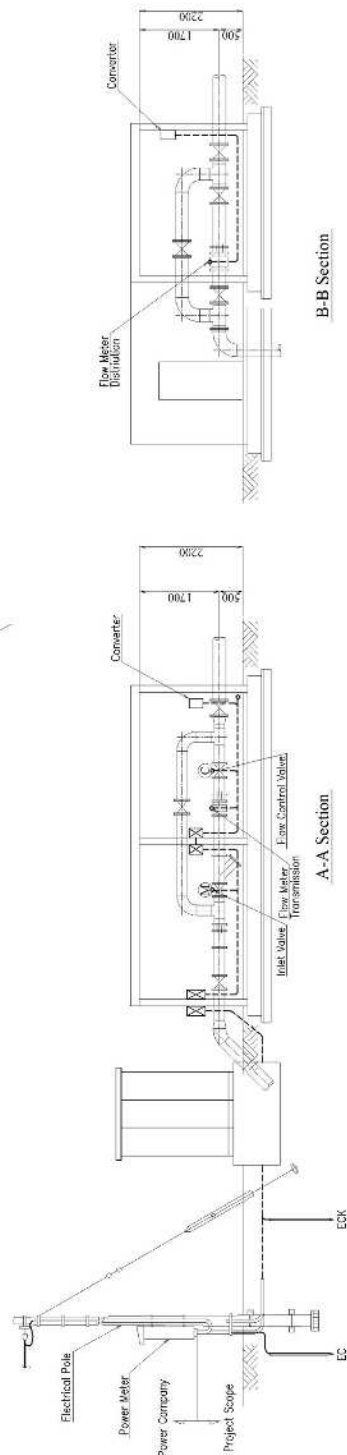
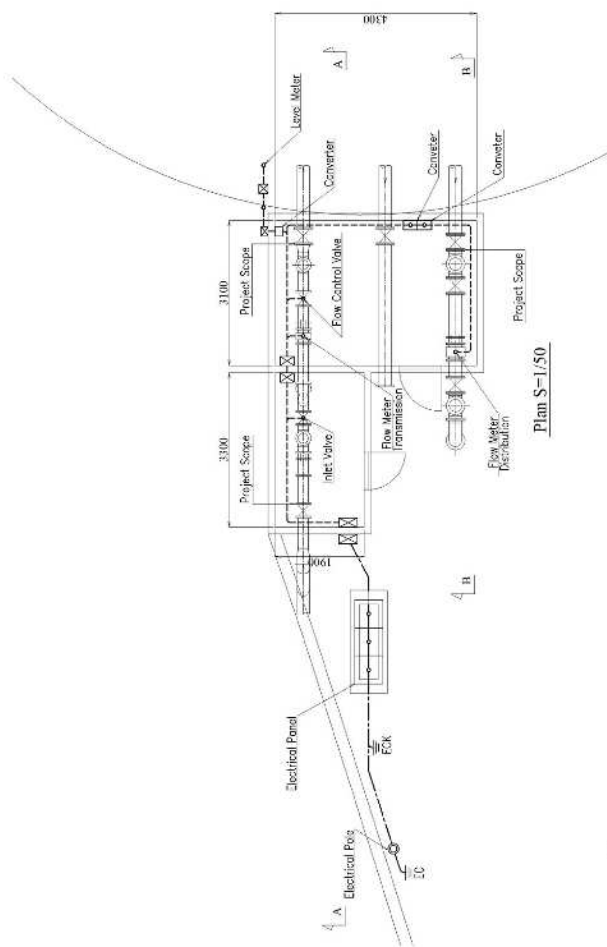
Project	The Preparatory Survey on The Project for Improvement of Water Supply in Jenn Municipality	Scale	1:50	Client	The Joint Venture of TEC International Co., Ltd. Yachiyo Engineering Co., Ltd. and PADECO Co., Ltd.	Contract No.	SD-07
Contract No.	Typical Drawing for Installation of Flowmeter	Date		Rev.	1.00		





Project: THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN JENIN MUNICIPALITY	Client: Palestinian Water Authority (PWA)	Design: The Joint Venture of TEC INTERNATIONAL CO., LTD. YACHIO ENGINEERING CO., LTD. and PADECO CO., LTD.	Designer: NABO TANAKA Designer: NABO TANAKA Designer: NABO TANAKA	Scale: 1:100 (A3) Date:	Approved:	Description: Al Saadiah Transmission Pump Station	PS-02
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THE PREPARATORY SURVEY ON
THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY
IN JENIN MUNICIPALITY

Palestinian Water Authority (PWA)

THE JOINT VENTURE OF TEC INTERNATIONAL CO., LTD.
YACHYO ENGINEERING CO., LTD. AND PADECO CO., LTD.

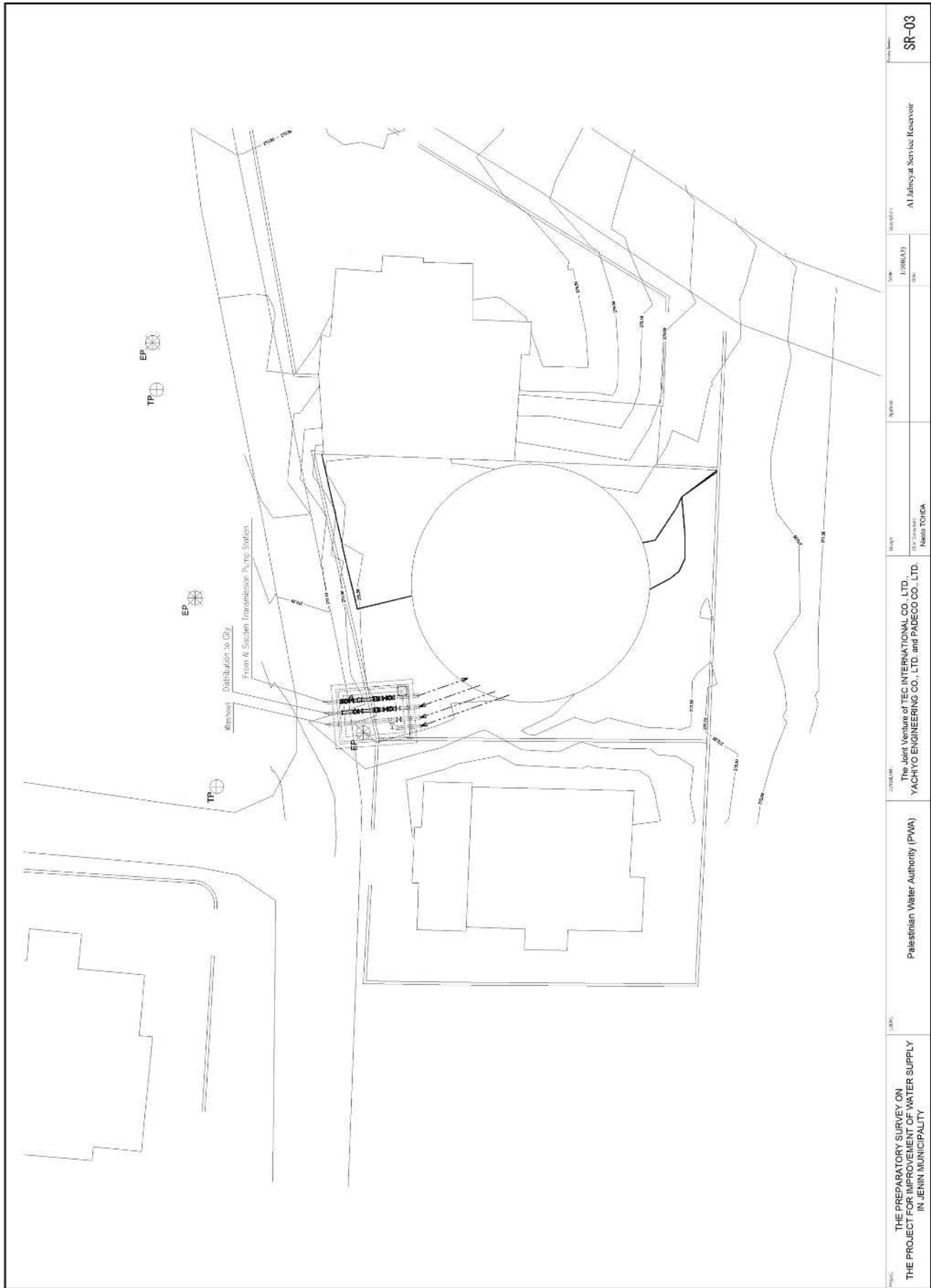
NAME: PAWA
NAME: YACHYO
NAME: PADECO

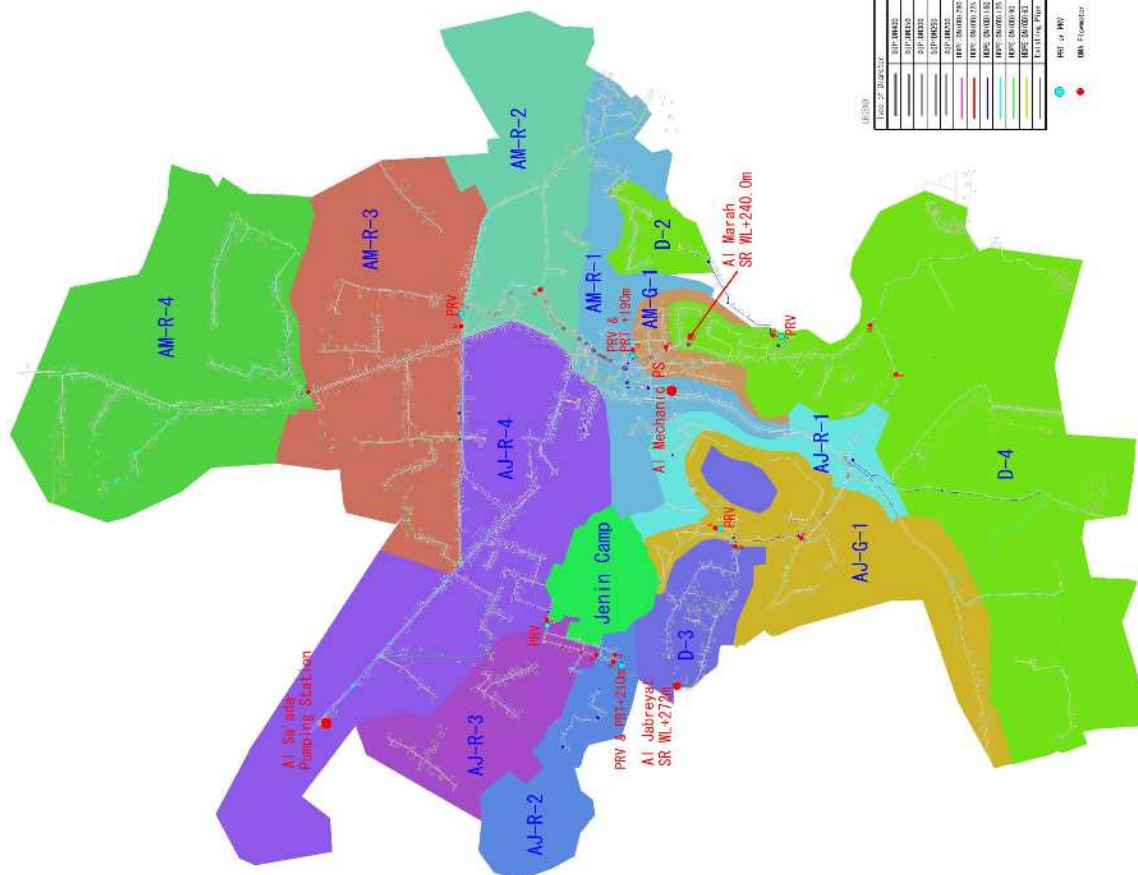
DATE: 1/10/2013

SCALE: 1:1000

AL MARAH SERVICE RESERVOIR

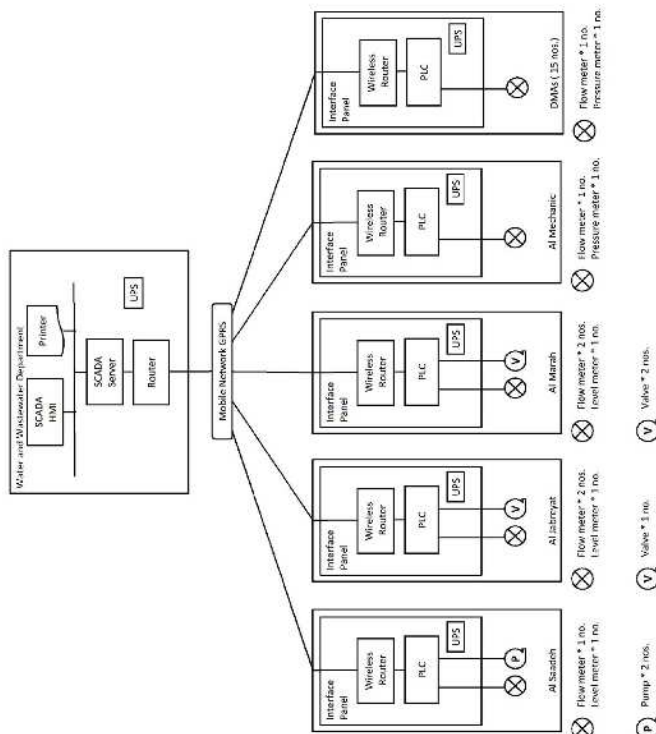
SR-02





Legend

Symbol	Description
PRV	Pressure Reducing Valve
Flow Meter	Flow Meter
Dam/Reservoir	Dam/Reservoir



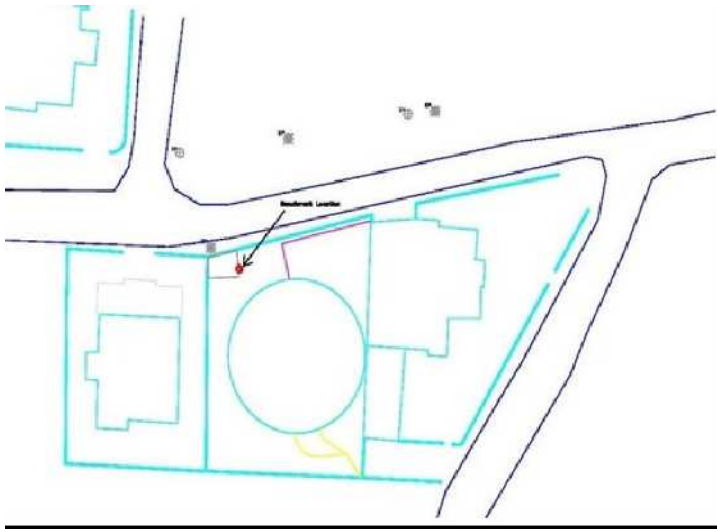
Legend

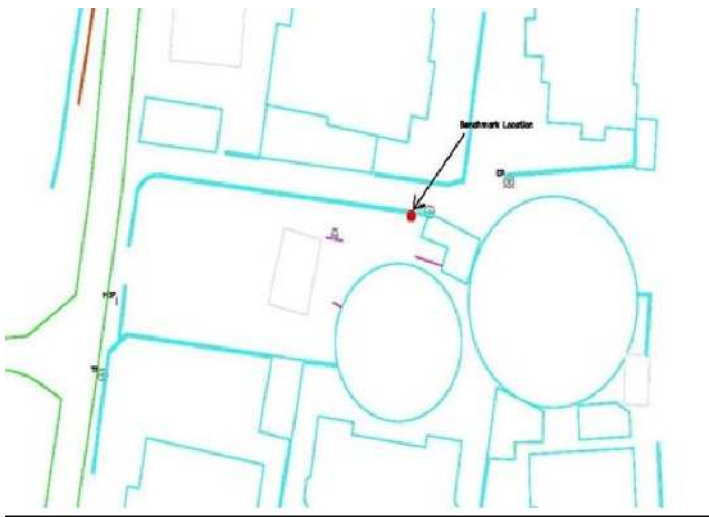
Symbol	Description
Pump	Pump
Valve	Valve
Dam/Reservoir	Dam/Reservoir

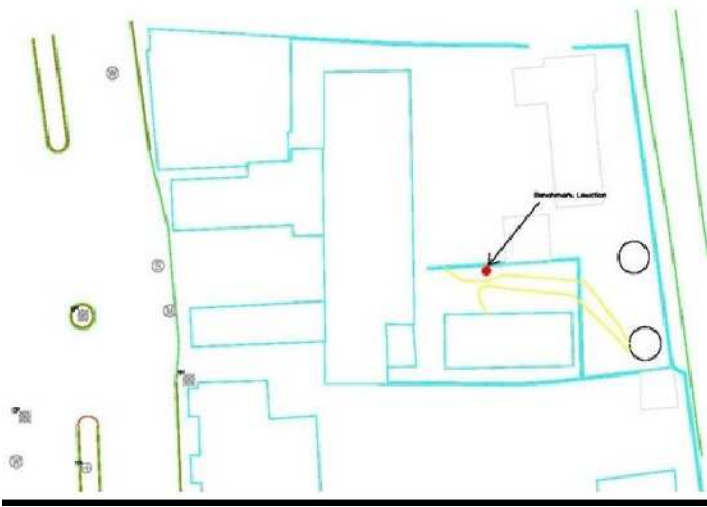
Appendix 10 Benchmark Report

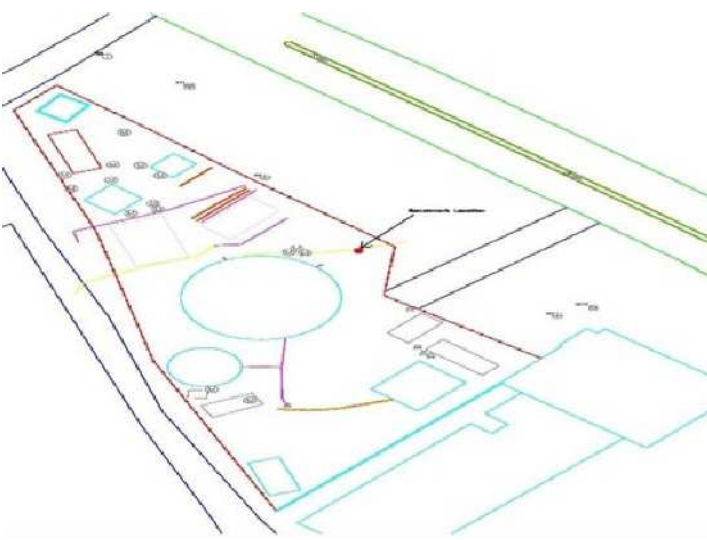
Appendix 10 Benchmark Report

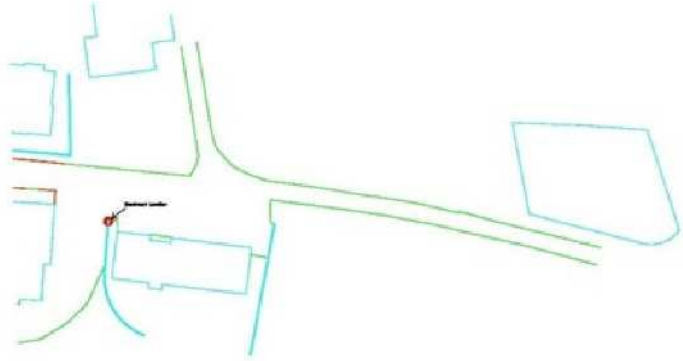
Coordinate System : Palestine 1923 Grid

Al Jabreyat Service Reservoir	
Site map 	Coordinates X= 176587.199, Y= 206942.639, Z= 272.154 Photo 

Al Marah Service Reservoir	
Site map 	Coordinates X= 178813.013, Y= 206845.814, Z= 239.227 Photo 

Al Mechanic Well	
Site map 	Coordinates X= 178500.267, Y= 206962.202, Z= 157.793 Photo 

Al Saadeh Well	
Site map 	Coordinates X= 176362.720, Y= 209181.792, Z= 122.766 Photo 

Water and Wastewater Department Office	
Site map 	Coordinates X= 178774.585, Y= 208010.258, Z= 132.900 Photo 

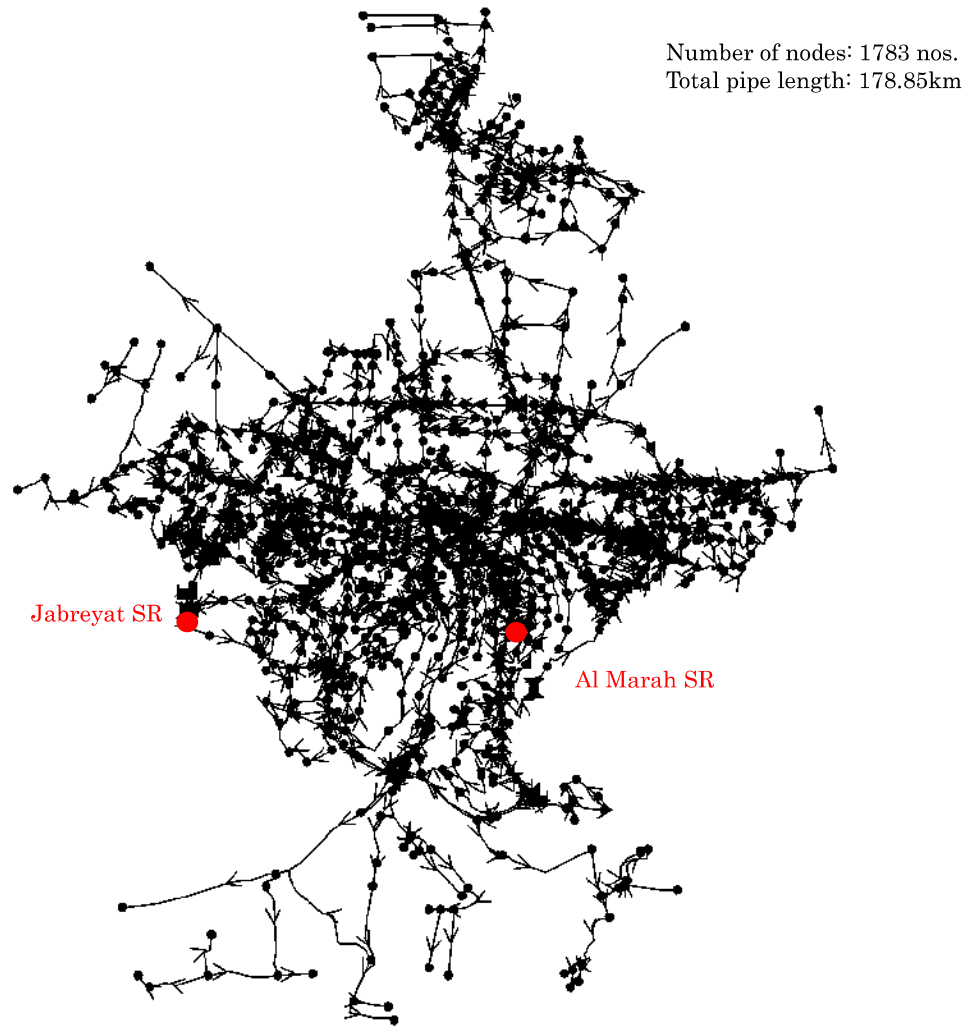
Appendix 11 Water Hammer Analysis

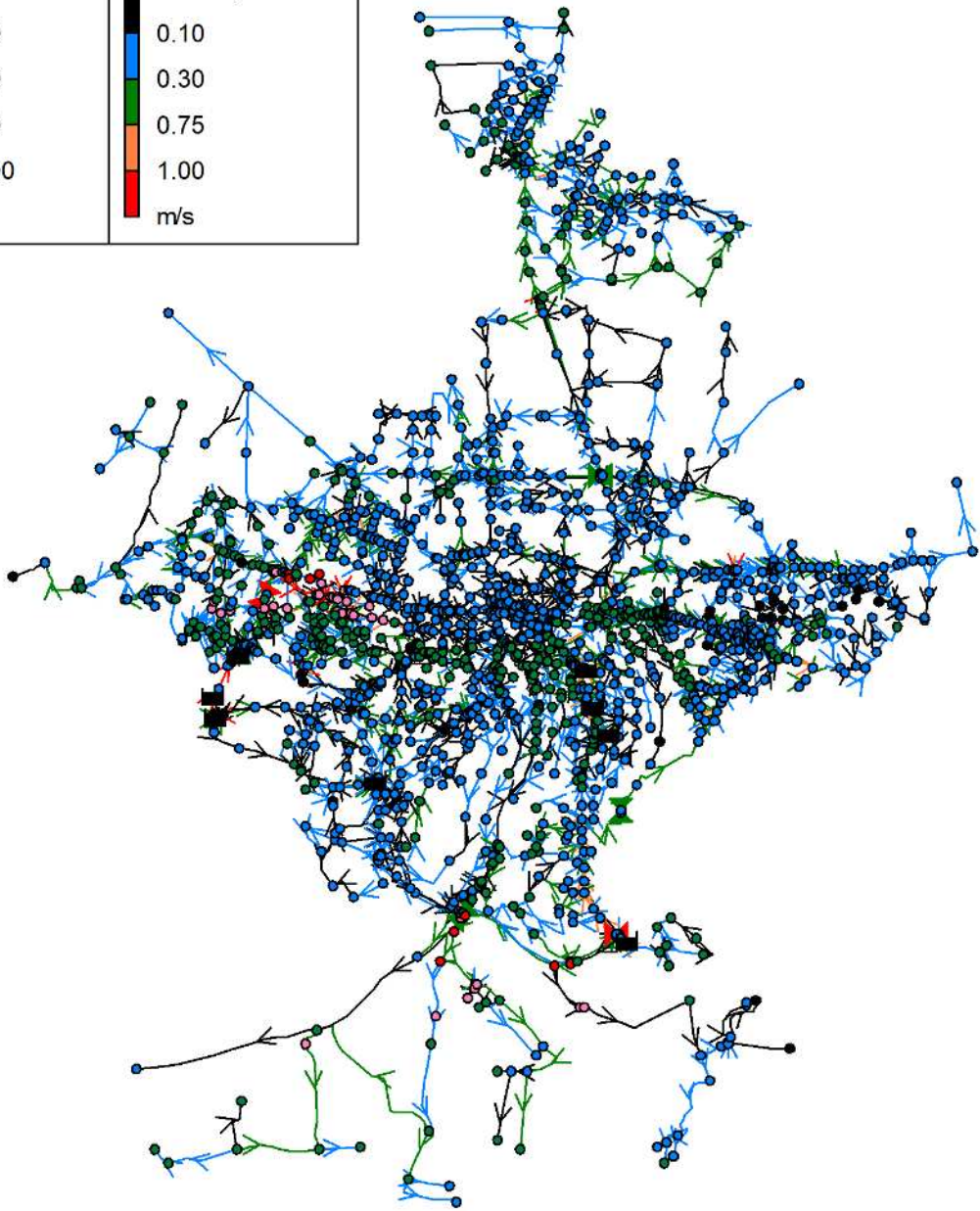
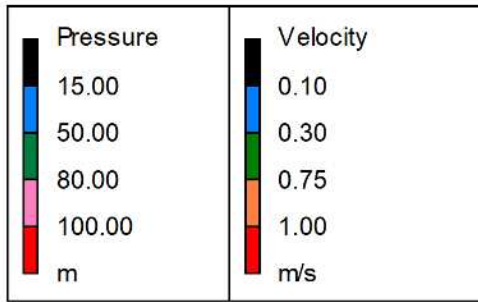
Appendix 11 Hydraulic Analysis of the Distribution Network

The hydraulic analysis of the water distribution network was conducted using EPANET ver2.2 under the following conditions:

Hydraulic formula	Hazen-Williams Equation
Roughness coefficient (C)	Existing pipes, newly installed ductile iron pipes (DIP): 110 Newly installed HDPE pipes: 130
Minimum residual pressure	Above 0.2 MPa at peak demand hours (minimum 0.1 MPa is exceptionally accepted in hydraulically disadvantageous areas)
Hourly peak factor	1.30
Firefighting conditions	Flow from a single outlet fire hydrant (0.5 m ³ /min) assumed at the location with the worst conditions (potentially generate negative pressure) in each zone

The design aims to ensure the minimum residual pressure during the peak demand and firefighting conditions in both the areas supplied by the existing facilities and the new facilities. The distribution network model, network analysis data, and results are presented below.





Node Data (1)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1	230.00	0.00	0.00	241.56	11.56
J10	166.83	0.00	0.00	208.65	41.82
J100	177.11	0.00	0.00	246.52	69.41
J1000	150.25	0.00	0.00	218.71	68.46
J1000001	250.00	4800.00	6240.00	270.10	20.10
J1000002	210.00	1870.00	2431.00	246.92	36.92
J1000003	190.00	0.00	0.00	209.76	19.76
J1000004	245.00	680.00	884.00	270.40	25.40
J1000005	211.09	5760.00	7488.00	239.58	28.49
J1000006	180.00	3770.00	4901.00	219.32	39.32
J1001	105.96	14.40	18.72	173.94	67.97
J1002	135.78	0.00	0.00	175.08	39.30
J1004	233.50	36.00	46.80	280.99	47.49
J1005	168.11	18.70	24.31	217.48	48.37
J1006	154.84	0.00	0.00	218.34	63.49
J1007	123.27	0.00	0.00	168.01	44.74
J1008	154.95	0.00	0.00	218.33	63.39
J1009	147.22	0.00	0.00	175.13	27.91
J101	213.85	9.00	11.70	246.48	32.63
J1010	141.33	6.60	8.58	175.13	33.80
J1011	147.95	1.20	1.56	175.12	27.18
J1012	155.62	0.00	0.00	218.33	62.71
J1013	147.88	0.00	0.00	175.12	27.24
J1014	155.70	0.00	0.00	218.33	62.63
J1015	126.67	0.00	0.00	167.57	40.90
J1016	148.60	0.00	0.00	175.12	26.52
J1017	149.86	0.00	0.00	218.36	68.50
J1018	124.29	20.40	26.52	150.30	26.00
J1019	211.88	0.00	0.00	275.66	63.78
J102	144.37	13.20	17.16	208.93	64.56
J1020	144.83	0.00	0.00	175.13	30.30
J1021	148.09	0.00	0.00	175.12	27.03
J1022	117.64	20.40	26.52	149.64	32.00
J1023	106.53	0.00	0.00	173.94	67.41
J1024	105.92	0.00	0.00	174.32	68.39
J1025	217.08	0.00	0.00	276.11	59.03
J1026	128.12	22.50	29.25	173.87	45.75
J1027	123.59	0.00	0.00	167.92	44.33
J1028	150.26	14.00	18.20	218.70	68.44
J103	153.46	0.00	0.00	209.29	55.83
J1030	147.28	0.00	0.00	175.12	27.84
J1031	147.34	0.00	0.00	175.13	27.79
J1032	148.43	0.00	0.00	175.12	26.69
J1033	277.90	23.70	30.81	276.57	48.67
J1034	145.94	0.00	0.00	175.13	29.19
J1035	107.38	0.00	0.00	150.45	43.07
J1036	105.66	0.00	0.00	174.08	68.42
J1037	124.42	0.00	0.00	167.84	43.42
J1038	270.83	26.00	33.80	316.62	45.79
J1039	138.90	0.00	0.00	175.10	36.20
J104	153.46	0.00	0.00	209.66	56.20
J1040	136.11	0.00	0.00	175.08	38.97
J1041	117.57	0.00	0.00	149.75	32.18
J1042	110.27	0.00	0.00	171.46	61.19
J1043	125.12	0.00	0.00	167.72	42.60
J1044	149.35	0.00	0.00	175.12	25.77
J1045	149.46	6.90	8.97	218.36	68.90
J1046	164.11	0.00	0.00	217.92	53.81
J1047	149.44	0.00	0.00	175.13	25.70
J1048	151.03	0.00	0.00	218.71	67.68
J1049	149.96	0.00	0.00	218.70	68.75

Node Data (2)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J105	153.69	25.20	32.76	209.26	55.57
J1050	125.22	0.00	0.00	169.96	44.74
J1051	149.30	0.00	0.00	175.13	25.84
J1052	125.24	0.00	0.00	167.67	42.43
J1053	125.24	0.00	0.00	167.67	42.44
J1054	148.85	0.00	0.00	175.13	26.28
J1055	153.23	0.00	0.00	218.46	65.24
J1056	152.01	25.20	32.76	218.71	66.70
J1057	155.19	0.00	0.00	218.26	63.08
J1058	151.27	26.40	34.32	218.70	67.43
J1059	126.60	10.50	13.65	175.02	48.42
J106	165.56	25.20	32.76	246.39	80.83
J1060	158.87	32.50	42.25	217.92	59.05
J1061	147.87	6.00	7.80	175.13	27.26
J1062	124.87	18.26	23.74	167.54	42.68
J1063	147.97	0.00	0.00	175.13	27.16
J1064	132.83	19.20	24.96	170.36	37.63
J1065	140.82	0.00	0.00	175.13	25.31
J1066	134.56	16.00	20.80	169.48	35.12
J1069	222.58	0.00	0.00	323.76	101.18
J107	151.49	0.00	0.00	209.37	57.88
J1070	155.55	10.50	13.65	218.63	63.08
J1071	150.71	0.00	0.00	218.69	67.99
J1072	190.00	32.30	41.99	238.41	48.41
J1073	136.49	0.00	0.00	174.88	38.38
J1074	143.44	0.00	0.00	175.13	31.69
J1075	124.31	17.60	22.88	171.01	46.70
J1076	156.90	0.00	0.00	218.80	61.90
J1077	150.13	0.00	0.00	175.13	25.00
J1078	150.22	0.00	0.00	175.13	24.91
J1079	150.13	0.00	0.00	175.13	25.00
J108	151.50	0.00	0.00	209.25	57.75
J1080	112.12	17.00	22.10	150.46	38.34
J1081	151.99	0.00	0.00	218.39	66.40
J1082	136.02	0.00	0.00	166.98	30.95
J1083	142.98	0.00	0.00	175.11	32.13
J1084	141.75	0.00	0.00	175.11	33.36
J1085	251.93	0.00	0.00	281.47	29.54
J1086	120.57	9.96	12.95	167.45	46.88
J1087	157.15	24.00	31.20	218.73	61.68
J1088	252.63	23.00	29.90	281.38	28.75
J1089	156.30	0.00	0.00	218.72	62.42
J109	162.71	0.00	0.00	209.24	46.53
J1090	142.15	0.00	0.00	175.11	32.96
J1091	108.23	0.00	0.00	173.66	65.43
J1092	146.19	0.00	0.00	175.13	28.94
J1093	166.47	23.80	30.94	218.50	52.03
J1094	107.63	19.20	24.96	171.29	63.66
J1095	124.58	15.30	19.89	150.40	25.82
J1096	115.66	19.20	24.96	173.14	57.48
J1097	136.85	0.00	0.00	166.20	29.35
J1098	167.80	10.20	13.26	238.68	71.18
J1099	139.55	4.50	5.85	175.09	35.94
J11	172.01	0.00	0.00	245.26	73.25
J110	143.41	17.60	22.88	208.93	65.52
J1100	136.82	13.50	17.55	175.08	38.26
J1101	136.78	0.00	0.00	174.88	38.09
J1102	230.47	11.50	14.95	279.19	48.72
J1103	113.95	14.30	18.59	167.37	53.41
J1104	148.18	0.00	0.00	175.13	26.95
J1105	235.54	18.40	23.92	280.90	45.36

Node Data (3)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1106	106.50	11.00	14.30	167.37	60.87
J1107	144.72	0.00	0.00	175.13	30.40
J1108	144.62	0.00	0.00	175.13	30.51
J1109	162.84	13.30	17.29	218.82	55.98
J1110	210.99	0.00	0.00	246.49	35.50
J1111	249.18	0.00	0.00	281.85	32.68
J1112	132.42	30.00	39.00	174.16	41.74
J1113	144.14	0.00	0.00	175.12	30.98
J1114	233.71	0.00	0.00	280.08	46.37
J1115	119.48	0.00	0.00	173.04	53.55
J1116	106.72	27.20	35.36	173.79	67.07
J1117	155.25	36.10	46.93	218.71	63.45
J1118	175.86	23.80	30.94	239.02	63.15
J1119	106.91	0.00	0.00	150.40	43.49
J1120	143.10	4.20	5.46	175.11	32.01
J1121	160.70	0.00	0.00	209.68	48.99
J1122	233.35	0.00	0.00	278.66	45.31
J1123	137.67	0.00	0.00	175.09	37.42
J1124	178.96	19.50	25.35	174.08	45.13
J1125	145.74	0.00	0.00	175.13	29.39
J1126	127.23	0.00	0.00	174.08	46.86
J1127	147.31	9.90	12.87	218.48	71.17
J1128	234.61	25.30	32.89	278.66	44.05
J1129	141.77	0.00	0.00	175.11	33.34
J1130	248.73	23.00	29.90	281.55	32.82
J1131	196.30	0.00	0.00	246.67	50.37
J1132	124.12	0.00	0.00	172.97	48.85
J1133	137.39	0.00	0.00	175.08	37.69
J1134	146.32	0.00	0.00	175.13	28.80
J1135	137.36	0.00	0.00	175.08	37.78
J1136	222.37	0.00	0.00	324.10	101.73
J1137	176.54	23.06	29.98	217.30	40.76
J1138	222.28	0.00	0.00	324.09	101.81
J1139	234.81	0.00	0.00	280.08	45.27
J1140	149.94	0.00	0.00	209.33	59.40
J1141	170.78	0.00	0.00	218.97	48.19
J1142	177.82	7.00	9.10	239.41	61.58
J1143	137.32	9.60	12.48	165.19	27.87
J1144	199.16	0.00	0.00	239.14	39.98
J1145	141.68	0.00	0.00	175.11	33.43
J1146	172.93	0.00	0.00	179.75	6.82
J1147	141.05	18.00	23.40	166.08	25.03
J1148	253.86	27.60	35.88	281.89	28.03
J1149	257.10	24.50	31.85	282.92	25.82
J1150	255.60	22.20	28.86	283.42	27.83
J1151	210.81	0.00	0.00	246.93	36.12
J1152	129.81	22.40	29.12	172.93	43.12
J1153	182.19	34.00	44.20	239.41	57.22
J1154	139.43	0.00	0.00	175.10	35.67
J1155	163.63	0.00	0.00	239.38	55.75
J1156	177.37	0.00	0.00	217.43	40.06
J1157	177.57	0.00	0.00	217.39	39.81
J1158	136.53	0.00	0.00	169.37	32.84
J1159	177.14	0.00	0.00	179.82	2.69
J1160	207.02	20.40	26.52	239.15	32.13
J1161	209.77	0.00	0.00	246.59	36.83
J1162	177.03	11.00	14.30	219.20	42.17
J1163	191.29	28.90	37.57	239.24	47.95
J1164	136.48	0.00	0.00	169.37	32.69

Node Data (4)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1163	171.22	0.00	0.00	218.91	47.69
J1164	177.97	0.00	0.00	217.34	39.38
J1165	241.36	0.00	0.00	281.02	39.66
J1166	136.50	0.00	0.00	172.93	36.43
J1167	129.26	30.00	39.00	174.22	44.98
J117	258.21	28.00	36.40	316.50	58.68
J1170	127.18	0.00	0.00	175.02	47.84
J1171	230.19	17.00	22.10	239.05	22.34
J1172	220.58	0.00	0.00	279.81	59.23
J1173	117.81	22.10	28.73	150.48	32.67
J1174	117.83	0.00	0.00	150.48	32.64
J1175	140.14	0.00	0.00	169.37	29.23
J1176	140.13	0.00	0.00	169.37	29.24
J1177	235.95	0.00	0.00	323.73	87.77
J1178	140.40	0.00	0.00	166.00	25.60
J1179	149.29	29.80	38.74	209.37	60.08
J1180	118.20	0.00	0.00	150.48	32.28
J1181	169.73	14.30	18.59	218.86	49.14
J1182	140.14	20.80	27.04	172.92	32.79
J1183	236.44	0.00	0.00	280.14	43.69
J1184	234.99	0.00	0.00	279.88	44.89
J1185	235.14	0.00	0.00	279.89	44.75
J1186	237.64	0.00	0.00	280.37	42.73
J1187	232.15	23.00	29.90	279.85	47.70
J1188	225.32	0.00	0.00	279.81	54.49
J1189	225.69	0.00	0.00	279.81	54.12
J1190	207.20	0.00	0.00	246.75	39.55
J1191	194.72	0.00	0.00	219.59	24.86
J1192	227.41	0.00	0.00	279.83	52.42
J1193	225.84	0.00	0.00	279.81	53.97
J1194	188.52	0.00	0.00	219.33	30.81
J1195	239.89	0.00	0.00	280.66	40.76
J1197	235.03	0.00	0.00	323.73	88.70
J1198	187.34	0.00	0.00	179.97	-7.37
J1199	119.21	0.00	0.00	150.49	31.29
J12	205.34	114.00	148.20	245.44	40.10
J1200	207.89	0.00	0.00	246.73	38.85
J1201	197.16	0.00	0.00	219.65	22.49
J1202	190.48	0.00	0.00	239.48	49.00
J1203	189.89	8.68	11.28	239.49	49.60
J1204	197.87	0.00	0.00	239.53	41.66
J1205	227.04	13.80	17.94	279.73	52.69
J1206	244.56	26.80	34.84	281.09	36.53
J1207	158.43	0.00	0.00	218.39	59.96
J1208	251.36	0.00	0.00	281.69	30.33
J1209	198.53	0.00	0.00	239.51	40.97
J121	255.60	0.00	0.00	282.15	26.65
J1211	252.78	16.50	21.45	302.25	49.47
J1210	203.57	0.00	0.00	219.82	18.25
J1212	153.08	200.00	260.00	218.33	65.25
J1213	117.02	16.00	20.80	150.33	33.30
J1214	122.51	4.80	6.24	172.54	50.03
J1215	146.38	2.40	3.12	175.12	28.74
J1216	126.21	4.80	6.24	172.47	46.26
J1217	159.18	44.00	57.20	218.42	59.24
J1218	109.03	20.40	26.52	150.32	41.29
J1219	202.36	13.02	16.93	239.44	37.08
J122	207.93	0.00	0.00	246.75	38.83
J1220	115.17	0.00	0.00	150.32	35.15
J1221	129.66	0.00	0.00	175.06	45.40

Node Data (5)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1221	164.88	42.90	55.77	218.77	53.89
J1222	121.40	51.00	66.30	150.51	29.12
J1223	151.00	8.00	10.40	172.12	42.14
J1224	129.98	17.80	22.88	165.91	27.67
J1225	138.24	0.00	0.00	219.09	36.05
J1226	163.04	11.00	14.30	150.32	37.85
J1227	112.47	0.00	0.00	279.71	51.80
J1228	227.91	0.00	0.00	174.98	42.92
J1229	132.06	15.00	0.00	246.74	40.74
J123	206.00	0.00	0.00	218.56	54.21
J1230	164.36	0.00	0.00	169.37	33.63
J1233	135.74	0.00	0.00	239.60	27.72
J1234	211.88	0.00	0.00	280.61	40.07
J1235	240.54	18.40	23.92	239.59	27.33
J1236	212.26	0.00	0.00	166.12	21.80
J1237	144.32	14.40	18.72	279.78	53.25
J1238	235.01	0.00	0.00	279.85	44.84
J1239	228.32	18.40	23.92	219.70	51.38
J124	204.30	0.00	0.00	246.74	42.44
J1240	261.07	0.00	0.00	283.14	22.07
J1241	216.25	5.10	6.63	239.59	23.35
J1242	232.69	0.00	0.00	279.82	47.12
J1243	227.54	0.00	0.00	279.74	52.20
J1244	140.66	0.00	0.00	169.31	28.65
J1245	226.57	0.00	0.00	279.78	53.21
J1246	226.20	0.00	0.00	239.87	13.67
J1247	226.53	0.00	0.00	279.78	53.25
J1248	123.45	0.00	0.00	150.55	27.10
J1249	226.84	0.00	0.00	279.77	52.93
J125	154.04	27.00	35.10	209.61	55.57
J1250	226.53	0.00	0.00	279.77	53.24
J1251	230.82	34.50	44.85	279.77	48.95
J1252	223.95	0.00	0.00	239.75	15.81
J1253	225.89	36.00	46.80	279.75	53.85
J1254	144.37	0.00	0.00	166.08	21.71
J1255	160.70	0.00	0.00	218.73	58.04
J1256	115.31	7.00	9.10	150.32	35.02
J1257	160.43	0.00	0.00	218.57	58.14
J1258	141.62	0.00	0.00	175.12	33.50
J1259	154.26	0.00	0.00	218.59	64.33
J126	204.67	0.00	0.00	246.74	42.07
J1260	159.96	0.00	0.00	218.57	58.61
J1261	262.77	0.00	0.00	283.65	20.89
J1262	125.28	0.00	0.00	150.59	25.30
J1263	236.37	0.00	0.00	279.76	43.39
J1264	198.42	13.20	17.16	239.27	40.85
J1265	129.98	57.60	74.88	162.41	37.43
J1266	125.60	0.00	0.00	150.60	25.00
J1267	210.65	0.00	0.00	239.30	28.65
J1268	125.78	9.00	11.70	175.10	48.32
J1269	137.35	0.00	0.00	169.37	32.02
J127	258.24	8.00	10.40	316.85	58.61
J1270	216.71	13.02	16.93	239.34	22.63
J1271	141.77	200.00	260.00	177.95	36.18
J1272	220.00	15.19	19.75	239.43	19.43
J1273	238.53	0.00	0.00	279.69	41.16
J1274	140.48	0.00	0.00	175.11	34.63
J1275	141.54	0.00	0.00	177.63	36.09
J1276	125.65	0.00	0.00	175.44	49.79
J1277	166.06	0.00	0.00	218.98	32.93
J1278	130.88	0.00	0.00	172.16	41.28
J1279	155.06	60.00	78.00	218.59	63.53

Node Data (6)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J128	149.09	0.00	0.00	218.97	30.31
J1280	188.67	53.00	68.90	218.97	30.31
J1281	154.00	0.00	0.00	218.61	64.61
J1282	141.97	12.80	16.64	166.04	24.07
J1283	132.86	0.00	0.00	171.81	38.95
J1284	138.60	8.00	10.40	172.93	34.33
J1286	161.63	0.00	0.00	218.74	57.11
J1287	134.60	25.60	33.28	171.52	36.92
J1288	127.81	0.00	0.00	175.10	47.29
J1289	150.39	0.00	0.00	178.53	28.14
J129	205.08	0.00	0.00	209.85	4.77
J1290	151.25	0.00	0.00	218.61	67.37
J1291	160.20	19.80	25.74	218.73	58.53
J1292	160.23	0.00	0.00	218.73	58.50
J1293	150.52	0.00	0.00	178.05	27.54
J1294	154.23	0.00	0.00	218.52	64.30
J1295	138.85	0.00	0.00	170.49	31.65
J1296	173.11	11.00	14.30	216.56	43.45
J1297	188.19	0.00	0.00	218.97	30.79
J1298	189.16	0.00	0.00	238.98	49.81
J1299	148.34	220.00	286.00	178.05	29.71
J13	208.93	0.00	0.00	245.50	36.58
J130	203.93	0.00	0.00	209.85	5.92
J1300	110.44	19.20	24.96	173.63	63.19
J1301	231.58	0.00	0.00	279.74	48.16
J1302	122.04	0.00	0.00	150.51	28.47
J1303	148.35	0.00	0.00	178.05	29.70
J1304	129.69	9.00	11.70	175.10	45.41
J1305	111.65	6.40	8.37	168.30	56.65
J1306	164.98	0.00	0.00	218.85	53.88
J1307	163.06	0.00	0.00	218.57	51.81
J1308	164.74	0.00	0.00	216.56	39.72
J1309	239.97	0.00	0.00	246.62	39.37
J131	207.25	0.00	0.00	189.23	25.22
J1310	144.01	14.40	18.72	169.23	25.22
J1311	136.74	10.50	13.65	175.11	38.37
J1312	153.86	0.00	0.00	218.52	64.66
J1313	122.14	3.36	4.37	150.51	28.37
J1314	239.95	29.10	37.83	279.67	39.72
J1315	209.63	27.36	35.57	239.12	29.49
J1316	153.27	110.00	143.00	218.40	65.03
J1317	145.34	0.00	0.00	168.46	23.12
J1318	137.59	35.20	45.76	177.63	40.03
J1319	144.23	0.00	0.00	177.63	33.41
J132	206.99	0.00	0.00	246.74	39.76
J1320	144.61	0.00	0.00	178.08	33.47
J1321	144.65	0.00	0.00	169.18	24.53
J1322	194.58	13.20	17.16	239.00	44.42
J1323	261.25	0.00	0.00	324.80	63.54
J1324	220.00	13.02	16.93	239.35	19.35
J1325	261.79	0.00	0.00	324.77	62.99
J1326	232.76	25.30	32.89	279.59	46.83
J1327	237.72	0.00	0.00	279.68	41.96
J1328	238.01	0.00	0.00	324.85	63.59
J1329	261.26	0.00	0.00	175.46	45.15
J133	130.31	15.40	20.02	175.46	45.15
J1330	239.83	0.00	0.00	279.68	39.85
J1331	127.96	14.40	18.72	168.32	40.36
J1332	143.51	0.00	0.00	178.18	34.67
J1333	147.14	0.00	0.00	169.14	22.00
J1334	143.57	0.00	0.00	178.16	34.58

Node Data (7)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1335	214.36	4.00	5.20	279.17	64.81
J1336	154.50	0.00	0.00	218.67	64.17
J1337	154.50	0.00	0.00	218.68	64.18
J1339	133.41	0.00	0.00	175.10	41.69
J134	125.63	34.10	44.33	175.24	49.61
J1340	133.79	0.00	0.00	175.10	41.31
J1341	147.53	0.00	0.00	178.05	30.53
J1342	262.25	0.00	0.00	324.76	62.51
J1343	144.23	0.00	0.00	168.94	24.71
J1345	125.86	1.44	1.87	150.54	24.68
J1346	141.36	16.00	20.80	168.61	27.25
J1347	128.65	8.16	10.61	177.25	48.60
J1348	154.84	18.70	24.31	218.57	63.73
J1349	152.61	0.00	0.00	218.35	65.73
J135	185.70	0.00	0.00	209.80	24.10
J1351	236.11	0.00	0.00	279.70	43.58
J1352	133.62	0.00	0.00	177.43	43.81
J1353	133.48	0.00	0.00	177.63	44.15
J1354	147.66	0.00	0.00	218.35	70.69
J1355	152.28	0.00	0.00	218.32	66.04
J1356	217.79	15.19	19.75	239.16	21.37
J1357	162.96	0.00	0.00	218.57	55.61
J1358	150.63	0.00	0.00	218.32	67.70
J1359	126.69	0.00	0.00	168.32	41.63
J136	138.87	7.70	10.01	175.71	36.90
J1360	191.97	11.00	14.30	238.93	46.96
J1361	131.34	0.00	0.00	177.36	46.02
J1362	148.01	0.00	0.00	168.85	20.84
J1363	174.97	23.10	30.03	216.35	41.39
J1364	145.82	43.20	56.16	168.01	22.19
J1365	152.35	0.00	0.00	218.30	65.95
J1366	152.30	0.00	0.00	218.50	66.20
J1367	152.56	0.00	0.00	218.50	65.94
J1368	130.21	0.00	0.00	177.32	47.11
J1369	122.48	0.00	0.00	150.51	28.02
J137	211.41	0.00	0.00	246.52	35.11
J1370	122.12	1.00	1.30	150.49	28.37
J1371	143.27	80.00	104.00	177.63	34.36
J1373	166.99	0.00	0.00	218.82	51.83
J1374	220.00	19.53	25.39	239.28	19.28
J1375	226.99	22.20	28.86	279.66	42.67
J1376	131.41	0.00	0.00	177.26	45.85
J1377	204.81	0.00	0.00	234.08	49.27
J1378	127.29	7.20	9.36	177.22	49.93
J1379	239.62	36.00	46.80	279.66	40.04
J138	211.11	0.00	0.00	246.74	35.63
J1380	128.20	0.00	0.00	177.26	49.06
J1381	167.09	0.00	0.00	218.57	51.48
J1382	151.61	30.70	39.91	218.26	66.64
J1383	204.03	28.21	36.67	237.73	33.70
J1384	126.41	0.00	0.00	175.96	49.55
J1385	154.59	0.00	0.00	218.30	63.71
J1386	131.85	7.86	9.98	177.36	45.51
J1387	125.99	0.00	0.00	150.50	24.51
J1388	126.48	0.00	0.00	177.22	50.74
J1389	133.59	17.60	22.88	168.45	34.86
J139	212.72	0.00	0.00	246.50	33.78
J1390	134.45	12.96	16.85	177.39	42.93
J1391	125.98	0.00	0.00	150.49	24.51
J1392	154.31	0.00	0.00	218.25	63.94
J1393	142.66	8.00	10.40	169.03	26.37

Node Data (8)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1394	126.32	0.00	0.00	177.26	50.74
J1395	128.32	3.36	4.37	177.26	48.94
J1396	155.20	0.00	0.00	218.33	63.13
J1397	123.40	2.88	3.74	150.49	27.09
J1398	155.54	0.00	0.00	218.30	62.76
J1399	155.87	0.00	0.00	218.29	62.42
J14	157.28	7.74	10.06	208.28	51.00
J140	170.99	0.00	0.00	209.75	38.77
J1400	133.91	0.00	0.00	177.33	43.43
J1401	146.04	15.40	20.02	168.85	22.82
J1402	157.14	0.00	0.00	218.49	61.36
J1403	130.12	22.88	29.74	177.25	47.13
J1404	157.58	0.00	0.00	218.33	60.76
J1405	122.34	0.00	0.00	150.48	28.15
J1406	158.27	0.00	0.00	218.15	59.88
J1407	202.90	0.00	0.00	218.76	15.86
J1408	132.17	0.00	0.00	178.86	44.69
J1409	173.06	0.00	0.00	218.57	45.51
J141	148.56	0.00	0.00	204.55	61.00
J1410	144.35	43.20	56.16	168.01	23.66
J1411	210.00	31.50	40.95	236.94	26.94
J1412	157.70	0.00	0.00	218.30	60.60
J1413	179.92	0.00	0.00	218.79	38.88
J1414	160.62	0.00	0.00	218.16	57.54
J1415	132.13	0.00	0.00	177.37	45.24
J1416	160.87	0.00	0.00	218.16	57.29
J1417	157.30	0.00	0.00	218.49	61.18
J1418	126.59	1.92	2.50	177.26	50.66
J1419	183.40	0.00	0.00	218.57	35.17
J142	213.88	0.00	0.00	246.74	32.86
J1420	174.39	48.00	62.40	169.73	45.34
J1421	274.36	0.00	0.00	323.30	48.93
J1422	159.28	27.20	35.36	217.92	58.67
J1423	163.12	0.00	0.00	218.16	55.04
J1424	163.10	0.00	0.00	218.16	55.06
J1425	270.86	0.00	0.00	324.49	53.64
J1426	110.02	0.00	0.00	172.53	62.52
J1427	116.05	15.00	19.50	150.39	34.34
J1428	163.51	0.00	0.00	218.16	54.65
J1429	163.02	0.00	0.00	218.14	55.11
J143	214.28	0.00	0.00	246.50	32.22
J1430	163.26	0.00	0.00	218.13	54.87
J1431	132.28	0.00	0.00	177.33	45.05
J1432	162.55	23.10	30.03	218.04	55.49
J1433	272.69	13.80	17.94	324.66	51.97
J1434	194.30	33.00	42.90	218.77	24.46
J1435	164.16	0.00	0.00	218.05	53.89
J1436	204.06	13.00	16.90	218.76	14.70
J1437	141.63	0.00	0.00	177.69	36.06
J1438	143.17	0.00	0.00	177.72	34.55
J1439	141.63	24.00	31.20	177.68	36.04
J1440	165.42	0.00	0.00	218.05	52.63
J1441	130.60	6.24	8.11	177.28	46.69
J1442	165.50	0.00	0.00	218.05	52.55
J1443	165.87	0.00	0.00	218.05	52.19
J1444	165.14	0.00	0.00	217.87	52.73
J1445	161.83	22.00	28.60	218.48	56.64
J1446	163.67	0.00	0.00	218.13	54.46
J1447	269.81	20.00	26.00	323.20	53.39
J1448	163.67	22.00	28.60	177.36	13.69
J1449	132.41	0.00	0.00	177.46	45.05

Node Data (9)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J145	215.76	0.00	0.00	246.49	30.74
J1450	165.49	24.20	31.46	218.05	52.57
J1451	166.16	0.00	0.00	218.05	51.89
J1452	142.30	0.00	0.00	168.94	26.64
J1453	135.46	0.00	0.00	169.23	33.77
J1454	279.86	0.00	0.00	323.30	43.44
J1455	273.44	25.30	32.89	324.63	51.19
J1456	167.59	0.00	0.00	218.05	50.46
J1457	169.04	0.00	0.00	217.87	48.83
J1458	126.51	0.00	0.00	177.26	50.75
J1459	165.77	0.00	0.00	218.30	52.53
J146	215.66	0.00	0.00	246.74	31.08
J1460	111.83	25.60	33.28	150.36	38.53
J1462	166.20	0.00	0.00	218.47	52.27
J1463	127.38	0.00	0.00	177.15	49.77
J1464	167.90	0.00	0.00	218.05	50.15
J1465	273.10	0.00	0.00	324.66	51.56
J1466	110.00	0.00	0.00	172.53	62.53
J1467	171.17	0.00	0.00	217.87	48.70
J1468	182.23	0.00	0.00	177.36	15.13
J1469	267.81	59.00	76.70	324.39	56.58
J147	273.62	28.50	37.05	302.28	28.66
J1470	172.03	0.00	0.00	217.87	45.83
J1471	169.23	0.00	0.00	218.14	48.91
J1472	140.98	26.60	34.58	168.58	27.60
J1473	128.36	25.28	32.86	177.19	48.83
J1475	277.60	20.00	26.00	323.27	45.67
J1476	170.30	0.00	0.00	217.94	47.64
J1477	176.38	0.00	0.00	217.83	41.45
J1478	139.80	0.00	0.00	168.99	29.19
J1479	175.52	19.80	25.74	217.53	42.31
J148	141.63	16.50	21.45	209.04	67.41
J1480	170.79	0.00	0.00	217.85	47.06
J1481	143.53	0.00	0.00	168.80	25.27
J1482	190.00	21.00	27.30	218.47	28.47
J1483	285.67	0.00	0.00	323.38	37.71
J1484	155.70	0.00	0.00	177.36	21.66
J1485	190.00	0.00	0.00	251.49	61.49
J1486	127.30	0.00	0.00	177.15	49.84
J1487	170.13	0.00	0.00	217.85	47.72
J1488	169.35	0.00	0.00	217.85	48.50
J1489	195.00	6.00	7.80	249.37	54.37
J149	190.88	0.00	0.00	246.26	55.37
J1490	144.34	0.00	0.00	177.50	33.16
J1491	143.59	0.00	0.00	177.36	33.77
J1492	131.77	29.40	38.22	169.19	37.42
J1493	190.00	0.00	0.00	251.49	61.49
J1494	200.00	15.00	19.50	251.16	51.16
J1495	132.62	17.60	22.88	177.19	44.56
J1496	191.03	16.00	20.80	251.75	60.72
J1497	126.43	0.00	0.00	177.12	50.70
J1498	126.06	6.72	8.74	150.45	24.39
J1499	169.38	0.00	0.00	218.08	48.71
J15	232.76	64.40	83.72	270.09	37.33
J150	193.30	0.00	0.00	243.45	50.15
J1500	200.00	0.00	0.00	251.42	51.42
J1501	172.49	0.00	0.00	217.85	45.36
J1502	135.52	35.00	45.50	168.91	33.39
J1503	203.01	20.00	26.00	251.99	48.98
J1504	188.47	80.00	104.00	248.20	59.73
J1505	200.00	0.00	0.00	251.42	51.42

Node Data (10)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1506	200.00	0.00	0.00	251.49	51.49
J1507	121.95	22.00	28.60	150.44	28.50
J1508	188.60	12.10	15.73	217.59	28.99
J1509	169.56	0.00	0.00	217.76	48.20
J151	216.84	9.00	11.70	246.74	29.89
J1510	126.09	0.00	0.00	150.45	24.36
J1511	266.92	0.00	0.00	323.66	56.73
J1512	192.83	0.00	0.00	251.42	58.59
J1513	203.10	10.00	13.00	251.80	48.71
J1514	139.86	0.00	0.00	177.17	37.32
J1515	172.57	0.00	0.00	218.08	45.52
J1516	270.45	49.00	63.70	324.39	53.93
J1517	211.00	0.00	0.00	252.06	41.06
J1518	202.60	0.00	0.00	251.26	48.66
J1519	228.01	0.00	0.00	253.12	25.11
J152	190.97	0.00	0.00	243.45	52.49
J1520	174.50	0.00	0.00	218.08	43.57
J1521	173.28	16.50	21.45	217.65	44.37
J1522	221.05	0.00	0.00	252.87	31.82
J1523	174.82	0.00	0.00	218.08	43.75
J1524	173.75	0.00	0.00	217.64	43.89
J1525	279.21	0.00	0.00	323.62	44.41
J1526	219.09	0.00	0.00	252.42	33.32
J1527	110.94	0.00	0.00	171.93	60.98
J1528	226.45	0.00	0.00	253.12	26.67
J1529	207.46	0.00	0.00	251.17	43.71
J153	148.10	0.00	0.00	209.66	61.57
J1530	209.39	38.00	49.40	250.91	41.52
J1531	273.66	59.00	76.70	324.43	50.76
J1532	225.95	24.00	31.20	253.13	27.18
J1533	227.08	0.00	0.00	253.12	26.04
J1534	140.39	10.50	13.65	177.31	36.92
J1535	142.19	0.00	0.00	177.31	35.13
J1536	203.32	0.00	0.00	217.16	13.84
J1537	178.52	0.00	0.00	217.98	39.45
J1538	215.45	26.00	33.80	251.04	35.59
J1539	180.01	0.00	0.00	217.51	37.50
J154	170.11	0.00	0.00	243.45	73.34
J1540	166.60	16.50	21.45	173.28	6.68
J1541	278.73	0.00	0.00	323.56	44.83
J1542	194.82	11.00	14.30	217.49	22.67
J1543	120.99	0.00	0.00	169.39	48.40
J1544	159.80	0.00	0.00	173.31	13.51
J1545	180.16	0.00	0.00	217.52	37.36
J1546	220.07	0.00	0.00	251.03	30.96
J1547	184.20	0.00	0.00	217.50	33.31
J1548	182.51	0.00	0.00	217.51	35.00
J1549	170.48	0.00	0.00	217.52	47.05
J155	176.32	0.00	0.00	243.45	67.14
J1550	180.87	15.40	20.02	217.50	36.64
J1551	228.28	0.00	0.00	253.05	24.77
J1552	214.58	15.00	19.50	250.60	36.02
J1553	182.59	7.70	10.01	217.43	34.84
J1554	140.83	0.00	0.00	177.30	36.47
J1555	141.69	0.00	0.00	177.30	35.61
J1556	221.64	0.00	0.00	251.02	29.38
J1557	113.19	36.80	47.84	170.40	57.22
J1558	227.50	34.00	44.20	252.98	25.48
J1559	227.52	0.00	0.00	252.98	25.46
J156	147.75	16.50	21.45	209.66	61.91
J1560	206.12	17.60	22.88	217.16	11.03

Node Data (11)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1561	141.13	10.50	13.65	177.29	36.16
J1562	184.53	0.00	0.00	217.44	32.91
J1563	183.45	0.00	0.00	217.44	33.98
J1564	288.37	0.00	0.00	323.57	35.20
J1565	151.32	0.00	0.00	173.39	22.07
J1566	148.23	28.80	37.44	173.39	25.16
J1567	178.90	0.00	0.00	217.41	38.51
J1568	200.94	5.50	217.35	16.42	
J1569	228.77	16.00	20.80	251.69	22.92
J157	163.29	0.00	0.00	243.45	80.17
J1570	226.03	0.00	0.00	251.00	24.98
J1571	184.32	0.00	0.00	217.41	33.09
J1572	184.02	0.00	0.00	217.41	33.39
J1573	182.59	0.00	0.00	217.41	34.83
J1574	228.29	0.00	0.00	251.17	22.87
J1575	122.61	0.00	0.00	150.42	27.81
J1576	117.32	10.00	13.00	150.27	32.96
J1578	187.83	0.00	0.00	217.44	29.61
J1579	112.85	25.20	32.76	150.17	37.31
J158	195.53	0.00	0.00	243.45	47.92
J1580	113.86	0.00	0.00	150.20	36.35
J1581	145.25	0.00	0.00	173.43	28.18
J1582	186.11	0.00	0.00	217.37	31.26
J1583	141.20	51.00	66.30	176.65	35.45
J1584	282.49	0.00	0.00	323.57	31.08
J1585	187.05	0.00	0.00	217.36	30.31
J1586	116.01	12.80	16.64	169.49	53.48
J1587	292.33	0.00	0.00	323.57	31.24
J1588	226.29	20.00	26.00	250.72	24.44
J1589	296.29	8.40	10.92	323.53	27.23
J159	147.41	0.00	0.00	245.46	98.05
J1590	121.43	40.60	52.78	169.12	47.69
J1591	225.10	20.00	26.00	250.80	25.70
J1592	180.23	0.00	0.00	217.27	37.04
J1593	170.89	19.80	25.74	217.27	46.38
J1594	201.69	0.00	0.00	217.24	15.55
J1595	142.00	0.00	0.00	176.60	34.60
J1596	142.06	0.00	0.00	176.60	34.53
J1597	142.25	0.00	0.00	176.60	34.35
J1598	142.63	0.00	0.00	176.60	33.97
J1599	142.68	0.00	0.00	176.60	33.92
J16	163.67	25.40	33.02	208.77	45.10
J160	147.36	0.00	0.00	245.46	98.10
J1600	146.78	0.00	0.00	173.47	26.69
J1601	142.92	0.00	0.00	176.14	33.22
J1602	142.33	34.50	44.85	176.56	34.23
J1603	189.75	0.00	0.00	217.30	27.55
J1604	190.12	0.00	0.00	217.30	27.18
J1605	186.92	0.00	0.00	217.30	30.38
J1606	142.56	0.00	0.00	176.59	34.03
J1607	184.06	0.00	0.00	217.30	33.24
J1608	147.00	16.00	20.80	173.45	26.45
J1609	147.08	0.00	0.00	176.60	29.52
J161	134.08	0.00	0.00	175.97	41.88
J1610	150.87	28.80	37.44	173.06	22.19
J1611	200.35	0.00	0.00	217.16	16.81
J1612	169.31	0.00	0.00	217.27	47.96
J1613	189.87	0.00	0.00	217.28	27.42
J1614	215.90	26.00	33.80	250.70	34.80
J1615	186.24	0.00	0.00	217.28	31.04
J1616	190.46	0.00	0.00	217.30	26.84

Node Data (12)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1617	117.60	50.40	65.52	189.14	51.54
J1618	223.07	0.00	0.00	250.62	27.55
J1619	222.46	18.00	23.40	250.61	28.16
J162	147.23	0.00	0.00	209.66	62.44
J1620	167.88	0.00	0.00	217.01	49.33
J1621	189.88	0.00	0.00	217.25	27.37
J1622	157.90	14.30	18.59	172.99	15.09
J1623	185.02	0.00	0.00	217.25	32.23
J1624	221.37	0.00	0.00	250.61	29.24
J1625	130.87	23.40	30.42	176.55	45.67
J1626	130.33	0.00	0.00	150.45	20.12
J1627	177.55	0.00	0.00	217.04	39.49
J1628	308.01	24.00	31.20	323.46	15.45
J1629	308.05	0.00	0.00	323.46	15.40
J163	146.99	17.20	22.36	209.59	62.60
J1630	191.61	0.00	0.00	217.18	25.58
J1631	165.86	15.40	20.02	217.01	51.14
J1632	217.89	0.00	0.00	250.62	32.93
J1633	190.19	0.00	0.00	217.22	27.03
J1634	131.04	0.00	0.00	176.52	45.48
J1635	149.54	0.00	0.00	173.40	23.86
J1636	186.15	0.00	0.00	217.22	31.07
J1637	216.00	0.00	0.00	250.70	34.70
J1638	191.66	0.00	0.00	217.18	25.53
J1639	193.39	0.00	0.00	217.18	23.79
J164	187.32	129.48	168.32	243.45	56.14
J1640	170.60	0.00	0.00	217.05	46.45
J1641	190.51	0.00	0.00	217.20	26.69
J1642	179.43	0.00	0.00	217.05	37.82
J1643	186.15	0.00	0.00	217.20	31.00
J1644	177.14	0.00	0.00	217.04	39.90
J1645	214.68	0.00	0.00	250.60	35.92
J1646	175.02	0.00	0.00	217.05	42.03
J1647	174.94	0.00	0.00	217.05	42.11
J1648	201.48	10.00	13.00	250.67	49.19
J1649	200.74	0.00	0.00	217.16	16.42
J165	159.52	0.00	0.00	243.64	84.13
J1650	152.69	15.30	19.89	173.36	20.67
J1651	199.10	13.20	17.16	217.16	18.06
J1652	178.40	0.00	0.00	217.05	38.84
J1653	178.78	0.00	0.00	217.05	38.27
J1654	210.94	0.00	0.00	250.57	39.63
J1655	178.74	11.00	14.30	217.05	38.31
J1656	191.84	0.00	0.00	217.18	25.34
J1657	190.83	26.40	34.32	217.19	26.36
J1658	180.43	0.00	0.00	217.05	36.62
J1659	178.21	0.00	0.00	217.05	38.84
J166	178.25	0.00	0.00	243.45	65.21
J1660	212.18	20.00	26.00	250.56	38.38
J1661	178.16	0.00	0.00	217.05	38.99
J1662	186.61	0.00	0.00	217.13	30.52
J1663	181.78	0.00	0.00	217.05	35.27
J1664	194.21	0.00	0.00	250.46	56.26
J1665	311.79	24.00	31.20	323.46	11.67
J1667	203.63	20.00	26.00	250.47	46.84
J1668	134.85	29.90	38.87	176.49	41.85
J1669	191.63	0.00	0.00	217.16	25.53
J167	147.12	0.00	0.00	245.44	98.33
J1670	162.20	11.90	15.47	176.25	14.05
J1671	186.57	0.00	0.00	217.16	30.59
J1672	170.27	6.80	8.84	176.24	5.97

Node Data (13)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1673	147.78	0.00	0.00	175.97	28.19
J1674	155.88	18.70	24.31	175.87	19.99
J1675	192.17	0.00	0.00	217.14	24.97
J1676	192.04	15.30	19.89	217.14	25.10
J1677	192.34	0.00	0.00	250.46	58.13
J1678	204.37	10.00	13.00	250.49	46.12
J1679	192.18	0.00	0.00	250.46	58.29
J1680	229.96	0.00	0.00	246.48	16.52
J1681	193.37	0.00	0.00	250.46	57.10
J1682	195.49	0.00	0.00	250.46	54.97
J1683	192.14	0.00	0.00	217.10	24.96
J1684	190.12	0.00	0.00	217.10	26.98
J1685	196.88	0.00	0.00	250.46	53.59
J1686	184.30	0.00	0.00	217.10	32.80
J1687	203.45	10.00	13.00	250.46	47.02
J1688	146.93	0.00	0.00	176.45	29.53
J1689	146.51	0.00	0.00	176.45	29.94
J1690	167.45	0.00	0.00	243.45	76.00
J1691	174.96	18.70	24.31	217.10	42.13
J1692	203.13	0.00	0.00	250.48	47.35
J1693	173.86	6.80	8.84	176.37	2.50
J1694	145.94	0.00	0.00	176.45	30.51
J1695	143.49	0.00	0.00	176.46	32.97
J1696	147.13	0.00	0.00	176.45	29.32
J1697	164.58	23.80	30.94	176.37	11.79
J1698	164.44	0.00	0.00	176.37	11.92
J1699	152.17	0.00	0.00	176.42	24.25
J1700	206.02	0.00	0.00	245.84	39.82
J1701	166.14	0.00	0.00	243.45	77.32
J1702	146.58	0.00	0.00	176.35	29.76
J1703	199.49	0.00	0.00	250.46	50.98
J1704	146.71	0.00	0.00	176.40	29.69
J1705	161.44	0.00	0.00	176.38	14.93
J1706	158.65	25.50	33.15	176.38	17.73
J1707	147.94	0.00	0.00	176.27	28.33
J1708	198.90	0.00	0.00	250.46	51.56
J1709	198.79	22.00	28.60	250.46	51.67
J1710	146.91	0.00	0.00	176.33	29.43
J1711	185.92	0.00	0.00	243.48	57.56
J1712	198.15	0.00	0.00	250.46	52.32
J1713	146.80	0.00	0.00	176.32	29.52
J1714	146.65	0.00	0.00	176.31	29.74
J1715	175.26	0.00	0.00	215.59	40.33
J1716	174.28	8.50	11.05	176.33	2.05
J1717	167.71	0.00	0.00	176.34	8.63
J1718	192.67	0.00	0.00	216.68	24.01
J1719	192.29	11.90	15.47	216.67	24.38
J1720	191.58	0.00	0.00	216.68	25.10
J1721	173.44	0.00	0.00	215.59	42.15
J1722	316.06	0.00	0.00	323.57	7.51
J1723	142.33	0.00	0.00	176.16	33.84
J1724	139.68	32.50	42.25	176.15	36.48
J1725	152.94	10.20	13.26	175.94	23.01
J1726	159.40	11.90	15.47	175.85	16.45
J1727	145.20	0.00	0.00	176.17	30.97
J1728	166.70	6.80	8.84	175.83	9.13
J1729	168.05	0.00	0.00	215.59	47.54
J1730	168.57	0.00	0.00	215.59	47.02
J1731	145.56	0.00	0.00	209.59	64.03

Node Data (14)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1730	180.60	0.00	0.00	215.52	34.92
J1731	181.52	0.00	0.00	214.49	32.97
J1732	177.99	19.50	25.35	215.52	37.53
J1733	170.76	22.30	28.99	215.59	44.83
J1734	119.66	58.00	75.40	150.30	30.64
J1735	173.09	45.00	58.50	209.21	36.12
J1736	144.98	18.20	23.66	176.07	31.09
J1737	174.79	50.00	65.00	209.49	34.70
J1738	144.88	0.00	0.00	176.12	31.24
J1739	144.88	0.00	0.00	179.46	34.04
J1740	145.42	0.00	0.00	175.99	25.04
J1741	150.95	36.00	46.80	215.52	52.67
J1742	162.85	0.00	0.00	211.19	46.81
J1743	164.38	22.00	28.60	215.28	58.03
J1744	157.26	0.00	0.00	175.99	21.95
J1745	154.04	0.00	0.00	175.99	21.95
J1746	150.85	0.00	0.00	175.85	25.00
J1747	145.81	0.00	0.00	175.94	30.12
J1748	147.65	0.00	0.00	175.51	27.86
J1749	156.46	0.00	0.00	215.11	58.65
J1750	147.89	26.50	34.45	175.51	27.61
J1751	268.39	33.50	43.55	302.29	33.91
J1752	158.62	0.00	0.00	215.14	56.52
J1753	162.25	24.00	31.20	214.98	52.73
J1754	147.20	58.50	76.05	175.86	28.66
J1755	158.81	16.50	21.45	175.14	16.33
J1756	155.38	20.50	26.65	175.21	19.84
J1757	150.93	0.00	0.00	175.50	24.57
J1758	173.84	0.00	0.00	214.89	41.06
J1759	174.36	0.00	0.00	214.89	40.53
J1760	173.41	0.00	0.00	214.95	41.55
J1761	160.10	0.00	0.00	243.64	83.54
J1762	151.28	0.00	0.00	175.51	24.23
J1763	165.68	16.50	21.45	175.00	9.32
J1764	148.28	0.00	0.00	175.92	27.64
J1765	151.94	0.00	0.00	175.92	23.98
J1766	148.13	0.00	0.00	175.76	27.63
J1767	180.93	0.00	0.00	214.87	33.95
J1768	151.57	0.00	0.00	175.52	23.95
J1769	160.01	31.00	40.30	175.07	15.06
J1770	152.54	0.00	0.00	175.52	22.98
J1771	151.97	0.00	0.00	175.51	23.54
J1772	145.23	0.00	0.00	243.95	98.67
J1773	176.62	19.50	25.35	214.98	38.36
J1774	152.07	0.00	0.00	175.52	23.44
J1775	152.20	0.00	0.00	175.52	23.32
J1776	152.07	0.00	0.00	175.52	23.45
J1777	148.02	0.00	0.00	175.70	27.68
J1778	185.37	16.50	21.45	214.92	29.55
J1779	170.07	12.00	15.60	175.37	5.30
J1780	169.64	12.00	15.60	175.36	5.82
J1781	185.73	22.50	29.25	214.87	29.14
J1782	161.03	9.00	11.70	175.39	14.36
J1783	145.06	0.00	0.00	0.00	-145.06
J1784	161.10	7.50	9.75	175.40	14.30
J1785	153.05	30.00	39.00	175.45	22.40
J1786	153.33	0.00	0.00	175.45	22.12
J1787	147.60	0.00	0.00	175.79	28.19
J1788	189.95	0.00	0.00	214.53	24.58
J1789	146.14	0.00	0.00	175.68	29.54
J1790	154.70	0.00	0.00	175.45	20.75

Node Data (15)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J1787	173.51	7.50	9.75	214.88	41.37
J1788	177.64	0.00	0.00	214.89	37.26
J1789	188.67	12.00	15.60	214.34	25.68
J179	145.18	0.00	0.00	243.90	98.71
J1790	161.70	12.00	15.60	175.37	13.67
J1791	162.47	0.00	0.00	175.40	22.63
J1792	143.31	20.80	27.04	175.66	32.35
J1793	146.85	0.00	0.00	175.40	28.95
J1794	153.87	7.50	9.75	175.37	21.50
J1795	151.75	37.50	48.75	175.37	23.63
J1796	160.09	16.50	21.45	214.22	54.13
J1797	141.25	0.00	0.00	175.55	34.30
J1798	153.99	7.50	9.75	175.36	21.37
J1799	140.36	0.00	0.00	175.65	35.29
J18	205.94	0.00	0.00	245.84	39.91
J180	145.09	0.00	0.00	245.37	100.28
J1800	150.33	0.00	0.00	175.37	25.04
J1801	134.54	36.40	47.32	175.96	41.02
J1802	138.68	0.00	0.00	175.64	36.96
J1803	137.71	46.00	59.80	175.53	37.82
J1804	150.30	6.00	7.80	175.37	25.08
J1805	149.01	9.00	11.70	175.08	26.06
J1806	143.14	10.50	13.65	175.11	31.98
J1807	137.12	0.00	0.00	175.33	38.22
J1808	131.70	36.90	47.97	173.92	42.27
J1809	138.24	0.00	0.00	175.38	37.14
J181	251.64	0.00	0.00	302.22	50.58
J1810	183.00	0.00	0.00	303.00	120.00
J1811	230.00	0.00	0.00	249.32	19.32
J182	144.84	0.00	0.00	239.97	95.76
J183	144.71	0.00	0.00	239.97	95.76
J184	255.29	34.00	44.20	302.18	46.89
J185	144.76	0.00	0.00	245.35	100.60
J186	144.67	0.00	0.00	245.35	100.68
J187	137.93	17.00	22.10	176.33	38.40
J188	165.04	54.78	71.21	226.89	58.35
J189	144.47	0.00	0.00	245.34	100.87
J19	211.98	0.00	0.00	245.84	33.87
J190	145.10	6.64	8.63	245.95	100.25
J191	131.43	11.90	15.47	176.16	44.73
J192	207.81	0.00	0.00	235.08	27.27
J193	134.50	0.00	0.00	176.38	41.89
J194	248.63	0.00	0.00	302.25	53.63
J195	202.56	0.00	0.00	235.08	32.52
J196	143.90	0.00	0.00	245.30	101.40
J197	143.90	0.00	0.00	239.97	96.07
J198	143.64	0.00	0.00	179.27	35.62
J199	143.80	0.00	0.00	209.59	65.79
J20	216.64	66.00	85.80	241.56	24.92
J200	164.56	0.00	0.00	208.95	44.29
J2000	217.90	87.98	114.37	234.59	16.68
J201	132.04	0.00	0.00	176.43	44.40
J202	211.78	0.00	0.00	235.05	23.27
J203	189.96	46.48	60.42	235.15	45.19
J204	249.92	0.00	0.00	302.25	52.33
J205	235.04	23.24	30.21	246.46	11.42
J206	249.56	19.50	25.35	302.25	52.70
J207	141.32	0.00	0.00	178.88	37.56
J208	263.14	10.50	13.65	302.28	39.14
J209	220.28	0.00	0.00	238.18	17.90
J21	151.84	21.50	27.95	208.06	50.21

Node Data (16)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J210	202.09	29.88	38.84	235.63	33.54
J211	254.31	0.00	0.00	302.26	47.95
J212	239.92	0.00	0.00	246.46	6.54
J213	219.69	13.20	17.16	318.99	99.30
J214	256.56	0.00	0.00	302.27	45.71
J215	246.90	22.50	29.25	302.01	55.11
J216	229.82	14.40	18.72	269.95	40.13
J217	259.23	0.00	0.00	271.27	12.04
J218	259.47	0.00	0.00	302.31	42.84
J219	157.24	33.20	43.16	228.03	70.79
J22	202.63	0.00	0.00	245.84	43.22
J220	169.70	21.58	28.05	227.91	58.21
J221	216.16	24.90	32.37	237.08	20.92
J222	137.93	37.40	48.62	178.27	40.34
J223	259.64	0.00	0.00	302.31	42.67
J224	143.47	16.60	21.58	245.21	101.75
J225	155.65	19.92	25.90	228.57	72.92
J226	131.51	32.30	41.99	176.84	45.33
J227	122.21	21.45	27.89	174.98	52.71
J228	185.04	9.96	12.95	237.53	51.90
J229	169.16	33.20	43.16	237.51	68.35
J23	219.48	0.00	0.00	245.84	26.36
J230	130.83	0.00	0.00	175.49	44.66
J231	186.91	9.96	12.95	234.47	47.56
J232	259.17	31.00	40.30	302.21	43.04
J233	125.05	22.10	28.73	175.85	50.80
J234	175.05	0.00	0.00	237.64	62.59
J235	172.86	31.54	41.00	237.64	64.78
J236	251.19	0.00	0.00	302.26	51.06
J237	133.72	0.00	0.00	177.72	44.00
J238	151.45	8.30	10.79	228.56	77.11
J239	179.21	0.00	0.00	237.55	58.28
J24	247.97	30.00	39.00	316.27	68.30
J240	211.34	11.50	14.95	270.10	58.76
J241	177.27	33.20	43.16	237.57	60.30
J242	260.12	13.50	17.55	302.32	42.20
J243	176.71	0.00	0.00	237.57	60.86
J244	176.10	0.00	0.00	237.58	61.48
J245	141.74	0.00	0.00	245.21	103.48
J246	131.90	0.00	0.00	177.55	45.68
J247	151.42	0.00	0.00	239.97	88.55
J248	252.78	40.00	52.00	318.09	65.31
J249	150.99	87.98	114.37	239.97	88.98
J25	203.52	0.00	0.00	245.84	42.32
J250	179.96	0.00	0.00	234.48	54.52
J251	262.10	0.00	0.00	302.31	40.21
J252	150.69	0.00	0.00	239.97	89.28
J253	171.30	0.00	0.00	237.65	66.35
J254	230.50	15.60	20.28	269.77	39.27
J255	181.69	40.56	52.73	235.02	53.33
J256	176.85	9.96	12.95	237.53	60.60
J257	144.71	8.30	10.79	239.95	95.18
J258	168.57	23.24	30.21	231.99	63.42
J259	177.00	8.30	10.79	234.47	57.47
J26	204.47	0.00	0.00	245.84	41.38
J260	130.53	0.00	0.00	177.42	46.89
J261	202.31	43.16	56.11	236.82	34.52
J262	175.12	21.58	28.05	237.63	62.51
J263	158.15	36.52	47.48	232.10	73.95
J264	177.46	0.00	0.00	236.87	59.41
J265	176.88	26.56	34.53	234.50	57.82

Node Data (17)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J266	169.07	16.60	21.58	237.73	68.66
J267	132.91	0.00	0.00	177.55	44.64
J268	177.44	0.00	0.00	236.83	59.38
J269	129.92	0.00	0.00	177.31	47.39
J27	143.70	28.60	37.18	208.57	64.87
J270	176.96	28.22	36.69	236.83	69.86
J271	172.73	0.00	0.00	236.87	64.14
J272	136.67	0.00	0.00	176.89	40.22
J273	150.98	0.00	0.00	238.93	87.95
J274	150.50	0.00	0.00	239.14	88.64
J276	225.21	16.80	21.84	269.75	44.54
J277	245.78	0.00	0.00	302.36	49.59
J278	250.18	0.00	0.00	302.26	52.09
J279	249.42	0.00	0.00	302.26	52.84
J28	250.11	36.00	46.80	316.46	66.35
J280	249.22	8.80	11.44	269.97	20.75
J281	134.40	0.00	0.00	177.17	42.77
J282	124.10	13.60	17.68	175.30	51.21
J283	158.02	11.62	15.11	237.47	79.45
J284	241.50	0.00	0.00	270.02	78.51
J285	243.56	0.00	0.00	270.01	26.45
J286	132.88	39.00	50.70	177.37	44.49
J287	245.52	22.00	28.60	269.35	23.83
J288	157.04	0.00	0.00	237.38	80.34
J289	150.81	0.00	0.00	238.59	87.79
J29	129.82	61.06	79.38	175.10	45.28
J290	264.92	9.50	12.35	302.32	37.40
J291	160.28	0.00	0.00	239.14	88.86
J292	150.78	56.44	73.37	238.56	87.78
J293	245.60	8.80	11.44	270.21	24.61
J294	253.85	0.00	0.00	302.36	48.51
J295	129.67	0.00	0.00	177.19	47.52
J296	160.41	33.20	43.16	234.01	73.60
J297	122.41	0.00	0.00	175.29	52.89
J298	129.66	0.00	0.00	175.26	45.60
J299	158.82	8.30	10.79	237.37	78.55
J3	181.98	0.00	0.00	244.94	62.96
J30	199.86	0.00	0.00	245.84	45.98
J300	242.94	0.00	0.00	270.21	27.28
J301	159.30	8.30	10.79	237.46	78.17
J302	194.85	16.60	21.58	237.38	82.53
J303	194.97	0.00	0.00	237.47	82.51
J304	122.42	0.00	0.00	175.30	52.89
J305	174.52	33.20	43.16	236.63	62.11
J306	127.96	0.00	0.00	177.19	49.23
J307	192.15	61.42	79.85	235.71	43.56
J308	127.95	0.00	0.00	175.25	47.30
J309	137.28	0.00	0.00	176.36	39.08
J31	194.04	0.00	0.00	245.84	51.80
J310	145.92	49.80	64.74	245.01	99.08
J311	182.59	0.00	0.00	236.96	74.37
J312	163.50	44.82	58.27	236.92	73.42
J313	259.86	0.00	0.00	302.35	42.49
J314	190.10	39.84	51.79	236.33	46.23
J315	166.46	39.84	51.79	236.89	70.43
J316	282.40	15.00	19.50	302.34	39.94
J317	149.52	34.86	45.32	238.05	88.53
J318	126.09	25.50	33.15	175.23	49.14
J319	235.00	0.00	0.00	269.30	34.30
J32	178.00	14.30	18.59	206.79	28.79
J320	236.92	21.58	28.05	246.46	9.54

Node Data (18)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J321	145.47	78.02	101.43	245.01	99.53
J322	236.05	68.06	88.48	246.35	10.30
J323	237.31	0.00	0.00	269.24	31.93
J324	125.27	0.00	0.00	177.19	51.92
J325	264.44	0.00	0.00	302.33	37.89
J326	236.35	0.00	0.00	269.24	32.89
J327	130.20	0.00	0.00	175.23	45.04
J328	151.89	0.00	0.00	237.46	85.48
J329	145.35	0.00	0.00	175.44	30.09
J33	178.00	21.60	28.08	201.24	30.21
J330	122.05	0.00	0.00	149.03	26.98
J331	151.95	0.00	0.00	236.19	84.24
J332	152.15	0.00	0.00	237.44	85.28
J333	151.85	0.00	0.00	237.47	85.63
J334	124.52	0.00	0.00	175.30	50.78
J335	256.03	26.00	33.80	269.47	13.45
J336	167.16	0.00	0.00	236.29	68.53
J337	151.77	0.00	0.00	236.82	95.05
J338	129.22	0.00	0.00	175.23	46.01
J339	228.37	16.80	21.84	269.80	41.44
J34	175.00	21.60	28.08	206.33	31.33
J340	130.67	0.00	0.00	176.52	45.85
J341	165.20	0.00	0.00	236.31	71.11
J342	151.27	87.98	114.37	236.18	84.91
J343	145.09	43.16	56.11	175.44	30.35
J344	122.98	0.00	0.00	175.38	52.40
J345	234.90	0.00	0.00	269.24	34.34
J346	239.10	0.00	0.00	269.10	30.10
J347	236.22	24.00	31.20	269.24	33.03
J348	122.84	0.00	0.00	175.41	52.57
J349	127.85	0.00	0.00	175.23	47.38
J35	175.00	23.40	30.42	200.72	25.72
J350	254.98	15.00	19.50	302.38	47.40
J351	161.53	29.88	38.84	236.49	74.96
J352	138.61	44.20	57.46	175.78	37.17
J354	215.63	87.98	114.37	268.22	52.59
J355	119.57	7.80	10.14	148.91	29.34
J356	254.61	22.00	28.60	317.86	63.25
J357	169.08	0.00	0.00	236.29	67.21
J358	170.05	26.56	34.53	236.81	66.76
J359	225.00	0.00	0.00	269.24	44.24
J36	176.53	0.00	0.00	207.44	30.91
J360	240.00	0.00	0.00	269.62	29.62
J361	168.91	59.76	77.69	236.29	67.38
J362	131.34	0.00	0.00	175.17	43.84
J363	168.92	0.00	0.00	236.29	67.37
J364	135.34	0.00	0.00	175.80	40.45
J365	131.51	46.80	60.84	176.05	44.54
J366	135.11	0.00	0.00	175.80	40.69
J367	263.12	0.00	0.00	302.36	39.24
J368	235.00	0.00	0.00	269.67	34.67
J369	166.42	39.84	51.79	236.31	69.89
J37	167.19	0.00	0.00	209.09	41.90
J370	127.25	0.00	0.00	175.23	47.98
J371	163.61	0.00	0.00	236.33	72.72
J372	235.00	0.00	0.00	269.67	34.67
J373	262.64	10.50	13.65	302.29	39.65
J374	221.66	32.00	41.60	269.11	47.44
J375	131.86	0.00	0.00	175.84	43.98
J376	225.00	0.00	0.00	269.25	44.25
J377	139.07	0.00	0.00	175.49	36.42

Node Data (19)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J378	131.95	0.00	0.00	175.82	43.87
J379	147.26	33.92	44.10	237.62	90.35
J380	176.16	0.00	0.00	202.12	25.96
J381	124.56	44.20	57.46	175.32	50.76
J382	124.48	0.00	0.00	175.48	51.00
J383	226.80	0.00	0.00	269.25	42.44
J384	226.85	0.00	0.00	269.25	42.40
J385	130.29	0.00	0.00	175.76	45.47
J386	259.92	14.50	18.85	302.39	42.47
J387	217.36	0.00	0.00	269.10	51.74
J388	178.36	21.58	28.05	236.78	58.42
J389	253.30	0.00	0.00	270.41	17.11
J390	119.49	11.70	15.21	148.88	29.39
J391	167.32	0.00	0.00	209.11	41.79
J392	144.43	0.00	0.00	175.44	30.97
J393	235.00	8.00	10.40	269.87	34.87
J394	153.64	89.64	116.53	236.19	82.55
J395	191.40	49.80	64.74	236.30	44.90
J396	144.45	0.00	0.00	175.44	31.00
J397	132.31	0.00	0.00	175.71	43.46
J398	219.08	0.00	0.00	269.10	50.02
J399	129.23	18.20	23.66	175.68	46.45
J400	143.13	0.00	0.00	208.57	85.44
J401	252.83	0.00	0.00	302.41	49.59
J402	142.24	0.00	0.00	175.45	33.21
J403	252.61	0.00	0.00	302.41	49.81
J404	252.22	0.00	0.00	270.38	18.15
J405	253.89	0.00	0.00	302.41	48.52
J406	250.47	0.00	0.00	270.35	19.89
J407	218.61	42.00	54.60	269.00	50.39
J408	181.47	53.12	69.06	236.71	35.30
J409	219.23	0.00	0.00	269.00	49.77
J410	127.71	0.00	0.00	175.60	47.90
J411	168.28	0.00	0.00	203.88	35.60
J412	245.13	0.00	0.00	270.31	25.19
J413	252.93	0.00	0.00	302.41	49.48
J414	236.14	0.00	0.00	270.16	34.02
J415	132.44	39.00	50.70	175.10	42.66
J416	251.99	0.00	0.00	270.32	18.34
J417	236.16	0.00	0.00	302.66	66.50
J418	241.65	0.00	0.00	270.27	28.62
J419	139.32	0.00	0.00	175.46	36.14
J420	215.02	0.00	0.00	269.00	53.98
J421	200.21	25.20	32.76	245.79	45.58
J422	114.34	0.00	0.00	148.93	34.58
J423	214.57	0.00	0.00	234.60	20.03
J424	139.30	0.00	0.00	175.45	36.16
J425	251.16	0.00	0.00	270.31	19.16
J426	237.98	7.70	10.01	270.23	32.25
J427	237.84	0.00	0.00	270.23	32.39
J428	214.14	18.00	23.40	234.60	20.45
J429	214.16	0.00	0.00	269.25	55.08
J430	139.30	0.00	0.00	175.45	36.15
J431	126.65	0.00	0.00	175.54	48.89
J432	173.00	0.00	0.00	206.46	33.46
J433	213.55	0.00	0.00	234.61	21.06
J434	132.54	0.00	0.00	175.70	43.16
J435	144.84	20.80	27.04	175.44	30.60
J436	126.53	0.00	0.00	175.53	49.00
J437	170.77	84.66	110.06	223.81	53.04

Node Data (20)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J438	234.91	0.00	0.00	302.66	67.75
J439	234.84	0.00	0.00	270.18	35.34
J440	173.00	15.60	20.78	270.09	33.99
J441	155.87	56.44	73.37	236.18	80.32
J442	135.34	0.00	0.00	175.30	39.97
J443	232.00	18.00	23.40	270.19	38.19
J444	246.37	0.00	0.00	270.33	23.96
J445	187.20	0.00	0.00	245.89	58.70
J446	220.00	18.00	23.40	269.91	49.91
J447	139.29	26.00	33.80	175.45	36.16
J448	127.55	0.00	0.00	175.49	47.94
J449	145.85	0.00	0.00	175.45	29.59
J450	132.65	0.00	0.00	175.18	42.53
J451	201.30	9.96	12.95	236.73	35.43
J452	142.19	0.00	0.00	175.45	33.25
J453	142.59	8.00	10.40	175.45	32.86
J454	235.20	3.30	4.29	270.22	35.03
J455	185.63	0.00	0.00	245.91	60.28
J456	242.71	19.35	25.15	270.30	27.59
J457	132.79	0.00	0.00	175.58	42.79
J458	225.00	0.00	0.00	270.29	45.29
J459	121.26	0.00	0.00	175.36	54.10
J460	127.79	0.00	0.00	175.36	47.57
J461	139.20	0.00	0.00	270.33	27.67
J462	242.66	0.00	0.00	175.45	28.59
J463	146.86	0.00	0.00	236.18	78.52
J464	157.66	0.00	0.00	209.07	50.05
J465	159.01	0.00	0.00	270.29	55.29
J466	215.00	0.00	0.00	270.32	26.84
J467	243.49	0.00	0.00	234.71	19.71
J468	215.00	0.00	0.00	270.15	39.41
J469	230.74	10.80	14.04	234.71	19.71
J470	215.00	0.00	0.00	175.45	39.93
J471	135.52	0.00	0.00	175.45	34.56
J472	114.37	19.80	25.74	148.93	39.70
J473	135.76	26.00	33.80	175.46	39.70
J474	147.10	0.00	0.00	175.10	28.00
J475	177.35	0.00	0.00	246.00	68.64
J476	132.85	0.00	0.00	175.18	42.33
J477	241.77	0.00	0.00	270.29	28.53
J478	183.10	39.84	51.79	236.76	53.66
J479	229.45	0.00	0.00	270.17	40.72
J480	133.84	0.00	0.00	175.45	41.61
J481	129.16	31.20	40.56	175.41	46.25
J482	212.15	0.00	0.00	234.62	22.47
J483	233.74	0.00	0.00	270.17	36.44
J484	241.50	6.60	8.58	270.17	28.67
J485	202.66	0.00	0.00	234.55	31.90
J486	181.82	34.20	44.46	246.07	64.24
J487	197.55	32.00	41.60	234.61	37.06
J488	238.98	12.90	16.77	270.28	31.29
J489	185.37	0.00	0.00	236.76	51.39
J490	196.75	0.00	0.00	234.55	37.81
J491	186.52	0.00	0.00	236.76	51.23
J492	186.64	0.00	0.00	234.61	47.97
J493	185.68	26.00	33.80	234.55	48.88
J494	133.06	0.00	0.00	175.47	42.42
J495	188.51	0.00	0.00	234.61	46.10
J496	189.09	0.00	0.00	234.61	45.53

Node Data (21)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J5	172.20	0.00	0.00	244.95	72.75
J50	170.57	23.40	30.42	206.36	35.79
J500	234.30	15.40	20.02	270.17	35.88
J5005	151.50	0.00	0.00	218.59	67.09
J5007	222.51	8.80	11.44	270.14	47.63
J501	142.81	0.00	0.00	175.43	32.62
J501	128.82	0.00	0.00	175.36	46.54
J503	244.20	0.00	0.00	270.37	76.13
J504	181.71	0.00	0.00	234.55	52.85
J505	131.53	0.00	0.00	175.42	43.90
J506	179.58	14.94	19.42	236.76	57.19
J507	124.89	0.00	0.00	175.36	50.46
J508	235.60	0.00	0.00	302.59	66.99
J509	149.62	0.00	0.00	175.10	25.48
J51	155.29	40.70	52.91	209.05	53.76
J510	177.82	20.00	26.00	218.06	40.24
J511	171.27	0.00	0.00	218.09	40.82
J512	139.29	7.20	9.36	175.42	36.13
J513	129.04	0.00	0.00	175.36	46.31
J514	206.40	40.00	52.00	320.16	53.76
J515	129.66	0.00	0.00	175.36	45.70
J516	159.60	24.90	32.37	227.19	67.59
J517	244.99	23.00	30.03	270.32	25.33
J518	159.30	0.00	0.00	227.19	67.89
J519	147.25	0.00	0.00	175.09	27.85
J52	168.95	23.40	30.42	207.21	38.32
J520	121.22	0.00	0.00	175.36	54.14
J521	170.23	0.00	0.00	236.76	66.53
J522	121.04	0.00	0.00	149.29	28.25
J523	129.23	0.00	0.00	175.36	46.12
J524	158.28	0.00	0.00	175.10	16.82
J525	197.78	10.00	13.00	234.34	36.56
J526	129.12	0.00	0.00	175.35	46.23
J527	169.09	3.32	4.32	175.10	6.01
J528	207.95	28.00	36.40	234.21	26.26
J529	157.64	0.00	0.00	175.10	17.45
J53	168.39	21.60	28.08	201.97	33.58
J530	157.70	0.00	0.00	175.10	17.39
J531	157.74	0.00	0.00	175.10	17.36
J532	157.87	0.00	0.00	175.10	17.22
J533	195.47	0.00	0.00	234.40	38.93
J534	222.13	0.00	0.00	270.14	48.01
J535	118.55	11.70	15.21	149.04	30.49
J536	116.08	5.40	7.02	148.94	32.86
J537	155.49	0.00	0.00	175.10	19.60
J538	114.71	18.00	23.40	148.91	34.20
J539	177.66	0.00	0.00	215.49	37.83
J54	170.88	0.00	0.00	246.09	75.22
J540	239.56	0.00	0.00	302.55	62.98
J541	146.81	0.00	0.00	175.09	28.28
J542	146.64	0.00	0.00	175.10	28.46
J543	168.29	0.00	0.00	218.09	49.79
J544	127.70	0.00	0.00	175.36	47.66
J545	199.81	44.00	57.20	231.39	31.58
J546	149.68	0.00	0.00	175.10	25.41
J547	149.86	16.20	21.06	175.09	25.24
J548	181.52	0.00	0.00	175.10	13.58
J549	166.24	0.00	0.00	218.08	51.84
J55	170.84	0.00	0.00	246.09	75.26
J550	179.77	26.00	33.80	234.24	54.47
J551	161.68	0.00	0.00	175.10	13.42

Node Data (22)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J552	172.16	0.00	0.00	215.49	43.33
J553	149.15	0.00	0.00	175.10	25.95
J554	161.71	0.00	0.00	218.09	56.38
J555	249.85	31.50	40.95	301.92	52.07
J556	120.00	14.30	18.59	187.05	47.05
J557	148.36	0.00	0.00	175.10	28.74
J558	146.39	0.00	0.00	175.09	28.70
J559	131.47	0.00	0.00	175.32	43.84
J56	170.78	0.00	0.00	246.09	75.31
J560	223.68	15.05	19.56	270.25	46.57
J561	241.06	19.35	25.15	270.24	29.18
J562	175.86	0.00	0.00	215.49	39.82
J563	146.09	0.00	0.00	175.10	29.01
J564	114.86	0.00	0.00	148.91	34.05
J565	170.68	0.00	0.00	215.49	44.81
J566	143.95	0.00	0.00	175.10	31.15
J567	160.83	0.00	0.00	218.09	57.25
J568	126.30	66.50	86.45	175.31	49.01
J569	152.20	0.00	0.00	175.10	22.90
J57	166.08	25.20	32.76	200.71	34.63
J570	166.33	28.00	36.40	215.49	49.16
J571	167.92	0.00	0.00	215.50	47.58
J572	165.70	0.00	0.00	215.50	49.80
J573	121.29	0.00	0.00	149.45	28.16
J574	161.67	0.00	0.00	218.09	56.42
J575	158.75	30.00	39.00	218.09	59.34
J576	151.07	0.00	0.00	175.10	24.03
J577	158.02	0.00	0.00	218.09	60.07
J578	119.07	22.80	29.64	149.06	29.99
J579	116.23	20.90	27.17	166.83	50.61
J58	164.67	0.00	0.00	208.51	43.84
J580	183.29	0.00	0.00	234.28	50.99
J581	258.58	38.70	50.31	301.66	43.09
J582	247.03	46.00	59.80	320.85	73.82
J583	157.39	0.00	0.00	218.09	60.70
J584	111.15	50.60	65.78	169.96	58.81
J585	242.91	0.00	0.00	321.22	78.30
J586	114.98	13.60	17.68	148.97	33.99
J587	118.45	8.50	11.05	148.98	32.53
J588	145.09	0.00	0.00	175.10	30.01
J589	145.09	0.00	0.00	175.10	30.01
J59	135.96	8.80	11.44	175.16	39.20
J590	150.09	0.00	0.00	175.10	25.01
J591	157.46	0.00	0.00	218.09	60.63
J592	233.78	0.00	0.00	321.33	87.55
J593	157.02	0.00	0.00	218.09	61.06
J594	133.83	0.00	0.00	175.27	41.44
J595	147.41	0.00	0.00	175.10	27.69
J596	115.00	0.00	0.00	148.91	33.91
J597	172.61	12.00	15.60	234.24	61.63
J598	237.54	20.10	26.13	270.18	32.65
J599	257.44	0.00	0.00	301.55	44.11
J6	177.75	56.30	73.19	244.95	67.20
J60	150.34	0.00	0.00	209.06	58.72
J600	121.82	0.00	0.00	175.29	53.46
J602	171.89	0.00	0.00	215.68	43.79
J603	144.65	0.00	0.00	175.10	30.45
J604	188.76	0.00	0.00	234.05	45.30
J605	124.70	0.00	0.00	175.29	51.09
J6053	142.00	0.00	0.00	175.12	33.12
J6055	117.00	35.05	45.56	148.93	31.93

Node Data (23)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J6057	158.00	0.00	0.00	175.10	17.10
J6058	159.00	31.54	41.00	238.08	79.08
J6059	230.00	32.00	41.60	269.78	31.78
J606	133.58	0.00	0.00	175.12	41.54
J6060	227.00	22.00	28.60	269.80	32.80
J6061	233.00	25.80	33.54	269.89	36.89
J609	127.45	0.00	0.00	175.28	47.83
J61	161.27	0.00	0.00	206.74	45.47
J610	166.33	28.00	36.40	215.65	47.34
J611	195.44	18.20	23.66	321.57	126.13
J612	123.77	34.20	44.46	175.28	51.51
J613	152.36	0.00	0.00	218.30	65.94
J614	151.75	0.00	0.00	175.10	23.35
J615	144.17	0.00	0.00	175.10	30.93
J616	153.92	0.00	0.00	218.09	64.17
J617	221.49	0.00	0.00	270.23	48.74
J618	218.67	20.00	26.00	233.53	14.86
J619	143.92	0.00	0.00	175.10	31.19
J62	173.59	0.00	0.00	246.13	72.54
J620	151.97	0.00	0.00	218.09	60.12
J621	253.49	34.75	45.17	301.23	47.74
J622	261.61	25.05	32.57	301.37	39.76
J623	222.20	10.75	13.98	270.23	48.04
J624	151.38	0.00	0.00	175.10	23.72
J625	155.36	0.00	0.00	218.09	62.73
J626	136.31	0.00	0.00	175.12	38.81
J627	220.23	12.00	15.60	233.46	13.23
J628	148.33	15.30	19.89	175.10	26.77
J629	142.73	0.00	0.00	175.12	32.39
J63	187.23	0.00	0.00	245.74	59.50
J630	135.62	21.60	28.08	175.24	39.63
J631	105.76	16.50	21.45	169.66	63.90
J632	140.61	0.00	0.00	175.10	34.50
J633	148.01	0.00	0.00	175.10	27.09
J634	146.07	5.40	7.02	175.10	29.04
J635	146.37	0.00	0.00	175.10	28.73
J636	143.63	23.40	30.42	175.10	31.47
J638	263.33	0.00	0.00	301.49	38.16
J639	143.79	0.00	0.00	175.10	31.31
J64	173.69	0.00	0.00	246.13	72.45
J640	263.24	26.45	34.39	301.49	38.25
J641	162.98	26.00	33.80	216.55	53.57
J642	280.89	32.00	41.60	319.67	38.79
J643	124.30	0.00	0.00	175.28	50.98
J644	123.10	0.00	0.00	175.28	52.18
J645	262.85	0.00	0.00	301.49	38.64
J646	199.16	0.00	0.00	270.12	70.97
J647	196.59	0.00	0.00	232.69	36.10
J648	133.17	0.00	0.00	175.12	41.95
J649	137.91	0.00	0.00	175.12	37.21
J65	160.33	0.00	0.00	209.19	48.86
J650	135.06	0.00	0.00	175.24	40.18
J651	216.31	0.00	0.00	233.53	17.23
J652	138.19	0.00	0.00	175.10	36.91
J653	112.17	27.20	35.36	146.71	34.54
J654	122.73	0.00	0.00	175.27	52.54
J655	186.64	0.00	0.00	321.91	135.27
J656	218.34	0.00	0.00	233.49	15.15
J657	137.46	0.00	0.00	175.23	37.77
J658	191.26	30.00	39.00	232.69	41.43
J659	191.11	0.00	0.00	232.69	41.59

Node Data (24)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J66	160.68	18.00	23.40	208.82	48.14
J660	159.14	0.00	0.00	218.09	58.96
J661	233.66	0.00	0.00	270.22	36.56
J662	159.21	0.00	0.00	218.09	58.88
J663	153.87	0.00	0.00	218.09	64.22
J664	153.96	0.00	0.00	218.30	64.34
J665	199.63	26.00	33.80	233.80	34.18
J666	290.09	28.00	36.40	319.52	29.43
J667	133.15	0.00	0.00	175.16	42.01
J668	189.23	0.00	0.00	232.69	43.46
J669	148.63	0.00	0.00	175.10	26.47
J67	162.36	0.00	0.00	246.00	83.64
J670	148.70	0.00	0.00	175.11	26.42
J671	114.53	22.10	28.73	147.02	32.49
J672	120.27	15.30	19.89	150.00	29.73
J673	143.88	0.00	0.00	175.11	31.23
J674	125.66	0.00	0.00	173.72	48.06
J675	146.67	2.70	3.51	175.10	28.43
J676	186.01	0.00	0.00	270.12	94.11
J677	187.67	0.00	0.00	232.69	45.02
J678	122.30	0.00	0.00	190.08	27.78
J679	127.93	53.20	69.16	173.72	45.80
J68	147.59	0.00	0.00	209.03	61.44
J680	185.58	0.00	0.00	270.12	84.54
J681	116.68	15.30	19.89	147.96	31.29
J682	259.48	20.75	26.98	301.39	41.91
J683	144.01	0.00	0.00	175.10	31.09
J684	144.02	0.00	0.00	175.10	31.08
J685	187.79	0.00	0.00	232.69	44.90
J686	132.89	13.30	17.29	175.05	42.17
J687	133.11	0.00	0.00	175.13	42.03
J688	182.47	38.00	49.40	232.68	50.22
J69	204.39	14.40	18.72	245.68	41.29
J690	159.09	0.00	0.00	218.09	59.00
J691	254.46	0.00	0.00	270.21	15.75
J692	122.44	0.00	0.00	150.08	27.64
J694	181.82	0.00	0.00	322.15	140.32
J695	216.93	0.00	0.00	233.53	16.60
J696	133.13	0.00	0.00	175.13	42.00
J697	256.08	27.95	36.33	301.49	45.41
J698	234.52	12.00	15.60	319.07	84.54
J699	119.15	0.00	0.00	149.15	30.00
J7	162.77	35.26	45.84	207.69	44.92
J70	265.53	0.00	0.00	271.19	5.66
J701	154.10	42.00	54.60	218.30	64.20
J702	243.73	12.90	16.77	270.21	26.48
J704	165.38	0.00	0.00	218.10	52.73
J705	215.46	0.00	0.00	233.53	18.07
J706	254.98	32.25	41.93	270.21	15.23
J707	152.76	0.00	0.00	218.30	65.54
J708	154.91	0.00	0.00	218.09	63.18
J709	205.00	0.00	0.00	233.66	28.66
J71	159.24	46.80	60.84	245.97	86.73
J710	152.02	0.00	0.00	175.12	23.10
J711	140.85	11.70	15.21	175.21	34.36
J712	107.14	4.40	5.72	169.83	62.69
J713	153.81	0.00	0.00	218.09	64.28
J714	253.43	0.00	0.00	270.21	16.78
J715	152.82	0.00	0.00	218.09	65.27
J716	205.00	36.00	46.80	233.60	28.60
J717	152.06	0.00	0.00	175.10	23.04

Node Data (25)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J718	149.10	0.00	0.00	175.12	26.02
J719	205.00	0.00	0.00	233.63	28.63
J720	148.91	0.00	0.00	175.12	26.21
J721	182.27	16.00	20.80	232.68	50.41
J722	205.00	0.00	0.00	233.63	28.63
J723	185.05	0.00	0.00	232.69	41.64
J724	184.42	12.00	15.60	218.08	33.66
J725	154.19	0.00	0.00	218.30	64.11
J726	205.00	0.00	0.00	233.63	28.63
J727	135.26	11.70	15.21	175.19	39.93
J728	132.93	0.00	0.00	175.13	42.20
J729	149.09	0.00	0.00	175.10	26.01
J73	175.90	0.00	0.00	246.18	70.28
J730	146.74	0.00	0.00	175.12	26.38
J731	144.31	12.60	16.38	175.11	30.81
J732	143.83	0.00	0.00	175.10	31.27
J733	176.81	0.00	0.00	218.10	41.29
J734	112.43	12.80	16.64	170.03	51.60
J735	237.92	20.00	26.00	319.09	81.17
J736	119.36	27.20	35.36	149.21	29.85
J737	206.36	0.00	0.00	233.59	27.24
J738	121.00	13.60	17.68	149.53	28.53
J739	237.91	0.00	0.00	319.10	81.13
J74	177.60	0.00	0.00	245.80	68.20
J740	205.00	0.00	0.00	233.63	28.63
J741	133.11	0.00	0.00	175.12	42.01
J742	122.74	0.00	0.00	150.09	27.35
J743	172.50	0.00	0.00	218.12	45.62
J744	179.53	0.00	0.00	232.69	53.16
J745	179.48	0.00	0.00	232.69	53.21
J746	172.39	12.00	15.60	218.12	45.73
J747	243.05	12.00	15.60	319.04	75.99
J748	132.85	0.00	0.00	175.12	42.26
J749	178.14	0.00	0.00	232.68	54.54
J75	259.23	0.00	0.00	302.27	43.00
J750	196.79	16.00	20.80	233.55	36.77
J751	177.68	0.00	0.00	232.68	55.00
J752	176.89	0.00	0.00	232.68	55.79
J753	176.82	0.00	0.00	232.68	55.87
J754	108.22	25.50	33.15	149.38	41.16
J755	176.69	0.00	0.00	232.68	55.99
J756	122.81	0.00	0.00	150.08	27.27
J757	122.86	5.10	6.63	150.09	27.24
J758	109.59	0.00	0.00	169.96	60.37
J759	148.88	0.00	0.00	175.10	26.22
J760	205.00	30.10	39.13	233.48	28.48
J761	122.83	0.00	0.00	150.08	27.25
J762	179.16	0.00	0.00	230.84	51.68
J763	149.02	8.10	10.53	175.14	26.12
J764	109.85	12.10	15.73	169.99	60.14
J765	243.74	0.00	0.00	319.05	75.32
J766	111.38	0.00	0.00	170.05	56.67
J767	196.66	20.00	26.00	232.85	36.18
J768	207.50	20.00	26.00	232.95	25.45
J769	132.92	0.00	0.00	175.12	42.19
J770	198.35	0.00	0.00	233.53	35.18
J771	176.08	0.00	0.00	218.12	42.04
J772	111.57	10.20	13.26	149.36	37.80
J773	175.92	0.00	0.00	218.13	42.22
J774	138.98	2.40	3.12	175.16	36.18
J775	182.02	15.60	20.28	230.25	48.23

Node Data (26)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J776	197.12	0.00	0.00	233.51	36.38
J777	141.89	0.00	0.00	175.18	33.29
J778	126.48	12.00	15.60	174.15	47.66
J779	136.83	2.10	2.73	175.16	38.33
J78	157.34	18.00	23.40	209.24	51.90
J780	171.68	0.00	0.00	218.15	46.41
J781	128.12	24.00	31.20	174.10	45.98
J782	116.86	22.30	28.99	149.36	32.50
J783	136.29	0.00	0.00	175.16	38.87
J784	125.13	0.00	0.00	174.15	49.02
J785	115.00	18.26	23.74	166.48	51.48
J786	123.89	0.00	0.00	174.15	50.26
J787	123.88	0.00	0.00	175.13	51.25
J788	179.77	22.00	28.60	232.68	52.91
J789	123.44	0.00	0.00	175.13	51.69
J79	183.16	18.20	23.66	246.38	63.22
J790	143.73	0.00	0.00	175.18	31.46
J791	119.53	0.00	0.00	149.40	29.87
J792	117.99	0.00	0.00	149.37	31.38
J793	123.18	8.50	11.05	150.11	26.92
J794	182.60	0.00	0.00	232.00	49.21
J795	120.81	0.00	0.00	149.64	28.83
J796	125.19	0.00	0.00	175.10	49.91
J797	179.12	0.00	0.00	232.68	53.55
J798	144.10	0.00	0.00	175.10	31.00
J799	162.07	0.00	0.00	218.14	56.07
J8	166.90	0.00	0.00	245.21	78.31
J80	176.40	0.00	0.00	245.81	69.41
J800	141.79	0.00	0.00	175.17	33.38
J801	120.85	13.60	17.68	148.91	28.06
J802	203.87	20.00	26.00	233.41	29.54
J803	112.16	0.00	0.00	170.07	57.91
J804	146.21	0.00	0.00	175.18	28.96
J806	141.38	2.10	2.73	175.17	33.79
J807	131.88	10.50	13.65	174.15	42.29
J808	146.18	0.00	0.00	175.10	28.92
J809	124.01	0.00	0.00	175.13	51.12
J81	151.52	29.70	38.61	209.09	57.57
J810	144.48	0.00	0.00	175.18	30.70
J811	175.94	0.00	0.00	218.15	42.20
J812	117.34	13.28	17.26	166.74	49.40
J813	159.70	14.00	18.20	218.15	58.45
J814	151.93	0.00	0.00	218.33	66.39
J815	179.90	0.00	0.00	232.68	52.78
J816	179.93	0.00	0.00	218.23	38.31
J817	145.66	0.00	0.00	175.18	29.52
J818	179.36	0.00	0.00	232.67	53.31
J819	179.80	36.00	46.80	218.23	38.44
J82	157.49	0.00	0.00	208.92	51.43
J820	179.49	0.00	0.00	232.67	53.18
J821	179.53	10.00	13.00	218.24	38.71
J822	112.31	0.00	0.00	170.04	57.67
J823	263.73	0.00	0.00	315.77	52.05
J824	244.69	12.00	15.60	315.64	70.75
J825	139.27	3.00	3.90	175.16	35.89
J826	120.64	16.60	21.58	166.48	45.84
J827	144.79	0.00	0.00	175.18	30.39
J828	154.77	0.00	0.00	218.24	63.46
J829	170.11	0.00	0.00	218.15	48.04
J83	155.74	0.00	0.00	209.24	53.50
J830	161.59	0.00	0.00	218.14	56.55

Node Data (27)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J831	167.05	0.00	0.00	218.12	51.07
J832	246.61	0.00	0.00	318.16	71.55
J833	200.00	36.55	47.51	233.41	33.41
J834	174.89	0.00	0.00	218.15	43.27
J835	145.23	0.00	0.00	175.18	29.95
J836	141.89	0.00	0.00	175.13	33.25
J837	125.41	15.00	19.50	175.08	49.68
J838	179.53	0.00	0.00	233.49	53.96
J839	143.68	0.00	0.00	175.18	31.50
J84	157.81	0.00	0.00	208.51	50.70
J840	160.55	0.00	0.00	218.14	57.60
J841	175.35	7.80	10.14	232.00	56.66
J842	145.36	4.20	5.46	175.18	29.81
J843	175.30	0.00	0.00	232.45	57.14
J844	140.88	1.50	1.95	175.13	34.26
J845	129.81	0.00	0.00	174.40	44.59
J846	143.64	0.00	0.00	175.13	31.49
J847	161.59	0.00	0.00	218.14	56.55
J848	114.34	13.28	17.26	166.59	32.25
J849	147.78	0.00	0.00	175.18	27.40
J85	163.00	18.00	23.40	245.65	82.65
J850	122.52	13.28	17.26	167.91	45.39
J851	210.00	14.00	18.20	233.32	23.32
J852	123.49	0.00	0.00	148.70	25.21
J853	123.51	0.00	0.00	150.15	26.64
J854	118.13	0.00	0.00	149.42	31.29
J855	148.22	0.00	0.00	218.09	69.87
J856	142.15	5.70	7.41	175.13	32.88
J857	143.71	0.00	0.00	175.13	31.42
J858	125.11	16.60	21.58	166.54	41.43
J859	140.73	2.40	3.12	175.11	34.39
J86	264.52	0.00	0.00	302.28	37.76
J860	175.44	28.05	36.47	218.17	42.73
J861	133.85	0.00	0.00	175.10	41.25
J862	147.59	0.00	0.00	175.18	27.58
J863	183.11	10.00	13.00	218.19	35.08
J864	142.37	0.00	0.00	175.13	32.76
J865	147.92	0.00	0.00	218.35	70.43
J866	138.34	12.60	16.38	175.14	36.80
J867	137.97	0.00	0.00	175.15	37.17
J868	121.10	0.00	0.00	174.33	41.24
J869	117.19	0.00	0.00	149.48	32.30
J87	265.34	0.00	0.00	271.93	6.60
J870	178.52	0.00	0.00	218.19	39.67
J871	183.25	10.00	13.00	233.26	50.01
J872	117.12	21.62	28.11	166.78	49.66
J873	129.96	23.24	30.21	167.25	37.29
J874	148.78	0.00	0.00	218.35	69.57
J875	142.20	0.00	0.00	175.17	32.97
J876	129.23	28.60	37.18	167.29	38.05
J877	160.83	20.00	26.00	233.13	52.30
J878	115.75	0.00	0.00	170.08	54.33
J879	149.01	0.00	0.00	218.35	69.34
J88	265.54	0.00	0.00	271.93	6.39
J880	123.67	0.00	0.00	150.18	26.51
J881	131.57	0.00	0.00	174.30	42.74
J882	267.62	0.00	0.00	315.77	48.15
J883	148.68	2.70	3.51	218.35	69.67
J884	132.47	7.50	9.75	174.30	41.84
J885	187.57	0.00	0.00	218.21	30.64
J886	140.25	0.00	0.00	175.12	34.87

Node Data (28)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J887	171.91	19.80	25.74	217.18	45.27
J888	116.98	0.00	0.00	170.15	53.17
J889	220.00	28.60	37.18	229.87	9.87
J89	170.60	0.00	0.00	246.27	75.67
J890	186.37	0.00	0.00	218.21	31.84
J891	159.92	30.00	39.00	218.14	59.12
J892	185.77	0.00	0.00	233.40	47.63
J893	230.00	34.50	44.85	283.12	53.12
J894	143.72	0.00	0.00	175.13	31.41
J895	183.99	0.00	0.00	218.22	34.23
J896	184.38	0.00	0.00	218.22	33.84
J897	121.03	16.60	21.58	167.91	46.88
J898	150.77	0.00	0.00	218.35	67.59
J899	142.97	0.00	0.00	175.13	32.21
J9	167.27	7.74	10.06	208.27	41.00
J90	151.75	0.00	0.00	209.13	57.37
J900	117.22	0.00	0.00	166.88	49.66
J901	144.77	0.00	0.00	175.12	30.35
J902	118.08	0.00	0.00	170.15	52.07
J903	130.72	12.00	15.60	174.40	44.18
J904	118.15	0.00	0.00	170.15	52.01
J905	118.26	0.00	0.00	170.15	51.90
J906	188.58	0.00	0.00	233.37	44.79
J907	145.45	0.00	0.00	175.12	29.67
J908	117.61	0.00	0.00	166.88	49.27
J909	147.38	0.00	0.00	218.35	70.97
J91	172.17	0.00	0.00	245.74	73.58
J910	150.10	0.00	0.00	218.35	68.26
J911	149.81	0.00	0.00	218.35	68.54
J912	118.55	0.00	0.00	170.15	51.60
J913	186.47	0.00	0.00	233.37	46.90
J914	120.52	20.60	26.78	148.38	27.86
J915	118.65	0.00	0.00	170.15	51.50
J916	122.70	0.00	0.00	148.52	25.92
J917	133.64	0.00	0.00	174.45	40.81
J918	144.76	0.00	0.00	175.16	30.40
J919	140.78	5.10	6.63	175.12	34.34
J92	184.24	16.40	21.32	246.51	62.27
J920	130.00	31.54	41.00	167.40	37.40
J921	230.00	0.00	0.00	283.30	53.30
J922	123.88	0.00	0.00	150.22	26.33
J923	144.37	0.00	0.00	175.13	30.76
J924	250.91	42.00	54.60	314.29	63.38
J925	119.60	0.00	0.00	170.15	50.55
J926	119.68	0.00	0.00	170.03	50.36
J927	118.46	0.00	0.00	167.00	48.54
J928	119.87	0.00	0.00	170.15	50.28
J93	265.70	22.50	29.25	302.28	36.58
J930	147.19	1.50	1.95	218.36	71.16
J931	143.55	3.30	4.29	175.13	31.78
J932	129.97	0.00	0.00	167.39	37.42
J933	125.87	13.28	17.26	166.92	41.04
J934	147.23	0.00	0.00	218.35	71.12
J935	147.04	0.00	0.00	218.35	71.32
J936	151.92	0.00	0.00	218.35	66.44
J937	147.25	2.70	3.51	175.12	27.87
J938	119.63	0.00	0.00	167.11	47.49
J939	143.09	0.00	0.00	175.13	32.05
J94	156.09	0.00	0.00	209.04	52.95
J940	127.67	21.00	27.30	174.52	46.85
J941	143.64	0.00	0.00	175.13	31.49

Node Data (29)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
J942	121.30	0.00	0.00	170.14	48.83
J943	121.33	0.00	0.00	170.14	48.81
J944	195.05	0.00	0.00	232.34	37.29
J945	121.58	0.00	0.00	170.16	48.58
J946	121.24	0.00	0.00	170.54	48.30
J947	121.63	0.00	0.00	170.03	48.41
J948	143.29	0.00	0.00	175.13	31.84
J949	108.29	11.20	14.56	172.48	64.20
J950	155.70	0.00	0.00	209.25	53.56
J951	119.00	40.00	52.00	171.22	52.22
J952	121.67	0.00	0.00	169.50	47.83
J953	115.57	0.00	0.00	171.67	56.10
J954	151.50	0.00	0.00	218.36	66.86
J955	120.50	0.00	0.00	167.51	47.01
J956	126.92	0.00	0.00	174.76	47.84
J957	198.24	24.90	32.37	275.57	77.33
J958	143.42	1.80	2.34	175.13	31.72
J959	126.14	0.00	0.00	175.03	48.89
J960	143.23	0.00	0.00	175.13	31.91
J961	267.51	0.00	0.00	271.88	4.37
J962	145.86	0.00	0.00	175.12	29.26
J963	272.64	56.00	72.80	315.81	43.16
J964	105.49	0.00	0.00	173.13	67.64
J965	230.75	23.00	29.90	280.97	50.23
J966	122.91	0.00	0.00	170.24	47.33
J967	143.54	0.00	0.00	175.13	31.59
J968	121.14	0.00	0.00	167.92	46.78
J969	145.31	0.00	0.00	175.13	29.82
J970	146.72	0.00	0.00	208.95	62.24
J971	122.25	19.92	25.90	168.92	46.66
J972	121.24	0.00	0.00	167.93	46.69
J973	203.79	14.40	18.72	232.32	28.53
J974	146.22	6.90	8.97	175.12	28.91
J975	151.08	0.00	0.00	218.32	67.24
J976	205.00	24.90	32.37	275.52	70.52
J977	144.10	3.90	5.07	175.13	31.03
J978	130.00	9.96	12.95	167.45	37.45
J979	123.02	0.00	0.00	167.70	44.68
J980	184.81	0.00	0.00	246.60	61.79
J981	151.63	10.80	14.04	218.29	66.66
J982	160.12	0.00	0.00	218.24	58.12
J983	230.00	13.80	17.94	283.66	53.66
J984	149.99	11.10	14.43	218.36	68.37
J985	160.17	33.01	42.91	218.24	58.08
J986	141.00	0.00	0.00	175.13	34.13
J987	150.15	0.00	0.00	218.36	68.20
J988	149.39	0.00	0.00	218.28	61.31
J989	151.21	27.60	35.88	218.36	68.97
J990	128.63	0.00	0.00	246.64	67.15
J991	128.00	0.00	0.00	174.52	46.52
J992	159.50	0.00	0.00	218.24	58.74
J993	160.00	0.00	0.00	218.25	58.25
J994	203.86	0.00	0.00	215.71	71.85
J995	158.97	0.00	0.00	218.27	59.30
J996	274.57	32.00	41.60	317.25	42.68
J997	227.24	34.50	44.85	278.64	51.40
J998	147.42	0.00	0.00	175.13	27.70
J999	148.81	0.00	0.00	175.13	26.31

Node Data (30)

Node ID	Elevation m	Base Demand CMD	Demand CMD	Head m	Pressure m
1	242.00	0.00	0.00	302.55	60.55
2	200.00	0.00	0.00	246.03	46.03
3	197.00	0.00	0.00	233.56	36.56
5	180.00	0.00	0.00	233.49	53.49
6	260.00	0.00	0.00	285.00	25.00
7	139.80	0.00	0.00	169.11	29.31
4	214.36	0.00	0.00	254.36	40.00
8	262.00	0.00	0.00	285.00	23.00
9	163.00	0.00	0.00	323.72	140.72
10	150.00	0.00	0.00	160.00	30.00
11	150.00	0.00	0.00	209.11	59.11
12	108.00	0.00	0.00	149.42	41.42
13	145.00	0.00	0.00	209.33	64.33
14	127.20	0.00	0.00	175.23	48.03

Pipe Data (1)

Link ID	Start	Node ID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
2	J1811	J115		213.5	250	110	6051.2	1.43	11.19
4	J70	J1000001		92.2	250	110	6240.0	1.47	11.85
5	J115	J122		41.6	250	110	3620.21	0.85	4.32
6	J122	J131		42.3	250	110	3031.7	0.71	3.11
7	J PR1+210	J129		70.0	250	110	2905.8	0.59	2.11
8	Al Marah	J1246		72.8	400	110	8009.1	0.74	1.84
P10	J1745	J1269		412.6	300	110	4863.7	0.8	2.97
P100	J1267	J1270		56.2	50	130	-22.5	0.13	0.66
P1000	J201	J203		114.0	50	110	124.0	0.73	21.2
P1001	J203	J195		104.2	100	110	114.4	0.17	0.62
P1002	J195	J192		23.9	50	110	0.0	0	0
P1003	J195	J202		61.1	100	110	114.4	0.17	0.62
P1004	J202	J200		25.3	50	110	114.4	0.67	18.27
P1005	J1733	J1732		58.4	50	110	25.4	0.15	1.12
P1006	J1733	J1718		191.6	75	130	-208.4	0.55	5.64
P1007	J1718	J1731		70.6	50	110	152.1	0.9	30.97
P1008	J1742	J1737		80.6	50	110	123.5	0.73	21.06
P1009	J1718	J1717		3.4	100	130	-331.3	0.49	3.28
P101	J1722	J1324		89.3	75	130	79.1	0.21	0.94
P1010	J1692	J1697		101.6	100	110	-8.8	0.01	0.01
P1011	J1686	J1690		70.1	100	110	24.3	0.04	0.04
P1012	J1714	J1720		32.8	50	110	0.0	0	0
P1013	J1728	J1729		3.4	50	110	0.0	0	0
P1014	J1711	J1740		267.5	75	130	92.9	0.24	1.26
P1015	J1740	J1745		54.1	50	130	46.1	0.21	2.49
P1016	J1740	J1744		79.8	50	130	0.0	0	0
P1017	J1792	J1799		106.8	150	110	155.1	0.1	0.15
P1018	J1799	J1802		66.2	150	110	135.1	0.1	0.15
P1019	J1752	J1764		82.8	150	110	463.6	0.33	1.16
P102	J1767	J1315		79.3	75	130	127.6	0.33	2.27
P1020	J1746	J1752		51.3	150	110	539.7	0.35	1.53
P1021	J1739	J1739		4.9	50	110	25.4	0.15	1.12
P1022	J1668	J1634		122.3	150	110	-192.7	0.13	0.23
P1023	J1689	J1693		8.6	150	110	-153.8	0.1	0.15
P1024	J1583	J1595		32.7	100	130	229.3	0.34	1.66
P1025	J1596	J1595		1.1	100	130	19.0	0.03	0.02
P1026	J1566	J1544		127.3	50	130	21.5	0.13	0.6
P1028	J1352	J1318		150.8	100	110	-171.3	0.25	1.32
P1029	J1352	J1390		107.9	75	130	48.9	0.13	0.38
P103	J1315	J1356		93.2	50	130	-17.1	0.1	0.39
P1030	J1390	J1415		96.0	75	130	32.1	0.08	0.18
P1031	J1415	J1449		73.6	100	130	-199.0	0.29	1.27
P1032	J1449	J1437		180.3	100	130	-199.0	0.29	1.27
P1033	J1514	J1439		189.5	100	130	-285.6	0.44	2.65
P1034	J1484	J1491		118.6	100	130	-28.6	0.04	0.04
P1035	J1491	J1508		297.9	150	110	711.4	0.47	2.56
P1036	J1448	J1468		49.4	150	110	-28.6	0.02	0.01
P1037	J1268	J789		625.9	100	130	-36.0	0.05	0.05
P1038	J789	J654		219.1	100	130	-138.5	0.21	0.65
P1039	J789	J795		98.5	100	130	102.6	0.15	0.37
P104	J1315	J1322		69.1	75	130	109.1	0.29	1.7
P1041	J526	J568		34.1	100	130	102.6	0.15	0.37
P1042	J568	J687		128.8	150	130	269.5	0.18	0.31
P1045	J696	J697		18.1	100	110	-46.4	0.07	0.12
P1048	J1100	J1122		24.3	100	110	-12.4	0.02	0.01
P105	J1383	J1322		142.3	50	110	-77.6	0.46	8.91
P1051	J192	J791		83.8	75	130	-47.2	0.12	0.36
P1052	J699	J736		51.9	75	130	-85.0	0.22	1.07
P1053	J191	J795		65.2	75	130	-167.5	0.44	3.76
P1054	J689	J738		112.6	50	110	-45.6	0.21	3.33
P1055	J1018	J922		113.7	150	130	422.4	0.28	0.71

Pipe Data (2)

Link ID	Start	Node ID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P1056	J880	J853		40.0	150	130	422.4	0.28	0.71
P1058	J1388	J1497		263.4	100	130	103.7	0.15	0.38
P1059	J1625	J1634		21.5	100	130	192.7	0.28	1.2
P106	J1383	J1411		291.7	50	110	41.0	0.24	2.73
P1060	J1628	J1510		335.4	150	110	0.0	0	0
P1061	J1486	J1497		44.8	100	130	119.4	0.18	0.49
P1062	J1497	J1625		367.7	100	130	223.1	0.33	1.57
P1063	J1080	J1035		254.6	150	110	65.0	0.04	0.03
P1065	J1217	J1218		188.5	75	130	-8.3	0.02	0.01
P1066	J1218	J1460		467.3	75	130	-21.0	0.05	0.08
P1067	J1460	J1427		236.9	100	130	-54.2	0.08	0.11
P1068	J1427	J1405		361.5	100	130	-85.3	0.13	0.27
P1069	J1427	J1256		339.7	50	130	11.6	0.07	0.19
P107	J1298	J1222		63.7	50	110	-14.3	0.08	0.30
P1070	J1227	J1220		188.3	75	130	-6.0	0.02	0.01
P1071	J600	J605		114.1	50	110	0.0	0	0
P1072	J330	J522		338.3	75	130	-70.7	0.19	0.76
P1073	J522	J573		88.8	75	130	-106.6	0.28	1.63
P1074	J573	J678		194.6	75	130	-154.1	0.4	3.22
P1075	J355	J389		76.3	50	110	15.2	0.09	0.44
P1076	J1452	J1478		56.3	50	110	-22.3	0.13	0.88
P1077	J1043	J1053		19.6	100	110	236.7	0.35	2.4
P1078	J849	J852		165.5	150	110	1007.5	0.66	4.87
P1079	J194	J1760		72.1	250	130	2617.6	0.62	1.74
P1080	J1560	J1226		86.8	200	130	1251.3	0.46	1.31
P1081	J1277	J1160		128.2	150	130	1108.0	0.41	1.05
P1082	J1160	J1163		37.3	150	130	1352.1	0.89	6.15
P1083	J1140	J1163		62.8	150	130	495.2	0.32	0.96
P1084	J1140	J1076		88.1	150	130	721.0	0.47	1.92
P1085	J1048	J1056		85.0	75	130	-6.3	0.02	0.01
P1086	J1048	J1000		53.8	100	130	44.8	0.07	0.03
P1087	J1028	J1049		76.7	100	130	26.6	0.04	0.03
P1088	J1049	J1058		38.9	75	130	-14.1	0.04	0.04
P1089	J1049	J1071		90.5	100	130	40.7	0.06	0.07
P109	J151	J141		46.2	50	130	9.1	0.05	0.12
P1090	J1071	J1116		64.5	100	130	-66.8	0.1	0.17
P1091	J1071	J1216		128.8	75	130	107.5	0.28	1.65
P1092	J1216	J1212		116.1	75	130	94.6	0.25	1.3
P1093	J1212	J1279		104.0	75	130	-134.0	0.35	2.49
P1094	J1116	J1222		142.8	100	130	-113.7	0.17	0.45
P1095	J1089	J1087		23.0	75	130	-48.4	0.13	0.38
P1096	J1056	J1087		58.7	75	130	-39.1	0.1	0.25
P1097	J1087	J1109		47.9	75	130	-118.7	0.31	1.99
P1098	J1181	J1222		104.0	150	130	476.6	0.31	0.89
P1099	J1048	J1055		163.5	150	130	637.9	0.42	1.53
P110	J1151	J1153		35.0	100	130	172.4	0.25	0.88
P1100	J1083	J1070		107.9	50	130	-30.9	0.18	1.19
P1101	J1076	J1048		53.5	150	130	676.4	0.44	1.7
P1102	J1055	J989		77.2	150	130	598.4	0.39	1.36
P1103	J989	J986		87.5	200	110	128.4	0.05	0.03
P1104	J1055	J1057		107.6	50	130	39.5	0.23	1.86
P1105	J821	J984		586.7	150	110	-13.0	0.01	0
P1106	J815	J788		116.6	100	110	0.0	0	0
P1107	J1019	J993		30.7	50	110	-32.4	0.19	1.76
P1108	J767	J768		191.3	150	110	-307.3	0.2	0.64
P111	J153	J141		144.1	100	130	172.4	0.25	0.88
P1110	J937	J972		45.3	50	110	-3.5	0.02	0.03
P1111	J865	J874		27.2	200	110	0.0	0	0
P1112	J849	J817		56.8	50	110	0.0	0	0
P1113	J710	J718		46.2	100	110	0.0	0	0
P1114	J715	J713		15.6	50	110	0.0	0	0

Pipe Data (3)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1115	J613	J664	132.1	100	110	0.0	0.0	0
P1116	J620	J616	39.3	50	110	0.0	0.0	0
P1117	J551	J548	9.0	150	110	0.0	0.0	0
P1118	J504	J498	17.9	75	110	0.0	0.0	0
P1119	J597	J580	94.6	50	110	-15.6	0.09	0.46
P112	J1171	J1158	153.9	50	130	-22.1	0.13	0.64
P1120	J839	J918	112.4	150	130	186.4	0.12	0.16
P1121	J918	J1051	177.0	150	130	186.4	0.12	0.16
P1122	J1051	J1078	88.5	200	110	144.9	0.05	0.03
P1123	J748	J769	37.6	50	110	0.0	0.0	0
P1124	J1133	J1215	117.6	200	110	146.2	0.05	0.03
P1125	J1133	J1107	38.6	100	130	0.1	0.0	0
P1126	J1108	J1104	3.1	500	130	-13.2	0.08	0.25
P1127	J1107	J1074	43.2	100	130	-13.2	0.02	0.01
P1128	J1074	J1124	70.4	50	110	0.0	0.0	0
P1129	J1074	J1010	107.0	100	130	-24.9	0.04	0.03
P113	J1158	J1143	34.3	100	130	86.2	0.13	0.27
P1130	J1010	J985	23.7	100	130	-44.7	0.07	0.08
P1131	J985	J917	124.9	50	130	1.9	0.01	0.01
P1132	J985	J867	172.5	100	130	-46.6	0.07	0.09
P1133	J867	J783	99.8	100	130	-63.1	0.09	0.15
P1134	J783	J727	135.1	100	130	73.9	0.11	0.2
P1135	J727	J657	129.5	100	130	-89.1	0.13	0.29
P1136	J657	J711	134.8	200	110	332.5	0.12	0.15
P1137	J523	J526	4.5	100	130	269.5	0.4	2.23
P1138	J515	J485	61.2	150	130	-427.9	0.28	0.73
P1139	J452	J434	48.7	150	130	-468.4	0.31	0.66
P114	J1177	J1143	112.6	75	130	-86.2	0.23	1.1
P1140	J348	J134	834.7	100	130	74.2	0.11	0.21
P1141	J344	J348	6.6	50	130	-63.9	0.38	4.54
P1142	J260	J246	38.5	150	110	-843.3	0.55	3.5
P1143	J260	J226	71.1	75	130	253.4	0.66	8.1
P1144	J226	J201	71.1	75	130	211.4	0.55	5.79
P1145	J201	J191	57.5	75	130	189.3	0.51	4.72
P1146	J191	J161	159.8	75	130	90.9	0.24	1.21
P1147	J161	J136	164.6	75	130	90.9	0.24	1.21
P1148	J133	J134	389.0	75	130	60.9	0.16	0.58
P1149	J187	J193	61.8	50	110	-22.1	0.13	0.87
P115	J1072	J1177	290.3	50	130	-42.0	0.25	2.09
P1150	J736	J791	93.0	75	130	-120.3	0.32	2.04
P1151	J671	J681	151.4	50	110	-64.1	0.38	6.25
P1152	J834	J891	104.1	75	130	26.3	0.07	0.12
P1153	J840	J891	92.8	75	130	12.7	0.03	0.03
P1154	J177	J179	2.7	150	110	2112.2	1.38	19.18
P1155	J180	J167	69.7	150	110	-454.8	0.3	1.12
P1156	J182	J183	4.3	50	110	0.0	0.0	0
P1157	J186	J185	4.0	150	110	-446.2	0.29	1.08
P1158	J199	J173	83.6	50	110	0.0	0.0	0
P1159	J168	J145	124.9	250	110	-464.7	0.11	0.1
P116	J1177	J1093	149.6	50	130	13.3	0.08	0.25
P1160	J322	J212	274.6	100	110	-88.5	0.13	0.59
P1161	J320	J212	276.0	250	110	-28.1	0.01	0
P1162	J494	J492	2.7	50	110	0.0	0.0	0
P1163	J518	J516	2.7	50	110	0.0	0.0	0
P1164	J321	J310	19.2	150	110	-101.4	0.07	0.07
P1165	J352	J364	77.6	75	130	-39.3	0.1	0.26
P1166	J352	J309	83.7	50	110	-68.0	0.4	6.98
P1167	J295	J286	85.4	150	130	-754.0	0.49	2.08
P1168	J272	J309	76.7	50	110	68.0	0.4	6.98
P1169	J286	J281	40.5	50	130	68.0	0.4	5.11
P117	J1264	J1267	81.7	50	130	-17.2	0.1	0.4

Pipe Data (4)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1170	J237	J222	101.2	150	110	-1073.1	0.7	5.47
P1171	J237	J267	61.6	150	130	872.7	0.57	2.73
P1172	J134	J29	611.4	100	130	79.4	0.12	0.23
P1173	J59	J134	414.2	50	130	-11.4	0.07	0.19
P1174	J86	J75	82.0	75	130	22.9	0.06	0.09
P1175	J75	J121	181.6	75	130	22.9	0.06	0.09
P1176	J121	J194	331.9	75	130	1.5	0	0
P1177	J194	J206	59.0	75	130	-23.8	0.04	0.02
P1178	J206	J236	100.6	100	130	-23.8	0.04	0.02
P1179	J206	J204	15.4	75	130	-0.1	0	0
P118	J1219	J267	67.5	75	130	122.3	0.32	2.1
P1180	J204	J211	141.7	75	130	-12.8	0.03	0.03
P1181	J204	J232	195.1	50	130	12.7	0.07	0.23
P1182	J232	J251	109.8	50	130	-27.6	0.16	0.96
P1183	J251	J290	112.2	150	110	-113.9	0.07	0.19
P1184	J211	J214	82.6	75	130	-31.3	0.08	0.17
P1185	J223	J251	75.1	150	110	-86.3	0.06	0.05
P1186	J218	J223	17.8	150	110	-29.3	0.02	0.01
P1187	J214	J223	81.0	75	130	-57.0	0.15	0.51
P1188	J214	J184	99.2	50	130	-25.7	0.15	0.46
P1189	J211	J181	91.7	50	130	18.5	0.11	0.46
P119	J1552	J1614	147.1	50	110	-19.5	0.11	0.69
P1190	J181	J184	68.7	50	130	18.5	0.11	0.46
P1191	J216	J284	184.2	75	130	-46.8	0.12	0.35
P1192	J284	J273.1	273.1	75	130	-58.2	0.15	0.53
P1193	J623	J661	70.3	150	110	149.9	0.1	0.14
P1194	J617	J650	180.7	50	110	-9.5	0.06	0.11
P1195	J473	J486	108.2	200	110	843.8	0.31	0.86
P1196	J423	J460	153.0	200	110	258.9	0.1	0.1
P1197	J402	J400	5.0	150	110	0.0	0	0
P1198	J416	J410	78.2	150	110	-316.4	0.21	0.57
P12	J88	J96	28.0	400	110	8097.5	0.75	1.88
P120	J1614	J1637	58.5	50	110	0.0	0	0
P1200	J500	J487	11.3	100	110	-20.0	0.03	0.02
P1201	J403	J414	34.8	150	130	627.0	0.41	1.48
P1202	J414	J423	15.9	150	130	386.5	0.25	0.6
P1203	J414	J481	118.9	150	130	240.5	0.16	0.25
P1204	J481	J491	69.4	150	130	240.5	0.16	0.25
P1205	J491	J561	143.5	75	130	40.3	0.11	0.27
P1206	J491	J560	179.6	150	130	183.4	0.12	0.15
P1207	J560	J623	167.3	150	130	154.3	0.1	0.11
P1208	J617	J623	4.2	50	130	9.5	0.06	0.08
P1209	J697	J645	170.6	150	110	-36.3	0.02	0.01
P121	J1614	J1648	102.6	50	110	13.0	0.08	0.33
P1210	J540	J508	93.3	150	110	-266.7	0.17	0.42
P1211	J453	J438	113.2	150	110	-52.2	0.03	0.02
P1212	J216	J254	184.5	50	130	28.1	0.17	0.99
P1213	J254	J276	207.7	70	130	7.8	0.05	0.09
P1214	J276	J339	179.3	50	130	-14.1	0.08	0.28
P1215	J339	J439	185.1	50	130	-35.9	0.21	1.56
P1216	J439	J412	146.6	75	130	56.2	0.15	0.5
P1217	J534	J474	110.8	150	110	-110.1	0.07	0.08
P1218	J534	J647	350.5	50	130	-57.2	0.34	0.7
P1219	J646	J5007	222.3	150	110	-98.7	0.06	0.07
P122	J1651	J1656	46.8	50	110	-17.2	0.1	0.54
P1220	J423	J442	226.2	100	130	127.7	0.19	0.56
P1221	J462	J470	61.1	100	130	233.7	0.34	1.72
P1222	J462	J470	32.9	200	110	0.0	0	0
P1223	J442	J391	121.4	100	130	295.1	0.43	2.67
P1224	J450	J450	128.1	50	130	42.9	0.25	2.14
P1225	J450	J391	85.3	50	130	19.5	0.11	0.5

Pipe Data (5)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1226	J391	J372	69.5	100	130	304.2	0.45	2.8
P1227	J376	J359	40.3	250	110	173.9	0.04	0.02
P1228	J360	J335	61.2	75	130	130.3	0.34	2.36
P1229	J287	J319	67.1	75	130	67.9	0.18	0.71
P123	J1630	J1638	14.0	50	110	0.0	0	0
P1230	J359	J377	38.1	250	110	241.8	0.06	0.03
P1231	J347	J345	5.1	100	130	210.6	0.31	1.41
P1232	J345	J376	40.5	100	110	0	0	0
P1233	J96	J217	498.0	250	110	1857.5	0.44	1.21
P1234	J217	J388	715.4	250	110	1857.5	0.44	1.21
P1236	J475	J473	7.1	200	130	843.8	0.31	0.63
P1237	J550	J533	116.1	50	130	330	0.2	1.4
P1238	J533	J486	78.4	150	130	-33.8	0.49	2.78
P1239	J528	J525	80.8	50	130	-36.4	0.21	1.6
P124	J1556	J1657	6.5	50	110	-17.2	0.11	0.54
P1240	J719	J726	5.4	150	130	509.7	0.33	1.01
P1241	J70	J776	15.9	50	130	36.3	0.21	1.59
P1242	J726	J760	93.0	75	130	104.3	0.27	1.56
P1243	J851	J833	202.3	50	130	-18.2	0.11	0.44
P1244	J399	J409	50.7	150	130	645.7	0.42	1.56
P1245	J434	J381	90.3	100	130	138.1	0.2	0.65
P1246	J409	J429	38.7	150	130	645.7	0.42	1.56
P1248	J318	J334	56.7	50	110	-25.9	0.15	1.16
P1249	J384	J375	51.1	150	130	639.6	0.42	1.54
P125	J1611	J1651	77.8	50	110	0	0	0
P1250	J375	J365	28.1	150	110	-1283.0	0.84	7.62
P1251	J384	J389	50.0	150	130	639.6	0.42	1.54
P1252	J282	J230	223.2	50	130	-25.9	0.15	0.85
P1253	J230	J191	145.1	50	110	-54.2	0.32	4.58
P1254	J122	J119	4.4	200	130	588.5	0.42	0.32
P1255	J124	J126	3.8	150	110	25.3	0.02	0
P1256	J119	J120	6.7	50	130	43.1	0.25	2.19
P1257	J120	J116	28.0	50	110	56.7	0.33	4.98
P1258	J98	J13	50.5	150	110	-520.1	0.34	1.43
P1259	J63	J74	93.8	50	110	-18.7	0.11	0.64
P126	J1667	J1667	65.8	50	110	28.2	0.17	1.46
P1260	J30	J31	32.4	50	110	0	0	0
P1261	J12	J13	16.2	100	110	-307.2	0.45	3.89
P1262	J26	J30	65.6	50	110	0	0	0
P1263	J19	J23	54.7	75	110	0	0	0
P1264	J22	J25	33.2	75	110	0	0	0
P1265	J11	J12	157.7	100	110	-159.0	0.23	1.15
P1266	J149	J139	105.4	250	110	-2567.0	0.61	2.29
P1267	J46	J48	47.4	50	110	-32.8	0.19	1.8
P1268	J135	J140	86.7	200	130	741.2	0.21	0.5
P1269	J140	J156	260.6	200	130	614.3	0.23	0.35
P127	J1664	J1680	58.9	50	110	0	0	0
P1270	J156	J141	73.7	150	110	532.4	0.35	1.49
P1271	J140	J112	127.1	100	130	126.9	0.19	0.55
P1272	J99	J98	42.4	150	110	-520.1	0.34	1.43
P1273	J106	J100	89.8	150	110	-520.1	0.34	1.43
P1274	J48	J54	54.0	50	110	-32.8	0.19	1.8
P1275	J103	J95	30.0	150	110	448.9	0.29	1.09
P1276	J37	J47	104.8	75	130	34.5	0.09	0.2
P1277	J47	J51	71.2	75	130	34.5	0.09	0.2
P1278	J51	J60	79.9	75	130	-18.4	0.05	0.06
P1279	J114	J108	90.3	75	130	80.4	0.21	0.96
P128	J1680	J1681	5.6	50	110	3.2	0.02	0.02
P1280	J81	J60	100.1	75	130	41.8	0.11	0.29
P1281	J90	J81	41.5	75	130	80.4	0.21	0.97
P1282	J08	J90	126.6	75	130	80.4	0.21	0.96

Pipe Data (6)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1283	J60	J68	43.5	50	130	23.4	0.14	0.71
P1284	J68	J97	103.6	50	130	23.4	0.14	0.71
P1285	J97	J102	34.7	50	130	23.4	0.14	0.71
P1286	J27	J14	225.4	75	130	93.9	0.25	1.29
P1287	J14	J21	229.9	50	130	28.0	0.16	0.88
P1288	J14	J7	79.9	50	130	10.1	0.06	0.15
P1289	J14	J9	240.4	50	130	45.8	0.27	2.46
P129	J1298	J1360	123.0	50	110	14.3	0.08	0.39
P1290	J1803	J1809	289.4	75	110	48.0	0.13	0.51
P1292	J1266	J1262	19.1	200	130	9.8	0.36	0.83
P1293	J1707	J1708	4.7	150	110	-13.0	0.01	0
P1294	J1708	J1701	29.5	150	110	-31.9	0.02	0.01
P1295	J1675	J1669	26.1	150	110	-382.0	0.25	0.81
P1296	J1679	J1685	50.7	50	110	0.7	0	0
P1297	J1710	J1691	72.0	50	110	-9.0	0.05	0.16
P1298	J1649	J1651	10.8	50	110	0	0	0
P1299	J1508	J1521	119.3	50	110	-15.7	0.09	0.46
P13	J1384	J1276	212.9	250	110	2703.5	0.64	2.43
P130	J1407	J1436	141.0	100	110	0.0	0	0
P1300	J1482	J1462	118.3	100	110	-27.3	0.04	0.04
P1301	J1520	J1515	25.1	75	110	-38.2	0.1	0.33
P1302	J1297	J1280	48.4	50	110	0.0	0	0
P1303	J1675	J1676	1.2	150	130	382.0	0.25	0.6
P1304	J1676	J1683	52.1	150	130	400.3	0.26	0.64
P1305	J1683	J1717	128.9	100	130	331.3	0.49	3.28
P1306	J1681	J1660	188.5	75	130	-63.2	0.17	0.62
P1307	J1660	J1645	18.9	75	130	-118.4	0.31	1.98
P1308	J1645	J1619	110.4	75	130	-24.5	0.06	0.11
P1309	J1619	J1624	8.1	75	130	22.0	0.06	0.09
P131	J1519	J1528	56.9	50	110	0.0	0	0
P1310	J1619	J1618	11.2	75	130	-69.9	0.18	0.74
P1311	J1614	J1645	77.8	75	130	93.9	0.25	1.29
P1312	J1614	J1530	247.0	100	130	-160.2	0.24	0.85
P1313	J1530	J1494	175.8	100	130	-209.6	0.31	1.4
P1314	J1494	J1506	96.0	100	130	-340.9	0.5	3.45
P1315	J1558	J1559	4.2	75	130	127.8	0.33	2.28
P1316	J1551	J1533	51.5	100	110	-172.0	0.25	1.33
P1317	J679	J686	184.8	50	110	69.2	0.41	7.19
P1318	J1309	J1351	74.9	75	130	-4.6	0.01	0
P1319	J1351	J1301	164.8	75	130	-42.7	0.11	0.3
P132	J1558	J1551	51.3	100	110	-172.0	0.25	1.33
P1320	J1328	J1327	2.5	50	110	11.0	0.07	0.24
P1321	J86	J83	16.5	75	130	-22.9	0.06	0.09
P1322	J1276	J1024	1085.9	250	110	1725.1	0.41	1.06
P1323	J1717	J1719	10.2	50	130	0.0	0	0
P1324	J1543	J1586	115.5	50	130	-25.5	0.15	0.83
P1325	J1426	J1466	72.7	50	110	0	0	0
P1326	J1036	J1001	37.1	150	130	1040.8	0.68	3.79
P1327	J1001	J962	162.0	150	110	1022.0	0.67	5
P1328	J1176	J1177	3.0	100	110	119.3	0.18	0.68
P1329	J904	J888	73.7	150	110	0.0	0	0
P1330	J904	J912	10.7	50	110	12.1	0.07	0.29
P1331	J905	J904	2.4	150	110	12.1	0.07	0.29
P1332	J754	J772	243.1	75	130	18.1	0.05	0.06
P1333	J869	J869	186.1	50	110	-21.5	0.13	0.82
P1334	J792	J854	58.7	50	110	-21.5	0.13	0.82
P1335	J119	J133	310.9	75	130	80.9	0.21	0.98
P1336	J119	J124	25.6	200	130	545.4	0.2	0.28
P1338	J485	J452	99.4	150	130	-468.4	0.31	0.86
P1339	J429	J380	90.1	50	110	39.1	0.23	2.51
P134	J1503	J1517	62.1	50	110	-26.0	0.15	1.18

Pipe Data (7)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P1340	J429	J434	5.3	150	130	606.6	0.4	1.39
P1341	J454	J454	78.6	50	110	29.7	0.17	1.5
P1342	J360	J376	92.3	75	130	173.9	0.46	4.03
P1343	J335	J287	90.1	75	130	96.5	0.25	1.35
P1344	J319	J359	82.8	75	130	67.9	0.18	0.71
P1345	J347	J323	44.7	250	110	0.0	0.0	0
P1346	J412	J433	37.0	150	110	-238.6	0.16	0.34
P1347	J726	J737	53.4	150	130	405.4	0.27	0.66
P1349	J160	J633	106.0	75	130	65.1	0.17	0.65
P135	J1496	J1513	66.9	50	110	-20.8	0.12	0.78
P1350	J1000	J1028	72.0	100	130	44.8	0.07	0.08
P1351	J1109	J1140	58.6	75	130	-135.9	0.36	2.55
P1352	J1058	J1089	47.0	75	130	-48.4	0.13	0.38
P1353	J1163	J1181	52.9	150	130	485.2	0.32	0.96
P1354	J1226	J1277	77.2	200	130	1251.3	0.46	1.31
P1355	J1070	J1076	74.9	50	130	-44.6	0.26	2.34
P1356	J1356	J1374	77.4	50	130	-36.8	0.22	1.64
P1357	J1161	J1158	142.1	100	130	134.8	0.21	0.62
P1358	J1270	J1222	49.8	50	130	-39.4	0.23	1.86
P1359	J1324	J1374	104.0	75	130	62.2	0.16	0.6
P136	J1517	J1513	36.8	100	110	423.5	0.62	7.05
P1360	J1253	J1327	118.3	75	130	-59.5	0.16	0.55
P1361	J1379	J1351	154.0	75	130	-38.1	0.1	0.24
P1362	J1263	J1309	144.7	50	130	17.8	0.1	0.43
P1363	J1301	J1251	105.3	75	130	-42.7	0.11	0.3
P1364	J1187	J1184	78.9	150	130	-291.5	0.19	0.36
P1365	J1242	J1251	99.8	50	130	18.3	0.11	0.45
P1366	J1085	J1147	135.2	50	130	-52.5	0.31	3.16
P1367	J1737	J1735	53.9	50	110	58.5	0.34	5.28
P1368	J1731	J1742	106.4	50	110	152.1	0.9	30.97
P1369	J1729	J1729	49.9	50	110	0.0	0	0
P137	J1506	J1493	44.6	100	110	0.0	0	0
P1370	J1725	J1727	99.8	50	110	8.8	0.05	0.16
P1371	J1724	J1725	93.0	50	110	24.3	0.14	1.04
P1372	J1704	J1699	66.5	100	110	-108.3	0.16	0.56
P1373	J1699	J1695	55.9	100	110	-108.3	0.16	0.56
P1374	J1703	J1704	28.3	100	110	-75.1	0.11	0.29
P1375	J1716	J1715	61.2	50	110	11.1	0.07	0.24
P1376	J1670	J1672	71.8	50	110	8.8	0.05	0.16
P1377	J1885	J1710	76.8	50	110	0.7	0	0
P1378	J1691	J1678	74.9	50	110	-9.0	0.05	0.16
P1379	J1678	J1654	92.6	50	110	-22.0	0.13	0.86
P138	J1402	J1367	131.2	150	110	-55.9	0.04	0.02
P1380	J1687	J1707	67.4	150	110	-13.0	0.01	0
P1382	J1682	J1681	28.4	150	110	-31.9	0.02	0.01
P1383	J1667	J1680	82.3	50	110	3.2	0.02	0.02
P1384	J1638	J1656	19.9	50	110	0.0	0	0
P1385	J1662	J1657	27.7	50	110	-34.3	0.2	1.97
P1386	J1631	J1644	49.6	50	110	-20.0	0.12	0.72
P1387	J1605	J1603	16.1	50	110	0.0	0	0
P1388	J1594	J1604	64.1	50	110	-22.9	0.13	0.93
P1389	J1560	J1594	90.4	50	110	-22.9	0.13	0.93
P1390	J1755	J1756	79.5	50	110	-48.1	0.28	3.67
P1391	J1719	J1781	50.9	50	110	-27.3	0.16	1.29
P1392	J1780	J1782	48.5	50	110	-25.4	0.15	1.12
P1393	J1767	J1761	91.0	50	110	21.5	0.13	0.82
P1394	J1760	J1769	43.6	100	110	-36.4	0.05	0.08
P1395	J1797	J1783	209.6	50	110	-25.4	0.15	1.12
P1396	J1806	J1797	198.1	50	110	-25.4	0.15	1.12
P1397	J1806	J1807	193.7	50	110	-25.4	0.15	1.12
P1398	J1783	J1762	115.1	50	110	-25.4	0.15	1.12

Pipe Data (8)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P1399	J1809	J1808	399.3	50	110	48.0	0.28	3.65
P14	J1757	J1758	4.5	150	130	0.0	0	0
P140	J1701	J1682	62.6	150	110	-31.9	0.02	0.01
P1400	J1785	J1792	74.8	150	110	182.1	0.12	0.2
P1401	J1764	J1774	56.4	150	110	463.6	0.3	1.16
P1402	J1736	J1746	86.6	150	110	539.7	0.35	1.53
P1403	J1711	J1709	2.48	150	110	-700.3	0.46	2.48
P1404	J1693	J1694	46.3	150	110	-153.8	0.1	0.15
P1405	J1490	J1534	145.1	50	110	27.3	0.16	1.29
P1406	J1722	J1726	63.3	100	110	-42.3	0.06	0.1
P1407	J1576	J1580	284.7	75	110	32.8	0.09	0.25
P1408	J1580	J1579	149.6	75	110	32.8	0.09	0.25
P1409	J1397	J1370	116.1	50	110	1.3	0.01	0
P141	J1681	J1677	5.5	150	110	0.0	0	0
P1410	J1347	J1368	97.1	50	110	-20.0	0.12	0.72
P1411	J1318	J1271	160.3	100	110	-217.1	0.32	2.04
P1412	J1320	J1271	105.2	150	110	477.1	0.31	1.22
P1413	J1303	J1299	2.4	50	130	0.0	0	0
P1414	J1299	J1320	61.0	150	110	-286.0	0.19	0.47
P1415	J1371	J1437	155.6	100	130	-104.0	0.15	0.38
P1416	J1673	J1601	160.7	50	110	-24.3	0.14	1.04
P1418	J1581	J1600	49.0	75	110	-58.9	0.15	0.74
P1419	J1610	J1600	83.6	50	110	-56.0	0.33	4.87
P142	J1669	J1671	35.5	50	110	0.0	0	0
P1420	J1591	J1618	75.6	50	110	38.3	0.23	2.41
P1421	J1588	J1570	54.3	50	110	-57.6	0.34	5.12
P1422	J1569	J1574	32.3	50	110	107.0	0.63	16.13
P1423	J1538	J1546	31.3	50	110	14.9	0.09	0.42
P1424	J1556	J1540	40.0	50	110	14.9	0.09	0.42
P1425	J1518	J1529	22.2	50	110	48.7	0.29	3.76
P1426	J1526	J1517	45.2	100	110	449.5	0.66	7.87
P1427	J1522	J1526	58.2	100	110	449.5	0.66	7.87
P1428	J1528	J1533	68.6	50	110	0.0	0	0
P1429	J1505	J1500	34.4	50	110	0.0	0	0
P143	J1638	J1639	11.2	50	110	0.0	0	0
P1430	J1483	J1485	32.9	100	110	0.0	0	0
P1431	J1489	J1504	75.9	50	110	104.0	0.61	15.32
P1432	J1417	J1402	50.4	100	110	-55.9	0.08	0.17
P1433	J1462	J1445	60.2	100	110	-27.3	0.04	0.04
P1434	J1445	J1417	63.2	100	110	-55.9	0.08	0.17
P1435	J1412	J1385	88.5	50	110	0.0	0	0
P1436	J1385	J1385	90.9	50	110	0.0	0	0
P1437	J1406	J1382	71.6	50	110	-30.0	0.18	1.53
P1438	J1432	J1406	71.2	50	110	-30.0	0.18	1.53
P1439	J1457	J1470	30.0	50	110	0.0	0	0
P144	J1559	J1569	57.4	50	110	127.8	0.75	22.42
P1440	J1444	J1457	28.7	50	110	0.0	0	0
P1441	J1479	J1470	32.7	50	110	-25.7	0.15	1.15
P1442	J1424	J1423	0.7	150	130	0.0	0	0
P1443	J1423	J1416	23.4	150	110	0.0	0	0
P1444	J1416	J1414	12.3	150	110	0.0	0	0
P1445	J1451	J1443	25.8	50	110	0.0	0	0
P1446	J1509	J1521	58.9	150	110	605.1	0.4	1.89
P1447	J1337	J1291	76.8	200	110	-142.5	0.27	0.88
P1448	J1348	J1336	99.1	50	110	-24.3	0.14	1.04
P1449	J1357	J1348	77.9	50	110	0.0	0	0
P145	J1574	J1591	57.9	50	110	64.3	0.38	6.29
P1450	J1381	J1357	67.2	50	110	0.0	0	0
P1451	J1409	J1381	106.5	50	110	0.0	0	0
P1452	J1349	J1354	78.8	50	110	0.0	0	0
P1453	J1349	J1316	56.1	100	110	-143.5	0.21	0.95

Pipe Data (9)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1454	J1294	J1281	26.7	100	110	-286.5	0.42	3.42
P1455	J1316	J1284	36.0	100	110	-286.5	0.42	3.42
P1456	J1313	J1306	155.9	100	110	-59.8	0.09	0.19
P1457	J1413	J1373	155.6	100	110	-59.8	0.09	0.19
P1458	J1434	J1413	152.2	100	110	-59.8	0.09	0.19
P1459	J1436	J1434	253.1	100	110	-16.9	0.02	0.02
P1460	J1618	J1632	61.7	50	110	0.0	0.0	0
P1461	J1330	J1328	93.1	50	110	-5.0	0.03	0.05
P1462	J1213	J1239	80.4	50	110	-10.5	0.06	0.22
P1463	J1249	J1245	56.4	50	110	-41.7	0.25	2.82
P1464	J1243	J1249	30.6	50	110	-25.7	0.15	1.15
P1465	J1204	J1188	67.9	50	110	-26.7	0.16	1.23
P1466	J1228	J1204	88.4	50	110	-8.7	0.05	0.16
P1467	J1188	J1193	2.3	50	110	-26.7	0.16	1.23
P1468	J1531	J1516	173.2	100	110	64.9	0.1	0.22
P1469	J1516	J1469	186.3	100	110	1.2	0	0
P1470	J1618	J1588	62.2	50	110	-31.6	0.19	1.68
P1471	J1425	J1455	118.4	75	110	-75.5	0.34	5.17
P1472	J1765	J1762	116.3	50	110	-57.5	0.34	5.1
P1473	J944	J913	227.5	50	110	-57.5	0.34	5.1
P1474	J797	J753	31.3	50	110	18.7	0.11	0.64
P1475	J723	J677	126.2	150	110	-86.3	0.06	0.05
P1476	J685	J659	73.7	150	110	-78.7	0.05	0.04
P1477	J677	J658	55.2	100	110	-28.6	0.04	0.05
P1478	J745	J723	42.3	150	110	-78.7	0.05	0.04
P1479	J744	J685	47.7	150	110	-78.7	0.05	0.04
P1480	J1574	J1570	107.0	100	110	-28.6	0.04	0.05
P1481	J721	J749	55.6	50	110	42.7	0.25	2.94
P1482	J788	J755	40.1	200	110	7.6	0	0
P1483	J984	J961	98.4	100	110	-28.6	0.04	0.05
P1484	J981	J919	1.4	100	130	46.8	0.07	0.09
P1485	J994	J992	592.4	150	110	46.8	0.03	0.02
P1486	J992	J984	108.1	150	110	155.6	0.1	0.15
P1487	J1060	J1046	58.7	150	110	155.6	0.1	0.15
P1488	J1005	J1046	143.9	50	110	-2.8	0.02	0
P1489	J1102	J1185	112.1	50	110	-80.1	0.3	3.95
P1490	J877	J906	126.7	50	110	-59.8	0.35	5.5
P1491	J768	J877	61.5	100	110	389.7	0.57	6.04
P1492	J885	J863	332.2	150	110	-359.3	0.24	0.72
P1493	J870	J860	287.4	150	110	-333.3	0.22	0.63
P1494	J975	J960	70.8	50	110	13.0	0.08	0.33
P1495	J910	J879	54.5	150	110	265.6	0.17	0.41
P1496	J983	J1017	71.6	50	110	14.0	0.08	0.38
P1497	J909	J930	65.6	200	110	68.3	0.03	0.01
P1498	J972	J1011	119.4	200	110	31.7	0.01	0
P1499	J972	J1011	27.9	100	110	-17.3	0.03	0.02
P1500	J1506	J1512	31.2	50	110	0.0	0	0
P1501	J1016	J999	57.5	50	110	-3.5	0.02	0.03
P1502	J997	J1021	18.3	50	110	48.7	0.29	3.76
P1503	J998	J997	21.4	50	110	0.0	0	0
P1504	J998	J1047	64.0	100	110	30.3	0.04	0.05
P1505	J1215	J1258	24.6	50	110	9.6	0.06	0.19
P1506	J1112	J1108	0.6	50	110	-41.4	0.06	0.2
P1507	J1090	J1063	58.9	100	110	143.1	0.05	0.03
P1508	J1152	J1128	89.4	200	110	-13.2	0.08	0.34
P1509	J1099	J1084	14.5	50	110	0.0	0	0
			26.4	50	110	-7.7	0.05	0.12
			73.0	50	110	-11.8	0.07	0.27

Pipe Data (10)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P151	J1512	J1518	43.7	50	110	48.7	0.29	3.76
P1510	J1038	J1074	52.9	50	110	-11.8	0.07	0.27
P1511	J1038	J1010	105.9	50	110	-11.2	0.07	0.25
P1512	J1340	J1339	14.6	150	110	74.9	0.05	0.04
P1513	J1311	J1340	115.2	150	110	74.9	0.05	0.04
P1514	J1221	J1170	168.7	100	110	67.9	0.1	0.24
P1515	J1169	J1123	57.8	50	110	37.7	0.22	2.34
P1516	J1059	J1170	142.8	100	110	8.7	0.01	0.01
P1517	J855	J840	42.9	50	110	60.7	0.36	5.65
P1518	J868	J840	101.5	50	110	-33.4	0.2	1.87
P1519	J1111	J1101	147.9	50	110	-55.9	0.33	4.86
P152	J1529	J1538	34.1	50	110	48.7	0.29	3.76
P1520	J861	J769	107.1	100	110	-46.4	0.07	0.12
P1521	J648	J741	152.4	50	110	0.0	0	0
P1522	J667	J594	129.7	100	110	-132.8	0.21	0.82
P1523	J559	J594	114.1	200	110	582.5	0.21	0.43
P1524	J632	J619	30.9	150	110	0.0	0	0
P1525	J711	J700	158.9	200	110	317.3	0.12	0.14
P1526	J839	J827	80.5	200	110	91.2	0.03	0.01
P1527	J903	J817	107.9	50	110	-15.6	0.09	0.46
P1528	J781	J884	161.0	50	110	-13.4	0.08	0.35
P1529	J807	J884	117.8	50	110	-27.1	0.16	1.27
P153	J1546	J1556	18.6	50	110	14.9	0.09	0.42
P1530	J784	J778	68.5	50	110	0.0	0	0
P1531	J763	J720	81.8	100	110	75.2	0.11	0.29
P1532	J759	J729	70.2	50	110	0.0	0	0
P1533	J877	J835	42.5	200	110	91.2	0.03	0.01
P1534	J673	J636	67.6	100	110	36.8	0.05	0.08
P1535	J634	J628	53.2	100	110	-4.3	0.01	0
P1536	J635	J639	76.0	50	110	0.0	0	0
P1537	J628	J614	67.8	100	110	0.0	0	0
P1538	J628	J569	111.5	100	110	20.7	0.03	0.03
P1539	J670	J628	84.1	100	110	44.9	0.07	0.11
P1540	J669	J729	83.9	50	110	0.0	0	0
P1541	J569	J537	69.3	100	110	20.7	0.03	0.03
P1542	J563	J588	54.5	100	110	-3.6	0.01	0
P1543	J563	J566	37.7	50	110	0.0	0	0
P1544	J588	J619	64.4	100	110	-3.6	0.01	0
P1545	J589	J571	68.3	50	110	1.1	0.01	0
P1546	J595	J590	55.9	50	110	0.0	0	0
P1547	J553	J563	46.6	50	110	-3.8	0.02	0.03
P1548	J547	J558	52.4	75	110	0.0	0	0
P1549	J546	J529	86.2	50	110	1.1	0.01	0
P155	J1537	J1676	350.8	50	110	38.2	0.23	2.4
P1550	J558	J541	30.0	75	110	0.0	0	0
P1551	J541	J519	37.0	75	110	0.0	0	0
P1557	J457	J476	159.0	50	110	0.0	0	0
P1558	J458	J453	66.0	150	110	85.6	0.06	0.05
P1559	J401	J390	64.3	50	110	6.9	0.04	0
P156	J1643	J1641	30.0	50	110	0.0	0	0
P1560	J377	J352	72.5	50	110	-49.9	0.29	3.92
P1561	J366	J378	89.6	75	130	-39.3	0.1	0.26
P1562	J281	J272	53.1	50	130	68.0	0.4	5.11
P1563	J267	J286	64.8	150	130	872.7	0.57	2.73
P1564	J364	J366	5.7	75	130	-39.3	0.1	0.25
P1565	J476	J484	51.3	50	110	0.0	0	0
P1566	J478	J465	82.9	150	110	116.5	0.08	0.09
P1567	J505	J497	50.3	150	110	-424.1	0.28	0.98
P157	J1636	J1633	26.3	50	110	0.0	0	0
P1570	J381	J348	102.5	100	130	138.1	0.2	0.65
P1571	J380	J344	103.7	50	110	-18.3	0.11	0.82

Pipe Data (11)

Link ID	Start L	NodeID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1572	J334	J344	J344	68.0	50	110	-25.9	0.15	1.16
P1573	J306	J295	J295	65.0	50	110	0.0	0.0	0.0
P1574	J308	J318	J318	68.9	50	110	10.3	0.06	0.21
P1575	J340	J295	J295	81.1	150	110	-1343.9	0.88	8.3
P1576	J362	J327	J327	72.4	50	110	-21.0	0.12	0.79
P1577	J365	J340	J340	56.5	150	110	-1343.9	0.88	8.3
P1578	J338	J327	J327	36.6	50	110	3.0	0.02	0.02
P1579	J461	J431	J431	66.5	150	110	-574.4	0.38	1.72
P1580	J1623	J1621	J1621	31.6	50	110	0.0	0.0	0.0
P1581	J431	J387	J387	41.6	150	110	-574.4	0.38	1.72
P1582	J451	J428	J428	29.7	100	110	-13.3	0.02	0.01
P1583	J269	J269	J269	61.7	150	110	-589.9	0.39	1.81
P1584	J246	J246	J246	46.7	150	110	-843.3	0.35	3.5
P1585	J193	J201	J201	56.4	50	110	-22.1	0.13	0.87
P1586	J222	J207	J207	103.0	150	110	-1121.7	0.73	5.94
P1587	J207	J198	J198	65.0	50	110	-1121.7	0.73	5.94
P1588	J173	J163	J163	58.2	150	110	0.0	0.0	0.0
P1589	J163	J153	J153	85.1	50	110	-22.4	0.13	0.89
P1590	J1615	J1613	J1613	24.4	50	110	0.0	0.0	0.0
P1591	J583	J605	J605	119.2	150	130	183.0	0.12	0.15
P1592	J536	J520	J520	141.6	50	110	0.0	0.0	0.0
P1593	J587	J578	J578	81.8	50	110	13.7	0.08	0.36
P1594	J535	J535	J535	144.6	50	110	-17.8	0.1	0.58
P1595	J578	J573	J573	128.4	50	110	20.7	0.12	0.77
P1596	J681	J699	J699	115.4	50	110	47.4	0.28	3.58
P1597	J477	J538	J538	9.1	50	110	9.7	0.06	0.19
P1598	J564	J596	J596	73.0	50	110	0.0	0.0	0.0
P1599	J1041	J1175	J1175	198.0	50	130	-48.0	0.28	3.66
P1600	J1313	J1302	J1302	16.4	50	110	-4.4	0.03	0.04
P1601	J692	J672	J672	111.5	50	110	19.9	0.12	0.72
P1602	J738	J756	J756	89.8	50	110	-63.3	0.37	6.11
P1603	J916	J852	J852	141.8	50	110	-26.8	0.16	1.24
P1604	J852	J801	J801	167.6	50	110	-26.8	0.16	1.24
P1605	J853	J793	J793	58.0	150	130	422.4	0.28	0.71
P1606	J801	J793	J793	122.9	75	130	-167.5	0.44	3.17
P1607	J795	J854	J854	81.7	50	150	-21.5	0.13	0.82
P1608	J1022	J1041	J1041	31.5	50	110	-48.0	0.28	3.66
P1609	J1022	J1041	J1041	31.5	50	110	-48.0	0.28	3.66
P1610	J1536	J1560	J1560	75.5	50	110	0.0	0.0	0.0
P1611	J1302	J1223	J1223	122.9	50	110	-4.4	0.03	0.04
P1612	J1248	J1223	J1223	99.3	150	110	258.9	0.17	0.39
P1613	J199	J1180	J1180	46.8	150	110	188.2	0.12	0.22
P1614	J922	J890	J890	55.6	150	130	422.4	0.28	0.71
P1615	J1095	J1018	J1018	124.2	150	130	448.9	0.29	0.8
P1616	J1345	J1262	J1262	130.3	150	110	-250.7	0.16	0.37
P1617	J1220	J1213	J1213	117.4	50	110	-3.6	0.02	0.03
P1618	J1213	J1180	J1180	148.3	50	110	-24.4	0.14	1.04
P1619	J833	J858	J858	125.8	50	110	43.1	0.25	3
P1620	J848	J908	J908	22.2	50	110	0.0	0.0	0.0
P1621	J872	J938	J938	106.6	50	110	-41.0	0.24	2.74
P1622	J897	J850	J850	80.9	100	110	17.3	0.03	0.02
P1623	J979	J979	J979	140.0	50	110	60.4	0.36	5.6
P1624	J858	J826	J826	69.9	50	110	21.6	0.13	0.83
P1625	J826	J785	J785	82.6	50	110	0.0	0.0	0.0
P1626	J954	J968	J968	38.2	50	110	-86.4	0.51	10.86
P1627	J785	J848	J848	109.7	50	110	-23.8	0.14	0.99

Pipe Data (12)

Link ID	Start L	NodeID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1628	J977	J938	J938	42.1	50	110	-41.0	0.24	2.74
P1629	J978	J920	J920	130.9	75	110	41.0	0.11	0.38
P1630	J1604	J1603	J1603	2.1	50	110	-22.9	0.13	0.93
P1631	J932	J1015	J1015	116.5	100	110	30.2	0.18	1.55
P1632	J1037	J1043	J1043	48.3	50	110	236.7	0.35	2.4
P1633	J970	J1007	J1007	129.0	100	110	422.3	0.62	7.01
P1634	J766	J734	J734	98.2	50	110	10.0	0.06	0.2
P1635	J112	J758	J758	98.2	50	110	-27.2	0.18	1.28
P1636	J758	J803	J803	84.9	50	110	-27.2	0.18	1.27
P1637	J872	J764	J764	91.5	50	110	15.7	0.09	0.46
P1638	J1179	J1146	J1146	88.8	50	110	-22.9	0.13	0.93
P1639	J1142	J1265	J1265	333.4	50	110	74.9	0.44	8.34
P1640	J1588	J1585	J1585	70.9	50	110	-7.2	0.04	0.11
P1641	J1015	J1052	J1052	67.8	50	110	-30.2	0.18	1.55
P1642	J951	J970	J970	67.7	100	110	448.2	0.66	7.83
P1643	J760	J716	J716	75.0	100	110	448.2	0.66	7.83
P1644	J716	J802	J802	76.3	50	110	-14.3	0.08	0.39
P1645	J802	J833	J833	87.6	50	110	26.6	0.16	1.22
P1646	J719	J709	J709	13.5	150	110	-612.4	0.4	1.94
P1647	J605	J604	J604	116.4	150	110	-646.2	0.42	2.14
P1648	J604	J533	J533	161.2	150	110	-646.2	0.42	2.14
P1649	J525	J533	J533	11.9	50	130	-65.0	0.38	4.69
P1650	J1542	J1548	J1548	56.8	50	110	-14.3	0.08	0.39
P1651	J580	J525	J525	133.1	50	110	-15.6	0.09	0.46
P1652	J618	J618	J618	65.5	150	110	26.0	0.02	0.01
P1653	J656	J627	J627	70.1	50	110	15.6	0.09	0.46
P1654	J702	J691	J691	46.4	150	110	41.9	0.03	0.01
P1655	J691	J714	J714	35.8	150	110	41.9	0.03	0.01
P1656	J714	J706	J706	23.8	150	110	41.9	0.03	0.01
P1657	J598	J561	J561	124.6	50	110	-15.2	0.09	0.43
P1658	J551	J555	J555	108.7	100	110	-225.7	0.33	2.2
P1659	J517	J466	J466	79.3	100	110	-23.2	0.03	0.03
P1660	J503	J517	J517	63.9	100	110	6.8	0.01	0
P1661	J474	J412	J412	139.7	150	110	-124.2	0.08	0.1
P1662	J460	J462	J462	88.8	200	110	233.7	0.09	0.08
P1663	J350	J294	J294	99.2	150	110	192.9	0.13	0.23
P1664	J385	J367	J367	165.3	150	110	154.2	0.1	0.15
P1665	J367	J316	J316	129.4	150	110	154.2	0.1	0.15
P1666	J313	J294	J294	121.1	150	110	-139.9	0.09	0.13
P1667	J290	J242	J242	102.6	150	110	-126.2	0.08	0.1
P1668	J316	J242	J242	213.4	150	110	134.7	0.09	0.12
P1669	J490	J499	J499	96.3	200	110	57.2	0.02	0.01
P1670	J1547	J1550	J1550	13.8	50	110	0.0	0	0
P1671	J386	J496	J496	146.5	50	110	0.0	0	0
P1672	J175	J218	J218	142.4	150	110	54.6	0.08	0.16
P1673	J147	J175	J175	165.0	150	110	-132.8	0.09	0.11
P1674	J137	J139	J139	6.9	250	110	3031.7	0.71	3.11
P1675	J138	J132	J132	32.3	150	110	-11.7	0.01	0
P1676	J132	J138	J138	14.9	150	110	-11.7	0.01	0
P1677	J142	J145	J145	15.9	250	110	464.7	0.11	0
P1678	J1548	J1545	J1545	19.4	50	110	-14.3	0.08	0.39
P1679	J131	J137	J137	32.3	250	110	3031.7	0.71	3.11
P1680	J113	J124	J124	50.7	150	110	-520.1	0.34	7.91
P1681	J641	J610	J610	110.2	50	110	72.8	0.43	7.43
P1682	J625	J591	J591	58.4	150	110	65.0	0.04	0.03

Pipe Data (13)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P1685	J773	J746	57.6	150	110	202.8	0.13	0.25
P1686	J771	J743	57.7	50	110	0.0	0.0	0
P1687	J733	J724	48.6	50	110	15.6	0.09	0.46
P1688	J840	J830	9.3	50	110	0.0	0.0	0
P1689	J828	J813	52.7	50	110	30.9	0.18	1.62
P169	J1553	J1562	33.1	50	110	-10.0	0.06	0.2
P1690	J813	J840	26.4	50	110	12.7	0.07	0.31
P1691	J663	J713	87.9	50	110	0.0	0.0	0
P1692	J664	J701	69.9	100	110	0.0	0.0	0
P1693	J690	J662	65.4	50	110	0.0	0.0	0
P1694	J704	J662	74.8	150	110	171.6	0.11	0.18
P1695	J575	J575	27.7	150	110	0.0	0.0	0
P1696	J549	J510	75.5	75	110	26.0	0.07	0.16
P1697	J543	J511	57.3	150	110	0.0	0.0	0
P1698	J432	J422	42.2	150	110	49.2	0.03	0.02
P17	J1776	J1788	189.7	50	130	9.8	0.06	0.14
P170	J1562	J1563	4.9	50	110	-10.0	0.06	0.2
P1700	J130	J135	101.5	200	130	741.2	0.27	0.5
P1701	J70	J96	60.4	250	110	6240.0	1.47	11.45
P1702	J87	J88	2.9	400	110	8097.5	0.75	1.88
P1704	J70	J16	63.8	100	110	164.1	0.24	1.22
P1705	J65	J39	153.9	150	110	306.2	0.2	0.54
P1706	J61	J41	144.5	50	110	119.3	0.7	19.76
P1707	J41	J38	89.4	50	110	119.3	0.7	19.76
P1708	J82	J66	104.7	50	110	23.4	0.14	0.97
P1709	J33	J44	60.2	50	110	63.2	0.37	6.09
P171	J1578	J1562	49.2	50	110	0.0	0.0	0
P1710	J32	J43	62.2	50	110	58.5	0.34	5.28
P1711	J126	J141	138.0	100	110	91.8	0.14	0.42
P1712	J105	J83	120.1	75	110	23.4	0.06	0.13
P1713	J67	J56	117.6	75	110	-80.8	0.16	0.79
P1714	J73	J89	73.1	150	110	-487.4	0.32	1.27
P1715	J89	J106	92.8	150	110	-487.4	0.32	1.27
P1716	J91	J80	66.2	50	110	-23.4	0.14	0.97
P1717	J1420	J1426	177.2	50	110	-105.8	0.62	15.81
P1718	J1492	J1543	175.1	50	110	-25.5	0.15	1.13
P1719	J1502	J1590	274.4	50	110	-20.7	0.12	0.77
P172	J1549	J1545	39.9	50	110	0.0	0.0	0
P1720	J1481	J1472	107.6	50	110	34.6	0.2	1.99
P1721	J1393	J1453	123.4	50	110	-30.7	0.18	1.6
P1722	J1401	J1452	98.6	50	110	-22.3	0.13	0.86
P1723	J1233	J1289	61.1	50	110	0.0	0.0	0
P1724	J1177	J1162	63.7	50	110	0.0	0.0	0
P1725	J1244	J1310	124.2	100	110	119.3	0.18	0.68
P1726	J1224	J1287	103.9	50	110	61.1	0.36	5.72
P1727	J1216	J1278	92.7	50	110	45.8	0.27	3.35
P1728	J1214	J1278	135.3	50	110	-41.6	0.25	2.8
P1729	J1283	J1278	31.4	50	110	-87.4	0.52	11.09
P173	J1567	J1572	29.5	50	110	0.0	0.0	0
P1730	J1042	J1094	160.4	50	110	25.0	0.15	1.09
P1731	J962	J949	129.2	150	110	1022.0	0.67	5
P1732	J928	J905	27.6	150	110	22.9	0.02	0
P1733	J1118	J1035	145.7	50	110	-13.8	0.08	0.37
P1734	J1295	J1287	55.7	50	110	-115.2	0.68	18.52
P1735	J1317	J1364	90.7	50	110	56.2	0.3	4.89
P1736	J1288	J1288	92.2	150	110	-24.3	0.02	0.01
P1738	J1323	J1329	15.1	200	110	-1826.3	0.67	3.49
P174	J1573	J1572	6.5	50	110	0.0	0.0	0
P1742	J584	J1050	718.1	75	130	0.0	0.0	0
P1744	J876	J1103	318.6	100	130	-82.9	0.12	0.25
P1745	J579	J876	483.4	50	130	-27.2	0.16	0.93

Pipe Data (14)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P1746	J876	J556	51.7	50	130	18.6	0.11	0.46
P1747	J611	J739	260.8	75	130	275.6	0.72	9.46
P1748	J592	J585	158.4	150	130	420.2	0.28	0.71
P175	J1572	J1571	1.4	50	110	0.0	0.0	0
P1750	J661	J1038	289.6	75	130	-143.0	0.37	2.81
P1751	J1038	J872	321.2	75	130	-178.9	0.46	4.16
P1753	J735	J698	62.1	50	130	15.0	0.09	0.33
P1754	J735	J765	98.1	50	130	15.6	0.09	0.33
P1755	J765	J747	48.0	50	130	15.6	0.09	0.33
P1756	J861	J924	444.9	50	130	54.6	0.32	3.4
P1757	J824	J882	395.3	50	130	-15.6	0.09	0.33
P1759	J514	J642	236.9	50	130	41.6	0.25	2.05
P176	J1612	J1593	36.0	50	110	0.0	0.0	0
P1760	J514	J666	395.7	50	130	36.4	0.21	1.6
P1761	J682	J213	1114.3	100	130	230.4	0.34	1.67
P1762	J1525	J1541	144.4	75	130	52.0	0.14	0.43
P1763	J1541	J1483	420.4	75	130	52.0	0.14	0.43
P1764	J1483	J1475	125.2	50	130	26.0	0.15	0.86
P1765	J1483	J1454	98.8	50	130	26.0	0.15	0.86
P1766	J1454	J1447	114.6	50	130	26.0	0.15	0.86
P1767	J1454	J1421	56.3	50	130	0.0	0.0	0
P1768	J213	J248	621.9	100	130	213.2	0.31	1.43
P1769	J248	J356	226.7	50	130	28.6	0.17	1.03
P177	J1592	J1593	41.8	50	110	0.0	0.0	0
P1770	J248	J177	490.0	75	130	132.6	0.35	2.44
P1771	J117	J127	309.1	50	130	10.4	0.06	0.16
P1772	J117	J28	402.5	75	130	85.8	0.22	1.09
P1773	J28	J24	103.0	50	130	39.0	0.23	1.82
P1774	J1575	J1734	591.2	100	130	75.4	0.11	0.21
P1775	J688	J372	6.1	200	130	0.0	0.0	0
P1776	J372	J360	19.8	100	130	304.2	0.45	2.8
P1777	J895	J832	442.7	50	130	-41.6	0.25	2.05
P178	J1593	J1582	89.4	50	110	-25.7	0.15	0.49
P1781	J1801	J1802	157.1	75	110	-47.3	0.12	0.49
P1782	J1081	J1206	191.7	50	130	0.0	0.0	0
P1783	J1206	J1212	50.1	50	130	31.5	0.19	1.22
P1785	J1217	J1230	64.9	50	130	-43.0	0.25	2.18
P1787	J1569	J1665	307.9	75	110	31.2	0.08	0.23
P1788	J1665	J1629	82.9	75	110	0.0	0.0	0
P1789	J1628	J1589	282.0	75	110	-31.2	0.08	0.23
P179	J1494	J1489	102.3	50	110	111.8	0.66	17.51
P1790	J1284	J1168	178.6	100	110	-10.4	0.02	0.01
P1791	J1168	J1182	64.4	100	110	27.0	0.04	0.04
P1792	J1062	J1086	117.7	100	110	128.8	0.19	0.78
P1793	J1208	J1202	94.6	50	130	11.3	0.07	0.18
P1794	J1137	J1155	79.1	50	130	-30.0	0.18	1.12
P1795	J331	J392	128.5	150	110	0.0	0.0	0
P1796	J392	J440	61.3	150	110	73.4	0.05	0.04
P1797	J440	J469	89.1	150	110	0.0	0.0	0
P1798	J976	J1019	77.1	50	110	-32.4	0.19	1.76
P1799	J1025	J1033	72.7	50	110	-64.7	0.38	6.37
P18	J1765	J1784	210.5	50	130	37.1	0.22	1.66
P180	J1467	J1444	61.9	50	110	0.0	0.0	0
P1800	J864	J1088	446.9	50	110	-22.6	0.13	0.9
P1801	J889	J775	165.2	50	110	-37.2	0.22	2.28
P1803	J1172	J982	300.2	50	130	62.8	0.37	4.4
P1804	J882	J921	152.9	50	130	44.9	0.26	2.36
P1805	J1567	J1721	353.8	50	110	0.0	0.0	0
P1806	J1584	J1564	46.8	50	110	0.0	0.0	0
P1807	J1587	J1525	181.6	100	110	-73.3	0.11	0.27
P1808	J1525	J1511	326.3	150	110	-125.3	0.08	0.1

Pipe Data (15)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P1809	J1433	J1465	94.1	150	110	0.0	0.0	0
P181	J1477	J1479	45.7	50	110	0.0	0.0	0
P1811	J1136	J1138	2.4	150	130	844.7	0.55	2.57
P1812	J1138	J1069	94.6	150	110	844.7	0.55	3.51
P1813	J1069	J1178	290.6	150	110	125.3	0.08	0.1
P1814	J1178	J1197	19.6	150	130	125.3	0.08	0.08
P1815	J1197	J1511	669.6	150	110	125.3	0.08	0.1
P1816	J415	J436	18.6	200	130	652.2	0.24	0.39
P1817	J203	J416	224.2	50	110	-11.4	0.07	0.26
P1818	J285	J289	165.0	50	110	11.4	0.07	0.26
P1819	J279	J278	19.6	50	110	0.0	0.0	0
P182	J1470	J1476	61.1	50	110	-25.7	0.15	1.15
P1820	J285	J284	36.4	50	130	-11.4	0.07	0.19
P1821	J680	J676	29.8	150	130	98.7	0.06	0.05
P1822	J676	J240	1053.3	200	110	98.7	0.04	0.02
P1823	J240	J15	1062.1	200	110	83.7	0.03	0.03
P1824	J694	J1069	617.7	150	110	-719.4	0.47	2.61
P1825	J694	J655	123.2	150	130	719.4	0.47	1.91
P1826	J1	J2	208.6	50	110	0.0	0.0	0
P1827	J1	J3	315.0	50	110	-95.8	0.51	10.73
P1829	J16	J10	152.3	100	110	131.1	0.19	0.8
P183	J1435	J1440	24.2	50	110	0.0	0.0	0
P1830	J1185	J1335	443.0	150	130	657.8	0.43	1.62
P1832	J1377	J1532	594.2	150	130	652.6	0.43	1.6
P1833	J10	J27	715.1	150	110	131.1	0.09	0.11
P1834	J27	J40	295.6	150	110	0.0	0.0	0
P1835	J1325	J1342	24.2	150	110	267.9	0.18	0.42
P1837	J1000006	J1194	3.4	300	110	-4901.0	0.8	3.01
P1839	J1200	J1190	19.1	350	110	7518.6	0.9	3.14
P184	J1442	J1443	13.1	50	110	0.0	0.0	0
P1841	J1000004	J388	7.7	250	110	-884.0	0.21	0.31
P1842	J388	J403	36.8	200	130	973.5	0.36	0.82
P1843	J419	J406	17.8	75	110	0.0	0.0	0
P1844	J496	J426	157.5	75	110	-33.8	0.09	0.27
P1845	J115	J1000002	6.3	250	110	2431.0	0.57	2
P1846	J129	J130	8.1	200	130	741.2	0.27	0.5
P1847	J129	J1000003	78.9	250	110	1764.6	0.42	1.1
P1849	J174	J198	76.2	200	130	1764.7	0.65	2.48
P185	J1456	J1451	22.6	50	110	0.0	0.0	0
P1851	J71	J67	36.8	75	110	-60.8	0.16	0.79
P1852	J1384	J1408	367.5	250	110	-2703.5	0.64	2.43
P1853	J1289	J1332	117.9	300	110	4883.7	0.8	2.97
P1854	J1293	J1299	21.2	150	110	0.0	0.0	0
P1855	J1332	J1408	543.0	250	110	2703.5	0.64	2.43
P1856	J1332	J1334	5.6	200	130	2160.2	0.8	3.61
P1857	J1334	J1320	35.7	150	130	763.1	0.51	2.13
P1858	J1334	J1438	274.8	200	130	1397.1	0.51	1.61
P186	J1443	J1440	5.3	50	110	0.0	0.0	0
P187	J1464	J1450	33.2	50	110	0.0	0.0	0
P188	J1440	J1450	37.4	50	110	0.0	0.0	0
P189	J1555	J1662	43.0	50	110	-34.3	0.21	1.97
P19	J1784	J1789	108.9	50	130	37.1	0.22	1.66
P190	J1655	J1652	1.7	50	110	20.0	0.12	0.72
P191	J1659	J1652	5.3	50	110	0.0	0.0	0
P192	J1659	J1640	36.9	50	110	0.0	0.0	0
P193	J1663	J1661	20.4	50	110	0.0	0.0	0
P194	J1659	J1661	1.7	50	110	0.0	0.0	0
P195	J1647	J1646	1.0	150	110	0.0	0.0	0
P196	J1645	J1661	15.9	50	110	0.0	0.0	0
P197	J1655	J1653	0.8	50	110	0.0	0.0	0
P198	J1658	J1653	8.6	50	110	0.0	0.0	0

Pipe Data (16)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P199	J1642	J1653	14.2	50	110	0.0	0.0	0
P2	J1246	J1252	60.8	400	110	8009.1	0.74	1.84
P20	J1789	J1796	205.7	50	130	21.5	0.13	0.6
P200	J1627	J1644	40.2	50	110	0.0	0.0	0
P201	J1644	J1652	6.2	50	110	-20.0	0.12	0.72
P202	J1620	J1631	31.3	50	110	0.0	0.0	0
P204	J1537	J1523	40.5	50	110	-38.2	0.23	2.4
P205	J1499	J1515	60.9	50	110	0.0	0.0	0
P206	J1501	J1487	48.4	50	110	0.0	0.0	0
P207	J1480	J1487	33.2	50	110	0.0	0.0	0
P208	J1487	J1488	6.2	50	110	0.0	0.0	0
P209	J1515	J1424	224.7	75	110	-38.2	0.1	0.33
P21	J1788	J1787	107.5	50	130	9.8	0.06	0.14
P210	J1424	J1392	82.2	75	110	-73.6	0.19	1.12
P211	J1422	J1429	107.1	50	110	-35.4	0.21	2.08
P212	J1471	J1429	84.7	50	110	0.0	0.0	0
P213	J1429	J1424	10.0	50	110	-35.4	0.21	2.08
P214	J1544	J1540	41.7	50	110	21.5	0.13	0.82
P216	J1366	J1367	11.6	150	110	55.9	0.04	0.02
P217	J1459	J1412	129.5	50	110	0.0	0.0	0
P218	J921	J893	57.2	50	110	44.9	0.26	3.23
P219	J175	J159	39.9	50	110	0.0	0.0	0
P22	J175	J159	97.2	75	130	-46.0	0.12	0.34
P220	J818	J843	20.8	50	110	86.3	0.51	10.85
P221	J818	J843	64.3	50	110	-67.6	0.4	6.9
P222	J843	J944	170.4	50	110	18.7	0.11	0.64
P223	J1280	J1277	14.4	100	110	-143.2	0.21	0.95
P224	J1280	J1254	188.0	50	110	74.3	0.44	8.22
P226	J1249	J1250	8.6	50	110	16.0	0.09	0.48
P227	J1188	J1173	30.2	50	110	0.0	0.0	0
P228	J887	J1005	255.5	50	110	-25.7	0.15	1.15
P229	J887	J1046	74.1	50	110	52.8	0.31	4.37
P23	J1759	J1751	73.3	75	130	-46.0	0.12	0.34
P230	J1057	J1060	136.1	50	110	39.5	0.23	2.54
P231	J1307	J1260	139.0	50	110	0.0	0.0	0
P232	J1306	J1286	88.2	200	110	1048.2	0.39	1.29
P233	J1286	J1255	50.9	200	110	280.0	0.1	0.11
P234	J1353	J1296	133.3	50	110	-30.0	0.18	1.53
P235	J1308	J1296	58.0	50	110	0.0	0.0	0
P236	J1326	J1327	51.9	50	110	-32.9	0.19	1.82
P237	J1328	J1250	177.7	50	110	-16.0	0.09	0.48
P238	J1419	J1409	79.3	50	110	0.0	0.0	0
P239	J1336	J1337	1.1	50	110	24.3	0.14	1.05
P24	J1770	J1748	163.4	50	130	-25.4	0.15	0.82
P241	J1392	J1382	22.7	100	110	-73.6	0.11	0.28
P242	J1392	J1365	45.4	100	110	-143.5	0.21	0.95
P243	J1365	J1355	24.2	100	110	-143.5	0.21	0.95
P244	J1358	J1355	30.3	50	110	0.0	0.0	0
P245	J1355	J1349	24.5	100	110	-143.5	0.21	0.95
P246	J1312	J1294	35.0	50	110	0.0	0.0	0
P247	J1303	J1341	60.0	50	110	0.0	0.0	0
P248	J1222	J1255	67.4	150	110	307.1	0.2	0.54
P249	J1255	J1281	66.3	150	110	587.1	0.38	1.79
P25	J1758	J1281	208.2	75	130	-51.5	0.14	0.42
P251	J1260	J1279	48.4	100	110	-88.7	0.13	0.39
P252	J1259	J1279	30.5	50	110	0.0	0.0	0
P253	J1279	J5005	32.3	100	110	0.0	0.0	0
P254	J1563	J1514	197.6	100	130	-295.6	0.44	2.85
P256	J1598	J1598	1.5	150	110	348.3	0.23	0.68
P257	J1599	J1609	70.1	100	110	0.0	0.0	0
P258	J1596	J1597	3.8	150	110	-19.0	0.01	0

Pipe Data (17)

Link ID	Start	NodeID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	Unithread loss m/km
P259	J1597	J1598	J1598	6.7	150	110	-363.1	0.24	0.74
P260	J1751	J1750	J1750	68.1	75	130	-128.7	0.34	2.31
P261	J1695	J1688	J1688	13.2	150	110	-108.3	0.07	0.08
P262	J1688	J1599	J1599	213.0	150	110	-348.3	0.23	0.68
P263	J1014	J987	J987	46.5	150	110	434.1	0.28	1.02
P264	J887	J984	J984	68.4	150	110	155.6	0.1	0.15
P265	J818	J870	J870	8.8	150	110	0.0	0	0
P266	J897	J896	J896	129.4	150	110	278.6	0.18	0.45
P267	J981	J981	J981	117.6	150	110	0.0	0	0
P268	J819	J816	J816	5.8	100	110	0.0	0	0
P269	J688	J721	J721	92.1	200	110	28.4	0.01	0
P270	J749	J751	J751	3.9	150	110	7.6	0	0
P271	J1750	J1748	J1748	30.2	50	130	25.4	0.15	0.82
P272	J752	J751	J751	14.0	200	110	-7.6	0	0
P273	J515	J559	J559	106.8	200	110	582.5	0.21	0.43
P274	J1274	J1132	J1132	204.9	108	110	54.6	0.08	0.16
P275	J654	J650	J650	80.4	200	110	449.7	0.17	0.27
P276	J650	J650	J650	45.5	150	110	0.0	0	0
P277	J650	J657	J657	75.5	200	110	421.6	0.16	0.24
P278	J777	J790	J790	63.5	100	110	-39.7	0.06	0.09
P279	J842	J839	J839	43.5	200	110	277.6	0.1	0.11
P280	J853	J862	J862	55.3	200	110	0.0	0	0
P281	J1750	J1743	J1743	70.6	200	110	-82.3	0.03	0.01
P282	J777	J800	J800	45.8	75	130	-154.1	0.4	3.22
P283	J1014	J1012	J1012	2.5	150	110	-434.1	0.06	0.09
P284	J1008	J1006	J1006	18.7	200	110	-434.1	0.28	1.02
P285	J986	J983	J983	85.4	200	110	-434.1	0.16	0.25
P286	J1017	J930	J930	45.8	200	110	-434.1	0.28	1.03
P287	J1017	J1045	J1045	113.4	200	110	19.2	0.01	0
P288	J1047	J1051	J1051	16.1	200	110	-41.4	0.02	0
P289	J1386	J1361	J1361	62.7	100	110	8.2	0.01	0
P290	J1743	J1733	J1733	95.2	75	130	-154.1	0.4	3.22
P291	J1361	J1361	J1361	51.8	100	110	-130.5	0.19	0.8
P292	J731	J901	J901	95.9	100	110	-122.4	0.18	0.71
P293	J801	J960	J960	242.9	100	110	-22.8	0.03	0.03
P294	J807	J901	J901	76.3	100	110	-22.8	0.03	0.03
P295	J860	J974	J974	43.2	150	110	0.0	0	0
P296	J1366	J1396	J1396	20.3	150	110	-22.8	0.01	0
P297	J1404	J1396	J1396	39.0	100	110	-31.8	0.05	0.06
P298	J1396	J1396	J1396	73.2	150	110	662.3	0.43	2.24
P299	J1396	J1398	J1398	21.4	150	110	0.0	0	0
P300	J1398	J1399	J1399	14.1	150	110	662.3	0.43	2.24
P301	J1399	J1430	J1430	6.2	350	110	7488.0	0.9	3.12
P302	J1428	J1423	J1423	3.3	150	110	662.3	0.43	2.24
P303	J1430	J1436	J1436	73.6	150	110	662.3	0.43	2.24
P304	J1484	J1468	J1468	30.8	150	110	0.0	0	0
P305	J1430	J1450	J1450	68.1	150	110	28.6	0.02	0.01
P306	J1450	J1476	J1476	33.8	150	110	662.3	0.43	2.24
P307	J1476	J1488	J1488	56.9	150	110	630.8	0.41	2.05
P308	J1488	J1509	J1509	45.3	150	110	605.1	0.4	1.89
P309	J1115	J1091	J1091	48.5	150	110	605.1	0.4	1.89
P310	J1115	J1560	J1563	62.4	100	130	262.9	0.39	2.13
P311	J1563	J1571	J1571	44.1	150	110	533.6	0.35	1.5
P312	J1571	J1571	J1571	16.3	150	110	523.6	0.34	1.45
P313	J1582	J1585	J1585	28.4	150	110	523.5	0.34	1.45
P314	J1585	J1603	J1603	8.8	150	110	497.8	0.33	1.32
P315	J1603	J1613	J1613	46.8	150	110	490.7	0.32	1.28

Pipe Data (18)

Link ID	Start	NodeID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	Unithread loss m/km
P316	J1613	J1621	J1621	17.1	150	110	467.8	0.31	1.18
P317	J1621	J1633	J1633	24.8	150	110	467.8	0.31	1.18
P318	J1633	J1641	J1641	24.2	150	110	467.8	0.31	1.18
P319	J1641	J1657	J1657	15.6	150	110	467.8	0.31	1.18
P320	J1657	J1669	J1669	14.4	150	110	467.8	0.31	1.18
P321	J1669	J1688	J1688	240.8	100	130	262.9	0.39	2.13
P322	J1688	J1723	J1723	35.2	150	110	-382.0	0.25	0.81
P323	J1723	J1736	J1736	58.3	150	110	-718.2	0.42	2.6
P324	J1736	J1773	J1773	3.3	150	110	0.0	0	0
P325	J1773	J1800	J1800	16.1	200	110	768.2	0.28	0.73
P326	J1800	J1804	J1804	201.8	150	110	344.0	0.23	0.67
P327	J1804	J1814	J1814	4.6	150	110	-240.1	0.16	0.34
P328	J1814	J1821	J1821	76.4	100	110	-42.3	0.06	0.1
P329	J1821	J1831	J1831	58.9	150	110	563.3	0.37	1.66
P330	J1831	J1845	J1845	54.2	100	110	281.5	0.41	3.31
P331	J1845	J1857	J1857	147.2	100	110	7.8	0.01	0
P332	J1857	J1868	J1868	58.8	100	130	237.9	0.35	1.77
P333	J1868	J1874	J1874	103.7	150	110	182.1	0.12	0.2
P334	J1874	J1882	J1882	41.0	75	110	107.8	0.28	2.27
P335	J1882	J1893	J1893	206.9	150	110	-153.8	0.1	0.15
P336	J1893	J1907	J1907	274.4	150	110	121.2	0.08	0.1
P337	J1907	J1915	J1915	22.6	150	110	-121.2	0.08	0.1
P338	J1915	J1928	J1928	75	110	110	45.8	0.12	0.46
P339	J1928	J1931	J1931	185.7	100	110	28.6	0.04	0.05
P340	J1931	J1945	J1945	250.5	150	110	-158.5	0.1	0.16
P341	J1945	J1957	J1957	170.5	150	110	-85.3	0.06	0.05
P342	J1957	J1968	J1968	109.4	150	110	-248.8	0.16	0.37
P343	J1968	J1974	J1974	56.5	100	130	190.1	0.28	1.17
P344	J1974	J1980	J1980	25.9	150	110	0.0	0	0
P345	J1980	J1990	J1990	32.2	150	110	143.1	0.09	0.13
P346	J1990	J2007	J2007	141.9	150	110	88.5	0.06	0.05
P347	J2007	J2015	J2015	161.5	100	110	67.9	0.1	0.24
P348	J2015	J2028	J2028	84.3	150	110	-24.3	0.02	0
P349	J2028	J2035	J2035	218.8	150	130	468.8	0.31	0.86
P350	J2035	J2045	J2045	26.8	150	110	125.3	0.08	0.1
P351	J2045	J2057	J2057	34.9	150	110	309.2	0.2	0.55
P352	J2057	J2068	J2068	3.2	100	110	0.0	0	0
P353	J2068	J2074	J2074	61.0	100	130	138.1	0.2	0.65
P354	J2074	J2080	J2080	167.1	100	110	309.1	0.46	3.94
P355	J2080	J2097	J2097	38.1	100	110	-236.7	0.35	2.4
P356	J2097	J2107	J2107	15.8	100	110	448.2	0.68	7.83
P357	J2107	J2115	J2115	140.7	75	110	54.0	0.14	0.63
P358	J2115	J2121	J2121	81.3	100	110	36.8	0.05	0.08
P359	J2121	J2128	J2128	24.1	100	110	-3.6	0.01	0
P360	J2128	J2135	J2135	76.2	150	110	0.0	0	0
P361	J2135	J2142	J2142	87.3	100	110	85.7	0.13	0.37
P362	J2142	J2150	J2150	55.8	100	110	30.3	0.04	0.05
P363	J2150	J2158	J2158	4.5	100	110	44.9	0.07	0.11
P364	J2158	J2168	J2168	71.4	100	130	37.4	0.06	0.06
P365	J2168	J2178	J2178	22.0	100	110	44.9	0.07	0.11
P366	J2178	J2186	J2186	70.0	100	110	2.8	0	0
P367	J2186	J2197	J2197	22.2	100	110	0.0	0	0
P368	J2197	J225	J225	24.5	100	110	-54.6	0.08	0.16
P369	J225	J235	J235	140.3	100	110	-17.3	0.03	0.02
P370	J235	J245	J245	55.9	100	110	-86.3	0.06	0.05
P371	J245	J257	J257	86.4	150	110	-7.6	0	0
P372	J257	J268	J268	4.4	150	110	-78.7	0.05	0.04
P373	J268	J275	J275	35.7	150	110	330.0	0.0	0
P374	J275	J288	J288	6.1	50	130	0.0	0	0
P375	J288	J297	J297	31.1	150	110	77.8	0.05	0.04
P376	J297	J307	J307	71.4	150	110	-98.7	0.06	0.07

Pipe Data (19)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P372	J542	J563	37.2	100	110	0.0	0	0
P373	J542	J509	60.0	150	110	0.0	0	0
P374	J530	J537	21.1	75	110	0.3	0	0
P375	J537	J547	63.2	75	110	21.1	0.06	0.11
P376	J515	J605	63.5	150	110	424.1	0.28	0.98
P377	J1684	J1693	15.2	100	110	-69.0	0.1	0.25
P378	J1684	J1718	134.2	50	110	44.7	0.26	3.2
P379	J1684	J1686	43.5	100	110	24.3	0.04	0.04
P38	J1115	J1300	267.5	150	130	386.1	0.25	0.6
P380	J1697	J1716	96.1	50	110	11.1	0.07	0.24
P381	J1697	J1698	1.5	100	110	-50.8	0.07	0.14
P382	J1698	J1670	110.3	50	110	24.3	0.14	1.04
P383	J1729	J1733	36.7	50	110	0.0	0	0
P384	J1730	J1732	19.9	50	110	0.0	0	0
P385	J1732	J1741	80.7	50	110	0.0	0	0
P386	J1706	J1724	143.4	50	110	37.6	0.22	2.32
P387	J1689	J1702	17.7	150	110	737.9	0.48	2.74
P388	J1747	J1756	88.7	100	110	11.7	0.02	0.01
P399	J1749	J1756	57.1	350	110	7518.6	0.38	3.14
P4	M_R17220	J1210	300.4	100	130	255.3	0.98	2.02
P400	J1800	J1798	50.3	50	110	9.8	0.06	0.19
P401	J1800	J1795	61.5	100	110	-17.6	0.03	0.02
P402	J1795	J1794	19.3	50	110	9.8	0.06	0.19
P403	J1795	J1791	91.6	100	110	-76.1	0.11	0.29
P404	J1766	J1771	6.6	50	110	0.0	0	0
P405	J1791	J1793	66.7	50	110	-46.1	0.21	3.4
P406	J1791	J1790	71.7	50	110	15.6	0.09	0.46
P407	J1777	J1781	127.5	100	110	-91.7	0.14	0.41
P408	J1786	J1782	54.1	50	110	-15.6	0.09	0.46
P409	J1716	J1780	58.0	50	110	-15.6	0.09	0.46
P41	J1527	J1557	185.5	75	130	255.3	0.67	8.21
P410	J1782	J1772	60.0	50	110	-25.4	0.15	1.12
P411	J1773	J1772	1.7	50	110	25.4	0.15	1.12
P412	J1772	J1771	16.9	50	110	0.0	0	0
P413	J1766	J1771	6.6	50	110	0.0	0	0
P414	J1766	J1771	26.7	50	110	0.0	0	0
P415	J1766	J1760	28.7	100	110	-36.4	0.05	0.08
P416	J1769	J1787	74.9	50	110	61.8	0.36	5.83
P417	J1769	J1773	18.5	100	110	-98.2	0.14	0.47
P418	J1773	J1781	58.3	100	110	158.0	0.23	1.13
P419	J1674	J1673	97.2	50	110	-24.3	0.14	1.04
P42	J1557	J1586	163.9	75	130	207.5	0.54	5.59
P420	J1601	J1600	82.7	50	110	155.6	0.92	32.3
P421	J1566	J1581	54.5	75	110	-58.9	0.15	0.74
P422	J1650	J1635	62.9	50	110	-19.9	0.12	0.72
P423	J1622	J1610	109.4	50	110	-18.6	0.11	0.63
P424	J1595	J1602	13.1	100	110	248.3	0.37	2.62
P425	J1602	J1601	10.0	50	110	179.9	1.06	42.27
P426	J1713	J1712	1.0	50	110	1.8	0.01	0.02
P427	J1602	J1700	220.8	50	110	23.6	0.14	0.98
P428	J1712	J1738	163.8	50	110	25.4	0.15	1.12

Pipe Data (20)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P429	J1739	J1762	179.4	50	110	25.4	0.15	1.12
P43	J1586	J1617	94.7	75	130	165.3	0.43	3.67
P430	J1437	J154.1	4.2	100	130	354.1	0.52	3.71
P431	J1439	J1490	136.2	50	110	27.3	0.16	1.29
P432	J1535	J1534	34.0	50	110	0.0	0	0
P433	J1534	J1554	48.2	50	110	13.7	0.08	0.36
P434	J1555	J1554	17.2	50	110	0.0	0	0
P435	J1554	J1561	26.5	50	110	13.7	0.08	0.36
P436	J1463	J1486	68.1	50	110	0.0	0	0
P437	J1262	J1248	85.0	150	110	258.9	0.17	0.39
P438	J1256	J1220	53.0	50	110	2.5	0.01	0.01
P439	J914	J816	110.3	50	110	-26.8	0.16	1.24
P44	J1247	J1245	1.9	150	130	-106.3	0.07	0.06
P440	J1319	J1275	94.3	50	110	0.0	0	0
P441	J1319	J1371	155.2	100	130	0.0	0	0
P442	J1353	J1275	308.7	50	110	0.0	0	0
P443	J1386	J1403	80.5	50	110	28.4	0.17	1.39
P444	J1403	J1441	95.0	50	110	-14.1	0.08	0.38
P445	J1403	J1473	188.2	50	110	12.7	0.08	0.31
P446	J1386	J1415	77.4	100	110	-46.6	0.07	0.12
P447	J1415	J1441	71.9	100	110	161.6	0.24	1.18
P448	J1473	J1441	105.1	100	110	-139.5	0.21	0.9
P449	J1473	J1486	61.6	100	110	119.4	0.18	0.68
P45	J1247	J1253	68.9	100	130	106.3	0.16	0.4
P450	J1415	J1431	36.2	50	110	22.9	0.13	0.93
P451	J1431	J1400	98.2	50	110	0.0	0	0
P452	J1431	J1495	160.5	50	110	22.9	0.13	0.93
P453	J1378	J1347	146.8	50	110	-9.4	0.06	0.59
P454	J1368	J1360	95.3	100	110	110.6	0.16	0.8
P455	J1376	J1395	138.0	50	110	0.0	0	0
P456	J1395	J1380	39.3	50	110	-6.9	0.04	0
P457	J1395	J1418	120.0	50	110	2.5	0.01	0.02
P458	J1394	J1418	68.0	50	110	0.0	0	0
P459	J1418	J1458	70.2	50	110	0.0	0	0
P46	J1375	J1379	93.5	75	130	8.8	0.02	0.02
P460	J1388	J1380	77.7	100	110	-103.7	0.15	0.52
P461	J1387	J1391	11.3	150	110	243.8	0.16	0.35
P462	J1387	J1397	120.0	50	110	5.0	0.03	0.06
P463	J1369	J1313	110.8	100	110	0.0	0	0
P464	J1223	J1199	100.0	150	110	188.2	0.12	0.22
P465	J1175	J1180	19.6	150	110	-153.9	0.11	0.17
P466	J1174	J1080	366.4	150	110	87.1	0.08	0.05
P467	J1218	J1118	200.7	50	110	-13.8	0.08	0.37
P468	J1023	J1001	36.8	150	110	0.0	0	0
P469	J952	J1042	194.7	50	110	25.0	0.15	1.09
P47	J1192	J1189	58.9	150	110	192.4	0.13	0.23
P470	J952	J950	97.8	150	110	982.5	0.64	4.65
P471	J1075	J950	228.4	50	110	-22.9	0.13	0.93
P472	J946	J950	170.7	150	110	-907.6	0.59	4.01
P473	J1064	J946	161.8	50	110	-25.0	0.15	1.09
P474	J946	J968	78.3	150	110	882.7	0.58	3.81
P475	J1066	J1082	66.5	50	110	169.0	0.1	37.64
P476	J1082	J1237	230.8	50	110	48.4	0.29	3.71
P478	J1282	J1284	78.9	50	110	-16.6	0.11	0.51
P479	J1062	J1097	38.5	50	110	120.7	0.71	20.16
P48	J1193	J1263	130.8	50	130	17.8	0.1	0.43
P480	J1146	J1097	64.3	50	110	-33.3	0.2	1.86
P481	J1146	J1237	123.6	50	110	-13.0	0.08	0.33
P482	J1225	J1179	91.4	50	110	-22.9	0.13	0.93
P483	J1097	J1142	91.0	50	110	87.4	0.51	11.09
P484	J905	J915	10.8	50	110	10.8	0.06	0.23

Pipe Data (21)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P485	J902	J904	43.0	50	110	0.0	0	0
P486	J926	J947	30.0	50	110	0.0	0	0
P487	J825	J915	15.4	50	110	0.0	0	0
P488	J915	J912	1.8	50	110	10.8	0.06	0.24
P489	J812	J878	74.8	50	110	22.9	0.14	0.93
P49	J1309	J1314	23.1	50	110	22.4	0.13	0.89
P490	J878	J822	98.5	50	110	15.7	0.09	0.46
P491	J878	J803	118.8	50	110	17.2	0.04	0.11
P493	J631	J712	211.6	50	110	-21.5	0.13	0.82
P494	J871	J1007	55.3	100	110	-185.6	0.27	1.53
P495	J971	J979	40.4	50	110	60.4	0.36	0
P496	J900	J908	20.9	50	110	0.0	0	0
P497	J908	J927	43.5	50	110	-41.0	0.24	2.74
P498	J812	J872	81.8	50	110	-17.3	0.1	0.55
P499	J838	J954	36.3	50	110	-86.4	0.51	10.86
P5	J1190	J1194	82.5	350	110	7518.6	0.9	3.14
P50	J1327	J1325	100.0	75	130	37.6	0.18	0.24
P500	J968	J971	3.3	100	110	-125.2	0.1	0.74
P5002	J1252	J1234	85.4	400	110	8009.1	0.24	1.84
P5003	J1210	J1200	55.3	350	110	7518.6	0.9	3.14
P5004	J74	J80	15.0	50	110	-18.7	0.11	0.64
P5005	J1296	J1164	249.3	50	110	44.3	0.26	3.16
P5006	J PRI-235	J475	341.8	200	110	843.8	0.31	0.84
P5007	Direct	J1329	42.6	250	110	3323.1	0.78	3.57
P5008	J1329	J1136	311.3	200	110	1496.9	0.55	2.41
P501	J868	J897	98.9	100	110	38.8	0.06	0.08
P5010	J1810	J415	647.3	200	110	652.2	0.24	0.52
P5012	J1521	J1524	5.5	150	110	567.9	0.37	1.68
P5013	J1520	J1523	4.0	75	110	38.2	0.1	0.33
P5014	J623	J515	15.6	150	110	-269.5	0.18	0.42
P5015	J696	J728	37.7	100	110	46.4	0.07	0.12
P5016	J1122	J1121	19.8	50	110	-13.7	0.08	0.36
P5017	J1258	J6053	8.4	150	110	143.1	0.09	0.13
P5018	J1174	J1175	1.6	150	110	-115.9	0.08	0.09
P5019	J586	J699	518.3	75	130	-46.6	0.12	0.35
P502	J1027	J1037	34.2	100	110	236.7	0.35	2.4
P5020	J586	J477	204.1	75	130	35.7	0.09	0.21
P5021	J477	J6055	235.7	75	130	0.2	0	0
P5022	J6055	J330	306.5	75	130	-45.3	0.12	0.33
P5023	J741	J748	13.4	50	110	0.0	0	0
P5024	J1597	J1606	12.8	150	110	344.0	0.23	0.67
P5025	J1702	J1709	25.6	150	110	737.9	0.48	2.74
P5026	J1700	J1712	38.2	50	110	23.6	0.14	0.96
P5027	J45	J46	8.7	50	110	-32.8	0.19	1.8
P5028	J99	J100	11.8	150	110	520.1	0.34	1.43
P5029	J361	J363	3.3	100	110	-77.7	0.11	0.3
P503	J1053	J1052	0.6	75	110	30.2	0.08	0.22
P5030	J328	J333	5.8	50	110	-32.4	0.19	1.76
P5031	J186	J189	9.9	150	110	446.2	0.29	1.08
P5032	J483	J6059	401.6	50	110	23.6	0.14	0.88
P5033	J6959	J6060	303.9	75	130	-18.1	0.05	0.06
P5034	J6960	J6061	259.2	75	130	-46.7	0.12	0.35
P5035	J6061	J702	335.7	75	130	-80.2	0.21	0.96
P5036	J430	J495	152.3	250	110	-57.2	0.01	0
P5037	J426	J430	3.3	50	110	-57.2	0.34	5.06
P5038	J658	J659	1.4	150	110	-252.7	0.17	0.37
P5039	J988	J1017	17.0	50	110	-3.5	0.02	0.03
P504	J873	J932	86.8	50	110	-30.2	0.18	1.55
P505	J1053	J1062	70.9	100	110	206.5	0.3	1.86
P506	J1066	J1176	159.9	100	110	119.3	0.18	0.68
P507	J1162	J1233	92.3	50	110	0.0	0	0

Pipe Data (22)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P508	J1177	J1244	87.3	100	110	119.3	0.18	0.68
P509	J1310	J1295	68.3	50	110	-115.2	0.68	18.51
P51	J1314	J1273	81.8	50	110	-10.5	0.06	0.22
P510	J1150	J1224	106.3	50	110	71.5	0.42	2.65
P511	J1131	J1216	117.6	50	110	52.0	0.31	4.25
P512	J1287	J1283	26.0	50	110	-87.4	0.52	11.60
P513	J1114	J1214	136.7	50	110	47.8	0.28	3.63
P514	J1310	J1321	23.4	100	110	215.8	0.32	2.02
P515	J1321	J1333	28.5	100	110	165.4	0.24	1.24
P516	J1321	J1343	60.6	50	110	50.4	0.3	4.01
P517	J1343	J1393	125.4	50	110	-20.3	0.12	0.74
P518	J1453	J1492	102.5	50	110	12.7	0.08	0.31
P519	J1453	J1420	166.3	50	110	-43.4	0.26	3.04
P52	J1239	J1243	29.0	50	110	-25.7	0.15	1.15
P520	J1343	J1346	43.0	50	110	70.7	0.42	7.5
P521	J1346	J1331	231.0	50	110	27.0	0.16	1.26
P522	J1359	J1331	62.4	50	110	0.0	0	0
P523	J1331	J1305	175.7	50	110	8.3	0.08	0.14
P524	J1346	J1389	173.0	50	110	22.9	0.13	0.93
P525	J1333	J1317	140.2	50	110	56.2	0.33	4.89
P526	J1333	J1362	64.3	50	110	53.9	0.32	4.54
P527	J1410	J1362	171.7	50	110	-56.2	0.33	4.89
P528	J1362	J1401	93.0	50	110	-2.3	0.01	0.01
P529	J1478	J1481	97.6	50	110	34.6	0.2	1.99
P53	J1245	J1193	257.4	150	110	-147.9	0.1	0.14
P530	J1478	J1502	76.5	50	110	24.8	0.15	1.08
P531	J513	J544	65.0	50	110	0.0	0	0
P532	J513	J502	30.4	100	110	0.0	0	0
P533	J502	J464	77.2	50	110	0.0	0	0
P534	J502	J507	145.2	50	110	0.0	0	0
P535	J463	J520	93.1	50	110	0.0	0	0
P536	J522	J535	115.9	50	110	35.9	0.21	2.14
P537	J420	J477	100.0	50	110	0.0	0	0
P538	J538	J564	57.0	50	110	0.0	0	0
P539	J566	J587	81.7	50	110	-6.7	0.04	0.1
P54	J1239	J1228	47.6	50	110	-8.7	0.05	0.16
P540	J513	J523	18.2	100	110	0.0	0	0
P541	J605	J612	28.2	150	130	183.0	0.12	0.15
P542	J612	J609	160.9	50	110	0.0	0	0
P543	J612	J644	57.8	150	130	138.5	0.09	0.09
P544	J644	J643	57.4	50	110	0.0	0	0
P545	J644	J654	33.1	150	130	138.5	0.09	0.09
P547	J742	J757	24.8	150	130	-173.9	0.11	0.14
P548	J757	J756	2.4	50	110	63.3	0.37	6.11
P549	J756	J761	8.6	50	110	0.0	0	0
P55	J1183	J1189	6.8	150	130	-192.4	0.13	0.17
P551	J653	J671	147.7	50	110	-35.4	0.21	2.08
P552	J757	J793	56.5	150	130	-243.9	0.16	0.26
P553	J789	J787	22.9	50	110	0.0	0	0
P554	J787	J809	21.4	50	110	0.0	0	0
P555	J778	J868	100.0	50	110	-33.4	0.2	1.87
P556	J788	J784	65.1	50	110	0.0	0	0
P557	J958	J955	46.5	50	110	60.7	0.36	5.65
P558	J837	J958	162.5	100	110	83.1	0.12	0.35
P559	J958	J1059	138.6	100	110	22.4	0.03	0.03
P56	J1192	J1187	94.5	150	130	-261.6	0.17	0.29
P560	J990	J940	66.3	50	110	0.0	0	0
P561	J1170	J1169	32.4	50	110	76.7	0.45	8.71
P562	J1125	J1123	78.0	50	110	0.0	0	0
P563	J1026	J1123	146.8	50	110	-29.3	0.17	1.46
P564	J1123	J1111	142.3	50	110	-16.9	0.1	0.53

Pipe Data (23)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P565	J1073	J1101	40.6	50	110	0.0	0	0
P566	J1101	J1134	41.4	50	110	-55.9	0.33	4.86
P567	J1135	J1134	2.2	50	110	0.0	0	0
P568	J1134	J1132	1.0	500	110	-55.9	0.33	4.87
P569	J1122	J1132	17.4	100	110	1.3	0	0
P57	J996	J1102	170.3	50	110	-44.9	0.26	3.23
P571	J1339	J1304	155.0	150	110	55.4	0.64	0.02
P572	J1229	J1339	173.9	50	110	-19.5	0.11	0.69
P573	J1121	J1089	61.4	50	110	-6.0	0.04	0.08
P574	J1121	J1152	72.6	50	110	-7.7	0.05	0.12
P575	J1144	J1128	20.1	50	110	0.0	0	0
P576	J1119	J1119	35.7	50	110	-7.7	0.05	0.12
P577	J1119	J1090	38.1	50	110	0.0	0	0
P578	J1112	J1112	28.2	50	110	-13.2	0.08	0.33
P579	J1100	J1040	96.6	100	110	-5.2	0.01	0
P58	J1113	J1139	33.8	100	110	0.0	0	0
P581	J1040	J1002	42.9	100	110	6.1	0.01	0
P582	J178	J781	79.1	50	110	17.8	0.1	0.58
P583	J881	J884	28.6	50	110	0.0	0	0
P584	J884	J917	65.4	50	110	-36.8	0.22	2.24
P585	J845	J903	88.9	50	110	0.0	0	0
P586	J917	J1002	146.3	50	110	-52.4	0.31	4.31
P588	J1002	J861	191.5	100	110	-46.4	0.07	0.12
P589	J606	J648	77.1	50	110	0.0	0	0
P59	J1183	J1185	67.5	150	130	1027.4	0.67	3.7
P590	J769	J728	77.6	100	110	-46.4	0.07	0.12
P591	J674	J679	100.4	50	110	0.0	0	0
P592	J687	J667	33.1	100	110	-132.8	0.2	0.82
P593	J606	J640	322.2	50	110	0.0	0	0
P594	J626	J649	65.8	50	110	0.0	0	0
P595	J649	J629	149.4	50	110	0.0	0	0
P596	J800	J806	13.6	50	110	11.3	0.07	0.25
P597	J806	J875	82.7	50	110	0.0	0	0
P598	J806	J774	95.5	50	110	8.5	0.05	0.15
P599	J774	J825	59.6	50	110	3.9	0.02	0.03
P6	J1198	M_PRT+190	8.7	300	110	-4863.7	0.8	2.97
P60	J1120	J1127	25.5	50	110	0.0	0	0
P600	J774	J779	72.5	50	110	1.5	0.01	0.01
P601	J779	J783	18.8	50	110	-10.8	0.06	0.23
P602	J779	J866	97.7	50	110	9.6	0.06	0.18
P603	J866	J867	13.9	50	110	-16.6	0.1	0.51
P604	J866	J919	121.9	50	110	9.8	0.06	0.19
P605	J919	J886	38.1	50	110	0.0	0	0
P606	J919	J859	112.4	50	110	3.1	0.02	0.02
P607	J844	J836	41.3	50	110	-2.0	0.01	0.01
P608	J800	J836	29.1	50	110	28.5	0.17	1.39
P609	J836	J856	22.5	100	110	26.5	0.04	0.04
P61	J1139	J1183	71.5	100	110	-128.4	0.19	0.77
P610	J856	J846	59.0	50	110	0.0	0	0
P611	J856	J864	16.6	100	110	19.1	0.03	0.02
P612	J864	J857	54.3	50	110	0.0	0	0
P613	J864	J859	54.7	100	110	19.1	0.03	0.02
P614	J899	J891	36.1	50	110	0.0	0	0
P615	J899	J931	34.0	100	110	19.1	0.03	0.02
P616	J931	J923	43.5	50	110	0.0	0	0
P617	J931	J941	24.1	100	110	14.8	0.02	0.01
P618	J941	J948	14.4	50	110	2.3	0.01	0.01
P619	J948	J939	12.7	50	110	0.0	0	0
P62	J1033	J1127	159.4	50	110	-95.6	0.56	13.09
P620	J948	J957	11.1	50	110	2.3	0.01	0.01
P621	J959	J957	8.1	50	110	0.0	0	0

Pipe Data (24)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P622	J957	J967	9.7	50	110	0.0	0	0
P623	J941	J977	37.4	100	110	12.5	0.02	0.01
P624	J969	J977	51.4	50	110	0.0	0	0
P625	J977	J1034	66.2	100	110	9.3	0.01	0.01
P626	J1034	J1031	46.5	50	110	0.0	0	0
P627	J1034	J1061	52.7	100	110	9.3	0.01	0.01
P628	J1061	J1094	44.1	50	110	0.0	0	0
P629	J1081	J1063	1.9	100	110	1.5	0	0
P63	J1127	J1139	62.7	50	110	-128.4	0.76	22.64
P630	J1063	J1079	32.0	100	110	1.5	0	0
P631	J1070	J1063	94.2	50	110	0.0	0	0
P632	J1077	J1078	1.1	200	110	0.0	0	0
P633	J1085	J1077	39.1	50	110	0.0	0	0
P634	J1079	J1078	4.4	200	110	-144.9	0.05	0.03
P635	J1079	J104	58.7	200	110	146.4	0.05	0.03
P636	J1092	J1104	25.1	200	110	0.0	0	0
P637	J1104	J1133	50.7	200	110	146.4	0.05	0.03
P638	J988	J934	97.8	50	110	3.5	0.02	0.03
P639	J935	J934	10.1	50	110	0.0	0	0
P64	J1183	J1186	50.8	150	130	-1156.8	0.76	4.6
P640	J1030	J1032	56.6	50	110	0.0	0	0
P641	J1044	J1032	27.4	50	110	0.0	0	0
P642	J1032	J1021	14.6	50	110	0.0	0	0
P643	J1009	J998	15.0	50	110	0.0	0	0
P644	J883	J934	79.8	50	110	-3.5	0.02	0.03
P645	J1021	J1011	6.8	50	110	9.6	0.06	0.19
P646	J1013	J1011	5.7	50	110	5.1	0.03	0.06
P647	J1013	J684	465.4	50	110	4.6	0.03	0.05
P648	J684	J675	71.5	50	110	3.5	0.02	0.03
P649	J684	J683	2.1	50	110	1.1	0.01	0
P65	J1186	J1195	61.2	150	110	-988.4	0.65	4.7
P650	J683	J732	80.2	50	110	0.0	0	0
P651	J683	J603	142.4	50	110	1.1	0.01	0
P652	J603	J595	62.0	50	110	0.0	0	0
P653	J590	J576	33.4	50	110	0.0	0	0
P654	J590	J633	67.7	50	110	0.0	0	0
P655	J633	J635	42.7	50	110	0.0	0	0
P656	J639	J798	259.6	50	110	0.0	0	0
P657	J639	J615	35.3	50	110	0.0	0	0
P658	J633	J624	67.6	50	110	0.0	0	0
P659	J616	J577	81.8	50	110	0.0	0	0
P66	J1195	J1205	88.0	150	110	-1012.3	0.66	4.91
P660	J616	J663	78.1	50	110	0.0	0	0
P661	J575	J683	20.9	50	110	0.0	0	0
P662	J633	J669	73.8	50	110	0.0	0	0
P663	J835	J842	9.7	200	110	91.2	0.03	0.02
P664	J835	J817	15.1	50	110	0.0	0	0
P665	J817	J804	15.0	50	110	0.0	0	0
P666	J810	J817	86.7	50	110	0.0	0	0
P667	J808	J759	64.7	50	110	0.0	0	0
P668	J729	J717	47.2	50	110	0.0	0	0
P669	J713	J708	17.8	50	110	0.0	0	0
P67	J1105	J1186	141.7	75	130	167.4	0.44	3.76
P670	J553	J891	8.1	50	110	0.0	0	0
P671	J591	J574	73.1	50	110	0.0	0	0
P672	J708	J690	50.3	50	110	0.0	0	0
P673	J660	J641	96.3	50	110	106.6	0.63	16.03
P674	J610	J602	49.9	50	110	0.0	0	0
P675	J610	J572	80.7	50	110	36.4	0.21	2.19
P676	J572	J571	41.4	50	110	0.0	0	0
P677	J572	J570	4.7	50	110	36.4	0.21	2.19

Pipe Data (25)

Link ID	Start	End	NodeID	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P678	J570	J552		43.7	50	110	0.0	0.0	0
P679	J570	J565		35.9	50	110	0.0	0.0	0
P68	J1105	J1166		84.5	100	110	-175.6	0.26	1.38
P680	J565	J539		49.0	50	110	0.0	0.0	0
P681	J565	J562		71.8	50	110	0.0	0.0	0
P682	J708	J855		254.5	50	110	0.0	0.0	0
P683	J814	J828		55.8	50	110	30.9	0.18	1.62
P684	J814	J874		73.9	100	110	-85.5	0.13	0.36
P685	J830	J769		28.2	50	110	0.0	0.0	0
P686	J830	J847		22.7	50	110	0.0	0.0	0
P687	J953	J975		96.9	50	110	14.0	0.08	0.38
P688	J953	J910		80.5	200	110	68.3	0.03	0.01
P689	J874	J879		8.0	200	110	-68.3	0.03	0.01
P69	J1235	J1195		48.7	50	110	-23.9	0.14	1.01
P690	J879	J898		80.9	50	110	0.0	0.0	0
P691	J898	J911		17.2	50	110	0.0	0.0	0
P692	J898	J936		63.3	50	110	0.0	0.0	0
P693	J659	J767		333.6	150	110	-281.3	0.18	0.46
P694	J871	J906		336.4	50	110	-13.0	0.08	0.33
P695	J906	J913		5.8	50	110	0.0	0.0	0
P696	J908	J992		33.4	150	110	-372.3	0.24	0.71
P697	J895	J885		13.6	50	110	13.0	0.08	0.32
P698	J885	J890		45.2	50	110	0.0	0.0	0
P699	J896	J895		3.7	150	110	278.6	0.18	0.45
P7	J1198	J1157		51.0	300	110	4863.7	0.8	2.97
P700	J964	J1004		120.4	50	110	-7.3	0.04	0.11
P701	J895	J870		75.7	150	110	265.6	0.17	0.41
P702	J838	J776		81.7	50	110	-16.3	0.06	0.19
P703	J838	J750		137.0	50	110	-16.3	0.1	0.46
P704	J716	J722		2.5	50	110	-102.7	0.61	14.95
P705	J722	J740		46.8	50	110	0.0	0.0	0
P706	J705	J716		22.2	50	110	-41.6	0.25	2.81
P707	J722	J719		1.1	150	110	-102.7	0.07	0.07
P708	J709	J665		74.6	150	110	-612.4	0.4	1.94
P709	J695	J651		89.7	150	110	26.0	0.02	0.01
P71	J1166	J1205		51.4	100	110	-175.6	0.26	1.38
P710	J705	J695		15.6	150	110	41.6	0.03	0.01
P711	J661	J598		153.9	50	110	11.0	0.06	0.24
P712	J695	J656		89.5	50	110	15.6	0.09	0.46
P713	J661	J702		70.1	150	110	138.9	0.09	0.12
P714	J645	J640		8.1	100	110	-36.3	0.05	0.08
P715	J682	J640		80.7	50	110	-27.0	0.16	1.26
P716	J638	J599		73.9	100	110	-130.3	0.19	0.79
P717	J621	J599		99.2	50	110	-45.2	0.27	3.27
P718	J640	J638		1.8	100	110	-97.7	0.14	0.47
P719	J638	J622		65.7	50	110	32.6	0.19	1.78
P72	J1129	J1207		92.7	50	110	-29.9	0.18	1.52
P720	J599	J581		81.4	100	110	-175.4	0.26	1.38
P721	J488	J487		146.2	150	110	-8.6	0.01	0.01
P722	J487	J483		84.4	150	110	-28.6	0.02	0.01
P723	J438	J425		105.7	150	110	-290.7	0.19	0.49
P724	J425	J459		63.5	50	110	4.3	0.03	0.04
P725	J425	J424		2.9	150	110	-295.0	0.19	0.5
P726	J424	J300		270.8	50	110	0.0	0.0	0
P727	J424	J416		78.1	150	110	-305.0	0.2	0.53
P728	J410	J409		49.0	100	110	-59.7	0.09	0.19
P729	J449	J471		56.4	100	110	-15.5	0.02	0.02
P73	J1207	J1205		86.7	150	110	1222.8	0.8	6.97
P730	J471	J466		73.4	100	110	-22.3	0.03	0.03
P731	J443	J449		89.7	100	110	44.2	0.07	0.11
P732	J471	J503		47.1	100	110	6.8	0.01	0

Pipe Data (26)

Link ID	Start	End	NodeID	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHead loss m/km
P733	J466	J443		57.6	100	110	-45.5	0.07	0.11
P734	J443	J405		47.8	100	110	-89.7	0.13	0.4
P735	J405	J410		97.6	100	110	256.8	0.17	0.39
P736	J405	J403		34.8	150	110	-346.5	0.23	0.67
P737	J400	J404		38.5	150	110	173.1	0.11	0.19
P738	J404	J411		6.7	200	110	0.0	0	0
P739	J400	J350		108.2	150	110	212.4	0.14	0.27
P74	J1098	J1095		27.8	50	130	-52.5	0.31	3.16
P740	J294	J277		42.8	150	110	55.0	0.03	0.02
P743	J404	J385		115.9	150	110	173.0	0.11	0.19
P744	J208	J242		98.6	50	110	-13.7	0.08	0.36
P745	J242	J218		85.7	150	110	103.5	0.07	0.07
P746	J93	J147		214.9	150	110	-52.7	0.03	0.02
P747	J325	J373		115.1	50	110	13.7	0.08	0.36
P748	J325	J313		101.1	150	110	-135.9	0.09	0.13
P749	J860	J834		40.6	150	110	229.1	0.15	0.31
P75	J1207	J1209		62.6	150	110	-1252.7	0.82	7.29
P750	J780	J834		83.0	50	110	0.0	0	0
P751	J829	J811		35.0	50	110	0.0	0	0
P752	J811	J834		25.2	150	110	-202.8	0.13	0.25
P753	J811	J773		55.5	150	110	202.8	0.13	0.25
P754	J831	J771		106.5	50	110	0.0	0	0
P755	J746	J743		0.9	50	110	15.6	0.09	0.45
P756	J743	J733		41.5	50	110	15.6	0.09	0.46
P757	J575	J549		63.2	75	110	26.0	0.07	0.16
P758	J426	J421		2.2	75	110	0.0	0	0
P759	J383	J427		82.4	200	110	0.0	0	0
P76	J1209	J1147		75.7	75	130	158.2	0.41	3.38
P761	J408	J406		5.8	50	110	0.0	0	0
P762	J406	J398		21.5	50	110	-54.6	0.32	4.64
P763	J398	J348		149.1	50	110	0.0	0	0
P764	J480	J480		182.5	200	110	98.8	0.04	0.02
P765	J498	J495		8.3	150	110	-57.2	0.04	0.02
P766	J498	J495		29.8	200	110	57.2	0.02	0.01
P767	J489	J493		79.6	50	110	0.0	0	0
P768	J746	J704		73.7	150	110	171.6	0.11	0.18
P769	J662	J660		0.9	150	110	171.6	0.11	0.17
P77	J1110	J1110		53.3	75	130	69.8	0.18	0.74
P770	J660	J625		69.5	150	110	65.0	0.04	0.03
P771	J591	J575		41.1	150	110	65.0	0.04	0.03
P772	J567	J554		43.3	150	110	0.0	0	0
P773	J567	J543		57.5	150	110	0.0	0	0
P774	J506	J492		27.2	50	110	13.0	0.08	0.32
P775	J492	J456		85.9	50	110	13.0	0.08	0.32
P776	J506	J482		54.8	150	110	-32.4	0.02	0.01
P777	J482	J521		72.4	50	110	0.0	0	0
P778	J527	J548		50.5	150	110	-4.3	0.03	0.04
P779	J532	J548		82.8	150	110	4.3	0	0
P78	J1209	J1240		109.1	150	110	-1410.9	0.92	9.09
P780	J532	J531		2.2	150	110	-4.3	0	0
P781	J531	J553		105.1	50	110	-3.6	0.02	0.03
P782	J603	J589		24.0	50	110	1.1	0.01	0
P783	J557	J546		50.7	150	110	1.1	0.01	0
P784	J511	J520		0.7	150	110	-0.7	0	0
P785	J529	J6057		0.9	150	110	-1.1	0	0
P786	J557	J479		22.8	150	110	0.0	0	0
P787	J557	J501		131.2	50	110	0.0	0	0
P788	J512	J501		75.1	50	110	-9.4	0.06	0.18
P79	J1240	J1261		150.0	150	110	-1442.7	0.94	9.47
P790	J463	J468		47.2	150	110	9.4	0.01	0
P791	J497	J478		82.9	150	110	150.3	0.1	0.14

Pipe Data (27)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P792	J465	J458	76.7	150	110	96.0	0.06	0.06
P793	J465	J451	44.0	100	110	20.5	0.03	0.03
P794	J428	J422	2.2	75	110	-43.0	0.11	0.41
P795	J428	J441	100.7	110	110	29.7	0.17	1.5
P796	J422	J418	2.9	75	110	-43.0	0.11	0.42
P797	J418	J417	4.8	75	110	-43.0	0.11	0.41
P798	J417	J377	61.0	75	110	-49.9	0.13	0.54
P799	J417	J401	75.6	50	110	6.9	0.04	0.1
P800	J1157	J1145	23.2	300	110	4883.7	0.8	2.97
P801	J1148	J1240	129.3	50	110	-31.9	0.19	1.71
P802	J480	J454	64.9	50	110	0.0	0	0
P803	J454	J413	58.7	50	110	29.7	0.17	1.5
P804	J497	J461	63.5	150	110	-574.4	0.38	1.72
P805	J399	J378	91.6	50	110	-29.8	0.18	1.51
P806	J378	J375	8.1	150	110	-643.5	0.42	2.12
P807	J324	J306	99.1	50	110	0.0	0	0
P808	J265	J269	62.8	150	110	-589.9	0.39	1.81
P809	J413	J362	97.7	50	110	-21.0	0.12	0.79
P810	J349	J338	48.3	50	110	3.0	0.02	0.02
P811	J327	J298	55.1	50	110	-18.0	0.11	0.59
P812	J1149	J1261	161.4	50	110	-28.9	0.17	1.43
P813	J298	J308	66.4	50	110	10.3	0.06	0.21
P814	J298	J230	168.6	50	110	-28.3	0.17	1.38
P815	J191	J233	216.1	50	110	28.7	0.17	1.41
P816	J344	J304	107.3	50	110	19.7	0.12	0.7
P817	J330	J355	105.9	50	110	25.4	0.15	1.12
P818	J304	J297	14.5	50	110	19.7	0.12	0.7
P819	J297	J282	73.5	50	110	-8.2	0.05	0.14
P820	J297	J227	233.8	50	110	27.9	0.16	1.34
P821	J453	J432	39.5	150	110	76.3	0.05	0.04
P822	J379	J317	138.2	50	110	-44.1	0.26	3.13
P823	J532	J524	3.9	50	110	0.0	0	0
P824	J516	J435	198.4	50	110	110.1	0.65	17.01
P825	J1342	J1433	242.4	150	110	267.9	0.18	0.42
P826	J516	J342	327.9	50	110	-142.4	0.84	27.42
P827	J342	J337	11.4	50	110	-209.8	1.24	56.18
P828	J337	J332	11.0	50	110	-209.8	1.24	56.18
P829	J342	J351	89.2	50	110	47.0	0.28	3.52
P830	J392	J371	88.3	100	110	-189.9	0.28	1.6
P831	J346	J361	55.8	100	110	0.0	0	0
P832	J357	J369	29.1	100	110	-77.7	0.11	0.3
P833	J363	J369	69.5	100	110	0.0	0	0
P834	J341	J369	55.9	50	110	0.0	0	0
P835	J369	J371	22.6	100	110	-129.5	0.19	0.79
P836	J1433	J1455	75.9	150	110	250.0	0.16	0.37
P837	J371	J351	39.4	100	110	-319.4	0.47	4.18
P838	J351	J312	66.4	100	110	-405.2	0.6	6.5
P839	J482	J407	135.3	150	110	-84.2	0.06	0.05
P840	J407	J393	74.6	50	110	84.7	0.38	6.37
P841	J407	J387	32.8	150	110	-218.0	0.14	0.29
P842	J358	J314	78.7	150	110	-246.0	0.31	0.36
P843	J358	J315	114.5	50	110	51.8	0.16	4.21
P844	J358	J305	128.0	150	110	-332.3	0.22	0.62
P845	J315	J312	87.1	50	110	43.2	0.25	3
P846	J315	J312	34.4	150	110	-427.3	0.28	0.99
P847	J1455	J1531	223.4	100	110	141.6	0.21	0.93
P848	J312	J311	9.2	150	110	-890.8	0.58	3.88
P849	J312	J271	113.4	100	110	130.9	0.19	0.8
P850	J271	J264	50.0	100	110	0.0	0	0
P851	J271	J270	53.0	100	110	130.9	0.19	0.8
P852	J268	J270	28.8	50	110	0.0	0	0

Pipe Data (28)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P853	J270	J307	118.7	50	110	79.9	0.47	9.39
P854	J270	J261	98.5	100	110	14.3	0.02	0.01
P855	J261	J221	90.6	50	110	-41.8	0.25	2.83
P856	J271	J205	28.8	50	110	-170.3	1	38.16
P857	J205	J205	68.2	50	110	-318.0	1.87	121.36
P858	J1459	J1425	90.6	75	110	-75.5	0.2	1.17
P859	J374	J386	42.0	100	110	54.6	0.08	0.16
P860	J374	J345	48.3	50	110	-114.4	0.67	18.27
P861	J374	J345	67.0	100	110	-210.6	0.31	1.93
P862	J382	J383	2.7	150	110	0.0	0	0
P863	J383	J376	26.6	250	110	0.0	0	0
P864	J383	J205	34.8	250	110	-116.5	0.03	0.01
P865	J205	J168	210.8	250	110	-464.7	0.11	0.1
P866	J126	J123	12.4	100	110	13.6	0.02	0.01
P867	J123	J120	20.6	50	110	13.6	0.08	0.35
P868	J110	J1004	161.5	50	130	69.8	0.41	5.36
P869	J110	J116	104.0	50	110	-21.3	0.13	0.81
P870	J116	J111	49.4	50	110	35.4	0.21	2.08
P871	J111	J146	114.5	50	110	-23.7	0.14	0.99
P872	J111	J146	42.5	50	110	11.7	0.07	0.27
P873	J151	J146	19.2	50	110	-11.7	0.07	0.27
P874	J139	J143	8.7	250	110	464.7	0.11	0.1
P875	J146	J142	17.3	150	110	-11.7	0.01	0
P876	J159	J149	348.5	250	110	-2567.0	0.61	2.29
P877	J159	J105	189.5	50	110	15.7	0.09	0.46
P878	J159	J173	78.8	150	110	2112.2	1.38	19.18
P879	J173	J176	188.3	100	110	168.3	0.25	1.28
P880	J176	J165	68.9	50	110	0.0	0	0
P881	J176	J176	100.1	50	110	-168.3	0.25	1.28
P882	J176	J169	79.4	50	110	0.0	0	0
P883	J176	J169	5.5	75	110	0.0	0	0
P884	J169	J166	37.9	100	110	0.0	0	0
P885	J166	J166	60.1	50	110	0.0	0	0
P886	J166	J164	30.8	100	110	0.0	0	0
P887	J164	J164	83.3	50	110	-32.4	0.19	1.76
P888	J164	J164	20.2	100	110	168.3	0.25	1.28
P889	J164	J152	108.0	100	110	0.0	0	0
P890	J164	J152	10.8	75	110	0.0	0	0
P891	J152	J390	8.0	150	110	49.2	0.03	0.02
P892	J390	J390	105.7	150	110	-56.1	0.04	0.02
P893	J343	J329	25.4	150	110	0.0	0	0
P894	J343	J291	70.9	50	110	258.4	1.52	82.66
P895	J291	J274	32.3	50	110	0.0	0	0
P896	J291	J289	6.7	50	110	258.4	1.52	82.66
P897	J289	J274	210.3	150	110	-424.6	0.28	0.98
P898	J274	J245	62.2	50	110	-64.7	0.38	6.37
P899	J245	J196	61.4	50	110	0.0	0	0
P900	J245	J196	80.4	150	110	-446.2	0.29	1.08
P901	J196	J189	35.7	150	110	-446.2	0.29	1.08
P902	J189	J190	25.0	50	110	8.6	0.05	0.15
P903	J185	J180	11.1	150	110	-454.8	0.3	1.12
P904	J185	J160	12.0	150	110	-454.8	0.3	1.12
P905	J167	J156	55.1	150	110	0.0	0	0
P906	J162	J156	97.8	100	110	126.9	0.19	0.76
P907	J112	J125	97.8	100	110	624.2	0.41	2.01
P908	J141	J118	90.5	150	110	0.0	0	0
P909	J141	J107	114.7	50	110	0.0	0	0
P910	J184	J185	7.6	150	130	-309.8	0.2	0.4
P911	J184	J118	20.7	150	110	585.4	0.38	1.78
P912	J118	J105	109.7	75	110	56.2	0.15	0.65

Pipe Data (29)

Link ID	Start	NodeID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P912	J83	J109	J83	120.8	50	110	0.0	0.0	0
P913	J83	J78	J83	42.0	75	110	23.4	0.06	0.13
P914	J56	J64	J56	55.9	75	110	58.0	0.15	0.72
P916	J158	J152	J158	67.2	50	110	0.0	0.0	0
P917	J42	J45	J42	57.3	50	110	-32.8	0.19	1.8
P918	J56	J55	J56	0.8	75	110	-2.8	0.01	0
P919	J55	J54	J55	0.6	75	110	-45.0	0.12	0.43
P92	J1238	J1184	J1238	67.1	50	130	-18.3	0.11	0.45
P920	J54	J49	J54	63.4	75	110	44.5	0.12	0.43
P921	J55	J80	J55	99.2	50	110	42.1	0.25	2.87
P922	J69	J63	J92	91.2	50	110	-18.7	0.11	0.64
P923	J85	J91	J85	94.4	50	110	23.4	0.14	0.97
P924	J128	J178	J128	261.6	50	110	0.0	0.0	0
P925	J183	J242	J183	232.6	50	110	0.0	0.0	0
P926	J247	J219	J247	5.2	50	110	0.0	0.0	0
P927	J249	J252	J249	3.1	50	110	10.8	0.06	0.23
P928	J257	J252	J257	67.4	50	110	-10.8	0.06	0.23
P929	J179	J249	J179	238.7	150	110	1943.8	1.27	16.45
P93	J1238	J1242	J1238	76.7	50	130	18.3	0.11	0.45
P930	J249	J273	J249	71.1	150	110	1818.7	1.19	14.54
P931	J273	J263	J273	83.7	50	110	256.8	1.51	81.69
P932	J263	J258	J263	72.2	50	110	30.2	0.18	1.56
P933	J263	J258	J263	84.2	50	110	179.1	1.06	41.82
P934	J238	J225	J238	47.2	50	110	-10.8	0.06	0.23
P935	J235	J219	J235	19.7	50	110	142.4	0.84	27.42
P936	J219	J188	J219	150.3	50	110	71.2	0.42	7.6
P937	J219	J220	J219	90.5	50	110	28.1	0.17	1.35
P938	J183	J197	J183	48.0	50	110	0.0	0.0	0
P939	J110	J148	J110	215.3	50	110	-16.7	0.1	0.52
P94	J1251	J1192	J1251	73.1	75	130	-69.2	0.18	0.73
P940	J153	J104	J153	194.9	50	110	0.0	0.0	0
P941	J114	J103	J114	44.2	150	110	448.9	0.29	1.09
P942	J95	J94	J95	7.6	50	110	142.7	0.84	27.53
P943	J95	J65	J95	115.3	150	110	306.2	0.2	0.54
P944	J94	J82	J94	128.6	50	110	23.4	0.14	0.97
P945	J94	J84	J94	27.1	50	110	119.3	0.7	19.76
P946	J84	J58	J94	176.0	50	110	0.0	0.0	0
P947	J84	J61	J94	89.5	50	110	119.3	0.7	19.76
P948	J38	J53	J53	107.4	50	110	28.1	0.17	1.36
P949	J38	J33	J33	73.1	50	110	91.3	0.54	12.02
P95	J1234	J1236	J1236	2.3	150	130	521.1	0.34	1.05
P950	J44	J57	J44	91.3	50	110	32.8	0.19	1.8
P951	J44	J35	J44	96.2	50	110	30.4	0.18	1.57
P952	J37	J36	J37	101.3	50	110	107.5	0.63	16.29
P953	J36	J52	J36	104.0	50	110	30.4	0.18	1.57
P954	J36	J32	J36	73.9	50	110	77.1	0.45	8.8
P955	J43	J50	J43	62.6	50	110	30.4	0.18	1.57
P956	J43	J34	J43	93.7	50	110	28.1	0.17	1.36
P957	J39	J37	J39	5.7	100	110	306.2	0.45	3.87
P958	J37	J20	J37	193.2	100	110	164.1	0.24	1.22
P959	J8	J6	J6	227.1	100	110	159.0	0.23	1.15
P96	J1236	J1241	J1236	30.1	75	130	6.6	0.02	0.01
P960	J6	J5	J6	46.5	50	110	0.0	0.0	0
P961	J3	J6	J3	30.8	100	110	-85.8	0.13	0.37
P962	J8	J11	J8	46.0	100	110	-159.0	0.23	0.45
P963	J13	J17	J13	87.1	100	110	-307.2	0.45	3.88
P964	J17	J19	J17	35.3	75	110	0.0	0.0	0
P966	J25	J26	J25	19.6	50	110	0.0	0.0	0
P967	J328	J302	J328	47.3	50	110	32.4	0.19	1.78
P968	J302	J288	J302	32.5	50	110	0.0	0.0	0
P969	J302	J289	J302	48.8	50	110	10.8	0.06	0.23

Pipe Data (30)

Link ID	Start	NodeID	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	UnitHeadloss m/km
P97	J1236	J1203	J1203	115.3	150	130	376.2	0.25	0.57
P970	J303	J301	J303	52.5	50	110	10.8	0.06	0.23
P971	J283	J303	J283	42.9	100	110	-15.1	0.02	0.01
P972	J333	J333	J333	51.5	100	110	-25.9	0.04	0.04
P973	J311	J332	J332	95.7	150	110	-1021.6	0.67	5
P974	J333	J332	J333	5.3	150	110	1231.4	0.81	7.06
P975	J333	J317	J317	74.5	150	110	-1289.7	0.84	7.69
P976	J317	J292	J292	58.6	150	110	-1379.1	0.9	8.71
P977	J289	J273	J273	2.4	150	110	1820.3	1.19	14.57
P978	J289	J273	J273	31.2	150	110	-1561.9	1.02	10.97
P979	J292	J6058	J6058	88.0	100	110	367.8	0.54	5.43
P98	J1236	J1272	J1272	62.4	75	130	138.3	0.36	2.64
P980	J266	J262	J266	78.5	50	110	28.1	0.17	1.35
P981	J229	J235	J235	44.0	50	110	-43.2	0.25	3
P982	J235	J234	J234	16.7	50	110	0.0	0.0	0
P983	J266	J263	J266	25.5	100	110	277.2	0.41	3.22
P984	J253	J235	J235	31.5	100	110	84.2	0.12	0.35
P985	J253	J244	J244	44.7	100	110	193.0	0.28	1.65
P986	J244	J243	J243	5.1	100	110	193.0	0.28	1.64
P987	J243	J241	J241	3.3	100	110	193.0	0.28	1.65
P988	J241	J239	J239	15.9	50	110	25.9	0.15	1.17
P989	J239	J256	J256	37.4	50	110	13.0	0.08	0.32
P990	J239	J228	J228	38.6	50	110	13.0	0.08	0.32
P991	J296	J265	J265	163.1	50	110	-43.2	0.25	3
P992	J265	J250	J250	24.0	50	110	23.7	0.14	0.99
P993	J259	J250	J250	28.2	50	110	-10.8	0.06	0.23
P994	J250	J231	J231	35.0	50	110	13.0	0.08	0.32
P995	J265	J255	J255	35.8	50	110	-101.4	0.5	14.82
P996	J255	J210	J210	155.4	50	110	-96.1	0.57	13.23
P997	J255	J210	J210	116.1	50	110	-58.1	0.34	5.2
P998	J209	J210	J210	147.7	50	110	147.7	0.87	29.34
P999	J210	J203	J203	117.8	50	110	50.8	0.3	4.07
J PRI-250				60.9	250	110	6051.2	1.43	11.19
3	J1115	J87	J87	35.2	400	110	-684.3	0.75	1.88
1	J1115	J1036	J1036	166.0	150	130	-684.3	0.45	1.74
10	J1036	J1024	J1024	24.7	150	130	-1725.1	1.13	9.65
11	J739	J832	J832	152.9	75	130	218.4	0.57	6.15
12	J735	J739	J739	29.4	75	130	-57.2	0.15	0.51
14	J845	J966	J966	21.0	150	110	-882.7	0.58	3.81
15	J156	J153	J153	35.4	150	110	60.5	0.04	0.03
16	J110	J102	J102	24.2	50	130	-6.2	0.04	0.06
17	J1086	J1103	J1103	180.0	100	130	115.8	0.17	0.47
18	J1103	J1106	J1106	86.4	100	130	14.3	0.02	0.01
19	J1155	J1164	J1164	13.2	50	110	44.3	0.26	3.16
20	J1154	J1155	J1155	5.1	50	110	74.3	0.44	8.22
21	J692	J611	J611	337.2	150	130	-420.2	0.28	0.71
22	J611	J655	J655	178.8	150	130	-719.4	0.47	1.91
23	J882	J961	J961	100.5	50	130	-15.6	0.09	0.33
24	J823	J882	J882	79.2	50	130	-420.2	0.28	0
25	J582	J585	J585	517.8	150	130	130.0	0.34	2.35
26	J582	J514	J514	295.2	75	130	130.0	0.07	0.06
27	J534	J5007	J5007	25.1	150	130	110.1	0.07	0.06
28	J18	J22	J22	66.5	75	110	0.0	0.0	0
29	J17	J18	J18	0.7	75	110	0.0	0.0	0
30	J1208	J1219	J1219	24.2	75	130	139.2	0.36	2.67
31	J1203	J1208	J1208	6.9	75	130	150.5	0.39	3.08
32	J1151	J1201	J1201	39.1	100	130	-225.7	0.33	1.61
35	J400	1	1	227.0	150	130	-385.5	0.25	0.6
36	1	J436	J436	176.9	150	130	-385.5	0.25	0.6
37	J1230	J1257	J1257	60.2	100	110	-43.0	0.06	0.1
38	J1257	J1260	J1260	5.5	100	110	-88.7	0.13	0.39

Pipe Data (31)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	Unit Head loss m/km
39	J1217	J1257	60.4	50	130	-45.7	0.27	2.44
40	J1206	J1217	23.1	50	130	-31.5	0.19	1.23
41	J1279	J1281	9.6	100	130	-300.6	0.44	2.73
42	J1522	J1532	32.8	100	110	-449.5	0.66	7.87
43	J1532	J1533	7.9	100	110	172.0	0.25	1.33
44	J1505	J1512	26.0	50	110	0.0	0.0	0.0
45	J1681	J1679	6.0	100	130	0.7	0.1	0.0
46	J1624	J1654	49.7	50	110	22.0	0.13	0.86
47	J1524	J1545	70.3	150	110	567.9	0.37	1.68
48	J1545	J1550	10.7	150	110	553.6	0.36	1.61
49	J1608	J1635	65.3	50	110	19.9	0.12	0.72
50	J1600	J1608	6.6	50	110	40.7	0.24	2.69
51	J1565	J1566	56.7	75	110	0.0	0.0	0.0
52	J1778	J1765	77.3	75	130	-14.5	0.04	0.04
53	J1758	J1765	39.1	75	130	51.5	0.14	0.42
54	J62	J64	1.8	150	110	-429.4	0.28	1.27
55	J64	J73	36.8	150	110	-487.4	0.32	1.27
56	J17	J2	461.4	150	130	-307.2	0.2	0.4
57	J2	J54	170.8	150	130	-307.2	0.2	0.4
58	J54	J67	52.0	150	130	-429.4	0.28	0.73
59	J658	J647	42.6	150	110	135.0	0.09	0.12
60	J647	J668	50.1	150	110	77.8	0.05	0.04
62	J766	J803	69.5	50	110	-10.0	0.06	0.2
63	J584	J734	463.9	100	130	-65.8	0.1	0.16
64	J803	J928	230.1	100	130	-102.4	0.15	0.37
65	J734	J803	169.5	100	130	-72.5	0.11	0.2
66	J215	J278	171.9	50	110	-29.3	0.17	1.46
67	J278	J277	67.8	50	110	-29.3	0.17	1.46
68	J236	J277	105.6	50	110	-23.8	0.14	1.1
69	J1584	J1589	39.7	75	110	73.3	0.19	1.11
70	J1584	J1587	3.6	75	110	-73.3	0.19	1.11
71	J436	J508	233.7	150	130	266.7	0.17	0.3
72	J1438	J1491	128.4	150	110	740.0	0.48	2.75
73	J1438	J1437	10.8	150	110	657.1	0.43	2.21
74	J737	3	53.9	150	130	405.4	0.27	0.66
75	3	J770	42.1	150	130	382.6	0.25	0.59
76	3	J750	4.2	50	130	22.9	0.13	0.66
77	5	J892	160.3	150	130	372.3	0.24	0.56
78	J770	5	94.0	150	130	346.3	0.23	0.49
79	J838	5	6.7	50	130	26.0	0.15	0.84
80	J1201	J1203	31.7	100	130	-225.7	0.33	1.61
81	J1261	6	137.2	150	110	-1471.6	0.96	9.82
82	J1323	J1325	8.8	200	130	1828.3	0.67	2.64
83	J1333	7	297.8	100	130	55.3	0.08	0.12
84	7	J1590	363.9	100	130	-26.4	0.04	0.03
85	J1590	J1617	60.4	100	130	-99.8	0.15	0.35
86	7	J1478	16.5	50	130	81.7	0.48	7.17
34	J198	J237	1000.0	150	130	643.0	0.42	1.55
61	4	J1377	173.8	150	130	652.6	0.43	1.6
87	J172	8	282.8	150	110	-86.7	0.06	0.05
88	6	8	48.6	150	130	86.7	0.06	0.04
90	9	J1136	721.7	200	110	-652.1	0.24	0.52
92	10	J174	218.8	200	130	1764.7	0.65	2.48
93	J1000003	11	263.0	200	130	1764.6	0.65	2.48
95	12	J1035	248.8	50	110	-51.2	0.3	4.12
96	J754	12	108.0	75	130	-51.2	0.13	0.42
97	J772	J782	310.2	75	130	4.8	0.01	0.01
98	J782	J792	57.8	75	130	-24.2	0.06	0.1
99	J692	J742	74.2	150	130	-173.9	0.11	0.14
100	J678	J692	26.6	150	130	-154.1	0.1	0.11
101	J687	J686	7.2	50	110	86.5	0.51	10.88

Pipe Data (32)

Link ID	Start	End	Length m	Diameter mm	Roughness	Flow CMD	Velocity m/s	Unit Head loss m/km
103	J148	13	124.0	50	110	-38.1	0.22	2.39
104	13	J153	137.8	50	110	-38.1	0.22	2.39
105	J457	J453	81.4	50	110	0.0	0.0	0
106	J501	J468	86.1	50	110	-9.4	0.06	0.18
107	J1039	J1040	87.2	50	110	11.2	0.07	0.25
108	J266	J6058	79.0	100	110	-326.8	0.48	4.36
109	J349	14	37.5	50	110	-3.0	0.02	0.02
110	J318	14	74.7	50	130	3.1	0.02	0.02
111	14	J370	28.6	50	110	0.0	0.0	0
112	J1708	J1710	4.6	50	110	-9.7	0.06	0.19

Appendix 12 Hydraulic Analysis of Distribution Network

Appendix 12 Water Hammer Analysis

(1) Case 1

Pipeline	Without Countermeasure			With Countermeasure		
	Figure	Max. negative pressure	Location (distance from the pump station)	Figure	Max. negative pressure	Location (distance from the pump station)
Al Saadeh - Al Jabreyat	Figure 1	-	-	Figure 3	-	-
Al Saadeh-Al Marah	Figure 2	11m	3,700m	Figure 4	-	-

(2) Case 2

Pipeline	Without Countermeasure		
	Figure	Max. negative pressure	Location (distance from the pump station)
Al Saadeh - Al Jabreyat	Figure 5	-	-

(3) Case 3

Pipeline	Without Countermeasure			With Countermeasure		
	Figure	Max. negative pressure	Location (distance from the pump station)	Figure	Max. negative pressure	Location (distance from the pump station)
Al Saadeh - Al Marah	Figure 6	36m	3,700m	Figure 7	6m	3,700m

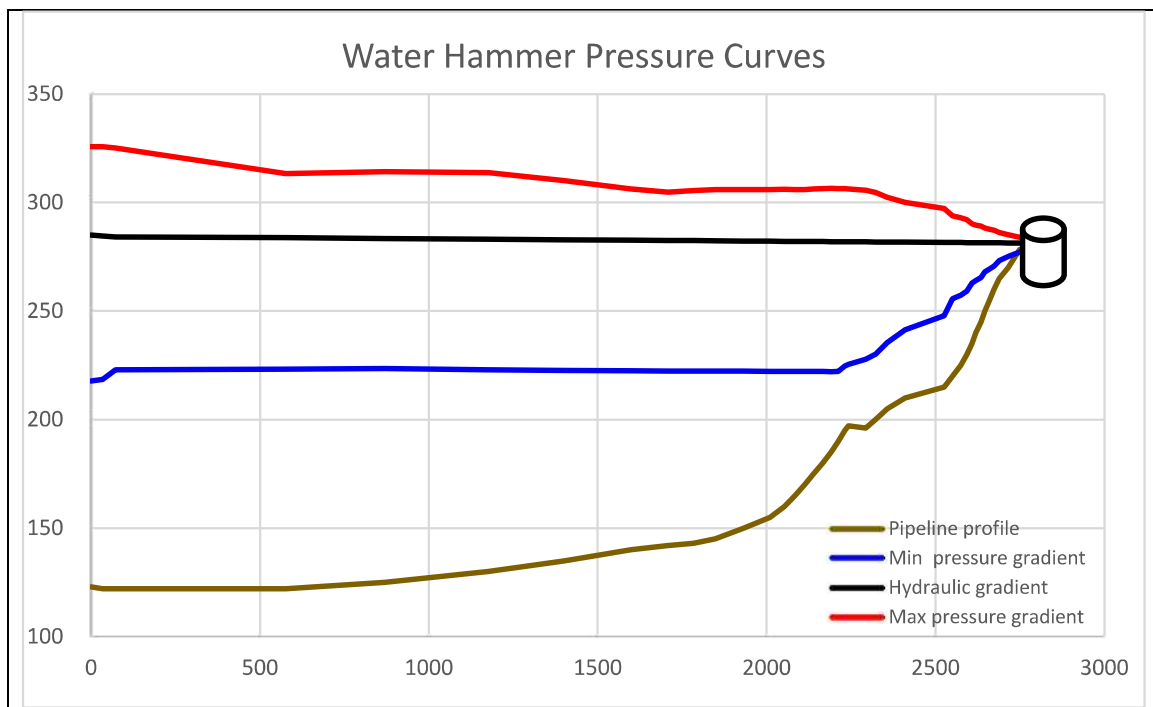


Figure 1 Case 1 : Al Saadeh Pump Station - Al Jabreyat Service Reservoir
(Without Countermeasure)

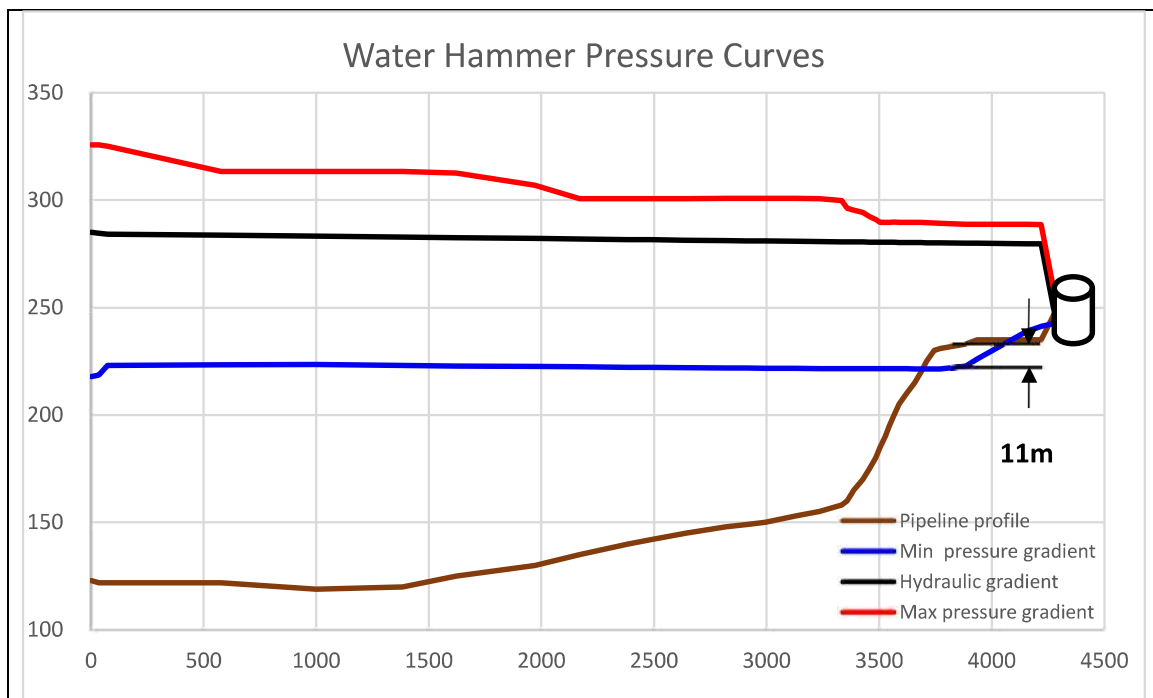


Figure 2 Case 1 : Al Saadeh Pump Station - Al Marah Service Reservoir
(Without Countermeasure)

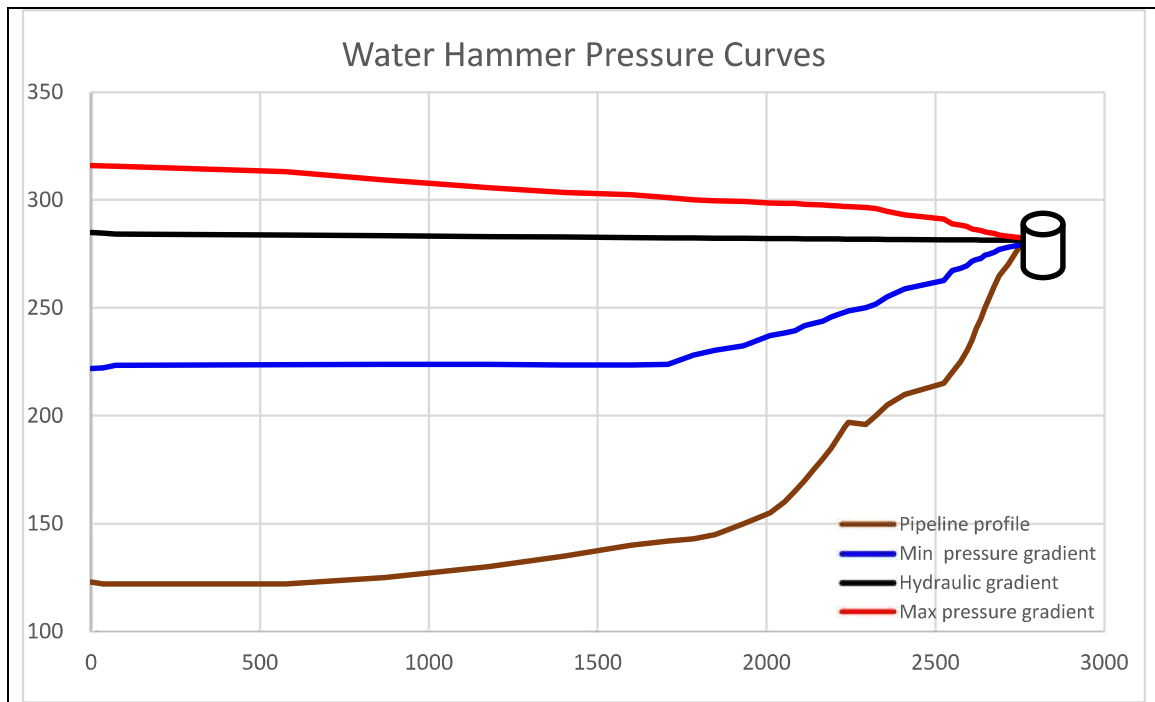


Figure 3 Case1 : Al Saadeh Pump Station - Al Jabreyat Service Reservoir
(With Countermeasure : $GD = 25\text{kgf-m}^2$)

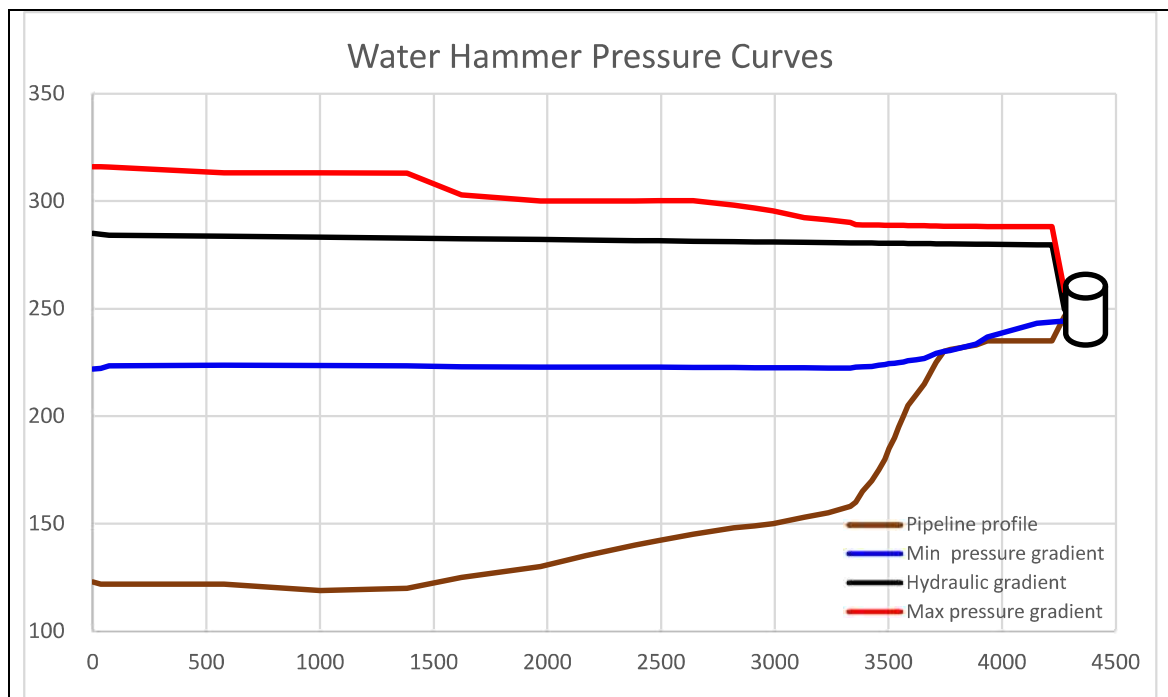


Figure 4 Case1 : Al Saadeh Pump Station - Al Marah Service Reservoir
(With Countermeasure : $GD = 25\text{kgf-m}^2$)

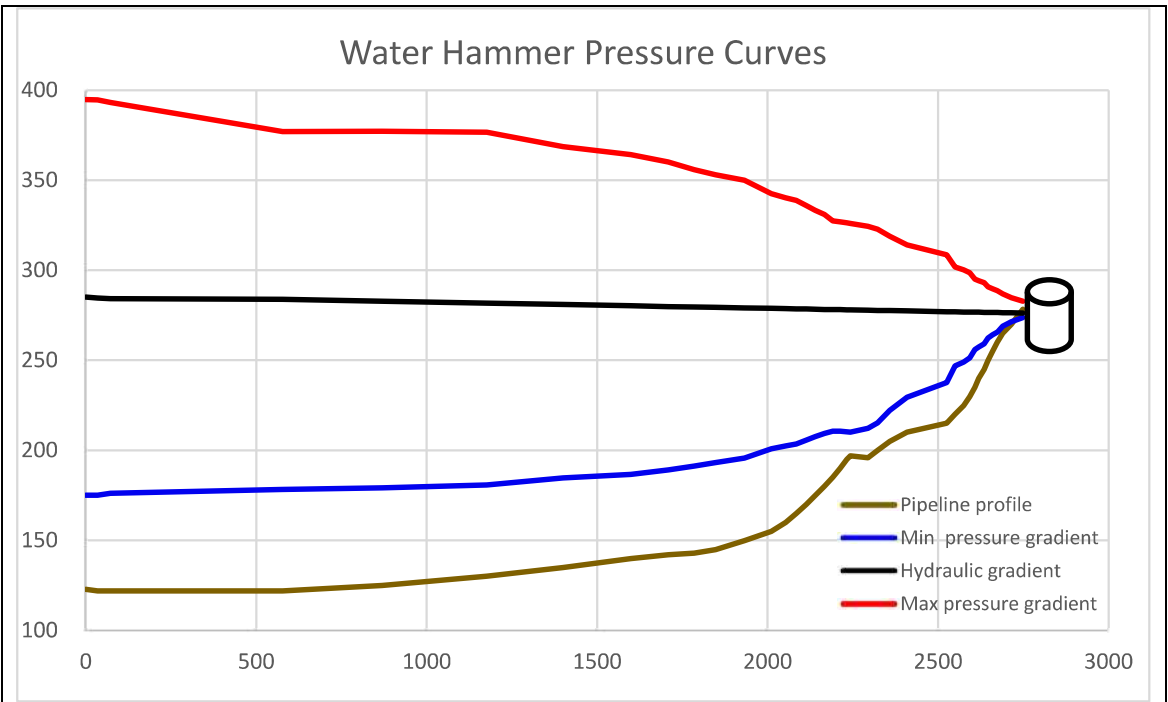


Figure 5 Case 2 : Al Saadeh Pump Station - Al Jabreyat Service Reservoir
(Without Countermeasure)

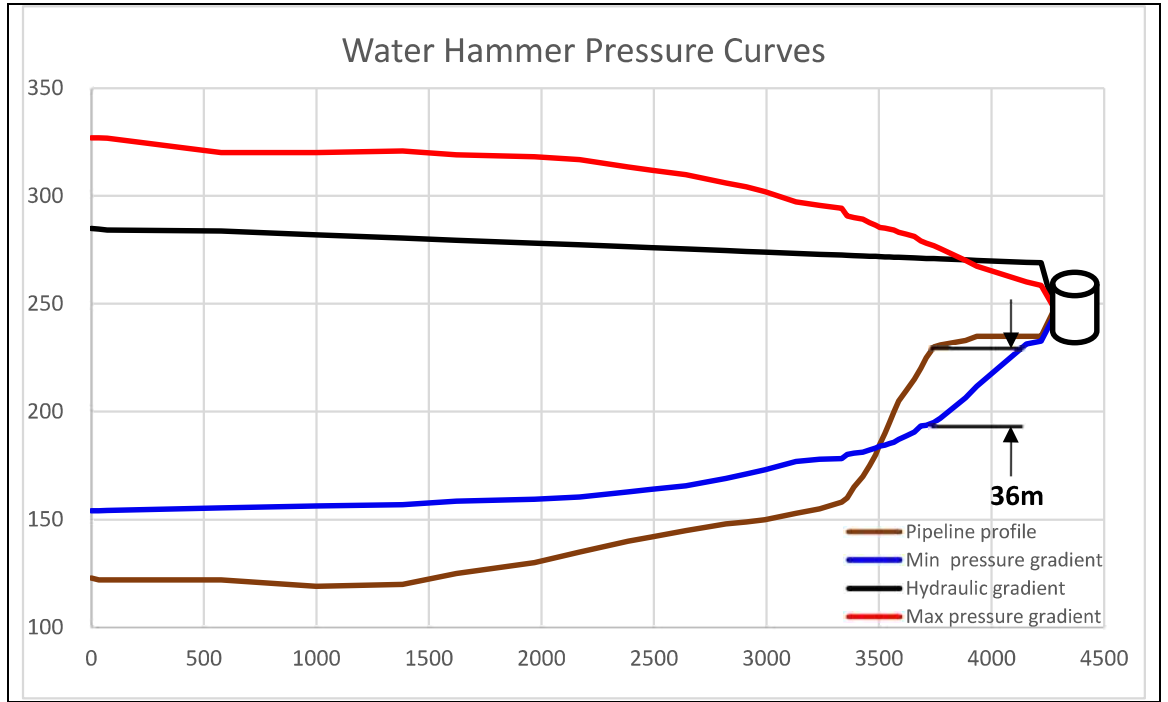


Figure 6 Case 3 : Al Saadeh Pump Station - Al Marah Service Reservoir
(Without Countermeasure)

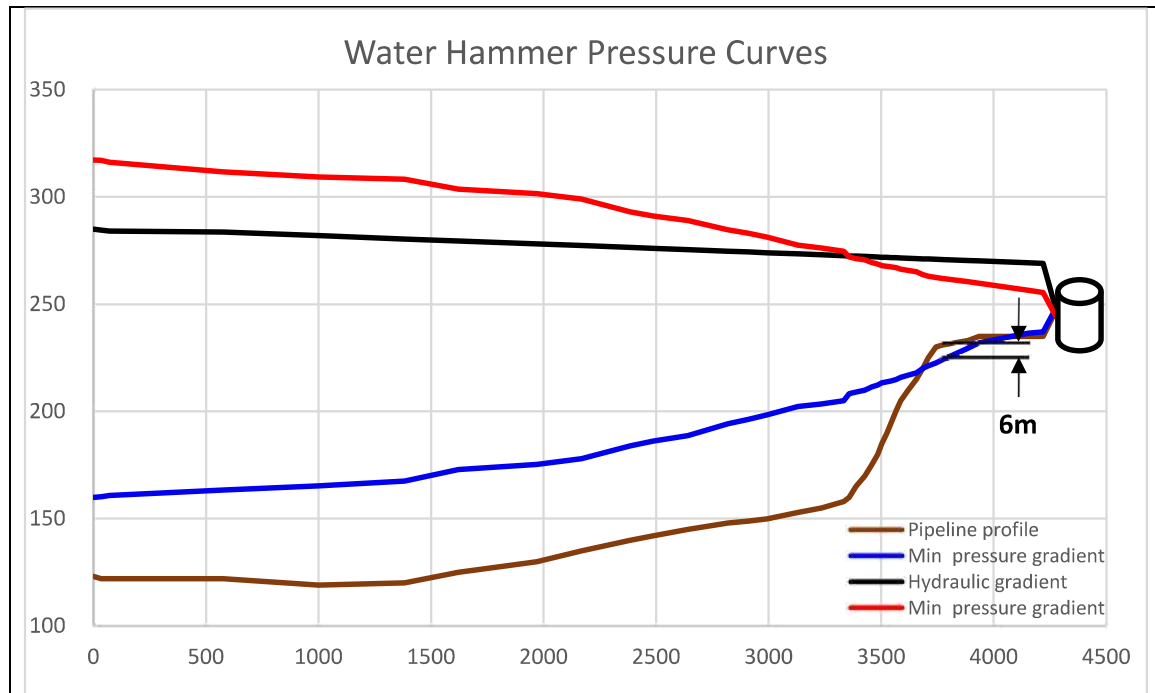


Figure 7 Case3 : Al Saadeh Pump Station - Al Marah Service Reservoir
(With Countermeasure : $GD = 25\text{kgf}\cdot\text{m}^2$)

