Planning of the Main Distribution Network of the Prambon Subdistrict Region in 2032

G N F Nugroho¹, *, A Purnomo¹, S Firdaus¹, B D Marsono¹ and R Sumarsono²

¹Department of Environmental Engineering, Faculty of Civil, Environmental and Geo Engineering. Institut Teknologi Sepuluh Nopember Surabaya 60111, Indonesia
²PDAM Delta Tirta Kabupaten Sidoarjo 61212, Indonesia

*Corresponding author’s e-mail: gregoriusnfn@gmail.com

Abstract. PDAM Sidoarjo targets to serve the western part of Sidoarjo Regency, which includes the Prambon Subdistrict, Tarik Subdistrict, Krembung Subdistrict, Tulangan Subdistrict and Balongbendo Subdistrict. The water requirements of 5 Subdistricts in 2023 were calculated, and the average water requirement would be 771 L/s, while at peak hour the water requirement would be 1,157 L/sec. The distribution system in the Prambon subdistrict is planned to use a loop system, having 3 large loops following the condition of the population distribution, also looping system because Prambon subdistrict is the initial area to drain water to other Subdistricts. The distribution system in Prambon Subdistrict is divided into 25 Blocks, so there are 25 primary to secondary tapping pipes. From the results of analysis, the main distribution network pipe diameter is 300 mm to 850 mm. The pressure reaches a peak of 41 m to 81 m and the velocity is 0.33 m/s to 2.04 m/s.

1. Introduction
The need for drinking water in Sidoarjo Regency increases in proportion to the development of the Regency which is getting more advanced in line with its increasing population every year. The fast growing industries are also a factor in increasing water demand, therefore it was necessary to increase the amount of drinking water that is supplied to customers each year. [1].

The current water demand in Sidoarjo was 6000 liters per second, wherein only around 1500 liters per second were met by PDAM Sidoarjo. Currently, PDAM Sidoarjo regency services were only available in the eastern part of the north and the south, while in the western region of the south there was no service from the Sidoarjo PDAM. In the future, Sidoarjo Regency PDAM is targeting to have services in the western part of Sidoarjo Regency. Gradually, the western region services would include Prambon Subdistrict, Tarik Subdistrict, Krembung Subdistrict, Tulangan Subdistrict and Balongbendo Subdistrict.[2].

Prambon Subdistrict is the closest target for service improvement because this Subdistrict is included in Order K2, where those in Order K1, namely Waru Subdistrict and Sidoarjo Subdistrict, have been served by PDAM. City order deals with the determination of development centers. Status of Order K2 is a small urban but a priority because one day it will develop into a big city with the development of industrial, service and trade activities [3].

The target of fulfilling 100% of drinking water from new services in the western region was targeted to start in 2023 in Prambon Subdistrict (PDAM Sidoarjo Regency, 2018). Currently, the fulfilment of drinking water demands in the majority of Prambon Subdistrict was done by non-piped
networks in the form of dug wells and bore wells, a small portion which had been served by rural non-PDAM pipelines managed by a self-help community called HIPPAM. The pipeline network service in Prambon Subdistrict was targeted to begin in 2023, which was expected to be able to continue to increase services, and spread to four other Subdistricts in the West Sidoarjo region including Tarik, Tulangan, Krembung and Balongbendo Subdistricts. For the realization of PDAM services in the Prambon area, the main distribution network of the Prambon Subdistrict was planned until 2032.

2. General Description

The scope of services would be located in the western region of Sidoarjo Regency, including Prambon, Tarik, Tulangan, Krembung and Balongbendo Subdistricts, Sidoarjo Regency, East Java. Distribution network planning would be located in Prambon Subdistrict, Sidoarjo Regency, East Java.

Prambon Subdistrict has an area of 3,417.9 hectares, consisting of 20 villages. The administrative boundaries of Prambon Subdistrict are as follows:

North : Krian Subdistrict and Wonoayu Subdistrict
East : Tulangan Subdistrict and Krembung Subdistrict
South : Mojokerto Regency
West : Tarik Subdistrict

The area and population per village in Prambon Subdistrict are shown in Table 1.

| Village          | Area (Ha) | Population (People) |
|------------------|-----------|---------------------|
| Prambon          | 196.3     | 4,500               |
| Kajartengguli    | 112.3     | 3,072               |
| Gedangrowo       | 159.2     | 3,696               |
| Wirobiting       | 158.1     | 4,362               |
| Sim pang         | 143.9     | 3,643               |
| Bulang           | 186.4     | 4,264               |
| Gampang          | 91.6      | 2,628               |
| Jatikalang       | 176.6     | 3,966               |
| Pejangkungan     | 137.4     | 3,444               |
| Kedungsoyo       | 285       | 4,902               |
| Kedungwonokerto  | 221.3     | 6,281               |
| Bendotretek      | 199.5     | 5,187               |
| Wonoplintahan    | 217       | 5,818               |
| Kedungkembar     | 209.3     | 3,207               |
| Jati Alun-alun   | 168.4     | 2,759               |
| Jedongcangkring  | 202.8     | 3,783               |
| Cangkringturi    | 126.5     | 2,753               |
| Simogirang       | 227.9     | 5,528               |
| Tenu             | 85.4      | 3,556               |
| Watutulis        | 112.3     | 4,727               |
| **Total**        | **3,417.2** | **82,076**          |

Source: BPS Sidoarjo regency, 2018

The Kalimati service plans to serve 100% of Prambon Subdistrict, bringing the total number of villages served to 20 villages with a population of 82,076. The following is an administrative map in Figure 1.
3. Material and Methods

3.1 Initial Preparation
Permission was required to obtain various data. Various parties that provided the needed data include PDAM Sidoarjo regency, Regional Development Planning Agency (Bappeda) of East Java Province, Sidoarjo Regency Regional Development Planning Agency (Bappeda), Sidoarjo Regency National Unity and Politics Agency (Bakesbangpol), Sidoarjo Regency Statistic Center and PUPR Office Sidoarjo Regency.

3.2 Study of Literatures
Literature study aimed to obtain a theoretical basis to support the paper. The basic theories were obtained from journals, books, articles, and other sources (regulations, brochures, and so on).
Technical instructions for planning the transmission and distribution system refer to Indonesian national standards (SNI) and the following regulations:
- SNI 7509-2011: Procedure for Planning Distribution Network Engineering and Water Supply System Service Unit Units.
- SNI 7511-2011: The Procedure for Installing Transmission Pipes and Distribution Pipes and Pipe Crossing Buildings.
- PERMEN PUPR number 18-2007: Implementation of Drinking Water Supply System Development.

3.3 Primary Data Collection
Primary data taken include:
1) Planning Area Topographic Field Survey:
   - Survey elevation and tapping point elevation, using GPS.
   - Survey condition of roads and road sides.
2) Water demands and Drinking Water Service Questionnaire Survey.
The survey used a questionnaire with a guided interview approach, where respondents were given the freedom to express answers while being guided by the surveyor and then the surveyor would fill in the questionnaire according to the answers. The survey question points of the questionnaire are as follows:

- Number of people in one house
- Amount of water usage
- Water use time
- Exiting drinking water access
- Willingness to connect to PDAMs
- Ability to pay for the price of drinking water

The respondents surveyed were residents in the Prambom Subdistrict area, and the determination of the number of respondents referred to the Guidelines for Preparation of SPAM Development Feasibility Study in the Minister of Public Works Regulation No. 18 of 2007 [4]. The calculation of the number of respondents needed is as follows:

\[ n = \frac{(Np(1-p))/((N-1)D+p(1-P))}{(1-0,5)} \]

\[ D = \frac{B^2}{t^2} \]

Where:
- \( n \) = number of respondents
- \( N \) = number of population (Household Connections)
  \( = 82,076 \text{ person} / 4 \text{ person} = 16415 \text{ Household Connections (HC)} \)
- \( p \) = the ratio of the elements in the sample that have the desired properties of the sample
  \( = 0,5 \)
- \( B \) = error rate = 6 %
- \( t \) = level of confidence = 95 %
- \( D = \left[0,06\right] \times 2/ \left[0,95\right] \times 2 = 0,004 \)
- \( n = (16415 \times 0,5 \times (1-0,5))/((16415-1)0,004+0,5(1-0,5)) = 62 \text{ respondents} \)

3.4 Secondary Data Collection

Secondary data collected include:
1) Number of Population and Public Facilities in the Planning Area.
2) Number of Prospective Customers in the Planning Area.
3) Amount of Water Usage of Customers in the Served Areas
4) Maps, including administrative maps of the planning area and RTRW maps.
5) PDAM technical data, including excitation distribution schemes, types of pipes and accessories, and the level of water loss.

3.5 Data Processing

1) Determination of service areas, based on land use, population density, exciting services through PDAM or HIPPAM. The planning area covers 20 villages in Prambom Subdistrict.
2) Population and public facilities projections, carried out for 10 plans until 2033 with reference to the previous population from 2010 to 2017 according to data held by BPS. Population data used for projection was the number of residents in the urban communities (kelurahan) in the planning area. Projection of the number of public facilities was carried out to determine non-domestic water needs. This projection was based on data on the number of general facilities in 2018.
3) Projection of drinking water demands, carried out to determine the water requirements for this distribution system, using peak hour discharge. The water demands that were taken into account include domestic, non-domestic water demands and leakage estimates.
4) Determination of the main distribution network layout:
   a. Determine the master pipeline system plan, determine closed or branch systems, or combination.
   b. Determine the location of the pipeline based on technical considerations in the technical provisions and see the condition of the road utility.
   c. Determine the map of the distribution of service blocks by referring to the RTRW map in the planning year.
   d. Determine the node division of discharge from the main pipe to serve the service blocks.
   e. Determine the hydraulic distribution system, based on technical provisions.
5) Measurement of topography (elevation) using data from the results of a field survey of elevation as input of processing in subsequent hydraulic analysis.
6) Determination of the location of the reservoir and the type of reservoir, in the form of ground reservoir or water tower, to be used as input for hydraulic analysis data.
7) Determination of pipe type and diameter in accordance with technical provisions, to be used as input for hydraulic analysis data, as well as pipe accessories.
8) The network created was then analyzed by the WaterCad program to find out the pressure, headloss, and speed of the water in the pipe in accordance with the criteria so that the water could flow well to the customer. Data inputted in the analysis using the WaterCad program include ground elevation data, diameter of the planned pipes, pipe length, pipe roughness coefficient, tapping discharge and pump head and discharge. Results of this analysis would reveal hydraulic pressure at each point.

4. Result and Discussion

4.1 Population and Public Facilities Projection
1) Population Projection
The population projection used the arithmetic method, which was selected based on the comparison of the correlation coefficient that was closest to 1 and the smallest standard deviation. The arithmetic method calculation formula is as follows:

$$ P_n = P_0 + r(n) $$

(3)

Where:
- $P_n$ = Population in projection year (people)
- $P_0$ = Population in baseline year (people)
- $r$ = average population growth each year
- $n$ = Period

Results of population projections up to 2032 are shown in Table 2.

| No | Village       | Total population (people) |
|----|---------------|---------------------------|
|    |               | 2017 | 2032  |
| 1  | Prambon       | 4500 | 5002  |
| 2  | Kajartengguli | 3072 | 3415  |
| 3  | Gedangrowo    | 3696 | 4108  |
| 4  | Wirobiting    | 4362 | 4849  |
| 5  | Simpang       | 3643 | 4050  |
| 6  | Bulang        | 4264 | 4740  |
| 7  | Gampang       | 2628 | 2921  |
| 8  | Jatikalang    | 3966 | 4409  |
No | Village | Total population (people)
--- | --- | ---
9 | Pejangkungan | 3444 | 3828
10 | Kedungsuco | 4902 | 5449
11 | Kedungwonokerto | 6281 | 6982
12 | Bendotretek | 5187 | 5766
13 | Wonoplintahan | 5818 | 6467
14 | Kedungkembar | 3207 | 3565
15 | Jati Alun-alun | 2759 | 3067
16 | Jedongcangkring | 3783 | 4205
17 | Cangkringturi | 2753 | 3060
18 | Simogirang | 5528 | 6145
19 | Temu | 3556 | 3953
20 | Watutulis | 4727 | 5254

| | | 2017 | 2032 |
--- | --- | --- | ---
Total | | 82076 | 91235 |

2) Projection of Public Facilities

Public facilities projections were done using the equation:

\[
\sum P_n / \sum P_0 = \sum F_n / \sum F_0
\]

Where:
- \(P_n\) = Population in projection year (people)
- \(P_0\) = Population in baseline year (people)
- \(F_n\) = Total Facility in projection year (unit)
- \(F_0\) = Total Facility in projection year (unit)

Results of projected public facilities until 2032 are shown in Table 3.

**Table 3. Projection of Public Facilities in Prambon Subdistrict**

| Facilities | Unit | 2017 | 2032 |
--- | --- | --- | ---
**Government Facilities** | Assembly Hall | 32 | 47 |
| Village level facilities | 20 | 20 |
| Sub-district level facilities | 6 | 6 |
| **Education** | Kindergarten | 24 | 26 |
| Elementary school | 36 | 40 |
| Middle School | 6 | 7 |
| High school | 3 | 3 |
| **Health** | Hospital | 1 | 1 |
| Public health centre | 1 | 1 |
| BKIA | 17 | 17 |
| Medical Center | 56 | 56 |
| **Place of Worship** | Mosque | 43 | 49 |
| Mushollah | 305 | 339 |
| Others | - | - |
| **Industry** | Large / Medium | 14 | 19 |
| Small | 35 | 39 |
| Folk Crafts | 88 | 97 |
| **Trade and Commerce** | Department store | 8 | 19 |
| Shopping centre/ Market | 3 | 3 |
| **Total** | 698 | 789 |
4.2 Water Demand Projection

1) Survey of Drinking Water Demands and Services

From the survey results, of the 71 respondents who were randomly surveyed in Prambon Subdistrict, 31% of them were willing to connect to PDAM in 2023 when the company would begin to provide service to reach its target. The figure of 31% was then used as an initial assumption of the percentage of services in the Prambon Subdistrict that would continue to increase until 2032. The water demand obtained from the water demands survey was 100 L/person/day.

2) Calculation of Water Demand Projection

Water demand projections were carried out by projecting domestic and non-domestic water demands. Domestic water demand was obtained from the total population multiplied by 100 L/person /day, while the coefficient for non-domestic water demand is shown in Table 4. Each of the water demand projections is shown in Table 5 and Table 6.

Table 4. Non-Domestic Needs Coefficient

| Facilities                | Flow (L/unit/day) |
|---------------------------|-------------------|
| Government Facilities     |                   |
| Assembly Hall             | 1000              |
| Village level facilities  | 500               |
| Subdistrict level facilities | 500              |
| Education                 |                   |
| Kindergarten              | 750               |
| Elementary school         | 2080              |
| Middle School             | 3470              |
| High school               | 1690              |
| Health                    |                   |
| Hospital                  | 70000             |
| Public health centre      | 3500              |
| BKIA                      | 3500              |
| Medical centre            | 1050              |
| Place of Worship          |                   |
| The mosque                | 2000              |
| Mushollah                 | 500               |
| Others                    | 500               |
| Industry                  |                   |
| Large / Medium            | 2000              |
| Small                     | 1750              |
| Folk Crafts               | 1500              |
| Trade and Commerce        |                   |
| Department store          | 1000              |
| Shopping Centre/ Market   | 8000              |

Table 5. Projection of Domestic Water demands

| No | Village       | Amount of Water Demands (L/s) |
|----|---------------|--------------------------------|
|    |               | 2023  | 2032  |
| 1  | Prambon       | 5.44  | 5.79  |
| 2  | Kajartengguli | 3.71  | 3.95  |
| 3  | Gedangrowo    | 4.47  | 4.76  |
| 4  | Wirobiting    | 5.27  | 5.61  |
| 5  | Simpang       | 4.40  | 4.69  |
| 6  | Bulang        | 5.16  | 5.49  |
| 7  | Gampang       | 3.18  | 3.38  |
| 8  | Jatikalang    | 4.80  | 5.10  |
| 9  | Pejangkungan  | 4.16  | 4.43  |
| 10 | Kedungsoego   | 5.93  | 6.31  |
| 11 | Kedungwonokerto | 7.59  | 8.08  |
Table 6. Projection of Non-Domestic Water demands

| Facilities                  | Amount of Water Demands (L/s) | 2023 | 2032 |
|-----------------------------|--------------------------------|------|------|
| Government Facilities      | Assembly Hall                 | 0.42 | 0.54 |
|                             | Village level facilities      | 0.12 | 0.12 |
|                             | district level facilities     | 0.03 | 0.03 |
| Education                  | Kindergarten                  | 0.22 | 0.23 |
|                             | Elementary school             | 0.94 | 0.96 |
|                             | Middle School                 | 0.24 | 0.28 |
|                             | High school                   | 0.06 | 0.06 |
| Health                     | Hospital                      | 0.81 | 0.81 |
|                             | Public Health Centre          | 0.04 | 0.04 |
|                             | BKIA                           | 0.69 | 0.69 |
| Place of Worship            | Medical Centre                | 0.68 | 0.68 |
|                             | The mosque                    | 1.09 | 1.13 |
|                             | Mushollah                     | 1.90 | 1.96 |
|                             | Others                        | 0.00 | 0.00 |
| Industry                   | Large / Medium                | 0.44 | 0.44 |
|                             | Small                         | 0.77 | 0.79 |
|                             | Folk Crafts                   | 1.63 | 1.68 |
| Trade and Commerce         | Department store              | 0.20 | 0.22 |
|                             | Shopping Centre / Market      | 0.28 | 0.28 |
| Total (L/s)                | Total                          | 10.54| 10.95|

3) Total Water Demands
The water demands of Prambon Subdistrict in 2032 are as follows:
1. Total population = 91,235 people
2. Population served by HIPPAM = 3,570 people
3. Population not served = 91,235 – 3,570 = 87,665 people
4. Percentage of service = 98 %
5. Population served = 98% x 87,665 people = 85,912 person
6. Population per connection = 6 people/unit
7. Number of house connections = 85,912/6
   = 14,319 HC
8. Domestic consumption unit = 100 L/people/day
   = 0.00116 L/people/day
9. Q Domestic average = 85.912 x 0.00116
   = 99.44 L/s
10. Customers of public facilities = 634 units
11. Percentage of service = 100%
12. Q public facilities average = 8.04 L/s
13. Industrial Customers = 155 units
14. Percentage of service = 100%
15. Q Industrial average = 2.91 L/s
16. % Leakage = 24.14 %
17. Average total Q = (domestic Q + Q public facilities + Industrial Q) x (100% + % leakage)
   = (99.44 + 8.04 + 2.91) x (124.14%)
   = 137.03 L/sec
18. Maximum daily Q = Maximum daily factor x Q Total average
   = 1.3 x 137.03 L/s
   = 178.14 L/s
19. Q Peak hour = Peak hour factor x Q average total
   = 1.5 x 137.03 L/s
   = 205.55 L/s

The water demands of Prambon Subdistrict and subdistricts around Prambon are presented in Table 7, and the calculation of water demands in Tarik, Tulangan, Krembung, and Balongbendo subdistricts was done according to the pipeline planning in Prambon Subdistrict in the form of a loop that would supply water to 5 Subdistricts.

| No | District     | Water Demand (L/s) | Maximum Day Water Demand (L/s) | Peak Hour Water Demand (L/s) |
|----|--------------|--------------------|-------------------------------|------------------------------|
| 1  | PRAMBON      | 137                | 178                           | 206                          |
| 2  | TARIK        | 127                | 166                           | 191                          |
| 3  | TULANGAN     | 228                | 297                           | 342                          |
| 4  | KREMBUNG     | 141                | 183                           | 211                          |
| 5  | BALONGBENDO  | 138                | 179                           | 207                          |
|    | Total (L/s)  | 771                | 1003                          | 1157                         |

4.3 Main Distribution Network Layout
The main distribution network layout is presented in Figure 2.
4.4 Network Analysis

The analysis of clean water network systems in this plan used the Water CAD program intended to determine the level of pressure and discharge that occurred in the existing network. Analysis of the network system began with the planned depiction of a clean water network map. From this description, the drinking water facility network was translated into a pipeline schematic (modeling) which was then analyzed by Water CAD. After the network model was created, the network properties were inputted, so the network could be run with the Water CAD program.

In the planning of the main distribution network, a loop system was made to prepare service to the networks outside the Prambon area, which consisted of 25 blocks according to the division in table 5.55. Then, from each tapping point the block was extended to a distribution network where there would be tapping points to a sub-block of a group of houses.

In using the Water CAD program, the Junction command includes elevation and discharge tapping data, while the pipe command includes the length, diameter, pipe type and pipe roughness coefficient.

The elevation data used was the elevation obtained through direct measurements in the field using the measure maps application on mobile phones. Discharge data was entered based on the calculation of the water demand for each block. Analysis was carried out during peak hour conditions. This was done so that the planned pipeline would be able to drain water even in peak hour conditions, namely when the water demand is highest. Laying of tapping points was determined based on the presence of residential houses in each block which could be seen from the Bappeda land use map. Flow tapping for each block included in the Water CAD program can be seen in Table 8.
| Block | Sub Block | Area  | Percent Sub Block | Number of HC Per Sub Block | Water Discharge per Sub Block (L/s) |
|-------|-----------|-------|-------------------|----------------------------|-----------------------------------|
| 1     | B-1a      | 91,666| 20%               | 153                        | 1.63                              |
| 1     | B-1b      | 13,711| 29%               | 226                        | 2.41                              |
| 1     | B-1c      | 233,623| 51%              | 390                        | 4.15                              |
| 2     | B-2a      | 58,514| 24%               | 73                         | 0.95                              |
| 2     | B-2b      | 80,237| 33%               | 100                        | 1.3                               |
| 2     | B-2c      | 27,290| 11%               | 34                         | 0.44                              |
| 2     | B-2d      | 77,188| 32%               | 96                         | 1.25                              |
| 3     | B-3a      | 124,740| 58%             | 317                        | 4.32                              |
| 3     | B-3b      | 56,749| 26%               | 144                        | 1.97                              |
| 3     | B-3c      | 35,040| 16%               | 89                         | 1.21                              |
| 4     | B-4a      | 18,895| 7%                | 39                         | 0.54                              |
| 4     | B-4b      | 123,159| 48%             | 256                        | 3.52                              |
| 4     | B-4c      | 114,361| 45%            | 237                        | 3.27                              |
| 5     | B-5a      | 205,327| 48%             | 244                        | 3.08                              |
| 5     | B-5b      | 128,807| 30%            | 153                        | 1.93                              |
| 5     | B-5c      | 50,466| 12%              | 60                         | 0.76                              |
| 5     | B-5d      | 46,289| 11%              | 55                         | 0.7                               |
| 6     | B-6a      | 46,442| 21%              | 73                         | 1.01                              |
| 6     | B-6b      | 74,101| 34%              | 116                        | 1.61                              |
| 6     | B-6c      | 96,382| 44%              | 152                        | 2.09                              |
| 7     | B-7a      | 102,307| 34%            | 162                        | 2.23                              |
| 7     | B-7b      | 45,442| 15%              | 72                         | 0.99                              |
| 7     | B-7c      | 79,566| 26%              | 126                        | 1.73                              |
| 7     | B-7d      | 75,331| 25%              | 119                        | 1.64                              |
| 8     | B-8a      | 79,979| 14%              | 147                        | 2.02                              |
| 8     | B-8b      | 89,563| 16%              | 165                        | 2.26                              |
| 8     | B-8c      | 102,552| 18%           | 188                        | 2.59                              |
| 8     | B-8d      | 298,800| 52%         | 549                        | 7.55                              |
| 9     | B-9a      | 89,067| 12%              | 114                        | 1.59                              |
| 9     | B-9b      | 89,067| 12%              | 114                        | 1.59                              |
| 9     | B-9c      | 71,869| 10%              | 92                         | 1.28                              |
| 9     | B-9d      | 467,715| 65%           | 600                        | 8.35                              |
| 10    | B-10a     | 53,677| 18%              | 123                        | 1.72                              |
| 10    | B-10b     | 84,158| 28%              | 192                        | 2.69                              |
| 10    | B-10c     | 63,658| 22%              | 145                        | 2.04                              |
| 10    | B-10d     | 94,271| 32%              | 215                        | 3.01                              |
| 11    | B-11a     | 243,590| 67%         | 471                        | 6.86                              |
| 11    | B-11b     | 118,148| 33%        | 229                        | 3.33                              |
| 12    | B-12a     | 119,668| 76%       | 424                        | 6.57                              |
| 12    | B-12b     | 38,084| 24%              | 135                        | 2.09                              |
| 13    | B-13a     | 167,253| 49%         | 318                        | 4.39                              |
| 13    | B-13b     | 170,925| 51%        | 325                        | 4.49                              |
| 14    | B-14a     | 73,891| 19%              | 107                        | 1.37                              |
From the results of the analysis, it was found that the remaining pressure in the network was worth more than 15 meters, ranging from 41 m to 81 m and the water velocity ranged from 0.33 m/s to 2.04 m/s. The pipe diameter ranged from 300 mm to 850 mm. The results of the Water CAD analysis are shown in Figure 3.
5. Conclusions
The total population of Prambon Subdistrict served in 2032 would be 91,235 people, from the analysis of water demands with added needs for public facilities and reduced domestic water demands that had been served by HIPPAM, the average water demand would be 137 L/s, while with a peak hour value of 1.5, water demand during peak hours would be 206 L/s. With accumulation of water demands in other Subdistricts to serve water using a pump with a head of 70 m and a flow of 290 L/s. The Prambon Subdistrict area would be divided into 25 service blocks with a diameter of the main distribution network ranging from 300 mm to 850 mm, with diameter selection taking note of minimum velocity, and ideal pressure value using the Water CAD analysis done during peak hours.

References
[1] Central Bureau of Statistics 2018 *Sidoarjo Regency in Figures 2018* (Sidoarjo: Statistics Indonesia)
[2] Sidoarjo Regency Government 2018 *Master Plan for Sidoarjo Regency Water Supply System* (Sidoarjo: Sidoarjo Regency Government)
[3] Sidoarjo Regency Government 2009 *Sidoarjo Regency Regional Regulation Number 6 Year 2009* (Sidoarjo: Sidoarjo Regency Government)
[4] PUPR PERMEN number 18-2007: *Implementation of Drinking Water Supply System Development*

Acknowledgments
Acknowledgments adressed to PDAM Delta Tirta of Sidoarjo Regency and Environmental Engineering Department Faculty of Civil and Geo Engineering ITS. Thank you for the help and support in completing this planning.