Annex:

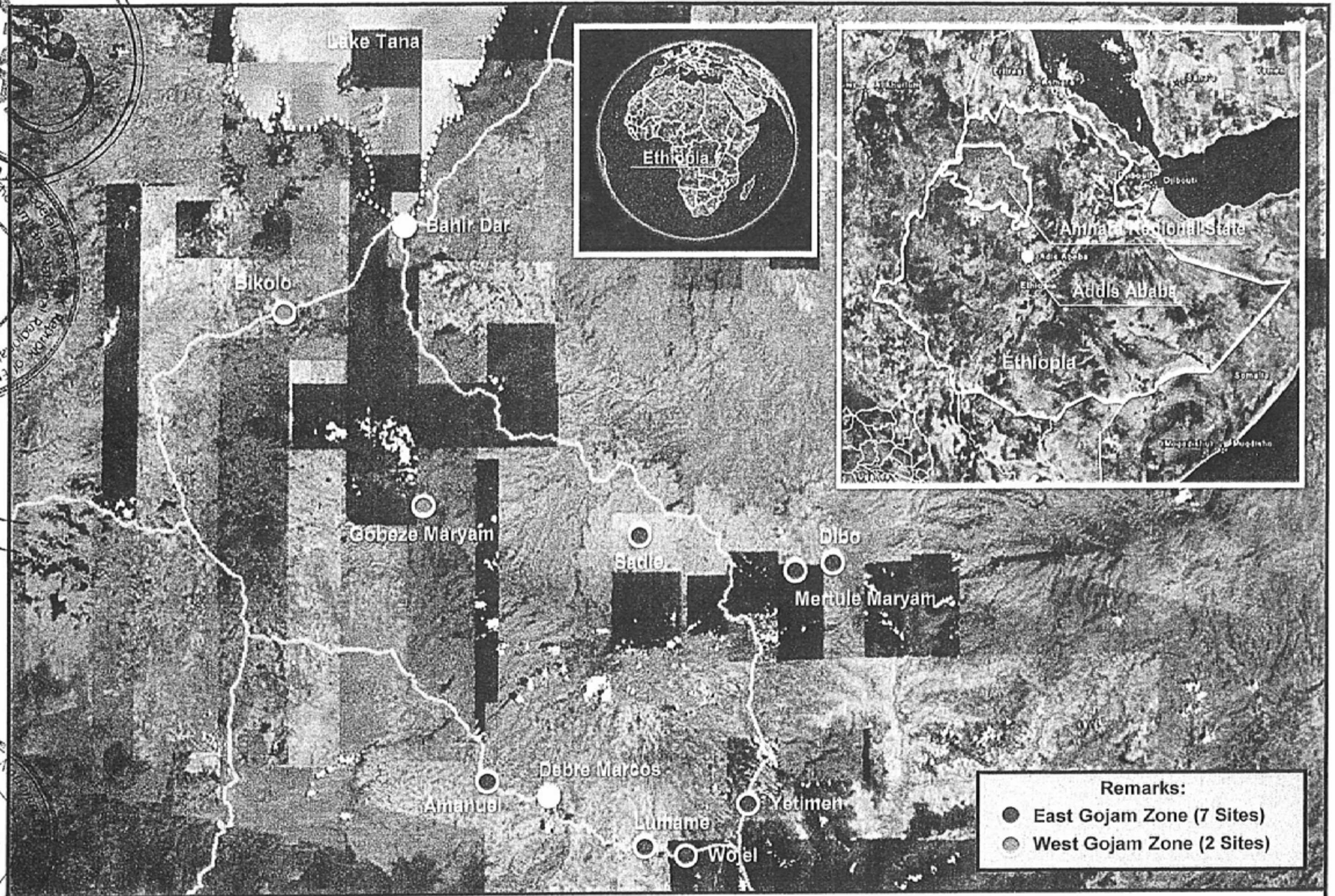
Annex-1 Project Sites

Annex-2 Components of the Project

Annex-3 Selected Sites

Annex-4 Organization Chart of the Responsible Organization

Annex-5 Project Cost Estimation



Location Map of the Target Sites

The Preparatory Survey for the Project for Small Town Water Supply in Southern Part of the Amhara Regional State

Annex-1

Japan International Cooperation Agency 3

Federal Democratic Republic of Ethiopia Amhara National Regional State Finance and Economic Development Bureau

Amhara ... Water Resources Development ...

Annex-2

Components of the Project

1. Construction of Water Supply Facilities: 9 towns as listed below

No.	Town	Population (2016)	Water supply amount (2016)
9	Mertule Maryam	17,829	328.97 m^3/day
10	Yetimen	3,877	74.33 m^3/day
12	Lumame	13,451	255.17 m^3/day
14	Wojel	3,758	121.22 m^3/day
15	Sedie	3,947	87.99 m^3/day
16	Dibo	2,510	89.22 m^3/day
	Amanuel	12,694	86.40 m^3/day
27	Gobeze Maryam	6,908	114.00 m^3/day
	Bikolo	5,811	181.43 m^3/day
Total		70,786	1,338.73 m^3/day

2. Technical Assistance consisting of:
   - To facilitate AWRDB and Woreda water office on the effective support system in proper management of Water Management Organization (WMO)
   - To institutionalize the operation and maintenance structures of WMO
   - To secure general understanding among the stakeholders on the operation and maintenance structures
   - To conduct technical trainings on the maintenance and repair of the facilities (implemented by EWTEC)
   - To conduct technical trainings on administrative tasks such as accountancy, book keeping and reporting
   - To assist WMO conducting monitoring and evaluation, modification of the plan

In the Federal Democratic Republic of Ethiopia The Amhara National Regional State Finance and Economic Development Bureau

Amhara National Regional State Water Resources Development B...

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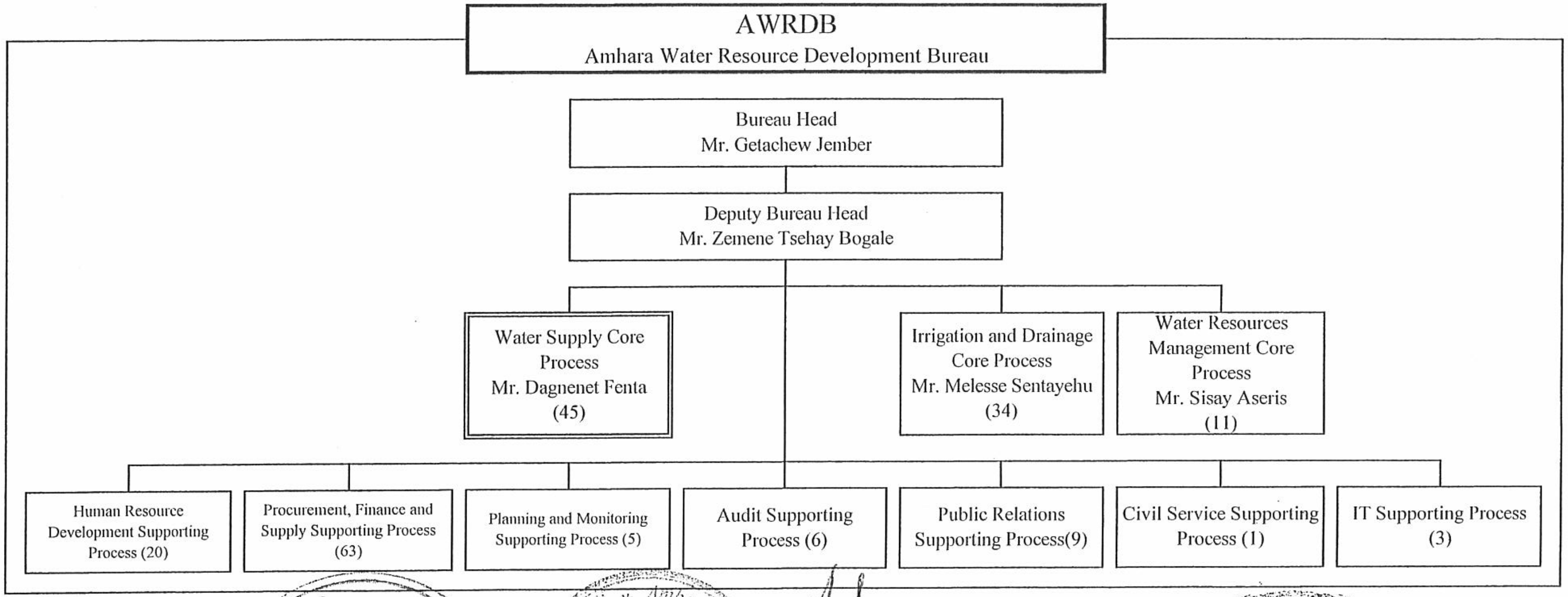
Annex-3

Selected Target Sites

No.	Zone	Woreda	Town
9	East Gojam	Enebsie Sar Midir	Mertule Maryam
10	East Gojam	Enemay	Yetimen
12	East Gojam	Awabel	Lumame
14	East Gojam	Awabel	Wojel
15	East Gojam	Hulet Egu Enesie	Sedie
16	East Gojam	Enebsie Sar Midir	Dibo
	East Gojam	Machakel	Amanuel
27	West Gojam	Quarit	Gobeze Maryam
	West Gojam	Macha	Bikolo

Organization Chart of the Responsible Organization



資料5. ソフトコンポーネント計画書

アムハラ州南部地方小都市給水計画
ソフトコンポーネント計画書

（1）ソフトコンポーネントを計画する背景

1）現状と課題

対象サイトにおいては、既存の水管理組織による運営・維持管理体制が整備されているが、管理費用の積み立て計画を立案し、それを基に水料金を徴収・管理し、水道施設を運営していく能力には乏しい。また、軽微な故障が発生しても、修繕せずに放置されている水道施設も散見される。他方、施設の故障を防ぐための定期保守を担う Woreda 水事務所の役割分担が明確ではなく、それにかかる予算や人員も十分に配置されていないのが現状である。

以上から、水管理組織の運営・維持管理にかかる課題は、以下のとおりである。

- 運営・維持管理体制が確立されていない
- 機器操作や軽微な修理に対応できない
- 水料金（運営・維持管理費）の徴収・管理能力が低い

2）ソフトコンポーネントの必要性

前述のとおり、既存の水管理組織による運営・維持管理体制は整備されているが、管理費用の積み立て計画を立案し、それを基に水料金を徴収･管理し、水道施設を運営していく能力には乏しい。また、軽微な修繕に対する能力も不足している。本プロジェクトで整備される水道施設は、水管理組織によって運営・維持管理が可能となる内容及び規模で計画するが、現状の水管理組織の体制及び技術力では能力不足と判断される部分がある。

したがって、円滑なプロジェクトの立ち上がりを確実とするため、ソフトコンポーネントによる技術支援を投入し、水管理組織及び Woreda 水事務所の運営・維持管理にかかる能力強化を支援する。なお、対象サイトには、公共水栓式または各戸給水式水道施設が存在するため、住民の衛生理念はある程度醸成されていると判断し、ソフトコンポーネント内での衛生教育は実施しない。

また、技術支援の内容としては、運営・維持管理能力の強化にかかるソフト面の支援に重点を置くが、エチオピア国地下水開発・水供給訓練センター（Ethiopian Water Technology Centre、以下「EWTEC」）と連携し、機械操作や軽微な修繕等のハード面についても技術支援を行なう。

（2）ソフトコンポーネントの目標

1）目標

ソフトコンポーネントの目標は、「水管理組織が主体となって水道施設の運営・維持管理が適切に実施されること」と定める。この上位目標は、「建設された水道施設がプロジェクト終了後も長期間にわたって利用される」ことである。すなわち、ソフトコンポーネントの実施によって、本プロジェクト終了後の水道施設が、水管理組織主体で持続的に運営・維持管理されることを目指すものである。なお、ソフトコンポーネントの PDM は、次表のとおりである。

PDM（ソフトコンポーネント）

プロジェクト要約	指標	入手手段	外部条件
上位目標 建設された水道施設がプロジェクト終了後も長期間に亘って利用される	住民の水因性疾病率の低下	･保健衛生の統計資料 ･住民アンケート	
ソフトコンポーネントの目標 水管理組織が主体となって、水道施設の運営･維持管理が適切に実行される	･ 全施設が年間を通して稼動している ･ 安全な水が得られる人口が増加する	･ 施設運転記録簿 ･ 施設利用登録簿	AWRDB が水管理組織主体の運営･維持管理政策を変更しない
成果 1. 水道施設の運営･維持管理に関わる実施体制が整う	1.1 実施機関において、住民主体の運営･維持管理に対する連携意識が高まり、水管理組織への支援体制が形成される 1.2 各サイトにおいて水管理組織が整備される 1.3 住民を含む関係者各自が自分の役割を明確に認識する	･ 関係者へのヒアリング ･ ワークショップ報告書 ･ 支援体制組織図 ･ 利用規約 ･ 水管理組織･組織図 ･ 運営･維持管理計画書 ･ 各担当者へのヒアリング	住民が主体となることに関して、関係機関からの異議がない
2. 運営･維持管理に必要な技能や知識を習得する	2.1 故障頻度が減少し、給水施設の未使用期間が短縮される 2.2 水管理組織での出納業務を含む運営記録が作成される 2.3 モニタリング･評価が計画に応じて実施され、活動に反映される	･ 活動記録簿 ･ 施設運転記録簿 ･ 技術訓練報告書 ･ 故障時修理マニュアル ･ 料金徴収出納帳 ･ 施設運転記録簿 ･ ソフトコンポーネント実施状況報告書	
活動			前提条件
1.1 AWRDB 及び Woreda の水管理組織への支援体制を整える 12 水管理組織の運営･維持管理体制を整備する 1.3 運営･維持管理体制に関する理解を得る 2.1 水道施設の点検修理等にかかる技術訓練（ハード面）を実施する 2.2 会計、記録等のアドミニストレーションにかかる技術指導（ソフト面）を実施する 2.3 活動のモニタリング･評価を実施し、計画の修正を行なう			関係者がプロジェクト実施に積極的である

2）支援体制配慮事項

ソフトコンポーネントは、水道施設建設前に行なう「実施体制の確立」（フェーズ 1）と建設中～後に行われる「運営・維持管理技術の習得」（フェーズ 2）の 2 フェーズ体制を取り、サイト単位で水管理組織を中心に啓蒙・教育活動を行なう。水道施設のハード面に関する維持管理に関しては、EWTEC から 2 名の講師を各サイトに招き、関係者に対する合同の技術訓練を実施する。

（3）ソフトコンポーネントの成果

運営・維持管理にかかるソフトコンポーネントの成果（直接効果）は、以下のとおりである。

成果 1：水道施設の運営・維持管理に関わる実施体制が整う

既存の水道施設は、サイト単位で水管理組織により運営されているが、故障や利用料金の支払い困難等の様々な問題に対処できていないのが現状である。また、AWRDB や Woreda 水事務所による支援体制はできているが、円滑に機能していない状態にある。

したがって、各機関における水管理組織への対応を見直したうえで、具体的な支援体制を整備する。また、利用規約を含む運営・維持管理計画を策定し、計画を具体的に推進させる。

成果 2：運営・維持管理に必要な技能や知識を習得する

水管理組織による運営・維持管理を推進するためには、現在欠如している技術的能力に対する補填が必要となる。実施機関による支援体制が整備されたうえで、具体的な問題に対応する能力を習得するために、水管理組織及び Woreda 職員に対する技術訓練（ハード面及びソフト面）を行なう。ハード面に対する技術訓練により、軽微な故障であれば水管理組織が修理し、複雑な修理が必要な場合は Woreda 職員が対応することが可能となり、各機関による実施体制がより明確になる。

また、持続的な運営・維持管理とするためには、適切な利用料金の徴収と管理が重要であるため、水管理組織及び Woreda 職員に対する会計管理に関する技術訓練を行なう。

さらに、水道施設の利用及び稼動状況を記録管理するため、記録作成にかかる訓練を実施する。水管理組織で作成された記録簿は、Woreda 水事務所から AWRDB に共有されることにより、故障による放置や水料金の徴収に関する問題が減少する。

（4）成果達成度の確認方法

上記の成果を達成するための指標と成果達成度の確認方法は、以下のとおりである。

成果達成度の確認方法

成果	達成度の確認項目	達成度の確認方法（案）
成果 1 水道施設の運営･維持管理に関わる実施体制が整う	実施機関において、住民主体の運営･維持管理に対する連携意識が高まり、水管理組織への支援体制が形成されたか	･関係者へのヒアリング ･ワークショップ報告書 ･支援体制組織図 ･利用規約
	各サイトにおいて、住民による水管理組織が形成、または再編成されたか	･水管理組織の組織図 ･運営･維持管理計画書
	住民を含む関係者各自が自分の役割を明確に認識しているか	･各担当者へのヒアリング ･関係者全体組織図
成果 2 運営･維持管理に必要な技能や知識を習得する	故障頻度が減少し、故障期間が短縮されたか	･関係機関の活動記録 ･施設運転記録簿 ･技術訓練報告書 ･故障時修理マニュアル
	水管理組織での出納業務を含む運営記録が作成される	･料金徴収出納帳 ･施設利用登録簿
	モニタリング･評価が計画に応じて実施され、活動に反映されたか	･モニタリング･評価記録 ･ソフトコンポーネント実施報告書

（5）ソフトコンポーネントの活動（投入計画）

1）活動区分

ソフトコンポーネントは、活動期間を「水道施設建設前」及び「施設建設中及び竣工後」の 2 フェーズに区分し、水管理組織を支援する実施機関である AWRDB 及び Woreda 水事務所の協力のもと、邦人コンサルタントがこれを統括する形で実施する。

また、水道施設の点検や修理等の技術訓練（ハード面）については、EWTEC の協力を仰ぐ。

2）役割分担

本邦コンサルタント、Woreda 職員及び EWTEC 講師の役割分担は、以下のとおりである。

本邦コンサルタント

ソフトコンポーネント計画の統括者として以下を担当する。

- ソフトコンポーネント実施運営管理
- ワークショップ、セミナー等の立ち上げにかかる作業
- AWRDB との協議及び Woreda 職員に対するワークショップの実施
- 他ドナー、NGO との連携にかかる調整業務
- 水管理組織に対する AWRDB、Woreda 水事務所の支援体制の整備
- EWTEC 講師による施設維持管理にかかる技術訓練（ハード面）の運営実施
- アドミニストレーションにかかる技術指導（ソフト面）
- 運営・維持管理マニュアルの作成

- 各種規約の立案補助
- 各種記録簿作成補助
- 活動のモニタリング・評価に関するレビュー
- 各フェーズにおける活動結果のレビューとフィードバック
- 実施機関及び JICA への報告

Woreda 職員

本邦コンサルタントの指示のもと、作業計画遂行のための現地活動を統括し、継続的に計画に関与する。本邦コンサルタントの不在時は、逐次活動の進捗状況確認を行なう。また、本邦コンサルタントが現地滞在中は、関係機関との調整を行ない、活動を補佐する。

- 住民による水管理組織の立ち上げ支援
- 各サイトでの住民集会開催における運営業務
- 各サイトでの運営・維持管理の状況確認と本邦コンサルタントへの報告
- EWTEC 講師による運営・施設維持管理にかかる技術研修（ハード面）調整
- 水管理組織の運営・維持管理に対する連携支援と定期監査
- 関係者によるモニタリング採集
- 邦人不在時における各関係機関との業務調整

EWTEC 講師

水管理組織職員及び Woreda 職員に対して、水道施設の運営・維持管理にかかる技術訓練（ハード面）を実施する。

- 新設水道施設に関する基礎知識の伝授
- 日常の点検方法
- 故障時の対応（軽微な故障の修理方法及び重度な故障の対応方法）
- スペアパーツの購入方法
- 施設の利用ルール
- 施設の清掃

3）活動計画

具体的な活動内容は、以下のとおりである。

＜実施体制の確立（フェーズ 1）＞

活動 1-1：AWRDB 及び Woreda の水管理組織への支援体制を整える

プロジェクト開始に伴い、実施機関である AWRDB において、プロジェクトの目的、必要性、内容、実施計画にかかる協議を行なう。その後、水管理組織による運営・維持管理を後方支援する Woreda の職員を対象に、既存の水道施設の使用状況、運営・維持管理にかかる現状把握及び住民主体の運営・維持管理の必要性・重要性を理解するためワークショップを実施する。Woreda 職員はこのワークショップを通じ、今後各サイトの水管理組織の職員及び住民を啓蒙指導するための住民参加型手法を習得する。

邦人コンサルタントは、各 Woreda 職員に対するヒアリングにおいて、これまでの水管理組織との関わり方や問題点を明らかにしたうえで、支援体制の組織図を作成する。さらに Woreda 職員と共に、活動 1-2 で選出される水管理組織の職員構成、役割、人選の方法、資金繰りを含めた運営体制及び利用規約について具体案を捻出する。

対象者：	AWRDB 職員、Woreda 職員
投　入：	邦人コンサルタント（10 日)、車両（本邦コンサル及び先方機関投入）
成果品：	支援体制組織図、利用規約

活動 1-2：水管理組織の運営・維持管理体制を整備する

水道施設が整備される 9 サイトにおいて、既存の水管理組織を対象として、その在り方と問題点を明らかにするためのワークショップを開催する。その結果を踏まえ、Woreda 職員主導の下で、今後の運営・維持管理活動に適切と思われる職員構成、役割、人選方法を提示し、現職員の理解を得る。

また、運営・維持管理の実施に際して水管理組織と住民との関わり方を再考し、次の住民集会での協議に先立ち、各水管理組織の連携による無理のない計画案を策定する。とりわけ、組織職員の給与や運営資金、それらを捻出するための適切な水料金の設定と徴収方法に関しては、活動 1-3 で行なわれる住民集会において提示できるよう本段階で策定する。

対象者：	水管理組織職員
投　入：	邦人コンサルタント（9 日)、Woreda 職員（9 日)、車両
成果品：	水管理組織・組織図、運営・維持管理計画書案

活動 1-3：運営・維持管理体制に関する理解を得る

各サイトを統括する Woreda 職員により、運営・維持管理にかかる概略説明を行なった後、活動 1-1、1-2 で得られた成果をもとに、住民を対象にしたワークショップを開催する。ワークショップでは、安全な水の継続的確保のための水道施設の周囲環境整備、利用規約に従った施設の運営・維持管理における住民参加の重要性、とりわけ水道施設の運営資金確保のための水料金徴収の必要性に関して住民からの理解を得る。水管理組織職員は、活動 1-2 で策定された水管理組織による運営・維持管理計画案を住民に提示し、今後の連携と協力を求める。

対象者：	住民、村評議会
投　入：	邦人コンサルタント（9 日)、Woreda 職員（9 日)、水管理組織職員（9 日)、車両

＜運営・維持管理技術の習得（フェーズ 2）＞

活動 2-1：水道施設の点検、修理等にかかる技術訓練（ハード面）を実施する

Woreda 水事務所及び水管理組織の施設管理担当者に対し、EWTEC 講師による水道施設の運営・維持管理にかかる基礎知識と日常点検方法、故障時の対応、軽微な故障への修理技術の習得のための技術訓練（ハード面）を、OJT 方式で実施する。プロジェクトの対象となる 9 サイトのうち、3 サイトが竣工した時点で第一回目の訓練を行う。引き続き 3 サイトが竣工する度に第二回目、第三回目の訓練を実施する。訓練終了後においても、各担当者が習得した維持管理技術や知識を継続的に実践できるよう、本邦コンサルタントは故障時修理マニュアル及び運転記録簿を作成し関係者に配布する。

対象者：	Woreda 職員、水管理組織職員
投　入：	EWTEC 講師（21 日×2 人）、邦人コンサルタント（15 日）、車両
成果品：	故障時修理マニュアル、活動記録簿、施設運転記録簿、技術訓練報告書

活動 2-2：会計、記録等のアドミニストレーションにかかる技術指導（ソフト面）を実施する

Woreda 及び水管理組織の職員、会計担当者に対し、施設の運営・維持管理におけるソフト面での技術習得のため、本邦コンサルタント主導による OJT 研修を実施する。

本活動では、水使用料金の設定・徴収・管理方法のみに拘わらず、施設運営経費、職員の報酬、修理に伴う部品代や修理費用の算出方法等の経理にかかる技能に加え、施設運転・稼動状況の記録作成方法等のアドミニストレーションに関する技能訓練を実施する。

本活動は、本体工事の各工区竣工後の活動 2-1 の訓練の後に引き続いて行なわれる。また、活動 2-1 と同様、アドミニストレーションにかかるマニュアル、料金徴収出納帳は、邦人コンサルタントが事前に作成し、変更があれば追記修正を行ない関係者に配布する。

対象者：	Woreda 職員、水管理組織職員
投　入：	邦人コンサルタント（12 日）、車両
成果品：	維持管理マニュアル、料金徴収出納帳、施設利用登録簿

活動 2-3：活動のモニタリング・評価を実施し、計画の修正を行なう

施設の運営・維持管理及びアドミニストレーションにかかる技術訓練の成果が活動に適切に反映しているか否か、各関係者によるモニタリング・評価を実施する。邦人コンサルタントは、その結果を次の工区の活動に生かすため、関係者に対する指導を行なう。

また、本プロジェクト終了後も、関係者自らが継続してモニタリング・評価を実施し、逐次運営・維持管理計画の修正を行なう。

対象者：	Woreda 職員、水管理組織職員、住民
投　入：	邦人コンサルタント（10 日）、水管理組織職員及び Woreda 職員（9 日）、車両
成果品：	モニタリング計画書、モニタリング評価記録

活動計画

活動	実施内容	形態	対象者(受講者)	実施主体者(投入者)＝投入
実施体制の確立	1.1 AWRDB 及び Woreda の水管理組織への支援体制を整える	協議 ワークショップ	AWRDB 職員 Woreda 職員	邦人コンサルタント
	1.2 水管理組織の運営・維持管理体制を整備する	ワークショップ	水管理組織職員	邦人コンサルタント Woreda 職員
	1.3 運営・維持管理体制に関する理解を得る	住民集会 OJT	住民、村評議会	Woreda 職員 水管理組織職員 邦人コンサルタント
運営・維持管理技術の習得	2.1 水道施設の点検、修理等にかかる技術訓練(ハード面)を実施する	セミナー OJT	Woreda 職員 水管理組織職員	EWTEC 講師 邦人コンサルタント
	2.2 会計、記録等のアドミニストレーションにかかる技術指導(ソフト面)を実施する	セミナー OJT	Woreda 職員 水管理組織職員	邦人コンサルタント
	2.3 活動のモニタリング・評価を実施し、計画の修正を行なう	モニタリング 評価	Woreda 職員 水管理組織職員	邦人コンサルタント

（6）ソフトコンポーネントの実施リソースの調達方法

本ソフトコンポーネントは、本邦コンサルタントによる直接支援型とするが、投入計画における水道施設の機械操作や故障時の対応、軽微な修繕等のハード面での技術移転に関しては、EWTEC と連携し、OJT 方式を用いて実施する。

（7）ソフトコンポーネントの実施工程

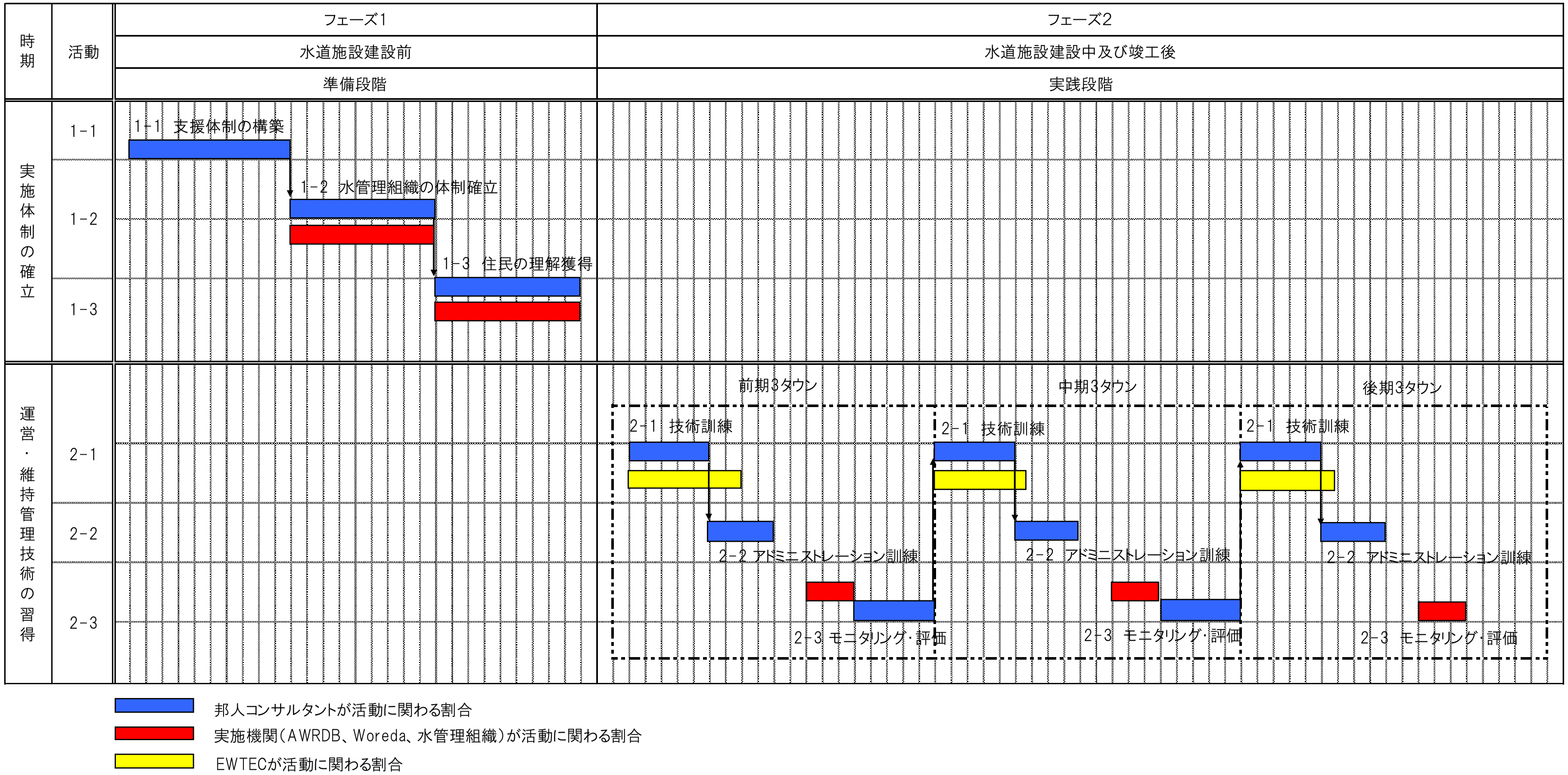
1）実施内容

運営・維持管理にかかるソフトコンポーネントの実施計画概念及び必要作業日数の算出根拠は、以下のとおりである。

ソフトコンポーネントは、フェーズ 1（建設前：28 日間）とフェーズ 2（建設中～建設後：37 日間）の 2 フェーズ体制とする。邦人コンサルタントの活動期間は、計 65 日を想定している。

邦人コンサルタントが現地で活動している期間は、水管理組織及び Woreda 職員が投入あるいは享受によって活動に参加するため、邦人に対し常にローカルスタッフが同行することになる。

EWTEC による技術支援は、各工区 5 日間ずつとし、邦人コンサルタントはマニュアル作成のため訓練の全期間同行する。邦人コンサルタントの不在時に実施されるモニタリング・評価に関しては、Woreda 職員主導のもとで関係者により実施される。



ソフトコンポーネント実施計画

必要作業日数の算出根拠

			活動No.	活動内容	対象者	投入者	実作業日数 邦人(1人)	実作業日数 現地(EWTEC:2人)	移動日数 邦人(1人)	移動日数 現地(EWTEC:2人)	合計 邦人(1人)	合計 現地(EWTEC:2人)
フェーズ1	実施体制の確立		1-1	AWRDB及びWoredaの水管理組織への支援体制を整える	AWRDB職員 Woreda職員	邦人コンサルタント	10		4		32	
			1-2	水管理組織の運営・維持管理体制を整備する	水管理組織職員	邦人コンサルタント Woreda職員	9					
			1-3	運営・維持管理体制に関する理解を得る	住民 村評議会	邦人コンサルタント Woreda職員 水管理組織職員	9					
フェーズ2	運営・維持管理技術の習得	前期3タウン	2-1	水道施設の点検修理等にかかる技術訓練(ハード面)を実施する	Woreda職員 水管理組織職員	邦人コンサルタント EWTEC講師	5	5 5	4	2 2	18	14
			2-2	会計、記録等のアドミニストレーションにかかる技術指導(ソフト面)を実施する		邦人コンサルタント	4					
			2-3	活動のモニタリング・評価を実施し、計画の修正を行なう			5					
		中期3タウン	2-1	水道施設の点検修理等にかかる技術訓練(ハード面)を実施する	Woreda職員 水管理組織職員	邦人コンサルタント EWTEC講師	5	5 5	4	2 2	18	14
			2-2	会計、記録等のアドミニストレーションにかかる技術指導(ソフト面)を実施する		邦人コンサルタント	4					
			2-3	活動のモニタリング・評価を実施し、計画の修正を行なう			5					
		後期3タウン	2-1	水道施設の点検修理等にかかる技術訓練(ハード面)を実施する	Woreda職員 水管理組織職員	邦人コンサルタント EWTEC講師	5	5 5	4	2 2	13	14
			2-2	会計、記録等のアドミニストレーションにかかる技術指導(ソフト面)を実施する		邦人コンサルタント	4					
			2-3	活動のモニタリング・評価を実施し、計画の修正を行なう		Woreda職員						
							65	30	16	12	81	42

2）邦人コンサルタントの派遣期間及び回数の妥当性検討

運営・維持管理活動は、合計 4 回の本邦コンサルタントによる現地作業からなる。活動は実施内容及び時期から、水道施設建設前に実施するフェーズ 1（実施体制の確立）及び水道施設建設中及び竣工後に実施するフェーズ 2（運営・維持管理技術の習得）に区分される。

実施機関を対象とする活動は、邦人コンサルタントが 100 %関与する。

フェーズ 1 では関係者による合意形成が重要となるため、段階毎に邦人コンサルタントが確認する必要がある。同様にフェーズ 2 においても、研修にかかる調整及びマニュアル、記録簿等の資料作成業務のため、期間中の滞在が必須となる。

したがって、邦人コンサルタントの派遣期間及び回数は、妥当と判断する。

（8）ソフトコンポーネントの成果品

本ソフトコンポーネントにおける成果品は、以下のとおりである。

- 支援体制組織図（活動 1-1）
- 利用規約（活動 1-1）
- 水管理組織・組織図（活動 1-2）
- 運営・維持管理活動計画書（活動 1-2）
- 故障時修理マニュアル（活動 2-1）
- 活動記録簿（活動 2-1）
- 施設運転記録簿（活動 2-1）
- 技術訓練報告書（活動 2-1）
- 維持管理マニュアル（活動 2-2）
- 料金徴収出納帳（活動 2-2）
- 施設利用登録簿（活動 2-2）
- モニタリング計画書、評価記録（活動 2-3）
- ソフトコンポーネント実施状況報告書（邦人コンサルタント派遣毎）
- 完了報告書（終了時、相手国政府、日本側に対して）

（9）相手国側の責務

実施機関（AWRDB 及び Woreda 水事務所）の分担事項は、以下のとおりである。

- 本邦コンサルタントとの提携によるプログラム全体の管理
- 各上層機関への報告
- プログラム実施にかかる他部署への協力要請
- 関係機関職員の提供及び現地活動費用、移動交通費、日当宿泊費等の経費負担
- EWTEC 講師による技術研修にかかる調整業務
- 合同協議会、ワークショップ開催にかかる会場準備、運営費用の負担

資料 6.　参考資料
6-1　収集資料リスト

番号	名称	形態（地図、報告書）		オリジナル・コピー	発行機関	発行年
1	Hydrogeological Map of Northern Ethiopia, S=1/1,000,000	水理地質図	図面／電子ファイル	コピー	GSE	2002
2	Regional Hydrogeological Investigation of Northern Ethiopia	同解説書	電子ファイル	コピー	GSE	2003
3	Geological Map of the Bahir Dar Area (NC37-1), S=1/250,000	地質図	図面／電子ファイル	コピー	GSE	2010
4	Geology Geochemistry and Gravity Survey of the Bahir Dar Area	同解説書	電子ファイル	コピー	GSE	2010
5	Geological Map of the Debre Tabor Area (NC37-2), S=1/250,000	地質図	図面／電子ファイル	コピー	GSE	2010
6	Geology Geochemistry and Gravity Survey of the Debre Tabor Area	同解説書	電子ファイル	コピー	GSE	2010
7	Geological Map of the Bure (NC37-5), S=1/250,000	地質図	図面／電子ファイル	コピー	GSE	2007
8	Geology of Bure map Sheet (NC37-5)	同解説書	電子ファイル	コピー	GSE	2007
9	Geological Map of Debre Marcos Sheet (NC37-6), S=1/250,000	地質図	図面／電子ファイル	コピー	GSE	2009
10	Topografhic Map, S=1/250,000, EMA3, NC37-1, Bahir Dar	地形図	図面	コピー	EMA	1996
11	Topografhic Map, S=1/250,000, 1502, NC37-2, Debre Tabor	地形図	図面	コピー	EMA	1972
12	Topografhic Map, S=1/250,000, EMA3, NC37-5, Bure	地形図	図面	コピー	EMA	1995
13	Topografhic Map, S=1/250,000, EMA3, NC37-6, Debre Mark'os	地形図	図面	コピー	EMA	1995
14	Topografhic Map, S=1/50,000, ETH4, , Debre Mark'os	地形図	図面	コピー	EMA	1995
15	Topographic Map S=1/50,000, ETH 4 1037 A2 DABI (Gebez Maryam)	地形図	図面	コピー	EMA	1987
16	Topographic Map S=1/50,000, ETH 4 1037 A3 BURE (Mankusa, Kuchie)	地形図	図面	コピー	EMA	1987
17	Topographic Map S=1/50,000, ETH 4 1037 B2 KERANIYO (Keranyo, Sedie)	地形図	図面	コピー	EMA	1984
18	Topographic Map S=1/50,000, ETH 4 1037 C1 KUCH (Kuchie)	地形図	図面	コピー	EMA	1987
19	Topographic Map S=1/50,000, ETH 4 1037 D2 AMBER (Amberi, Lumamie)	地形図	図面	コピー	EMA	1984
20	Topographic Map S=1/50,000, ETH 4 1037 D4 LUMAME (Amberi, Lumamie)	地形図	図面	コピー	EMA	1984
21	Topographic Map S=1/50,000, ETH 4 1038 A2 MERTO LEMARYAM (Mertle Maryam, Dibo)	地形図	図面	コピー	EMA	1998
22	Topographic Map S=1/50,000, ETH 4 1038 C1 BICHENA (Bichena, Yetimen)	地形図	図面	コピー	EMA	1984
23	Topographic Map S=1/50,000, ETH 4 1038 C3 DEJEN (Wejele)	地形図	図面	コピー	EMA	1984
24	Topographic Map S=1/50,000, ETH 4 1137 A1 KUNZLA (Kunzila)	地形図	図面	コピー	EMA	1987
25	Topographic Map S=1/50,000, ETH 4 1137 C1 MER AWI (Mer-Awi)	地形図	図面	コピー	EMA	1987
26	Topographic Map S=1/50,000, ETH 4 1137 C4 ADAMA TERARA (Gebez Maryam)	地形図	図面	コピー	EMA	1987
27	Topographic Map S=1/50,000, ETH 4 1137 D3 GONJ (Gonji Kollela)	地形図	図面	コピー	EMA	1984

GSE：Geological Survey of Ethiopia
EMA：Ethiopian Mapping Agency

資料 7. その他の資料・情報
7-1　水理計算書

Hydraulic Calculation

1. Mertule Maryam

1.1. Basal Condition

Since the checked quantity of water intake is 424.01m3/day, and it is less than maximum daily supply and average daily supply, water facilities of Mertule Maryam are planed by total quantity of water intake.

1.2. Water Intake

There are two existing water sources in Mertule Maryam, both of two water sources are spring. One is transmitted to reservoir by gravity flow (139.35m3/day), and another is transmitted to the collection chamber by gravity flow (91.96m3/day) and then pumped up to reservoir.

The volume of existing collection chamber is 28.65m3 and another 28.83m3 of new collection chamber is designed, so totally 57.48m3 of volume of collection chambers are secured. Total volume of collection chamber is calculated 15 hours of volume of water intake (i.e. 91.96m3 x 15 hours / 24 hours = 57.48m3).

It was confirmed that another three springs are existing in Mertule Maryam. One is 42.59m3/day of volume, second one is 92.70m3/day and third one is 57.41m3/day. These three springs are transmitted by gravity flow, so at the end of this project, total 424.01m3/day of volume of water intake is secured.

The specification of pump at collection chamber is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from collection chamber to reservoir tank is 40m and flow volume is 3.19L/sec (91.96m3/day / 8 hours), so it is needed 3.7kw of capacity of pump.

1.3. Transmission Line

The specification of transmission lines is calculated by the conditions of each water intake. Diameter is decided by the calculation with Hazen-Williams formula. Each distance of each water intake to reservoir tank is from 440m to 3015m. Diameters of transmission line are almost 3”, only one transmission line’s diameter is 1”1/2.

1.4. Reservoir Tank

There are three existing reservoir tanks in Mertule Maryam. The volume is, first: 82.98m3, second: 50.36m3, third: 50.36m3. All the three reservoir tanks are not leaking water and it is useful, it is planed the new reservoir tank as additional. Required total capacity of reservoir tanks is 212.01m3, so short capacity is 28.31m3, it is planed 30m3 of reservoir tank by reinforced concrete.

1.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Mertule Maryam, but some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

1.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

2. Yetimen

2.1. Basal Condition

In Yetimen, average daily supply is 102.98m3/day, maximum daily supply is 123.58m3/day and checked quantity of water intake is 250.56m3/day. Quantity of water intake is sufficient, so water facilities of Yetimen are planed by average and maximum daily supply.

2.2. Water Intake

There is one existing borehole as water sources in Yetimen, but new borehole was drilled and there is no problem about quality and quantity of that borehole, it is planed to use new borehole for this project.

From the borehole to reservoir tank, the water is pumped up, the specification of pump at borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from borehole to reservoir tank is 70m and flow volume is 4.29L/sec (123.58m3/day / 8 hours), so it is needed 5.5kw of capacity of pump.

2.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Distance from borehole to reservoir tank is 1250m. Diameter of transmission line is 3”.

2.4. Reservoir Tank

There is an existing reservoir tank in Yetimen. The volume of reservoir tank is 60m3. Existing reservoir tank is now leaking, there is a option only to repair the existing reservoir tank, but preventing water leakage can not be guaranteed for the future because of the technical difficulty, new reservoir tank is planed in Yetimen.

Required capacity of reservoir tank is 64.36m3, so it is planed 70m3 of reservoir tank by reinforced concrete.

2.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Yetimen, but some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

2.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

3. Lumame

3.1. Basal Condition

In Lumame, average daily supply is 342.64m3/day, maximum daily supply is 411.17m3/day and checked quantity of water intake is 399.17m3/day. Quantity of water intake is enough for average daily supply, so water facilities of Lumame are planed by average daily supply and quantity of water intake.

3.2. Water Intake

There are two existing boreholes as water sources in Lumame, but total quantity of those two boreholes is not enough for new water facilities (first: 57.60m3/day, second: 86.40m3/day, total: 144.00m3/day), so new borehole was drilled and it was confirmed the quantity of new borehole is 255.17m3/day. It is not enough for maximum daily supply but satisfied average daily supply, so it is planed to use all of three boreholes for this project.

From each borehole to reservoir tank, the water is pumped up, the specification of pump at borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Each total head from borehole to reservoir tank is 90m (first), 100m (second) and 110m (third). Flow volume is 2.00L/sec (57.60m3/day / 8 hours), 3.00L/sec (86.40m3/day / 8 hours) and 8.86L/sec (255.17m3/day / 8 hours), so each borehole need 5.5kw, 5.5kw and 15kw of capacity of pump.

3.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Existing transmission lines of existing two boreholes are combined on the line to reservoir tank. So, existing pumps do not function at the same time because of interfering with each other. It is planed to replace new transmission lines independently for existing transmission lines, and also planed to set new transmission line for new borehole.

Distance and diameter of each transmission line is 1927.22m (first: existing, 3”), 1475.14m (second: existing, 3”), 1208.09m (third: new, 4”).

3.4. Reservoir Tank

There is an existing reservoir tank (elevated tank) in Lumame. The volume of existing reservoir tank is 50m3. Existing reservoir tank is functioning and new reservoir tank is planed to satisfy the total capacity of reservoir tank.

Required capacity of reservoir tank is 121.30m3, so it is planed 123m3 of reservoir tank by elevated type.

3.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Lumame, but some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

3.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

4. Wojel

4.1. Basal Condition

In Wojel, average daily supply is 101.02m3/day, maximum daily supply is 121.22m3/day and checked quantity of water intake is 224.64m3/day. Quantity of water intake is sufficient, so water facilities of Wojel are planed by average and maximum daily supply.

4.2. Water Intake

There is one existing borehole as water sources in Wojel, but that borehole was abandoned and new borehole was drilled. There is no problem about quality and quantity of new borehole, it is planed to use new borehole for this project.

From the new borehole to reservoir tank, the water is pumped up, the specification of pump at borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from borehole to reservoir tank is 90m and flow volume is 4.21L/sec (121.22m3/day / 8 hours), so it is needed 7.5kw of capacity of pump.

4.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter of transmission line is decided by the calculation with Hazen-Williams formula. Distance from borehole to reservoir tank is 1000m. Diameter of transmission line is 3".

4.4. Reservoir Tank

There is an existing reservoir tank in Wojel. The volume of existing reservoir tank is 60m3 but that reservoir tank was deserted, so new reservoir tank is planed in Wojel.

Required capacity of reservoir tank is 63.14m3, so it is planed 70m3 of reservoir tank by reinforced concrete.

4.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Lumame, but every water facilities ware abandoned in wojel and it is difficult to confirm the condition of existing distribution line, so new distribution line is planed.

4.6. Water Faucet

Every existing water faucets are replaced new and additional new water faucets are constructed.

5. Sedie

5.1. Basal Condition

In Sedie, average daily supply is 106.66m3/day, maximum daily supply is 127.99m3/day and checked quantity of water intake is 256.32m3/day. Quantity of water intake is sufficient, so water facilities of Yetimen are planed by average and maximum daily supply.

5.2. Water Intake

There is one existing borehole as water sources in Sedie, but new borehole was drilled and there is no problem about quality and quantity of that borehole, it is planed to use new borehole for this project.

From the borehole to reservoir tank, the water is pumped up, the specification of pump at borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from borehole to reservoir tank is 110m and flow volume is 4.44L/sec (127.99m3/day / 8 hours), so it is needed 7.5kw of capacity of pump.

5.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Distance from borehole to reservoir tank is 1455m. Diameter of transmission line is 3”.

5.4. Reservoir Tank

There is an existing reservoir tank in Sedie. The volume of existing reservoir tank is 60m3. Existing reservoir tank is located low elevation, so new reservoir tank is planed in Sedie.

Required capacity of reservoir tank is 66.66m3, so it is planed 70m3 of reservoir tank by reinforced concrete.

5.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Sedie, but some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

5.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

6. Dibo

6.1. Basal Condition

In Dibo, average daily supply is 74.35m3/day, maximum daily supply is 89.22m3/day and checked quantity of water intake is 256.32m3/day. Quantity of water intake is sufficient, so water facilities of Dibo are planed by average and maximum daily supply.

6.2. Water Intake

There is no existing borehole and any other water facility in Dibo except hand pump, so new borehole was drilled and there is no problem about quality and quantity of that borehole, it is planed to use new borehole for this project.

From the borehole to reservoir tank, the water is pumped up, the specification of pump at borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from borehole to reservoir tank is 90m and flow volume is 3.10L/sec (89.22m3/day / 8 hours), so it is needed 5.5kw of capacity of pump.

6.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Distance from borehole to reservoir tank is 2070m. Diameter of transmission line is 3”.

6.4. Reservoir Tank

There is no existing reservoir tank in Dibo. Required capacity of reservoir tank is 46.47m3, so it is planed 50m3 of reservoir tank by elevated type.

6.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now there are no distribution lines in Dibo, so every pipeline for distribution is set as new.

6.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

7. Amanuel

7.1. Basal Condition

In Amanuel, average daily supply is 326.76m3/day, maximum daily supply is 392.11m3/day and checked quantity of water intake is 230.40m3/day. Quantity of water intake is not enough for average and maximum daily supply, so water facilities of Amanuel are planed by quantity of water intake.

7.2. Water Intake

There are two existing boreholes as water sources in Amanuel, but one of existing boreholes is abandoned and quantity of another existing borehole is not enough (144.00m3/day) for new water facilities, so new borehole was drilled and it was confirmed the quantity of new borehole is 86.40m3/day. Total amount of water intake is not enough for average and maximum daily supply but it was not found another water intake as drilling, so it is planed to use two boreholes (existing and new) for this project.

From each borehole to reservoir tank, the water is pumped up, existing borehole and pump is functioning well, so at this project, only the pump for new borehole is set. The specification of pump at new borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from new borehole to reservoir tank is 100m. Flow volume is 3.00L/sec (86.40m3/day / 8 hours), so new borehole needs 5.5kw of capacity of pump.

7.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Existing transmission line is functioning, so only new transmission line from new borehole to reservoir tank.

Distance and diameter of new transmission line is 2386m. Diameter of transmission line is 3”.

7.4. Reservoir Tank

There is two existing reservoir tanks (elevated tank) in Amanuel. Although the volume of existing reservoir tanks are 60m3 and 30m3, both reservoir tanks are leaking. So it is planed to construct new reservoir tank, required capacity of reservoir tank is 115.2m3, so it is planed 120m3 of reservoir tank by elevated type.

7.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Amanuel, but some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

7.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

8. Gobeze Maryam

8.1. Basal Condition

Since the checked quantity of water intake is 164.00m3/day as a spring, and it is less than maximum daily supply and average daily supply, water facilities of Gobeze Maryam are planed by total quantity of water intake.

8.2. Water Intake

There is a existing water source in Gobeze Maryam as spring. The water is transmitted to the collection chamber by gravity flow and then pumped up to reservoir.

The volume of existing collection chamber is 19.87m3 and another 82.63m3 of new collection chamber is designed, so totally 102.50m3 of volume of collection chambers are secured. Total volume of collection chamber is calculated 15 hours of volume of water intake (i.e. 164.00m3 x 15 hours / 24 hours = 102.50m3).

The specification of pump at collection chamber is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from collection chamber to reservoir tank is 100m and flow volume is 5.69L/sec (164.00m3/day / 8 hours), so it is needed 11kw of capacity of pump.

8.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Distance from water intake to reservoir tank is 1300m. Diameters of transmission line are 3”.

8.4. Reservoir Tank

There is a existing reservoir tank in Gobeze Maryam. The volume of existing reservoir tank is 50m3. But elevation of existing reservoir tank is not enough to distribute high area, existing reservoir tank will be abandoned and new reservoir tank is planed instead. Required capacity of reservoir tank is 102.50m3, so it is planed 105m3 of reservoir tank by reinforced concrete.

8.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Gobeze Maryam, but some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

8.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

9. Bikolo

9.1. Basal Condition

In Bikolo, average daily supply is 151.19m3/day, maximum daily supply is 181.43m3/day and checked quantity of water intake is 403.20m3/day. Quantity of water intake is sufficient, so water facilities of Bikolo are planed by average and maximum daily supply.

9.2. Water Intake

There is one existing borehole as water sources in Bikolo, but new borehole was drilled and there is no problem about quality and quantity of that borehole, it is planed to use new borehole for this project.

From the borehole to reservoir tank, the water is pumped up, the specification of pump at borehole is calculated by 9 hours running per day (4 hours in the morning, 4 hours in the afternoon and 1 hour recess). Total head from borehole to reservoir tank is 110m and flow volume is 6.30L/sec (181.43m3/day / 8 hours), so it is needed 11kw of capacity of pump.

9.3. Transmission Line

The specification of transmission lines is calculated by the conditions of water intake. Diameter is decided by the calculation with Hazen-Williams formula. Distance from water intake to reservoir tank is 5533m. Diameters of transmission line are 4”.

9.4. Reservoir Tank

There is an existing reservoir tank in Bikolo. The volume of existing reservoir tank is only 25m3. Moreover, the location of existing reservoir tank is centering of Bikolo town, water pressure for distribution is not enough. That is why existing reservoir tank will be abandoned and new reservoir tank is planed instead at high area of Bikolo town. Required capacity of reservoir tank is 94.49m3, so it is planed 105m3 of reservoir tank by reinforced concrete.

9.5. Distribution Line

Distribution lines are calculated by Hazen-Williams formula with peak hourly supply. Now distribution lines are already set in Bikolo, but new reservoir tank is designed to construct at high area, it is needed to extend the distribution line. And some lines are not in the ground, those lines crop out. So basically lines are replaced by the necessity of changing diameter, but also are changed at the lines that pipes are cropping out.

9.6. Water Faucet

Every existing water faucets are replaced and additional new water faucets are constructed.

Hydrologic Calculation

1. Basic Number

No.	Towns	Zone	Woreda	Existing Population 2012	Projection of pop. 2016	School number of students	Hospital, Clinic
9	Mertule Maryam	East Gojam	Enebsie Sar Midir	15,124	17,829	7,180	10
10	Yetimen	East Gojam	Enemay	3,289	3,877	2,346	11
12	Lumame	East Gojam	Awabel	11,410	13,451	5,735	10
14	Wojel	East Gojam	Awabel	3,188	3,758	2,486	10
15	Sedie	East Gojam	Hulet Egu Enesie	3,348	3,947	2,712	10
16	Dibo	East Gojam	Enebsie Sar Midir	2,129	2,510	2,839	10
---	Amanuel	East Gojam	Machakel	10,768	12,694	6,002	10
27	Gobeze Maryam	West Gojam	Quarit	5,860	6,908	4,938	10
---	Bikolo(Wetet Abay)	West Gojam	Mecha	4,929	5,811	3,000	10
Total				60,045	70,785	37,238	91

--- Annual Growth Rate of Population ---

Growth Rate : 4.2 %

--- Number of students and beds ---

It is based on the result of field study.

2. Water Demand

(AD : 2012) Unit : m3/day

No.	Towns	Daily Water Demand(m3/day) General 20 l/c/day	School 5 l/c/day	Hospital, Clinic 25 l/c/day	Total	Ineffective water 15 %	Average Daily Supply	Maximum Daily Supply factor : 1.2	Peak Hourly Supply factor : 2.0
9	Mertule Maryam	302.48	35.90	0.25	338.63	50.79	389.42	467.30	778.84
10	Yetimen	65.78	11.73	0.28	77.79	11.67	89.46	107.35	178.92
12	Lumame	228.20	28.68	0.25	257.13	38.57	295.70	354.84	591.40
14	Wojel	63.76	12.43	0.25	76.44	11.47	87.91	105.49	175.82
15	Sedie	66.96	13.56	0.25	80.77	12.12	92.89	111.47	185.78
16	Dibo	42.58	14.20	0.25	57.03	8.55	65.58	78.70	131.16
---	Amanuel	215.36	30.01	0.25	245.62	36.84	282.46	338.95	564.92
27	Gobeze Maryam	117.20	24.69	0.25	142.14	21.32	163.46	196.15	326.92
---	Bikolo(Wetet Abay)	98.58	15.00	0.25	113.83	17.07	130.90	157.08	261.80
Total		1,200.90	186.20	2.28	1,389.38	208.40	1,597.78	1,917.33	3,195.56

Unit of Water Demand : 20 l/c/day (Average Daily Demand)
5 l/c/day (School)
25 l/c/day (Hospital)

Ineffective Water : 15 %

Factor of Water Supply : 1.2 (Maximum Daily Supply)
2.0 (Peak Hourly Supply)

(AD : 2016) Unit : m3/day

No.	Towns	Daily Water Demand(m3/day) General 20 l/c/day	School 5 l/c/day	Hospital, Clinic 25 l/c/day	Total	Ineffective water 15 %	Average Daily Supply	Maximum Daily Supply factor : 1.2	Peak Hourly Supply factor : 2.0
9	Mertule Maryam	356.58	35.90	0.25	392.73	58.91	451.64	541.97	903.28
10	Yetimen	77.54	11.73	0.28	89.55	13.43	102.98	123.58	205.96
12	Lumame	269.02	28.68	0.25	297.95	44.69	342.64	411.17	685.28
14	Wojel	75.16	12.43	0.25	87.84	13.18	101.02	121.22	202.04
15	Sedie	78.94	13.56	0.25	92.75	13.91	106.66	127.99	213.32
16	Dibo	50.20	14.20	0.25	64.65	9.70	74.35	89.22	148.70
---	Amanuel	253.88	30.01	0.25	284.14	42.62	326.76	392.11	653.52
27	Gobeze Maryam	138.16	24.69	0.25	163.10	24.47	187.57	225.08	375.14
---	Bikolo(Wetet Abay)	116.22	15.00	0.25	131.47	19.72	151.19	181.43	302.38
Total		1,415.70	186.20	2.28	1,604.18	240.63	1,844.81	2,213.77	3,689.62

3. Volume of Water Intake

Unit : m3/day

No.	Towns	Maximum Daily Supply m3/day	Volume of Water Intake(Existing) Borehole	Spring	Total	Volume of Water Intake(New) Borehole	Spring	Total	Volume of Water Intake(Total) Borehole	Spring	Total	Design Volume Water Intake	Water Coverage	Remarks
9	Mertule Maryam	541.97	0.00	139.35	139.35	0.00	0.00	0.00	0.00	424.01	424.01	424.01	78.23%	Existing use
			0.00	91.96	91.96	0.00	0.00	0.00						Existing use
			0.00	0.00	0.00	0.00	42.59	42.59						New
			0.00	0.00	0.00	0.00	92.70	92.70						New
			0.00	0.00	0.00	0.00	57.41	57.41						New
10	Yetimen	123.58	0.00	0.00	0.00	0.00	0.00	0.00	250.56	0.00	250.56	123.58	100.00%	Abolishment
			0.00	0.00	0.00	250.56	0.00	250.56						New
12	Lumame	411.17	57.60	0.00	57.60	0.00	0.00	0.00	399.17	0.00	399.17	399.17	97.08%	Existing use
			86.40	0.00	86.40	0.00	0.00	0.00						Existing use
			0.00	0.00	0.00	255.17	0.00	255.17						New
14	Wojel	121.22	0.00	0.00	0.00	0.00	0.00	0.00	224.64	0.00	224.64	121.22	100.00%	Abolishment
			0.00	0.00	0.00	224.64	0.00	224.64						New
15	Sedie	127.99	0.00	0.00	0.00	0.00	0.00	0.00	256.32	0.00	256.32	127.99	100.00%	Abolishment
			0.00	0.00	0.00	256.32	0.00	256.32						New
16	Dibo	89.22	0.00	0.00	0.00	256.32	0.00	256.32	256.32	0.00	256.32	89.22	100.00%	New
---	Amanuel	392.11	144.00	0.00	144.00	0.00	0.00	0.00	230.40	0.00	230.40	230.40	58.76%	Existing use
			0.00	0.00	0.00	0.00	0.00	0.00						Abolishment
			0.00	0.00	0.00	86.40	0.00	86.40						New
27	Gobeze Maryam	225.08	0.00	164.00	164.00	0.00	0.00	0.00	0.00	164.00	164.00	164.00	72.86%	Existing use
---	Bikolo(Wetet Abay)	181.43	0.00	0.00	0.00	0.00	0.00	0.00	403.20	0.00	403.20	181.43	100.00%	Abolishment
			0.00	0.00	0.00	403.20	0.00	403.20						New
Total		2,213.77	288.00	395.31	683.31	1,732.61	192.70	1,925.31	2,020.61	588.01	2,608.62	1,861.02	84.07%	---

4. Intake, Transmission Facilities

No.	Towns	Volume of Water Intake (m3/day)			Elevation(m)				Transmission Pipe, Intake to the ground, the ground to Tank					Pump Plan(8h/day)		
		Spring		Borehole	Intake Facilities		Tank	Vertical Drop	Length (m)	Diameter (mm)	Velocity (m/s)	Hydraulic Grade (‰)	Head loss (m)	Lifting Range (m)	Flow Volume (L/s)	Spec (kw)
		Gravity	Pump		Intake Point	Ground										
9	Mertule Maryam	139.35	0.00	0.00	2,737.94	2,737.94	2,711.09	26.85	800.00	75	0.37	3.66	2.93	---	---	---
		0.00	91.96	0.00	2,630.69	2,630.69	2,667.92	-37.23	440.00	75	0.72	1.70	0.75	40.00	3.19	3.7
		42.59	0.00	0.00	2,848.73	2,848.73	2,711.09	137.64	3,015.40	40	0.39	8.73	26.33	---	---	---
		92.70	0.00	0.00	2,790.81	2,790.81	2,711.09	79.72	790.00	75	0.24	1.72	1.36	---	---	---
		57.41	0.00	0.00	2,678.33	2,678.33	2,664.87	13.46	1,444.86	75	0.15	0.71	1.03	---	---	---
10	Yetimen	0.00	0.00	123.58	2,382.83	2,405.63	2,445.78	-62.95	60.00	50	2.19	21.13	1.27	70.00	4.29	5.5
									1,250.00	75	0.97	2.93	3.67			
12	Lumame	0.00	0.00	57.60	2,418.84	2,464.13	2,505.77	-86.93	55.00	50	1.02	5.15	0.28	90.00	2.00	5.5
									1,927.22	75	0.45	0.71	1.38			
		0.00	0.00	86.40	2,412.34	2,462.95	2,505.77	-93.43	55.00	50	1.53	10.90	0.60	100.00	3.00	5.5
									1,475.14	75	0.68	1.51	2.23			
		0.00	0.00	255.17	2,407.00	2,424.95	2,505.77	-98.77	40.00	65	2.67	22.52	0.90	110.00	8.86	15.0
									1,208.09	100	1.13	2.76	3.34			
14	Wojel	0.00	0.00	121.22	2,403.96	2,442.88	2,488.58	-84.62	55.00	50	2.14	20.39	1.12	90.00	4.21	7.5
									1,000.00	75	0.95	2.83	2.83			
15	Sedie	0.00	0.00	127.99	2,446.25	2,468.29	2,547.55	-101.30	60.00	50	2.26	22.55	1.35	110.00	4.44	7.5
									1,455.27	75	1.01	3.13	4.56			
16	Dibo	0.00	0.00	89.22	2,374.98	2,420.18	2,452.64	-77.66	55.00	50	1.58	11.57	0.64	90.00	3.10	5.5
									2,071.06	75	0.70	1.61	3.33			
---	Amanuel	0.00	0.00	144.00	2,147.20	2,197.20	2,302.89	-155.69	100.00	50	2.55	28.05	2.80	170.00	5.00	13.0
									2,800.00	75	1.13	3.89	10.90			
		0.00	0.00	144.00	2,302.89	2,302.89	2,397.78	-94.89	2,800.00	75	1.13	3.89	10.90	110.00	5.00	9.2
		0.00	0.00	86.40	2,306.14	2,336.49	2,397.78	-91.64	32.00	50	1.53	10.90	0.35	100.00	3.00	5.5
									2,386.25	75	0.68	1.51	3.61			
27	Gobeze Maryam	0.00	164.00	0.00	2,156.40	2,156.40	2,243.37	-86.97	1,304.06	75	1.29	4.95	6.46	100.00	5.69	11.0
---	Bikolo(Wetet Abay)	0.00	0.00	181.43	1,855.63	1,905.63	1,953.02	-97.39	50.00	65	1.90	11.98	0.60	110.00	6.30	11.0
									5,533.39	100	0.80	1.47	8.14			
Total		332.05	255.96	1,417.01	---	---	---	---	---	---	---	---	---	---	---	---

5. Transmission Facilities (Relay Tank)

No.	Towns	Water Intake m3/day	Required Capacity of Tank (m3)	Vol. of Existing Tank (m3)	Additional capacity (m3)
9	Mertule Maryam	91.96	57.48	28.65	28.83
27	Gobeze Maryam	164.00	102.50	19.87	82.63

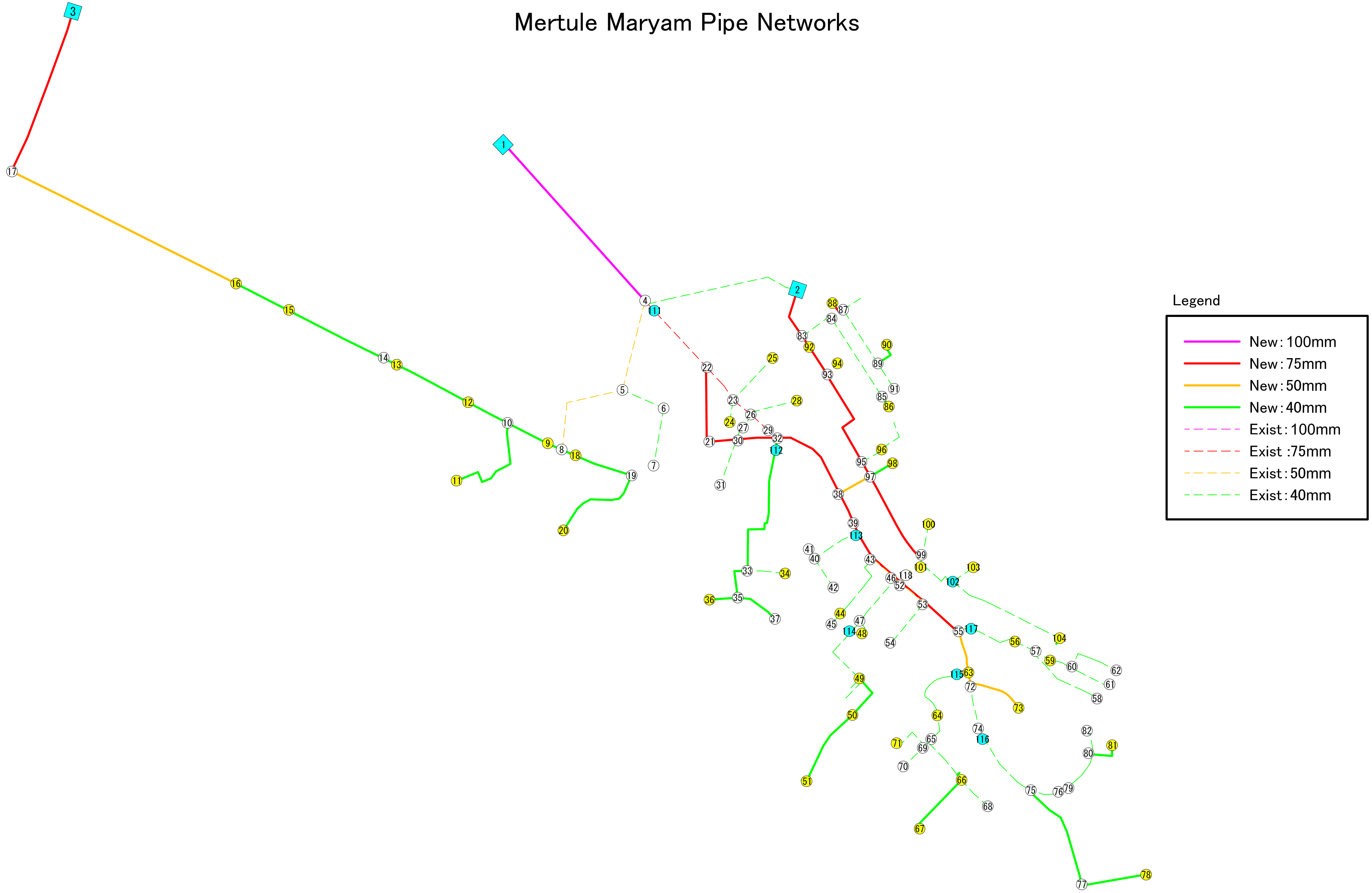
6. Distribution Facilities (Reservoir Tank)

No.	Towns	Average Daily Supply (m3/day)	Volume of Intake Water (m3/day)	Required Capacity Reservoirs (m3)		Existing Reservoir (m3)	Existing Use (m3)	Short Capacity (m3)	Plan of Reservoir Tank						Remarks
				12 hour	15 hour				Width (m)	Length (m)	Net Depth (m)	Number of Tank	Volume (m3)	Category	
9	Mertule Maryam	451.64	424.01	212.01	---	82.98	82.98	28.31	φ6.20	---	2.75	1	82.98	RC	Existing use
						50.36	50.36		φ5.40	---	2.20	1	50.36	Stone Masonry	Existing use
						50.36	50.36		φ5.40	---	2.20	1	50.36	Stone Masonry	Existing use
						---	---		3.00	4.00	2.50	1	30.00	RC	New
10	Yetimen	102.98	123.58	---	64.36	60.00	0.00	64.36	---	---	---	---	---	Stone Masonry	Abolishment
						---	---		4.50	6.00	2.50	1	67.50	RC	New
12	Lumame	342.64	399.17	171.32	---	50.02	50.02	121.30	2.60	5.20	1.85	2	50.02	Elevated Tank	Existing use
						---	---		4.00	7.50	2.05	2	123.00	Elevated Tank	New
14	Wojel	101.02	121.22	---	63.14	60.00	0.00	63.14	---	---	---	---	---	Stone Masonry	Abolishment
						---	---		4.50	6.00	2.50	1	67.50	RC	New
15	Sedie	106.66	127.99	---	66.66	60.00	0.00	66.66	---	---	---	---	---	Elevated Tank	Abolishment
						---	---		4.50	6.00	2.50	1	67.50	RC	New
16	Dibo	74.35	89.22	---	46.47	0.00	0.00	46.47	5.00	5.00	2.05	1	51.25	Elevated Tank	New
---	Amanuel	326.76	230.40	115.20	---	60.00	0.00	115.20	---	---	---	---	---	Elevated Tank	Abolishment
						30.00	0.00		---	---	---	---	---	Elevated Tank	Abolishment
						---	---		4.00	7.50	2.05	2	123.00	Elevated Tank	New
27	Gobeze Maryam	187.57	164.00	---	102.50	50.00	0.00	102.50	---	---	---	---	---	Stone Masonry	Abolishment
						---	---		3.00	7.00	2.50	2	105.00	RC	New
---	Bikolo(Wetet Abay)	151.19	181.43	---	94.49	25.00	0.00	94.49	---	---	---	---	---	Stone Masonry	Abolishment
						---	---		3.00	7.00	2.50	2	105.00	RC	New
Total		1,844.81	1,861.02	498.53	437.62	578.72	233.72	702.43	---	---	---	---	868.47		

7. Distribution Facilities (Pipeline)

Distribution pipelines of each site are determined by the hydraulic calculation.

Mertule Maryam Pipe Networks



——————Mertule Maryam <<Case.1 : Hazen-Williams Formula>>——————

Tank	3	Maximum EHP	69.227	(m)
Node	109	Minimum EHP	0.000	(m)
Line	113	Maximum I	0.000	(‰)
Pump, Decom	9	Maximum V	0.000	(m/s)
Convergence Gap	0.00 (cm)			
Calculation	2 (times)			

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

——— NodeData ———

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2711.092	2,711.092		0.000	0.000	Reservoir Tank
2	2667.920	2,667.920		0.000	0.000	Reservoir Tank
3	2678.330	2,678.330		0.000	0.000	Protect Spring
4	2711.092	2,678.563		32.528	0.000	
5	2711.092	2,683.449		27.643	0.000	
6	2711.092	2,676.987		34.104	0.000	
7	2711.092	2,666.009		45.082	0.000	
8	2711.092	2,669.977		41.114	0.000	
9	2711.092	2,670.943		40.148	0.000	
10	2711.092	2,667.801		43.290	0.000	
11	2711.092	2,647.574		63.517	0.000	
12	2711.092	2,661.335		49.756	0.000	
13	2711.092	2,661.633		49.459	0.000	
14	2711.092	2,663.275		47.817	0.000	
15	2711.092	2,652.036		59.056	0.000	
16	2711.092	2,650.905		60.187	0.000	
17	2678.330	2,610.000		68.330	0.000	
18	2711.092	2,669.435		41.657	0.000	
19	2711.092	2,665.041		46.051	0.000	
20	2711.092	2,660.441		50.651	0.000	
21	2678.563	2,646.951		31.612	0.000	
22	2678.563	2,650.877		27.686	0.000	
23	2678.563	2,649.199		29.364	0.000	
24	2678.563	2,639.156		39.407	0.000	

——— LineData ———

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	4	100.0	738.592	110	0.000	0.000	0.000	0.000	0.000
2	83	75.0	177.672	110	+++++	+++++	+++++	+++++	+++++
3	17	75.0	586.845	110	0.000	0.000	0.000	0.000	0.000
4	2	37.5	532.902	110	+++++	+++++	+++++	+++++	+++++
4	5	50.0	315.819	110	0.000	0.000	0.000	0.000	0.000
4	111	75.0	5.000	110	0.000	0.000	0.000	0.000	-32.528
5	6	37.5	173.162	110	0.000	0.000	0.000	0.000	0.000
5	8	37.5	356.867	110	0.000	0.000	0.000	0.000	0.000
6	7	37.5	210.687	110	0.000	0.000	0.000	0.000	0.000
8	9	37.5	38.912	110	0.000	0.000	0.000	0.000	0.000
8	18	37.5	28.446	110	0.000	0.000	0.000	0.000	0.000
9	10	37.5	167.427	110	0.000	0.000	0.000	0.000	0.000
10	11	37.5	375.927	110	0.000	0.000	0.000	0.000	0.000
10	12	37.5	152.470	110	0.000	0.000	0.000	0.000	0.000
12	13	37.5	276.997	110	0.000	0.000	0.000	0.000	0.000
13	14	37.5	47.669	110	0.000	0.000	0.000	0.000	0.000
14	15	37.5	366.847	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	203.839	110	0.000	0.000	0.000	0.000	0.000
16	17	50.0	858.018	110	+++++	+++++	+++++	+++++	+++++
18	19	37.5	228.057	110	0.000	0.000	0.000	0.000	0.000
19	20	37.5	333.917	110	0.000	0.000	0.000	0.000	0.000
21	22	75.0	254.447	110	0.000	0.000	0.000	0.000	0.000
21	30	75.0	98.839	110	0.000	0.000	0.000	0.000	0.000
22	23	75.0	144.166	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2678.563	2,648.840		29.723	0.000	
26	2678.563	2,639.255		39.309	0.000	
27	2678.563	2,638.286		40.277	0.000	
28	2678.563	2,640.412		38.151	0.000	
29	2678.563	2,633.869		44.694	0.000	
30	2678.563	2,638.502		40.061	0.000	
31	2678.563	2,635.328		43.235	0.000	
32	2678.563	2,633.840		44.723	0.000	
33	2633.840	2,606.060		27.781	0.000	
34	2633.840	2,594.605		39.235	0.000	
35	2633.840	2,602.746		31.094	0.000	
36	2633.840	2,607.019		26.821	0.000	
37	2633.840	2,587.186		46.654	0.000	
38	2678.563	2,628.299		50.264	0.000	
39	2678.563	2,623.546		55.017	0.000	
40	2623.546	2,605.298		18.249	0.000	
41	2623.546	2,606.458		17.089	0.000	
42	2623.546	2,602.136		21.411	0.000	
43	2623.546	2,617.831		5.715	0.000	
44	2623.546	2,594.942		28.604	0.000	
45	2623.546	2,589.029		34.518	0.000	
46	2623.546	2,610.616		12.931	0.000	
47	2623.546	2,598.849		24.697	0.000	
48	2623.546	2,595.483		28.063	0.000	
49	2598.849	2,575.018		23.831	0.000	
50	2598.849	2,566.153		32.696	0.000	
51	2598.849	2,549.208		49.641	0.000	
52	2623.546	2,611.045		12.501	0.000	
53	2623.546	2,608.679		14.867	0.000	
54	2623.546	2,598.152		25.395	0.000	
55	2678.563	2,610.185		68.378	0.000	
56	2610.185	2,600.317		9.868	0.000	
57	2610.185	2,590.637		19.548	0.000	
58	2610.185	2,573.553		36.632	0.000	
59	2610.185	2,586.678		23.508	0.000	
60	2610.185	2,572.897		37.288	0.000	
61	2610.185	2,560.109		50.076	0.000	
62	2610.185	2,555.223		54.962	0.000	
63	2678.563	2,613.779		64.784	0.000	
64	2613.779	2,597.077		16.703	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
23	24	37.5	76.626	110	0.000	0.000	0.000	0.000	0.000
23	25	37.5	193.779	110	0.000	0.000	0.000	0.000	0.000
23	26	75.0	78.843	110	0.000	0.000	0.000	0.000	0.000
26	27	37.5	63.445	110	0.000	0.000	0.000	0.000	0.000
26	28	37.5	165.855	110	0.000	0.000	0.000	0.000	0.000
26	29	75.0	94.027	110	0.000	0.000	0.000	0.000	0.000
30	31	37.5	163.997	110	0.000	0.000	0.000	0.000	0.000
30	32	75.0	135.739	110	0.000	0.000	0.000	0.000	0.000
32	38	75.0	306.663	110	0.000	0.000	0.000	0.000	0.000
32	112	37.5	0.100	110	0.000	0.000	0.000	0.000	-44.723
33	34	37.5	131.019	110	0.000	0.000	0.000	0.000	0.000
33	35	37.5	135.480	110	0.000	0.000	0.000	0.000	0.000
35	36	37.5	96.947	110	0.000	0.000	0.000	0.000	0.000
35	37	37.5	155.253	110	0.000	0.000	0.000	0.000	0.000
38	39	75.0	149.759	110	0.000	0.000	0.000	0.000	0.000
38	97	50.0	124.408	110	0.000	0.000	0.000	0.000	0.000
39	113	75.0	0.100	110	0.000	0.000	0.000	0.000	-55.017
39	118	75.0	227.583	110	0.000	0.000	0.000	0.000	0.000
40	41	37.5	22.791	110	0.000	0.000	0.000	0.000	0.000
40	42	37.5	117.963	110	0.000	0.000	0.000	0.000	0.000
43	44	37.5	264.336	110	0.000	0.000	0.000	0.000	0.000
43	46	65.0	105.762	110	0.000	0.000	0.000	0.000	0.000
44	45	37.5	47.986	110	0.000	0.000	0.000	0.000	0.000
46	47	37.5	192.998	110	0.000	0.000	0.000	0.000	0.000
46	52	65.0	23.052	110	0.000	0.000	0.000	0.000	0.000
47	48	37.5	46.357	110	0.000	0.000	0.000	0.000	0.000
47	114	37.5	0.100	110	0.000	0.000	0.000	0.000	-24.697
49	50	37.5	162.117	110	0.000	0.000	0.000	0.000	0.000
50	51	37.5	280.793	110	0.000	0.000	0.000	0.000	0.000
52	53	50.0	105.543	110	0.000	0.000	0.000	0.000	0.000
53	54	38	185.127	110	0.000	0.000	0.000	0.000	0.000
55	63	50	145.769	110	0.000	0.000	0.000	0.000	0.000
55	117	38	0.100	110	0.000	0.000	0.000	0.000	-68.378
56	57	38	79.436	110	0.000	0.000	0.000	0.000	0.000
57	58	38	280.099	110	0.000	0.000	0.000	0.000	0.000
57	59	38	60.044	110	0.000	0.000	0.000	0.000	0.000
59	60	38	78.645	110	0.000	0.000	0.000	0.000	0.000
60	61	38	142.935	110	0.000	0.000	0.000	0.000	0.000
60	62	38	197.215	110	0.000	0.000	0.000	0.000	0.000
63	72	50	37.566	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
65	2613.779	2,576.356		37.423	0.000	
66	2613.779	2,573.891		39.888	0.000	
67	2613.779	2,553.076		60.703	0.000	
68	2613.779	2,570.643		43.136	0.000	
69	2613.779	2,574.186		39.593	0.000	
70	2613.779	2,563.787		49.993	0.000	
71	2613.779	2,567.443		46.336	0.000	
72	2678.563	2,616.146		62.417	0.000	
73	2678.563	2,641.121		37.442	0.000	
74	2678.563	2,619.902		58.662	0.000	
75	2619.902	2,597.497		22.405	0.000	
76	2619.902	2,601.146		18.755	0.000	
77	2619.902	2,552.038		67.864	0.000	
78	2574.476	2,544.476	75.426	30.000	0.000	reak Pressure Val
79	2619.902	2,599.225		20.677	0.000	
80	2619.902	2,585.933		33.969	0.000	
81	2619.902	2,572.614		47.288	0.000	
82	2619.902	2,586.446		33.455	0.000	
83	2678.563	2,653.412		25.151	0.000	
84	2678.563	2,646.151		32.413	0.000	
85	2678.563	2,614.118		64.445	0.000	
86	2678.563	2,609.337		69.227	0.000	
87	2678.563	2,642.879		35.685	0.000	
88	2678.563	2,643.004		35.560	0.000	
89	2678.563	2,615.695		62.868	0.000	
90	2678.563	2,613.128		65.436	0.000	
91	2678.563	2,609.365		69.198	0.000	
92	2678.563	2,649.415		29.148	0.000	
93	2678.563	2,635.990		42.573	0.000	
94	2678.563	2,630.675		47.888	0.000	
95	2678.563	2,627.783		50.780	0.000	
96	2678.563	2,619.503		59.060	0.000	
97	2678.563	2,626.850		51.714	0.000	
98	2678.563	2,613.347		65.216	0.000	
99	2678.563	2,612.993		65.570	0.000	
100	2678.563	2,610.654		67.910	0.000	
101	2678.563	2,611.913		66.650	0.000	
102	2607.572	2,607.572	70.991	0.000	0.000	reak Pressure Tan
103	2607.572	2,598.508		9.064	0.000	
104	2607.572	2,572.544		35.028	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
63	115	38	0.100	110	0.000	0.000	0.000	0.000	-64.784
64	65	38	113.377	110	0.000	0.000	0.000	0.000	0.000
65	66	38	172.393	110	0.000	0.000	0.000	0.000	0.000
65	69	38	14.938	110	0.000	0.000	0.000	0.000	0.000
66	67	38	226.436	110	0.000	0.000	0.000	0.000	0.000
66	68	38	131.300	110	0.000	0.000	0.000	0.000	0.000
69	70	38	102.389	110	0.000	0.000	0.000	0.000	0.000
69	71	38	143.007	110	0.000	0.000	0.000	0.000	0.000
72	73	50	195.905	110	0.000	0.000	0.000	0.000	0.000
72	74	38	157.571	110	0.000	0.000	0.000	0.000	0.000
74	116	38	0.100	110	0.000	0.000	0.000	0.000	-58.661
75	76	38	97.487	110	0.000	0.000	0.000	0.000	0.000
76	77	38	335.366	110	0.000	0.000	0.000	0.000	0.000
76	79	38	37.283	110	0.000	0.000	0.000	0.000	0.000
77	78	38	221.917	110	0.000	0.000	0.000	0.000	-45.426
79	80	38	145.320	110	0.000	0.000	0.000	0.000	0.000
80	81	38	117.716	110	0.000	0.000	0.000	0.000	0.000
80	82	38	79.963	110	0.000	0.000	0.000	0.000	0.000
83	84	38	128.469	110	0.000	0.000	0.000	0.000	0.000
83	92	75	42.444	110	0.000	0.000	0.000	0.000	0.000
84	85	38	320.993	110	0.000	0.000	0.000	0.000	0.000
84	87	38	49.509	110	0.000	0.000	0.000	0.000	0.000
85	86	38	25.157	110	0.000	0.000	0.000	0.000	0.000
87	88	38	26.182	110	0.000	0.000	0.000	0.000	0.000
87	89	38	221.991	110	0.000	0.000	0.000	0.000	0.000
89	90	38	91.771	110	0.000	0.000	0.000	0.000	0.000
89	91	38	103.369	110	0.000	0.000	0.000	0.000	0.000
92	93	75	117.501	110	0.000	0.000	0.000	0.000	0.000
93	94	38	51.545	110	0.000	0.000	0.000	0.000	0.000
93	95	75	365.347	110	0.000	0.000	0.000	0.000	0.000
95	96	38	81.890	110	0.000	0.000	0.000	0.000	0.000
95	97	75	59.027	110	0.000	0.000	0.000	0.000	0.000
97	98	38	90.806	110	0.000	0.000	0.000	0.000	0.000
97	99	75	334.654	110	0.000	0.000	0.000	0.000	0.000
99	100	38	120.771	110	0.000	0.000	0.000	0.000	0.000
99	101	50	18.706	110	0.000	0.000	0.000	0.000	0.000
101	102	38	160.098	110	0.000	0.000	0.000	0.000	-70.991
102	103	38	86.388	110	0.000	0.000	0.000	0.000	0.000
102	104	38	418.211	110	0.000	0.000	0.000	0.000	0.000
111	22	75	293.703	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
111	2678.563	2,678.563	32.528	0.000	0.000	reak Pressure Tan
112	2633.840	2,633.840	44.723	0.000	0.000	reak Pressure Tan
113	2623.546	2,623.546	55.017	0.000	0.000	reak Pressure Tan
114	2598.849	2,598.849	24.697	0.000	0.000	reak Pressure Tan
115	2613.779	2,613.779	64.784	0.000	0.000	reak Pressure Tan
116	2619.902	2,619.902	58.662	0.000	0.000	reak Pressure Tan
117	2610.185	2,610.185	68.378	0.000	0.000	reak Pressure Tan
118	2678.563	2,611.045		67.518	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
112	33	38	522.930	110	0.000	0.000	0.000	0.000	0.000
113	40	38	174.553	110	0.000	0.000	0.000	0.000	0.000
113	43	75	98.768	110	0.000	0.000	0.000	0.000	0.000
114	49	38	278.695	110	0.000	0.000	0.000	0.000	0.000
115	64	38	269.183	110	0.000	0.000	0.000	0.000	0.000
116	75	38	286.580	110	0.000	0.000	0.000	0.000	0.000
117	56	38	210.779	110	0.000	0.000	0.000	0.000	0.000
118	55	75	261.653	110	0.000	0.000	0.000	0.000	0.000
118	101	38	92.744	110	0.000	0.000	0.000	0.000	0.000

------Mertule Maryam <<Case.2 : Hazen-Williams Formula>>------

Tank	3	Maximum EHP	67.985	(m)
Node	109	Minimum EHP	0.000	(m)
Line	113	Maximum I	64.767	(‰)
Pump, Decom	9	Maximum V	1.125	(m/s)

Convergence Gap 0.88 (cm)

Calculation 16 (times)

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2711.092	2,711.092		0.000	-6.509	Reservoir Tank
2	2667.920	2,667.920		0.000	-1.898	Reservoir Tank
3	2678.330	2,678.330		0.000	-0.607	Protect Spring
4	2702.434	2,678.563		23.871	0.000	
5	2697.738	2,683.449		14.289	0.000	
6	2697.738	2,676.987		20.750	0.000	
7	2697.738	2,666.009		31.728	0.000	
8	2676.192	2,669.977		6.214	0.000	
9	2675.214	2,670.943		4.270	0.225	
10	2673.054	2,667.801		5.252	0.000	
11	2672.021	2,647.574		24.447	0.225	
12	2672.367	2,661.335		11.032	0.225	
13	2672.282	2,661.633		10.650	0.225	
14	2672.349	2,663.275		9.074	0.000	
15	2672.861	2,652.036		20.826	0.225	
16	2674.347	2,650.905		23.443	0.225	
17	2677.985	2,610.000		67.985	0.000	
18	2675.910	2,669.435		6.475	0.225	
19	2675.283	2,665.041		10.243	0.000	
20	2674.367	2,660.441		13.926	0.225	
21	2669.074	2,646.951		22.123	0.000	
22	2672.702	2,650.877		21.825	0.000	
23	2672.598	2,649.199		23.400	0.000	
24	2672.388	2,639.156		33.232	0.225	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	4	100.0	738.592	110	6.509	0.829	11.721	8.657	0.000
2	83	75.0	177.672	110	3.140	0.711	12.339	2.192	0.000
3	17	75.0	586.845	110	0.607	0.138	0.588	0.345	0.000
4	2	37.5	532.902	110	1.242	1.125	64.767	34.515	0.000
4	5	50.0	315.819	110	1.196	0.609	14.872	4.697	0.000
4	111	75.0	5.000	110	4.071	0.922	19.957	0.100	-23.771
5	6	37.5	173.162	110	0.000	0.000	0.000	0.000	0.000
5	8	37.5	356.867	110	1.196	1.083	60.375	21.546	0.000
6	7	37.5	210.687	110	0.000	0.000	0.000	0.000	0.000
8	9	37.5	38.912	110	0.745	0.675	25.139	0.978	0.000
8	18	37.5	28.446	110	0.451	0.408	9.912	0.282	0.000
9	10	37.5	167.427	110	0.520	0.471	12.901	2.160	0.000
10	11	37.5	375.927	110	0.225	0.204	2.746	1.032	0.000
10	12	37.5	152.470	110	0.294	0.267	4.501	0.686	0.000
12	13	37.5	276.997	110	0.069	0.062	0.306	0.085	0.000
13	14	37.5	47.669	110	-0.156	-0.142	-1.397	-0.067	0.000
14	15	37.5	366.847	110	-0.156	-0.142	-1.397	-0.512	0.000
15	16	37.5	203.839	110	-0.382	-0.346	-7.290	-1.486	0.000
16	17	50.0	858.018	110	-0.607	-0.309	-4.239	-3.637	0.000
18	19	37.5	228.057	110	0.225	0.204	2.746	0.626	0.000
19	20	37.5	333.917	110	0.225	0.204	2.746	0.917	0.000
21	22	75.0	254.447	110	-3.395	-0.769	-14.258	-3.628	0.000
21	30	75.0	98.839	110	3.395	0.769	14.258	1.409	0.000
22	23	75.0	144.166	110	0.676	0.153	0.718	0.104	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2672.066	2,648.840		23.226	0.225	
26	2672.591	2,639.255		33.336	0.000	
27	2672.591	2,638.286		34.305	0.000	
28	2672.136	2,640.412		31.724	0.225	
29	2672.591	2,633.869		38.722	0.000	
30	2667.665	2,638.502		29.163	0.000	
31	2667.665	2,635.328		32.337	0.000	
32	2665.730	2,633.840		31.889	0.000	
33	2628.657	2,606.060		22.597	0.000	
34	2628.297	2,594.605		33.692	0.225	
35	2628.285	2,602.746		25.539	0.000	
36	2628.019	2,607.019		20.999	0.225	
37	2628.285	2,587.186		41.098	0.000	
38	2662.371	2,628.299		34.072	0.000	
39	2660.651	2,623.546		37.105	0.000	
40	2623.546	2,605.298		18.249	0.000	
41	2623.546	2,606.458		17.089	0.000	
42	2623.546	2,602.136		21.411	0.000	
43	2623.364	2,617.831		5.533	0.000	
44	2622.638	2,594.942		27.696	0.225	
45	2622.638	2,589.029		33.609	0.000	
46	2623.104	2,610.616		12.488	0.000	
47	2616.199	2,598.849		17.349	0.000	
48	2616.071	2,595.483		20.588	0.225	
49	2592.996	2,575.018		17.978	0.225	
50	2591.389	2,566.153		25.236	0.225	
51	2590.618	2,549.208		41.410	0.225	
52	2623.104	2,611.045		12.059	0.000	
53	2623.104	2,608.679		14.425	0.000	
54	2623.104	2,598.152		24.952	0.000	
55	2657.467	2,610.185		47.282	0.000	
56	2608.096	2,600.317		7.779	0.225	
57	2607.878	2,590.637		17.240	0.000	
58	2607.878	2,573.553		34.324	0.000	
59	2607.713	2,586.678		21.035	0.225	
60	2607.713	2,572.897		34.816	0.000	
61	2607.713	2,560.109		47.603	0.000	
62	2607.713	2,555.223		52.490	0.000	
63	2651.699	2,613.779		37.920	0.225	
64	2604.148	2,597.077		7.071	0.225	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
23	24	37.5	76.626	110	0.225	0.204	2.746	0.210	0.000
23	25	37.5	193.779	110	0.225	0.204	2.746	0.532	0.000
23	26	75.0	78.843	110	0.225	0.051	0.094	0.007	0.000
26	27	37.5	63.445	110	0.000	0.000	0.000	0.000	0.000
26	28	37.5	165.855	110	0.225	0.204	2.746	0.455	0.000
26	29	75.0	94.027	110	0.000	0.000	0.000	0.000	0.000
30	31	37.5	163.997	110	0.000	0.000	0.000	0.000	0.000
30	32	75.0	135.739	110	3.395	0.769	14.258	1.935	0.000
32	38	75.0	306.663	110	2.944	0.667	10.952	3.359	0.000
32	112	37.5	0.100	110	0.451	0.408	9.913	0.001	-31.888
33	34	37.5	131.019	110	0.225	0.204	2.746	0.360	0.000
33	35	37.5	135.480	110	0.225	0.204	2.746	0.372	0.000
35	36	37.5	96.947	110	0.225	0.204	2.746	0.266	0.000
35	37	37.5	155.253	110	0.000	0.000	0.000	0.000	0.000
38	39	75.0	149.759	110	3.021	0.684	11.482	1.720	0.000
38	97	50.0	124.408	110	-0.076	-0.039	-0.091	-0.011	0.000
39	113	75.0	0.100	110	1.127	0.255	1.849	0.000	-37.105
39	118	75.0	227.583	110	1.894	0.429	4.837	1.101	0.000
40	41	37.5	22.791	110	0.000	0.000	0.000	0.000	0.000
40	42	37.5	117.963	110	0.000	0.000	0.000	0.000	0.000
43	44	37.5	264.336	110	0.225	0.204	2.746	0.726	0.000
43	46	65.0	105.762	110	0.901	0.272	2.456	0.260	0.000
44	45	37.5	47.986	110	0.000	0.000	0.000	0.000	0.000
46	47	37.5	192.998	110	0.901	0.817	35.780	6.906	0.000
46	52	65.0	23.052	110	0.000	0.000	0.000	0.000	0.000
47	48	37.5	46.357	110	0.225	0.204	2.746	0.127	0.000
47	114	37.5	0.100	110	0.676	0.612	21.003	0.002	-17.347
49	50	37.5	162.117	110	0.451	0.408	9.913	1.607	0.000
50	51	37.5	280.793	110	0.225	0.204	2.746	0.771	0.000
52	53	50.0	105.543	110	0.000	0.000	0.000	0.000	0.000
53	54	38	185.127	110	0.000	0.000	0.000	0.000	0.000
55	63	50	145.769	110	2.028	1.033	39.567	5.768	0.000
55	117	38	0.100	110	0.451	0.408	9.913	0.001	-47.281
56	57	38	79.436	110	0.225	0.204	2.746	0.218	0.000
57	58	38	280.099	110	0.000	0.000	0.000	0.000	0.000
57	59	38	60.044	110	0.225	0.204	2.746	0.165	0.000
59	60	38	78.645	110	0.000	0.000	0.000	0.000	0.000
60	61	38	142.935	110	0.000	0.000	0.000	0.000	0.000
60	62	38	197.215	110	0.000	0.000	0.000	0.000	0.000
63	72	50	37.566	110	0.901	0.459	8.814	0.331	0.000

--- NodeData ---   --- LineData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (1/s)	Remarks	Node ST	Node EN	D (mm)	L (m)	Coef C	Q (1/s)	V (m/s)	I (‰)	HL (m)	P (m)
65	2601.767	2,576.356		25.411	0.000		63	115	38	0.100	110	0.901	0.817	35.782	0.004	-37.917
66	2600.058	2,573.891		26.166	0.225		64	65	38	113.377	110	0.676	0.612	21.003	2.381	0.000
67	2599.436	2,553.076		46.360	0.225		65	66	38	172.393	110	0.451	0.408	9.912	1.709	0.000
68	2600.058	2,570.643		29.414	0.000		65	69	38	14.938	110	0.225	0.204	2.746	0.041	0.000
69	2601.725	2,574.186		27.539	0.000		66	67	38	226.436	110	0.225	0.204	2.746	0.622	0.000
70	2601.725	2,563.787		37.939	0.000		66	68	38	131.300	110	0.000	0.000	0.000	0.000	0.000
71	2601.333	2,567.443		33.890	0.225		69	70	38	102.389	110	0.000	0.000	0.000	0.000	0.000
72	2651.368	2,616.146		35.222	0.000		69	71	38	143.007	110	0.225	0.204	2.746	0.393	0.000
73	2651.236	2,641.121		10.115	0.225		72	73	50	195.905	110	0.225	0.115	0.676	0.133	0.000
74	2648.059	2,619.902		28.157	0.225		72	74	38	157.571	110	0.676	0.612	21.003	3.309	0.000
75	2617.061	2,597.497		19.564	0.000		74	116	38	0.100	110	0.451	0.408	9.913	0.001	-28.156
76	2616.095	2,601.146		14.948	0.000		75	76	38	97.487	110	0.451	0.408	9.912	0.966	0.000
77	2615.174	2,552.038		63.136	0.000		76	77	38	335.366	110	0.225	0.204	2.746	0.921	0.000
78	2574.476	2,544.476	70.088	30.000	0.225	reak Pressure Val	76	79	38	37.283	110	0.225	0.204	2.746	0.102	0.000
79	2615.992	2,599.225		16.768	0.000		77	78	38	221.917	110	0.225	0.204	2.746	0.609	-40.088
80	2615.593	2,585.933		29.660	0.000		79	80	38	145.320	110	0.225	0.204	2.746	0.399	0.000
81	2615.270	2,572.614		42.656	0.225		80	81	38	117.716	110	0.225	0.204	2.746	0.323	0.000
82	2615.593	2,586.446		29.147	0.000		80	82	38	79.963	110	0.000	0.000	0.000	0.000	0.000
83	2665.727	2,653.412		12.315	0.000		83	84	38	128.469	110	0.676	0.612	21.003	2.698	0.000
84	2663.029	2,646.151		16.879	0.000		83	92	75	42.444	110	2.464	0.558	7.876	0.334	0.000
85	2662.148	2,614.118		48.030	0.000		84	85	38	320.993	110	0.225	0.204	2.746	0.881	0.000
86	2662.079	2,609.337		52.742	0.225		84	87	38	49.509	110	0.451	0.408	9.913	0.491	0.000
87	2662.538	2,642.879		19.660	0.000		85	86	38	25.157	110	0.225	0.204	2.746	0.069	0.000
88	2662.467	2,643.004		19.463	0.225		87	88	38	26.182	110	0.225	0.204	2.746	0.072	0.000
89	2661.929	2,615.695		46.234	0.000		87	89	38	221.991	110	0.225	0.204	2.746	0.610	0.000
90	2661.677	2,613.128		48.549	0.225		89	90	38	91.771	110	0.225	0.204	2.746	0.252	0.000
91	2661.929	2,609.365		52.564	0.000		89	91	38	103.369	110	0.000	0.000	0.000	0.000	0.000
92	2665.393	2,649.415		15.978	0.225		92	93	75	117.501	110	2.239	0.507	6.594	0.775	0.000
93	2664.618	2,635.990		28.628	0.000		93	94	38	51.545	110	0.225	0.204	2.746	0.142	0.000
94	2664.477	2,630.675		33.802	0.225		93	95	75	365.347	110	2.013	0.456	5.418	1.979	0.000
95	2662.639	2,627.783		34.856	0.000		95	96	38	81.890	110	0.225	0.204	2.746	0.225	0.000
96	2662.414	2,619.503		42.911	0.225		95	97	75	59.027	110	1.788	0.405	4.349	0.257	0.000
97	2662.382	2,626.850		35.533	0.000		97	98	38	90.806	110	0.225	0.204	2.746	0.249	0.000
98	2662.133	2,613.347		48.786	0.225		97	99	75	334.654	110	1.487	0.337	3.089	1.034	0.000
99	2661.348	2,612.993		48.356	0.000		99	100	38	120.771	110	0.225	0.204	2.746	0.332	0.000
100	2661.017	2,610.654		50.363	0.225		99	101	50	18.706	110	1.261	0.643	16.416	0.307	0.000
101	2661.041	2,611.913		49.128	0.225		101	102	38	160.098	110	0.451	0.408	9.913	1.587	-51.883
102	2607.572	2,607.572	51.883	-0.000	0.000	reak Pressure Tan	102	103	38	86.388	110	0.225	0.204	2.746	0.237	0.000
103	2607.335	2,598.508		8.827	0.225		102	104	38	418.211	110	0.225	0.204	2.746	1.148	0.000
104	2606.423	2,572.544		33.879	0.225		111	22	75	293.703	110	4.071	0.922	19.957	5.861	0.000

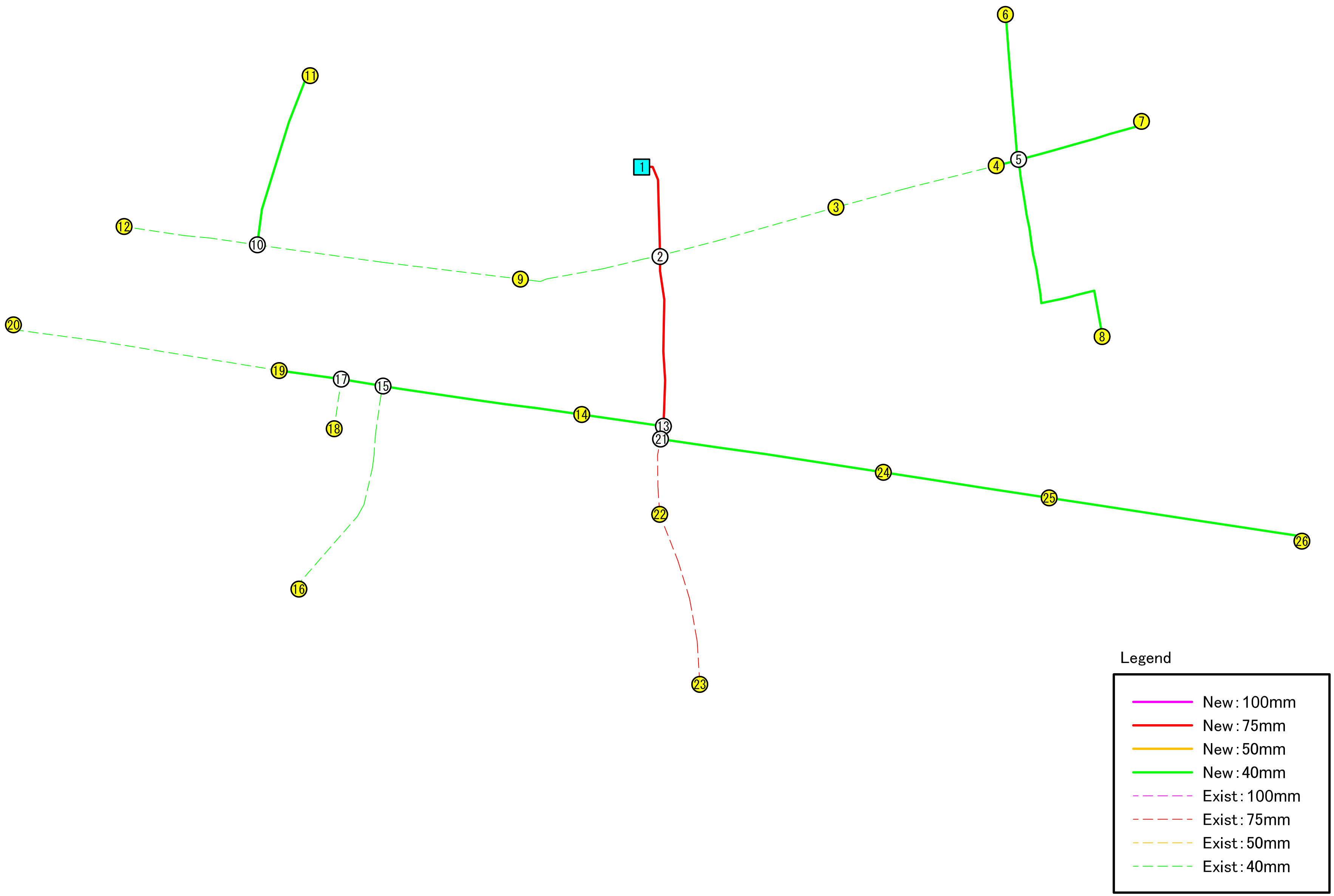
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
111	2678.563	2,678.563	23.771	0.000	0.000	reak Pressure Tan
112	2633.840	2,633.840	31.888	-0.000	0.000	reak Pressure Tan
113	2623.546	2,623.546	37.105	-0.000	0.000	reak Pressure Tan
114	2598.849	2,598.849	17.347	0.000	0.000	reak Pressure Tan
115	2613.779	2,613.779	37.917	-0.000	0.000	reak Pressure Tan
116	2619.902	2,619.902	28.156	-0.000	0.000	reak Pressure Tan
117	2610.185	2,610.185	47.281	-0.000	0.000	reak Pressure Tan
118	2659.551	2,611.045		48.506	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
112	33	38	522.930	110	0.451	0.408	9.913	5.184	0.000
113	40	38	174.553	110	0.000	0.000	0.000	0.000	0.000
113	43	75	98.768	110	1.127	0.255	1.849	0.183	0.000
114	49	38	278.695	110	0.676	0.612	21.003	5.853	0.000
115	64	38	269.183	110	0.901	0.817	35.780	9.631	0.000
116	75	38	286.580	110	0.451	0.408	9.913	2.841	0.000
117	56	38	210.779	110	0.451	0.408	9.913	2.089	0.000
118	55	75	261.653	110	2.479	0.561	7.963	2.084	0.000
118	101	38	92.744	110	-0.585	-0.530	-16.074	-1.491	0.000

Yetimen Pipe Networks



------Yetimen <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	37.204	(m)
Node	25	Minimum EHP	13.863	(m)
Line	25	Maximum I	0.000	(‰)
Pump, Decom	0	Maximum V	0.000	(m/s)
Convergence Gap	0.00 (cm)			
Calculation	2 (times)			

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2445.775	2,445.775		0.000	-0.000	Reservoir Tank
2	2445.775	2,430.247		15.528	0.000	
3	2445.775	2,427.969		17.806	0.000	
4	2445.775	2,427.235		18.540	0.000	
5	2445.775	2,427.269		18.506	0.000	
6	2445.775	2,418.940		26.835	0.000	
7	2445.775	2,430.110		15.665	0.000	
8	2445.775	2,420.266		25.509	0.000	
9	2445.775	2,431.912		13.863	0.000	
10	2445.775	2,424.229		21.546	0.000	
11	2445.775	2,418.920		26.855	0.000	
12	2445.775	2,413.235		32.540	0.000	
13	2445.775	2,419.148		26.627	0.000	
14	2445.775	2,421.306		24.469	0.000	
15	2445.775	2,424.991		20.784	0.000	
16	2445.775	2,416.621		29.154	0.000	
17	2445.775	2,424.153		21.622	0.000	
18	2445.775	2,423.421		22.354	0.000	
19	2445.775	2,421.428		24.347	0.000	
20	2445.775	2,408.571		37.204	0.000	
21	2445.775	2,419.148		26.627	0.000	
22	2445.775	2,416.366		29.409	0.000	
23	2445.775	2,411.422		34.353	0.000	
24	2445.775	2,416.708		29.067	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	122.593	110	0.000	0.000	0.000	0.000	0.000
2	3	37.5	233.440	110	0.000	0.000	0.000	0.000	0.000
2	9	37.5	181.823	110	0.000	0.000	0.000	0.000	0.000
2	13	75.0	218.028	110	0.000	0.000	0.000	0.000	0.000
3	4	37.5	211.438	110	0.000	0.000	0.000	0.000	0.000
4	5	37.5	29.691	110	0.000	0.000	0.000	0.000	0.000
5	6	37.5	186.444	110	0.000	0.000	0.000	0.000	0.000
5	7	37.5	168.369	110	0.000	0.000	0.000	0.000	0.000
5	8	37.5	314.448	110	0.000	0.000	0.000	0.000	0.000
9	10	37.5	338.976	110	0.000	0.000	0.000	0.000	0.000
10	11	37.5	227.765	110	0.000	0.000	0.000	0.000	0.000
10	12	37.5	172.222	110	0.000	0.000	0.000	0.000	0.000
13	14	37.5	105.331	110	0.000	0.000	0.000	0.000	0.000
13	21	75.0	16.799	110	0.000	0.000	0.000	0.000	0.000
14	15	37.5	256.414	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	286.635	110	0.000	0.000	0.000	0.000	0.000
15	17	37.5	54.082	110	0.000	0.000	0.000	0.000	0.000
17	18	37.5	63.991	110	0.000	0.000	0.000	0.000	0.000
17	19	37.5	79.942	110	0.000	0.000	0.000	0.000	0.000
19	20	37.5	349.857	110	0.000	0.000	0.000	0.000	0.000
21	22	75.0	96.666	110	0.000	0.000	0.000	0.000	0.000
21	24	37.5	287.787	110	0.000	0.000	0.000	0.000	0.000
22	23	75.0	224.852	110	0.000	0.000	0.000	0.000	0.000
24	25	37.5	214.222	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2445.775	2,416.328		29.447	0.000	
26	2445.775	2,416.715		29.060	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
25	26	37.5	333.357	110	0.000	0.000	0.000	0.000	0.000

------Yetimen <<Case.2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	33.260	(m)
Node	25	Minimum EHP	8.156	(m)
Line	25	Maximum I	17.312	(‰)
Pump, Decom	0	Maximum V	0.552	(m/s)

Convergence Gap 0.99 (cm)

Calculation 12 (times)

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2445.775	2,445.775		0.000	-2.071	Reservoir Tank
2	2445.075	2,430.247		14.828	0.000	
3	2441.034	2,427.969		13.065	0.122	
4	2438.613	2,427.235		11.378	0.122	
5	2438.414	2,427.269		11.145	0.000	
6	2438.250	2,418.940		19.310	0.122	
7	2438.266	2,430.110		8.156	0.122	
8	2438.137	2,420.266		17.871	0.122	
9	2443.853	2,431.912		11.941	0.122	
10	2442.777	2,424.229		18.548	0.000	
11	2442.577	2,418.920		23.657	0.122	
12	2442.626	2,413.235		29.391	0.122	
13	2444.692	2,419.148		25.544	0.000	
14	2442.868	2,421.306		21.562	0.122	
15	2439.932	2,424.991		14.941	0.000	
16	2439.680	2,416.621		23.059	0.122	
17	2439.568	2,424.153		15.415	0.000	
18	2439.512	2,423.421		16.091	0.122	
19	2439.315	2,421.428		17.887	0.122	
20	2439.007	2,408.571		30.436	0.122	
21	2444.685	2,419.148		25.537	0.000	
22	2444.682	2,416.366		28.316	0.122	
23	2444.682	2,411.422		33.260	0.000	
24	2442.751	2,416.708		26.043	0.122	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	122.593	110	2.071	0.469	5.709	0.700	0.000
2	3	37.5	233.440	110	0.609	0.552	17.311	4.041	0.000
2	9	37.5	181.823	110	0.365	0.331	6.722	1.222	0.000
2	13	75.0	218.028	110	1.096	0.248	1.758	0.383	0.000
3	4	37.5	211.438	110	0.487	0.441	11.450	2.421	0.000
4	5	37.5	29.691	110	0.365	0.331	6.721	0.200	0.000
5	6	37.5	186.444	110	0.122	0.110	0.879	0.164	0.000
5	7	37.5	168.369	110	0.122	0.110	0.879	0.148	0.000
5	8	37.5	314.448	110	0.122	0.110	0.879	0.276	0.000
9	10	37.5	338.976	110	0.244	0.221	3.173	1.076	0.000
10	11	37.5	227.765	110	0.122	0.110	0.879	0.200	0.000
10	12	37.5	172.222	110	0.122	0.110	0.879	0.151	0.000
13	14	37.5	105.331	110	0.609	0.552	17.312	1.823	0.000
13	21	75.0	16.799	110	0.487	0.110	0.391	0.007	0.000
14	15	37.5	256.414	110	0.487	0.441	11.452	2.936	0.000
15	16	37.5	286.635	110	0.122	0.110	0.879	0.252	0.000
15	17	37.5	54.082	110	0.365	0.331	6.723	0.364	0.000
17	18	37.5	63.991	110	0.122	0.110	0.879	0.056	0.000
17	19	37.5	79.942	110	0.244	0.221	3.173	0.254	0.000
19	20	37.5	349.857	110	0.122	0.110	0.879	0.308	0.000
21	22	75.0	96.666	110	0.122	0.028	0.030	0.003	0.000
21	24	37.5	287.787	110	0.365	0.331	6.722	1.935	0.000
22	23	75.0	224.852	110	0.000	0.000	0.000	0.000	0.000
24	25	37.5	214.222	110	0.244	0.221	3.172	0.680	0.000

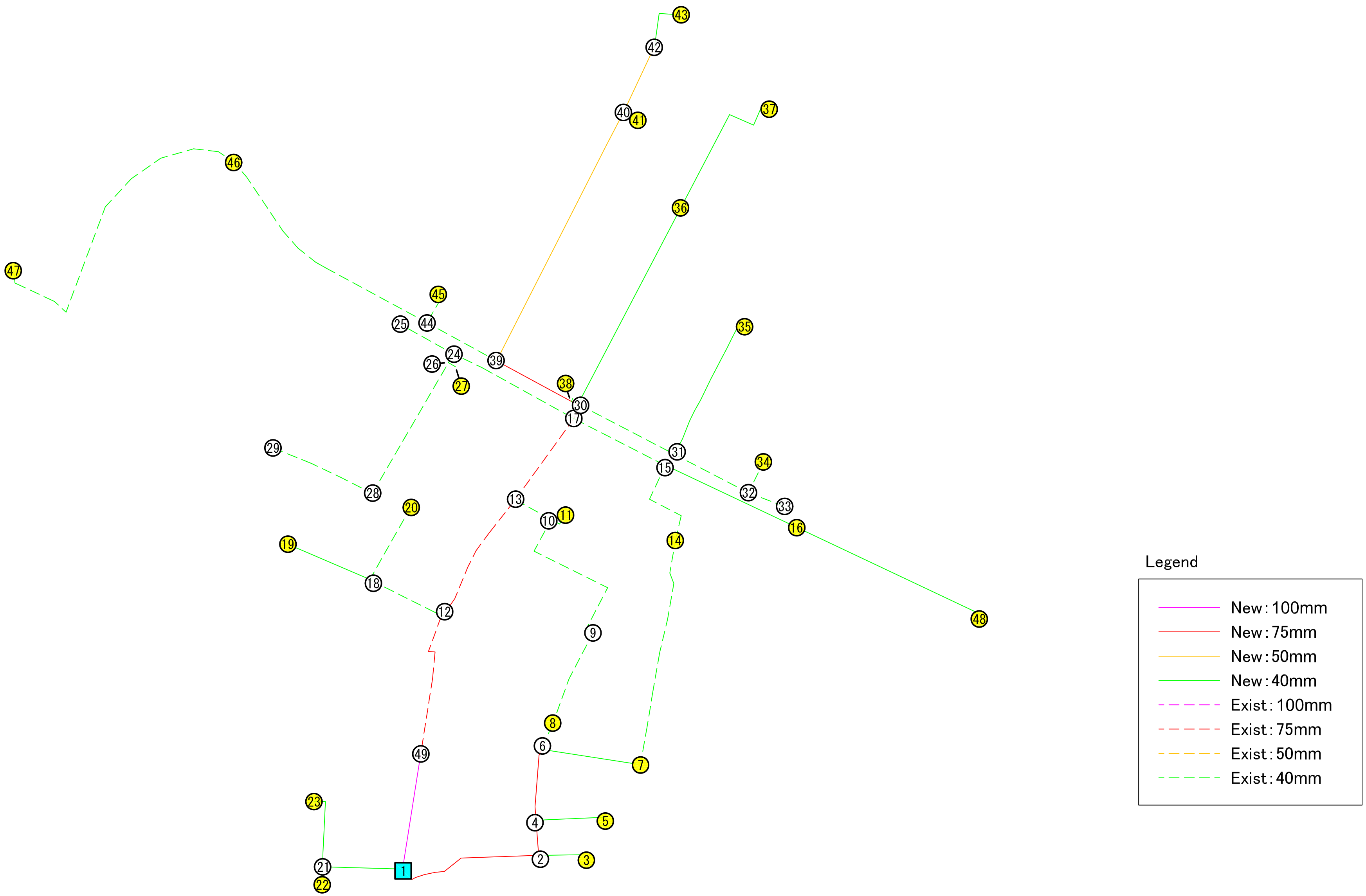
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2442.071	2,416.328		25.743	0.122	
26	2441.778	2,416.715		25.063	0.122	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
25	26	37.5	333.357	110	0.122	0.110	0.879	0.293	0.000

Lumame Pipe Networks



------Lumame <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	52.343	(m)
Node	48	Minimum EHP	12.929	(m)
Line	50	Maximum I	0.000	(‰)
Pump, Decom	0	Maximum V	0.000	(m/s)
Convergence Gap	0.00 (cm)			
Calculation	2 (times)			

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (1/s)	Remarks
1	2505.819	2,497.769		8.050	0.000	Reservoir Tank
2	2505.819	2,485.570		20.249	0.000	
3	2505.819	2,478.002		27.817	0.000	
4	2505.819	2,483.278		22.541	0.000	
5	2505.819	2,475.730		30.089	0.000	
6	2505.819	2,479.872		25.947	0.000	
7	2505.819	2,471.057		34.762	0.000	
8	2505.819	2,479.479		26.340	0.000	
9	2505.819	2,476.115		29.704	0.000	
10	2505.819	2,476.975		28.844	0.000	
11	2505.819	2,476.515		29.304	0.000	
12	2505.819	2,490.686		15.133	0.000	
13	2505.819	2,480.695		25.124	0.000	
14	2505.819	2,467.909		37.910	0.000	
15	2505.819	2,466.395		39.424	0.000	
16	2505.819	2,462.879		42.940	0.000	
17	2505.819	2,469.119		36.700	0.000	
18	2505.819	2,484.223		21.596	0.000	
19	2505.819	2,466.960		38.859	0.000	
20	2505.819	2,482.798		23.021	0.000	
21	2505.819	2,488.260		17.559	0.000	
22	2505.819	2,487.557		18.262	0.000	
23	2505.819	2,487.846		17.973	0.000	
24	2505.819	2,465.203		40.616	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (1/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	240.166	110	0.000	0.000	0.000	0.000	0.000
1	21	37.5	124.844	110	0.000	0.000	0.000	0.000	0.000
1	49	100.0	186.712	110	0.000	0.000	0.000	0.000	0.000
2	3	37.5	75.572	110	0.000	0.000	0.000	0.000	0.000
2	4	75.0	58.442	110	0.000	0.000	0.000	0.000	0.000
4	5	37.5	116.212	110	0.000	0.000	0.000	0.000	0.000
4	6	75.0	123.637	110	0.000	0.000	0.000	0.000	0.000
6	7	37.5	158.415	110	0.000	0.000	0.000	0.000	0.000
6	8	37.5	39.525	110	0.000	0.000	0.000	0.000	0.000
7	14	37.5	361.055	110	0.000	0.000	0.000	0.000	0.000
8	9	37.5	156.505	110	0.000	0.000	0.000	0.000	0.000
9	10	37.5	270.158	110	0.000	0.000	0.000	0.000	0.000
10	11	37.5	27.311	110	0.000	0.000	0.000	0.000	0.000
10	13	37.5	64.905	110	0.000	0.000	0.000	0.000	0.000
12	13	75.0	211.914	110	0.000	0.000	0.000	0.000	0.000
12	18	37.5	120.098	110	0.000	0.000	0.000	0.000	0.000
13	17	75.0	157.353	110	0.000	0.000	0.000	0.000	0.000
14	15	37.5	154.475	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	229.472	110	0.000	0.000	0.000	0.000	0.000
15	17	37.5	162.406	110	0.000	0.000	0.000	0.000	0.000
16	48	37.5	330.309	110	0.000	0.000	0.000	0.000	0.000
17	24	37.5	214.586	110	0.000	0.000	0.000	0.000	0.000
17	30	75.0	23.287	110	0.000	0.000	0.000	0.000	0.000
18	19	37.5	149.669	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2505.819	2,462.249		43.570	0.000	
26	2505.819	2,467.756		38.063	0.000	
27	2505.819	2,468.042		37.777	0.000	
28	2505.819	2,482.775		23.044	0.000	
29	2505.819	2,462.028		43.791	0.000	
30	2505.819	2,469.119		36.700	0.000	
31	2505.819	2,466.103		39.716	0.000	
32	2505.819	2,463.965		41.854	0.000	
33	2505.819	2,463.243		42.576	0.000	
34	2505.819	2,462.506		43.313	0.000	
35	2505.819	2,465.147		40.672	0.000	
36	2505.819	2,465.892		39.927	0.000	
37	2505.819	2,466.766		39.053	0.000	
38	2505.819	2,469.773		36.046	0.000	
39	2505.819	2,467.287		38.532	0.000	
40	2505.819	2,473.213		32.606	0.000	
41	2505.819	2,472.929		32.890	0.000	
42	2505.819	2,481.970		23.849	0.000	
43	2505.819	2,487.080		18.739	0.000	
44	2505.819	2,463.032		42.787	0.000	
45	2505.819	2,461.905		43.914	0.000	
46	2505.819	2,453.476		52.343	0.000	
47	2505.819	2,463.283		42.536	0.000	
48	2505.819	2,466.677		39.142	0.000	
49	2505.819	2,492.890		12.929	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
18	20	37.5	133.816	110	0.000	0.000	0.000	0.000	0.000
21	22	37.5	23.435	110	0.000	0.000	0.000	0.000	0.000
21	23	37.5	120.584	110	0.000	0.000	0.000	0.000	0.000
24	25	37.5	97.004	110	0.000	0.000	0.000	0.000	0.000
24	26	37.5	16.021	110	0.000	0.000	0.000	0.000	0.000
26	27	37.5	12.562	110	0.000	0.000	0.000	0.000	0.000
26	28	37.5	238.879	110	0.000	0.000	0.000	0.000	0.000
28	29	37.5	174.023	110	0.000	0.000	0.000	0.000	0.000
30	31	37.5	169.219	110	0.000	0.000	0.000	0.000	0.000
30	36	37.5	349.479	110	0.000	0.000	0.000	0.000	0.000
30	38	75.0	14.847	110	0.000	0.000	0.000	0.000	0.000
31	32	37.5	129.307	110	0.000	0.000	0.000	0.000	0.000
31	35	37.5	237.093	110	0.000	0.000	0.000	0.000	0.000
32	33	37.5	61.048	110	0.000	0.000	0.000	0.000	0.000
32	34	37.5	54.019	110	0.000	0.000	0.000	0.000	0.000
36	37	37.5	253.273	110	0.000	0.000	0.000	0.000	0.000
38	39	75.0	136.194	110	0.000	0.000	0.000	0.000	0.000
39	40	50.0	440.235	110	0.000	0.000	0.000	0.000	0.000
39	44	37.5	124.093	110	0.000	0.000	0.000	0.000	0.000
40	41	37.5	24.327	110	0.000	0.000	0.000	0.000	0.000
40	42	50.0	114.120	110	0.000	0.000	0.000	0.000	0.000
42	43	37.5	88.219	110	0.000	0.000	0.000	0.000	0.000
44	45	37.5	55.325	110	0.000	0.000	0.000	0.000	0.000
44	46	37.5	405.357	110	0.000	0.000	0.000	0.000	0.000
46	47	37.5	558.375	110	0.000	0.000	0.000	0.000	0.000
49	12	75.0	240.335	110	0.000	0.000	0.000	0.000	0.000

------Lumame <<Case.2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	31.480	(m)
Node	48	Minimum EHP	4.408	(m)
Line	50	Maximum I	35.149	(‰)
Pump, Decom	0	Maximum V	0.913	(m/s)

Convergence Gap 0.97 (cm)

Calculation 13 (times)

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2505.819	2,497.769		8.050	-6.845	Reservoir Tank
2	2504.262	2,485.570		18.692	0.000	
3	2503.915	2,478.002		25.913	0.298	
4	2503.972	2,483.278		20.694	0.000	
5	2503.438	2,475.730		27.708	0.298	
6	2503.522	2,479.872		23.650	0.000	
7	2498.709	2,471.057		27.652	0.298	
8	2502.394	2,479.479		22.915	0.298	
9	2500.513	2,476.115		24.398	0.000	
10	2497.265	2,476.975		20.290	0.000	
11	2497.139	2,476.515		20.624	0.298	
12	2500.208	2,490.686		9.522	0.000	
13	2497.118	2,480.695		16.423	0.000	
14	2493.918	2,467.909		26.009	0.298	
15	2493.477	2,466.395		27.082	0.000	
16	2489.671	2,462.879		26.792	0.298	
17	2494.568	2,469.119		25.449	0.000	
18	2498.216	2,484.223		13.993	0.000	
19	2497.528	2,466.960		30.568	0.298	
20	2497.601	2,482.798		14.803	0.298	
21	2503.748	2,488.260		15.488	0.000	
22	2503.640	2,487.557		16.083	0.298	
23	2503.194	2,487.846		15.348	0.298	
24	2493.581	2,465.203		28.378	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	240.166	110	2.218	0.502	6.483	1.557	0.000
1	21	37.5	124.844	110	0.595	0.539	16.590	2.071	0.000
1	49	100.0	186.712	110	4.031	0.514	4.828	0.901	0.000
2	3	37.5	75.572	110	0.298	0.270	4.596	0.347	0.000
2	4	75.0	58.442	110	1.921	0.435	4.965	0.290	0.000
4	5	37.5	116.212	110	0.298	0.270	4.596	0.534	0.000
4	6	75.0	123.637	110	1.623	0.368	3.635	0.449	0.000
6	7	37.5	158.415	110	0.825	0.748	30.383	4.813	0.000
6	8	37.5	39.525	110	0.798	0.723	28.539	1.128	0.000
7	14	37.5	361.055	110	0.528	0.478	13.271	4.791	0.000
8	9	37.5	156.505	110	0.500	0.453	12.023	1.882	0.000
9	10	37.5	270.158	110	0.500	0.453	12.022	3.248	0.000
10	11	37.5	27.311	110	0.298	0.270	4.596	0.126	0.000
10	13	37.5	64.905	110	0.203	0.184	2.256	0.146	0.000
12	13	75.0	211.914	110	3.436	0.778	14.579	3.090	0.000
12	18	37.5	120.098	110	0.595	0.539	16.590	1.992	0.000
13	17	75.0	157.353	110	3.639	0.824	16.211	2.551	0.000
14	15	37.5	154.475	110	0.230	0.208	2.853	0.441	0.000
15	16	37.5	229.472	110	0.595	0.539	16.589	3.807	0.000
15	17	37.5	162.406	110	-0.365	-0.331	-6.713	-1.090	0.000
16	48	37.5	330.309	110	0.298	0.270	4.596	1.518	0.000
17	24	37.5	214.586	110	0.298	0.270	4.596	0.986	0.000
17	30	75.0	23.287	110	2.976	0.674	11.161	0.260	0.000
18	19	37.5	149.669	110	0.298	0.270	4.596	0.688	0.000

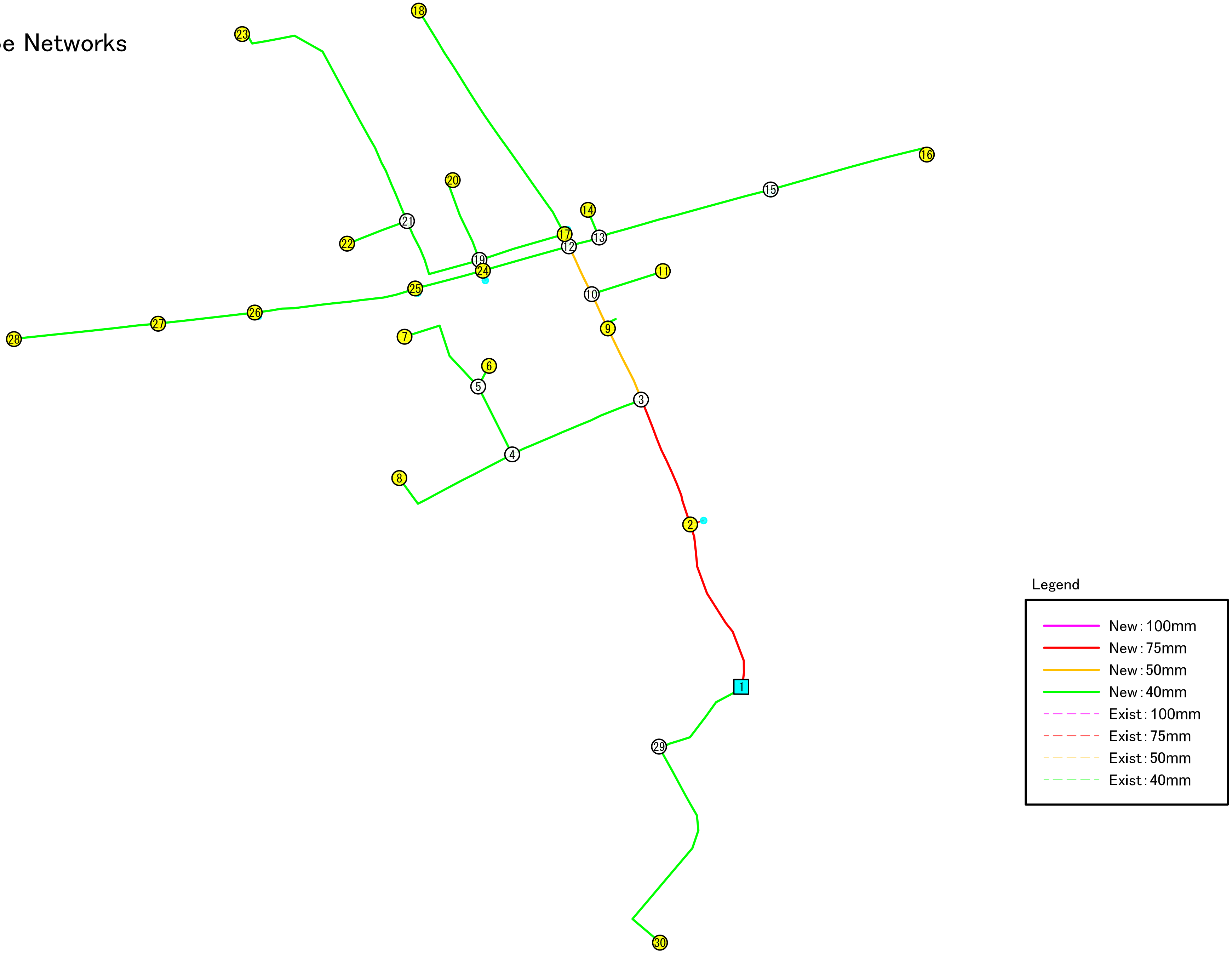
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2493.581	2,462.249		31.332	0.000	
26	2493.508	2,467.756		25.752	0.000	
27	2493.450	2,468.042		25.408	0.298	
28	2493.508	2,482.775		10.733	0.000	
29	2493.508	2,462.028		31.480	0.000	
30	2494.308	2,469.119		25.189	0.000	
31	2491.500	2,466.103		25.397	0.000	
32	2490.906	2,463.965		26.941	0.000	
33	2490.906	2,463.243		27.663	0.000	
34	2490.658	2,462.506		28.152	0.298	
35	2490.411	2,465.147		25.264	0.298	
36	2488.510	2,465.892		22.618	0.298	
37	2487.346	2,466.766		20.580	0.298	
38	2494.243	2,469.773		24.470	0.298	
39	2493.822	2,467.287		26.535	0.000	
40	2492.023	2,473.213		18.810	0.000	
41	2491.911	2,472.929		18.982	0.298	
42	2491.894	2,481.970		9.924	0.000	
43	2491.488	2,487.080		4.408	0.298	
44	2489.460	2,463.032		26.428	0.000	
45	2489.206	2,461.905		27.301	0.298	
46	2482.735	2,453.476		29.259	0.298	
47	2480.169	2,463.283		16.886	0.298	
48	2488.152	2,466.677		21.475	0.298	
49	2504.918	2,492.890		12.028	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
18	20	37.5	133.816	110	0.298	0.270	4.596	0.615	0.000
21	22	37.5	23.435	110	0.298	0.270	4.596	0.108	0.000
21	23	37.5	120.584	110	0.298	0.270	4.596	0.554	0.000
24	25	37.5	97.004	110	0.000	0.000	0.000	0.000	0.000
24	26	37.5	16.021	110	0.298	0.270	4.596	0.074	0.000
26	27	37.5	12.562	110	0.298	0.270	4.596	0.058	0.000
26	28	37.5	238.879	110	0.000	0.000	0.000	0.000	0.000
28	29	37.5	174.023	110	0.000	0.000	0.000	0.000	0.000
30	31	37.5	169.219	110	0.595	0.539	16.589	2.807	0.000
30	36	37.5	349.479	110	0.595	0.539	16.589	5.797	0.000
30	38	75.0	14.847	110	1.786	0.404	4.338	0.064	0.000
31	32	37.5	129.307	110	0.298	0.270	4.596	0.594	0.000
31	35	37.5	237.093	110	0.298	0.270	4.596	1.090	0.000
32	33	37.5	61.048	110	0.000	0.000	0.000	0.000	0.000
32	34	37.5	54.019	110	0.298	0.270	4.596	0.248	0.000
36	37	37.5	253.273	110	0.298	0.270	4.596	1.164	0.000
38	39	75.0	136.194	110	1.488	0.337	3.095	0.422	0.000
39	40	50.0	440.235	110	0.595	0.303	4.086	1.799	0.000
39	44	37.5	124.093	110	0.893	0.809	35.149	4.362	0.000
40	41	37.5	24.327	110	0.298	0.270	4.596	0.112	0.000
40	42	50.0	114.120	110	0.298	0.152	1.132	0.129	0.000
42	43	37.5	88.219	110	0.298	0.270	4.596	0.405	0.000
44	45	37.5	55.325	110	0.298	0.270	4.596	0.254	0.000
44	46	37.5	405.357	110	0.595	0.539	16.589	6.725	0.000
46	47	37.5	558.375	110	0.298	0.270	4.596	2.566	0.000
49	12	75.0	240.335	110	4.031	0.913	19.596	4.710	0.000

Wojel Pipe Networks



------Wojel <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	61.324	(m)
Node	29	Minimum EHP	3.995	(m)
Line	29	Maximum I	0.000	(‰)
Pump, Decom	0	Maximum V	0.000	(m/s)
Convergence Gap	0.00 (cm)			
Calculation	2 (times)			

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2488.580	2,488.580		0.000	-0.000	Reservoir Tank
2	2488.580	2,468.554		20.026	0.000	
3	2488.580	2,457.691		30.889	0.000	
4	2488.580	2,459.356		29.224	0.000	
5	2488.580	2,454.353		34.227	0.000	
6	2488.580	2,453.681		34.899	0.000	
7	2488.580	2,449.408		39.172	0.000	
8	2488.580	2,453.958		34.622	0.000	
9	2488.580	2,452.918		35.662	0.000	
10	2488.580	2,450.606		37.974	0.000	
11	2488.580	2,445.876		42.704	0.000	
12	2488.580	2,448.677		39.903	0.000	
13	2488.580	2,447.566		41.014	0.000	
14	2488.580	2,446.475		42.105	0.000	
15	2488.580	2,438.025		50.555	0.000	
16	2488.580	2,429.792		58.788	0.000	
17	2488.580	2,448.557		40.023	0.000	
18	2488.580	2,448.522		40.058	0.000	
19	2488.580	2,449.100		39.480	0.000	
20	2488.580	2,444.628		43.952	0.000	
21	2488.580	2,444.988		43.592	0.000	
22	2488.580	2,443.362		45.218	0.000	
23	2488.580	2,449.607		38.973	0.000	
24	2488.580	2,449.100		39.480	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	281.892	110	0.000	0.000	0.000	0.000	0.000
1	29	37.5	169.070	110	0.000	0.000	0.000	0.000	0.000
2	3	75.0	215.938	110	0.000	0.000	0.000	0.000	0.000
3	4	37.5	224.731	110	0.000	0.000	0.000	0.000	0.000
3	9	50.0	126.041	110	0.000	0.000	0.000	0.000	0.000
4	5	37.5	121.741	110	0.000	0.000	0.000	0.000	0.000
4	8	37.5	221.458	110	0.000	0.000	0.000	0.000	0.000
5	6	37.5	37.460	110	0.000	0.000	0.000	0.000	0.000
5	7	37.5	177.094	110	0.000	0.000	0.000	0.000	0.000
9	10	50.0	60.825	110	0.000	0.000	0.000	0.000	0.000
10	11	37.5	120.052	110	0.000	0.000	0.000	0.000	0.000
10	12	50.0	84.910	110	0.000	0.000	0.000	0.000	0.000
12	13	37.5	50.613	110	0.000	0.000	0.000	0.000	0.000
12	17	37.5	20.865	110	0.000	0.000	0.000	0.000	0.000
12	24	37.5	143.358	110	0.000	0.000	0.000	0.000	0.000
13	14	37.5	47.965	110	0.000	0.000	0.000	0.000	0.000
13	15	37.5	285.724	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	267.710	110	0.000	0.000	0.000	0.000	0.000
17	18	37.5	428.253	110	0.000	0.000	0.000	0.000	0.000
17	19	37.5	142.781	110	0.000	0.000	0.000	0.000	0.000
19	20	37.5	143.976	110	0.000	0.000	0.000	0.000	0.000
19	21	37.5	175.749	110	0.000	0.000	0.000	0.000	0.000
21	22	37.5	102.786	110	0.000	0.000	0.000	0.000	0.000
21	23	37.5	446.829	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2488.580	2,446.366		42.214	0.000	
26	2488.580	2,436.621		51.959	0.000	
27	2488.580	2,432.338		56.242	0.000	
28	2488.580	2,427.256		61.324	0.000	
29	2488.580	2,482.319		6.261	0.000	
30	2488.580	2,484.585		3.995	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
24	25	37.5	112.254	110	0.000	0.000	0.000	0.000	0.000
25	26	37.5	261.224	110	0.000	0.000	0.000	0.000	0.000
26	27	37.5	155.753	110	0.000	0.000	0.000	0.000	0.000
27	28	37.5	233.817	110	0.000	0.000	0.000	0.000	0.000
29	30	37.5	387.175	110	0.000	0.000	0.000	0.000	0.000

------Wojel <<Case.2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	50.405	(m)
Node	29	Minimum EHP	3.610	(m)
Line	29	Maximum I	22.615	(‰)
Pump, Decom	0	Maximum V	0.764	(m/s)

Convergence Gap 0.50 (cm)

Calculation 14 (times)

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2488.580	2,488.580		0.000	-2.035	Reservoir Tank
2	2487.171	2,468.554		18.617	0.107	
3	2486.200	2,457.691		28.509	0.000	
4	2485.009	2,459.356		25.653	0.000	
5	2484.705	2,454.353		30.352	0.000	
6	2484.679	2,453.681		30.998	0.107	
7	2484.582	2,449.408		35.174	0.107	
8	2484.856	2,453.958		30.898	0.107	
9	2483.349	2,452.918		30.431	0.107	
10	2482.150	2,450.606		31.544	0.000	
11	2482.067	2,445.876		36.191	0.107	
12	2480.707	2,448.677		32.030	0.000	
13	2480.580	2,447.566		33.014	0.000	
14	2480.547	2,446.475		34.072	0.107	
15	2480.382	2,438.025		42.357	0.000	
16	2480.197	2,429.792		50.405	0.107	
17	2480.422	2,448.557		31.865	0.107	
18	2480.126	2,448.522		31.604	0.107	
19	2479.666	2,449.100		30.566	0.000	
20	2479.566	2,444.628		34.938	0.107	
21	2479.226	2,444.988		34.238	0.000	
22	2479.155	2,443.362		35.793	0.107	
23	2478.917	2,449.607		29.310	0.107	
24	2478.751	2,449.100		29.651	0.107	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	281.892	110	1.928	0.437	4.999	1.409	0.000
1	29	37.5	169.070	110	0.107	0.097	0.693	0.117	0.000
2	3	75.0	215.938	110	1.821	0.412	4.497	0.971	0.000
3	4	37.5	224.731	110	0.321	0.291	5.297	1.190	0.000
3	9	50.0	126.041	110	1.499	0.764	22.615	2.850	0.000
4	5	37.5	121.741	110	0.214	0.194	2.500	0.304	0.000
4	8	37.5	221.458	110	0.107	0.097	0.693	0.153	0.000
5	6	37.5	37.460	110	0.107	0.097	0.693	0.026	0.000
5	7	37.5	177.094	110	0.107	0.097	0.693	0.123	0.000
9	10	50.0	60.825	110	1.392	0.709	19.715	1.199	0.000
10	11	37.5	120.052	110	0.107	0.097	0.693	0.083	0.000
10	12	50.0	84.910	110	1.285	0.655	16.999	1.443	0.000
12	13	37.5	50.613	110	0.214	0.194	2.500	0.127	0.000
12	17	37.5	20.865	110	0.536	0.485	13.640	0.285	0.000
12	24	37.5	143.358	110	0.536	0.485	13.640	1.955	0.000
13	14	37.5	47.965	110	0.107	0.097	0.693	0.033	0.000
13	15	37.5	285.724	110	0.107	0.097	0.693	0.198	0.000
15	16	37.5	267.710	110	0.107	0.097	0.693	0.185	0.000
17	18	37.5	428.253	110	0.107	0.097	0.692	0.297	0.000
17	19	37.5	142.781	110	0.321	0.291	5.296	0.756	0.000
19	20	37.5	143.976	110	0.107	0.097	0.693	0.100	0.000
19	21	37.5	175.749	110	0.214	0.194	2.500	0.439	0.000
21	22	37.5	102.786	110	0.107	0.097	0.693	0.071	0.000
21	23	37.5	446.829	110	0.107	0.097	0.693	0.309	0.000

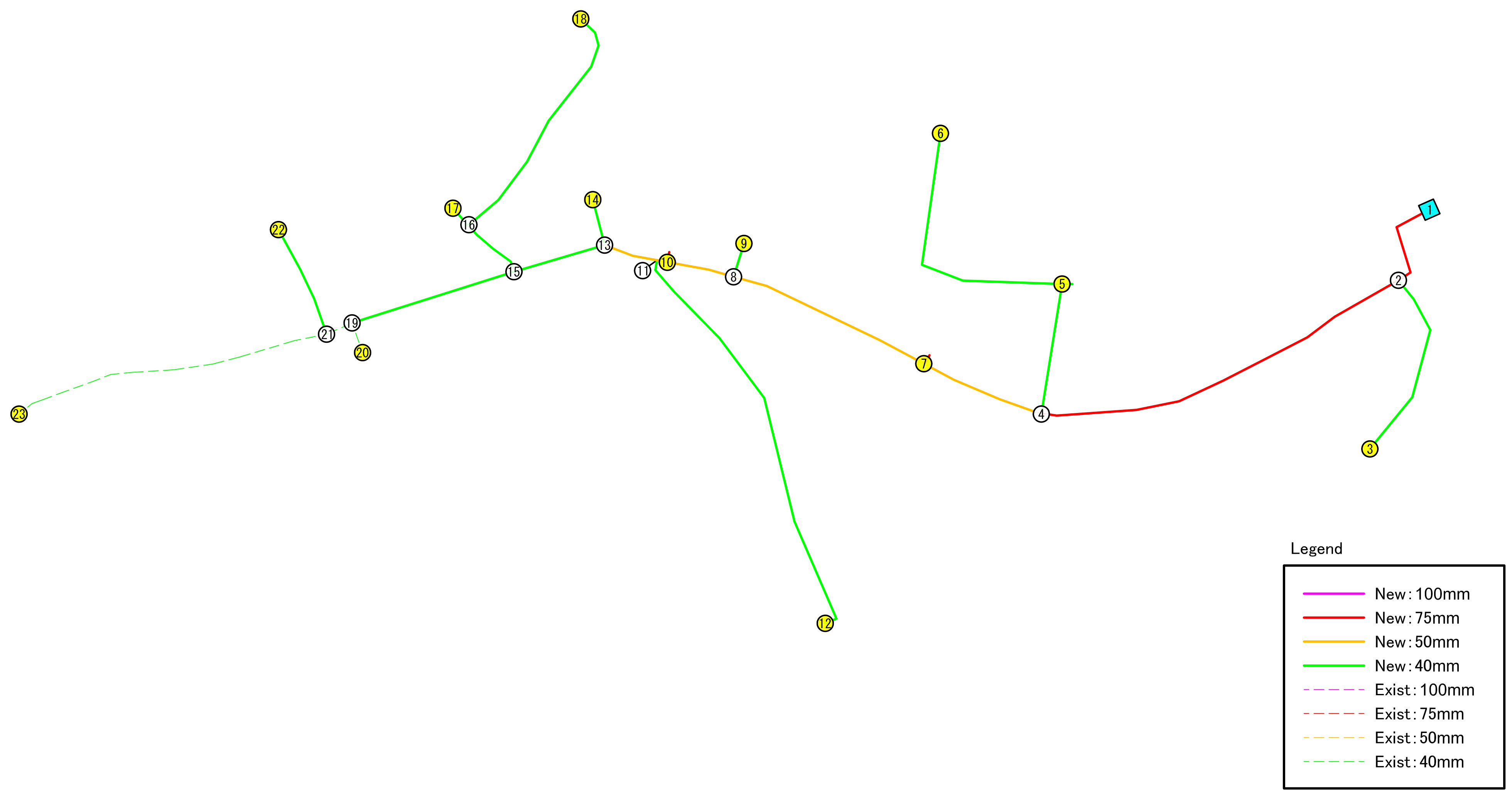
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2477. 738	2, 446. 366		31. 372	0. 107	
26	2476. 355	2, 436. 621		39. 734	0. 107	
27	2475. 965	2, 432. 338		43. 627	0. 107	
28	2475. 803	2, 427. 256		48. 547	0. 107	
29	2488. 463	2, 482. 319		6. 144	0. 000	
30	2488. 195	2, 484. 585		3. 610	0. 107	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
24	25	37. 5	112. 254	110	0. 428	0. 388	9. 023	1. 013	0. 000
25	26	37. 5	261. 224	110	0. 321	0. 291	5. 297	1. 384	0. 000
26	27	37. 5	155. 753	110	0. 214	0. 194	2. 500	0. 389	0. 000
27	28	37. 5	233. 817	110	0. 107	0. 097	0. 693	0. 162	0. 000
29	30	37. 5	387. 175	110	0. 107	0. 097	0. 693	0. 268	0. 000

Sedie Pipe Networks



------Sedie <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	53.574	(m)
Node	22	Minimum EHP	2.501	(m)
Line	22	Maximum I	0.000	(‰)
Pump, Decom	0	Maximum V	0.000	(m/s)
Convergence Gap	0.00 (cm)			
Calculation	2 (times)			

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2549.547	2,547.547		2.000	-0.000	Reservoir Tank
2	2549.547	2,547.046		2.501	0.000	
3	2549.547	2,536.065		13.482	0.000	
4	2549.547	2,523.827		25.720	0.000	
5	2549.547	2,526.481		23.066	0.000	
6	2549.547	2,514.206		35.341	0.000	
7	2549.547	2,513.260		36.287	0.000	
8	2549.547	2,507.277		42.270	0.000	
9	2549.547	2,507.277		42.270	0.000	
10	2549.547	2,507.060		42.487	0.000	
11	2549.547	2,507.083		42.464	0.000	
12	2549.547	2,505.031		44.516	0.000	
13	2549.547	2,506.727		42.820	0.000	
14	2549.547	2,508.331		41.216	0.000	
15	2549.547	2,504.935		44.612	0.000	
16	2549.547	2,505.625		43.922	0.000	
17	2549.547	2,504.639		44.908	0.000	
18	2549.547	2,495.973		53.574	0.000	
19	2549.547	2,502.041		47.506	0.000	
20	2549.547	2,502.041		47.506	0.000	
21	2549.547	2,501.727		47.820	0.000	
22	2549.547	2,498.880		50.667	0.000	
23	2549.547	2,500.127		49.420	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	82.469	110	0.000	0.000	0.000	0.000	0.000
2	3	37.5	164.065	110	0.000	0.000	0.000	0.000	0.000
2	4	75.0	326.205	110	0.000	0.000	0.000	0.000	0.000
4	5	37.5	109.160	110	0.000	0.000	0.000	0.000	0.000
4	7	50.0	107.358	110	0.000	0.000	0.000	0.000	0.000
5	6	37.5	231.116	110	0.000	0.000	0.000	0.000	0.000
7	8	50.0	175.117	110	0.000	0.000	0.000	0.000	0.000
8	9	37.5	29.102	110	0.000	0.000	0.000	0.000	0.000
8	10	50.0	56.618	110	0.000	0.000	0.000	0.000	0.000
10	11	50.0	8.812	110	0.000	0.000	0.000	0.000	0.000
11	12	37.5	353.802	110	0.000	0.000	0.000	0.000	0.000
11	13	50.0	45.623	110	0.000	0.000	0.000	0.000	0.000
13	14	37.5	39.152	110	0.000	0.000	0.000	0.000	0.000
13	15	37.5	78.806	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	55.669	110	0.000	0.000	0.000	0.000	0.000
15	19	37.5	141.599	110	0.000	0.000	0.000	0.000	0.000
16	17	37.5	19.174	110	0.000	0.000	0.000	0.000	0.000
16	18	37.5	214.400	110	0.000	0.000	0.000	0.000	0.000
19	20	37.5	26.235	110	0.000	0.000	0.000	0.000	0.000
19	21	37.5	23.255	110	0.000	0.000	0.000	0.000	0.000
21	22	37.5	96.237	110	0.000	0.000	0.000	0.000	0.000
21	23	37.5	267.699	110	0.000	0.000	0.000	0.000	0.000

------Sedie <<Case.2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	39.862	(m)
Node	22	Minimum EHP	1.996	(m)
Line	22	Maximum I	30.503	(‰)
Pump, Decom	0	Maximum V	0.843	(m/s)

Convergence Gap 0.85 (cm)

Calculation 13 (times)

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

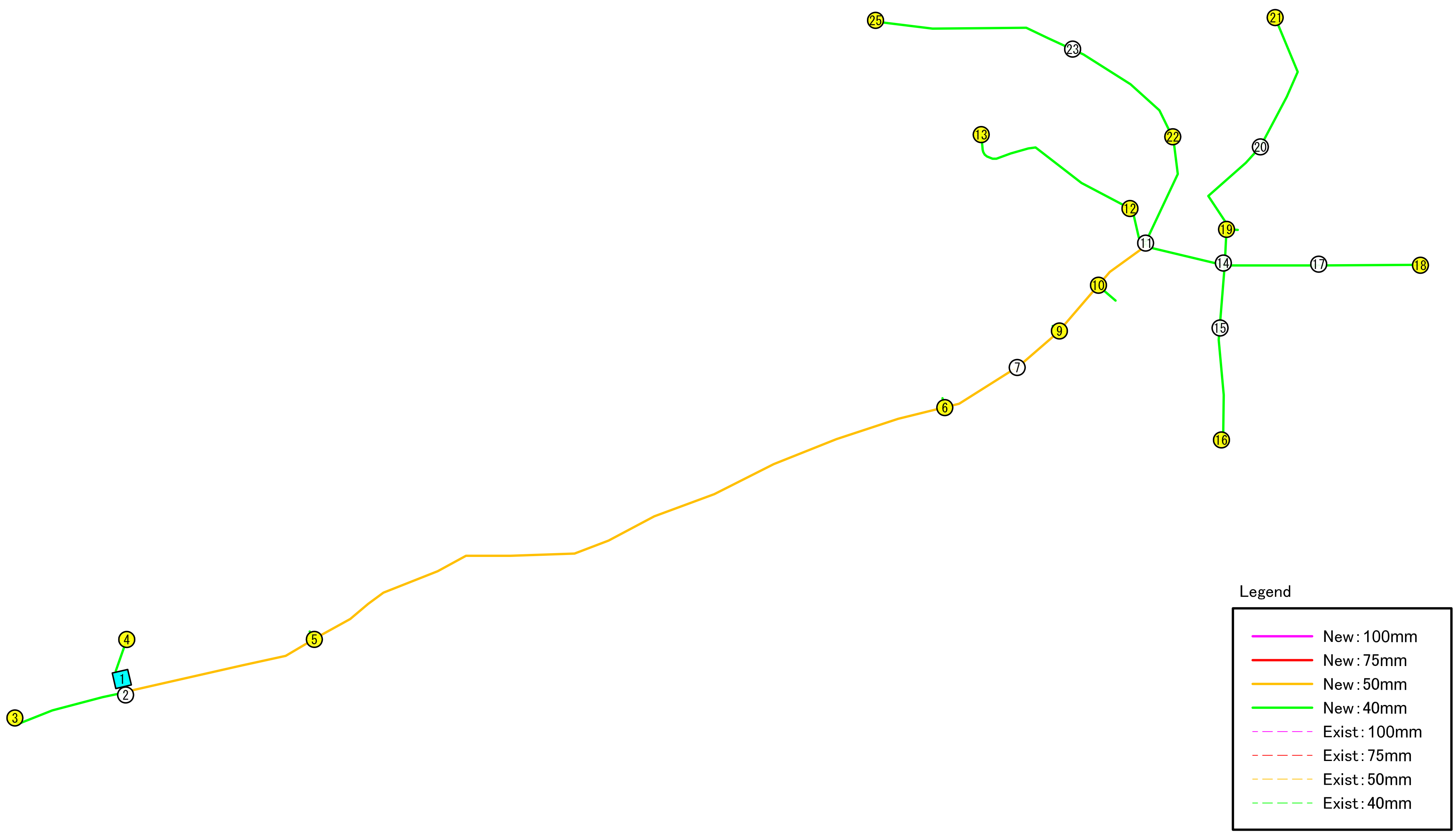
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2549.547	2,547.547		2.000	-2.150	Reservoir Tank
2	2549.042	2,547.046		1.996	0.000	
3	2548.788	2,536.065		12.723	0.165	
4	2547.321	2,523.827		23.494	0.000	
5	2546.711	2,526.481		20.230	0.165	
6	2546.353	2,514.206		32.147	0.165	
7	2544.409	2,513.260		31.149	0.165	
8	2540.502	2,507.277		33.225	0.000	
9	2540.457	2,507.277		33.180	0.165	
10	2539.486	2,507.060		32.426	0.165	
11	2539.363	2,507.083		32.280	0.000	
12	2538.815	2,505.031		33.784	0.165	
13	2538.882	2,506.727		32.155	0.000	
14	2538.821	2,508.331		30.490	0.165	
15	2536.478	2,504.935		31.543	0.000	
16	2536.167	2,505.625		30.542	0.000	
17	2536.137	2,504.639		31.498	0.165	
18	2535.835	2,495.973		39.862	0.165	
19	2534.801	2,502.041		32.760	0.000	
20	2534.760	2,502.041		32.719	0.165	
21	2534.671	2,501.727		32.944	0.000	
22	2534.522	2,498.880		35.642	0.165	
23	2534.256	2,500.127		34.129	0.165	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	82.469	110	2.150	0.487	6.119	0.505	0.000
2	3	37.5	164.065	110	0.165	0.150	1.549	0.254	0.000
2	4	75.0	326.205	110	1.985	0.450	5.277	1.721	0.000
4	5	37.5	109.160	110	0.331	0.300	5.590	0.610	0.000
4	7	50.0	107.358	110	1.654	0.843	27.123	2.912	0.000
5	6	37.5	231.116	110	0.165	0.150	1.549	0.358	0.000
7	8	50.0	175.117	110	1.489	0.759	22.314	3.908	0.000
8	9	37.5	29.102	110	0.165	0.150	1.547	0.045	0.000
8	10	50.0	56.618	110	1.323	0.674	17.940	1.016	0.000
10	11	50.0	8.812	110	1.158	0.590	14.009	0.123	0.000
11	12	37.5	353.802	110	0.165	0.150	1.549	0.548	0.000
11	13	50.0	45.623	110	0.992	0.506	10.531	0.480	0.000
13	14	37.5	39.152	110	0.165	0.150	1.549	0.061	0.000
13	15	37.5	78.806	110	0.827	0.749	30.503	2.404	0.000
15	16	37.5	55.669	110	0.331	0.300	5.590	0.311	0.000
15	19	37.5	141.599	110	0.496	0.450	11.845	1.677	0.000
16	17	37.5	19.174	110	0.165	0.150	1.549	0.030	0.000
16	18	37.5	214.400	110	0.165	0.150	1.549	0.332	0.000
19	20	37.5	26.235	110	0.165	0.150	1.547	0.041	0.000
19	21	37.5	23.255	110	0.331	0.300	5.590	0.130	0.000
21	22	37.5	96.237	110	0.165	0.150	1.549	0.149	0.000
21	23	37.5	267.699	110	0.165	0.150	1.549	0.415	0.000

Dibo Pipe Networks



------Dibo <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	52.609	(m)
Node	25	Minimum EHP	5.945	(m)
Line	25	Maximum I	0.000	(‰)
Pump, Decom	0	Maximum V	0.000	(m/s)

Convergence Gap 0.00 (cm)

Calculation 2 (times)

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2460.637	2,452.637		8.000	-0.000	Reservoir Tank
2	2460.637	2,452.637		8.000	0.000	
3	2460.637	2,454.692		5.945	0.000	
4	2460.637	2,452.637		8.000	0.000	
5	2460.637	2,449.122		11.515	0.000	
6	2460.637	2,427.184		33.453	0.000	
7	2460.637	2,425.528		35.109	0.000	
8	2460.637	2,426.495		34.142	0.000	
9	2460.637	2,423.994		36.643	0.000	
10	2460.637	2,422.498		38.139	0.000	
11	2460.637	2,419.690		40.947	0.000	
12	2460.637	2,419.665		40.972	0.000	
13	2460.637	2,420.837		39.800	0.000	
14	2460.637	2,416.953		43.684	0.000	
15	2460.637	2,417.560		43.077	0.000	
16	2460.637	2,418.852		41.785	0.000	
17	2460.637	2,413.151		47.486	0.000	
18	2460.637	2,410.035		50.602	0.000	
19	2460.637	2,416.928		43.709	0.000	
20	2460.637	2,411.380		49.257	0.000	
21	2460.637	2,408.028		52.609	0.000	
22	2460.637	2,415.263		45.374	0.000	
23	2460.637	2,424.553		36.085	0.000	
24	2460.637	2,410.020		50.617	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	50.0	17.292	110	0.000	0.000	0.000	0.000	0.000
1	4	37.5	59.380	110	0.000	0.000	0.000	0.000	0.000
2	3	37.5	149.799	110	0.000	0.000	0.000	0.000	0.000
2	5	50.0	247.922	110	0.000	0.000	0.000	0.000	0.000
5	6	50.0	861.812	110	0.000	0.000	0.000	0.000	0.000
6	7	50.0	104.195	110	0.000	0.000	0.000	0.000	0.000
7	8	37.5	108.556	110	0.000	0.000	0.000	0.000	0.000
7	9	50.0	70.404	110	0.000	0.000	0.000	0.000	0.000
9	10	50.0	75.833	110	0.000	0.000	0.000	0.000	0.000
10	11	50.0	80.550	110	0.000	0.000	0.000	0.000	0.000
11	12	37.5	51.921	110	0.000	0.000	0.000	0.000	0.000
11	14	37.5	101.410	110	0.000	0.000	0.000	0.000	0.000
11	22	37.5	143.415	110	0.000	0.000	0.000	0.000	0.000
12	13	37.5	235.909	110	0.000	0.000	0.000	0.000	0.000
14	15	37.5	81.991	110	0.000	0.000	0.000	0.000	0.000
14	17	37.5	120.299	110	0.000	0.000	0.000	0.000	0.000
14	19	37.5	42.612	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	141.846	110	0.000	0.000	0.000	0.000	0.000
17	18	37.5	127.783	110	0.000	0.000	0.000	0.000	0.000
19	20	37.5	140.266	110	0.000	0.000	0.000	0.000	0.000
20	21	37.5	179.378	110	0.000	0.000	0.000	0.000	0.000
22	23	37.5	171.836	110	0.000	0.000	0.000	0.000	0.000
23	24	37.5	131.438	110	0.000	0.000	0.000	0.000	0.000
23	25	37.5	255.236	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2460.637	2,419.665		40.972	0.000	
26	2460.637	2,421.018		39.619	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
25	26	37.5	157.144	110	0.000	0.000	0.000	0.000	0.000

------Dibo <<Case.2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	32.658	(m)
Node	25	Minimum EHP	5.463	(m)
Line	25	Maximum I	19.695	(‰)
Pump, Decom	0	Maximum V	0.709	(m/s)

Convergence Gap 0.53 (cm)

Calculation 14 (times)

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (1/s)	Remarks
1	2460.637	2,452.637		8.000	-1.518	Reservoir Tank
2	2460.296	2,452.637		7.659	0.000	
3	2460.155	2,454.692		5.463	0.127	
4	2460.581	2,452.637		7.944	0.127	
5	2456.204	2,449.122		7.082	0.127	
6	2444.499	2,427.184		17.315	0.127	
7	2443.361	2,425.528		17.833	0.000	
8	2443.259	2,426.495		16.764	0.127	
9	2442.761	2,423.994		18.767	0.127	
10	2442.275	2,422.498		19.777	0.000	
11	2441.758	2,419.690		22.068	0.000	
12	2441.758	2,419.665		22.093	0.000	
13	2441.758	2,420.837		20.921	0.000	
14	2441.027	2,416.953		24.074	0.000	
15	2440.950	2,417.560		23.390	0.000	
16	2440.816	2,418.852		21.964	0.127	
17	2440.914	2,413.151		27.763	0.000	
18	2440.793	2,410.035		30.758	0.127	
19	2440.987	2,416.928		24.059	0.000	
20	2440.855	2,411.380		29.475	0.000	
21	2440.686	2,408.028		32.658	0.127	
22	2440.724	2,415.263		25.461	0.127	
23	2440.140	2,424.553		15.587	0.000	
24	2440.016	2,410.020		29.996	0.127	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (1/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	50.0	17.292	110	1.392	0.709	19.695	0.341	0.000
1	4	37.5	59.380	110	0.127	0.115	0.943	0.056	0.000
2	3	37.5	149.799	110	0.127	0.115	0.943	0.141	0.000
2	5	50.0	247.922	110	1.265	0.645	16.508	4.093	0.000
5	6	50.0	861.812	110	1.139	0.580	13.582	11.705	0.000
6	7	50.0	104.195	110	1.012	0.516	10.920	1.138	0.000
7	8	37.5	108.556	110	0.127	0.115	0.943	0.102	0.000
7	9	50.0	70.404	110	0.886	0.451	8.528	0.600	0.000
9	10	50.0	75.833	110	0.759	0.387	6.410	0.486	0.000
10	11	50.0	80.550	110	0.759	0.387	6.410	0.516	0.000
11	12	37.5	51.921	110	0.000	0.000	0.000	0.000	0.000
11	14	37.5	101.410	110	0.380	0.344	7.209	0.731	0.000
11	22	37.5	143.415	110	0.380	0.344	7.209	1.034	0.000
12	13	37.5	235.909	110	0.000	0.000	0.000	0.000	0.000
14	15	37.5	81.991	110	0.127	0.115	0.943	0.077	0.000
14	17	37.5	120.299	110	0.127	0.115	0.943	0.113	0.000
14	19	37.5	42.612	110	0.127	0.115	0.943	0.040	0.000
15	16	37.5	141.846	110	0.127	0.115	0.943	0.134	0.000
17	18	37.5	127.783	110	0.127	0.115	0.943	0.120	0.000
19	20	37.5	140.266	110	0.127	0.115	0.943	0.132	0.000
20	21	37.5	179.378	110	0.127	0.115	0.943	0.169	0.000
22	23	37.5	171.836	110	0.253	0.229	3.403	0.585	0.000
23	24	37.5	131.438	110	0.127	0.115	0.943	0.124	0.000
23	25	37.5	255.236	110	0.127	0.115	0.943	0.241	0.000

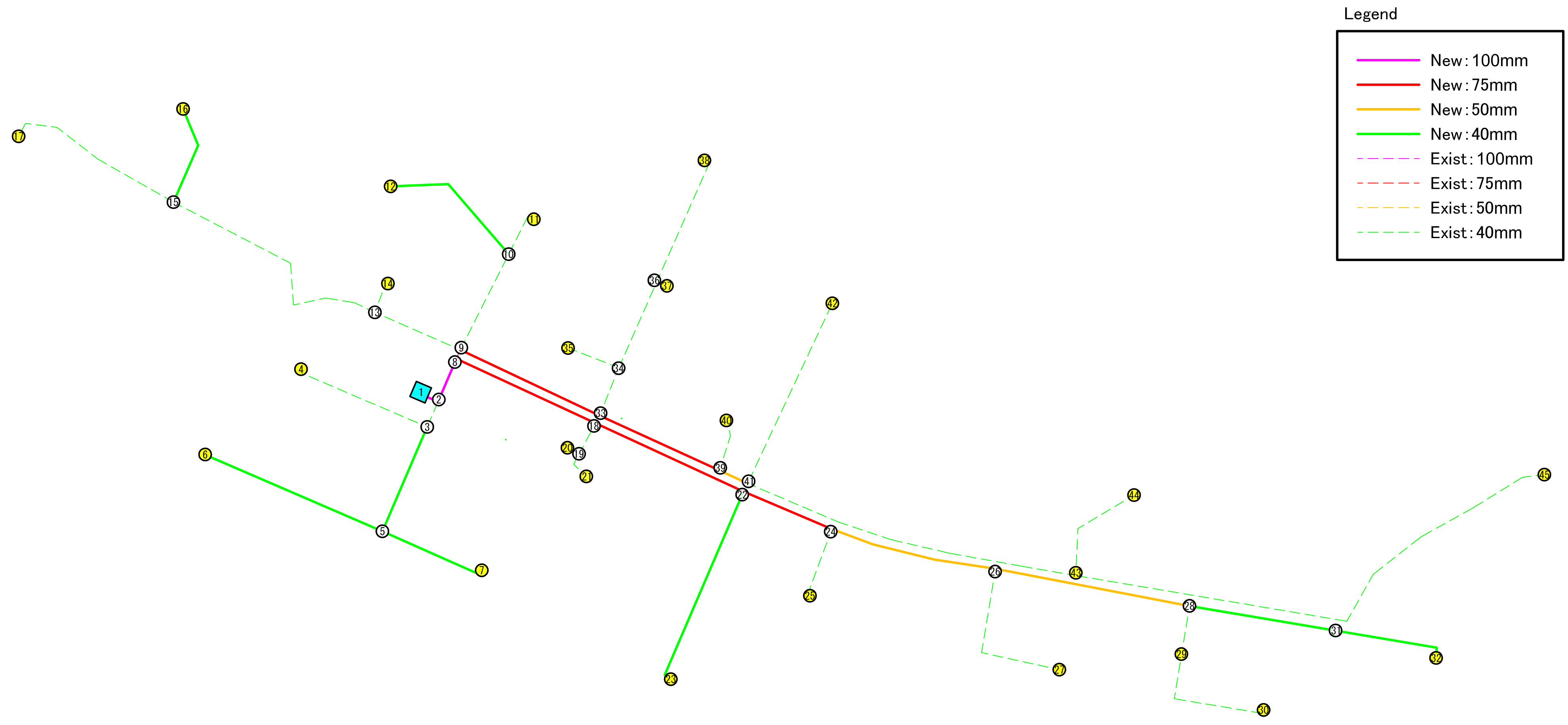
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2439. 899	2, 419. 665		20. 234	0. 127	
26	2439. 899	2, 421. 018		18. 881	0. 000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
25	26	37. 5	157. 144	110	0. 000	0. 000	0. 000	0. 000	0. 000

Amanuel Pipe Networks



------Amanuel <<Case. 1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	36. 735	(m)
Node	44	Minimum EHP	7. 360	(m)
Line	44	Maximum I	0. 000	(‰)
Pump, Decom	0	Maximum V	0. 000	(m/s)

Convergence Gap 0. 00 (cm)

Calculation 2 (times)

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2395. 780	2, 387. 780		8. 000	0. 000	Reservoir Tank
2	2395. 780	2, 388. 420		7. 360	0. 000	
3	2395. 780	2, 383. 858		11. 922	0. 000	
4	2395. 780	2, 383. 308		12. 472	0. 000	
5	2395. 780	2, 363. 538		32. 242	0. 000	
6	2395. 780	2, 361. 485		34. 295	0. 000	
7	2395. 780	2, 359. 045		36. 735	0. 000	
8	2395. 780	2, 386. 000		9. 780	0. 000	
9	2395. 780	2, 385. 123		10. 657	0. 000	
10	2395. 780	2, 375. 800		19. 980	0. 000	
11	2395. 780	2, 374. 125		21. 655	0. 000	
12	2395. 780	2, 365. 257		30. 523	0. 000	
13	2395. 780	2, 385. 955		9. 825	0. 000	
14	2395. 780	2, 381. 832		13. 949	0. 000	
15	2395. 780	2, 378. 646		17. 134	0. 000	
16	2395. 780	2, 371. 777		24. 003	0. 000	
17	2395. 780	2, 368. 373		27. 407	0. 000	
18	2395. 780	2, 381. 915		13. 865	0. 000	
19	2395. 780	2, 379. 442		16. 338	0. 000	
20	2395. 780	2, 379. 859		15. 921	0. 000	
21	2395. 780	2, 376. 847		18. 933	0. 000	
22	2395. 780	2, 382. 000		13. 780	0. 000	
23	2395. 780	2, 377. 818		17. 962	0. 000	
24	2395. 780	2, 382. 532		13. 248	0. 000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	100. 0	28. 598	110	0. 000	0. 000	0. 000	0. 000	0. 000
2	3	37. 5	43. 799	110	0. 000	0. 000	0. 000	0. 000	0. 000
2	8	100. 0	64. 943	110	0. 000	0. 000	0. 000	0. 000	0. 000
3	4	37. 5	207. 736	110	0. 000	0. 000	0. 000	0. 000	0. 000
3	5	37. 5	167. 220	110	0. 000	0. 000	0. 000	0. 000	0. 000
5	6	37. 5	282. 031	110	0. 000	0. 000	0. 000	0. 000	0. 000
5	7	37. 5	158. 173	110	0. 000	0. 000	0. 000	0. 000	0. 000
8	9	75. 0	14. 197	110	0. 000	0. 000	0. 000	0. 000	0. 000
8	18	75. 0	223. 946	110	0. 000	0. 000	0. 000	0. 000	0. 000
9	10	37. 5	156. 993	110	0. 000	0. 000	0. 000	0. 000	0. 000
9	13	37. 5	136. 127	110	0. 000	0. 000	0. 000	0. 000	0. 000
9	33	75. 0	225. 047	110	0. 000	0. 000	0. 000	0. 000	0. 000
10	11	37. 5	71. 098	110	0. 000	0. 000	0. 000	0. 000	0. 000
10	12	37. 5	219. 644	110	0. 000	0. 000	0. 000	0. 000	0. 000
13	14	37. 5	49. 610	110	0. 000	0. 000	0. 000	0. 000	0. 000
13	15	37. 5	378. 050	110	0. 000	0. 000	0. 000	0. 000	0. 000
15	16	37. 5	148. 405	110	0. 000	0. 000	0. 000	0. 000	0. 000
15	17	37. 5	568. 506	110	0. 000	0. 000	0. 000	0. 000	0. 000
18	19	37. 5	50. 906	110	0. 000	0. 000	0. 000	0. 000	0. 000
18	22	75. 0	238. 624	110	0. 000	0. 000	0. 000	0. 000	0. 000
19	20	37. 5	19. 150	110	0. 000	0. 000	0. 000	0. 000	0. 000
19	21	37. 5	43. 526	110	0. 000	0. 000	0. 000	0. 000	0. 000
22	23	37. 5	302. 739	110	0. 000	0. 000	0. 000	0. 000	0. 000
22	24	75. 0	139. 919	110	0. 000	0. 000	0. 000	0. 000	0. 000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (1/s)	Remarks
25	2395.780	2,382.519		13.261	0.000	
26	2395.780	2,379.000		16.780	0.000	
27	2395.780	2,381.417		14.363	0.000	
28	2395.780	2,378.714		17.066	0.000	
29	2395.780	2,381.880		13.900	0.000	
30	2395.780	2,382.016		13.764	0.000	
31	2395.780	2,380.916		14.864	0.000	
32	2395.780	2,380.916		14.864	0.000	
33	2395.780	2,382.057		13.723	0.000	
34	2395.780	2,383.000		12.780	0.000	
35	2395.780	2,383.000		12.780	0.000	
36	2395.780	2,381.798		13.982	0.000	
37	2395.780	2,381.705		14.075	0.000	
38	2395.780	2,365.052		30.728	0.000	
39	2395.780	2,382.106		13.675	0.000	
40	2395.780	2,383.000		12.780	0.000	
41	2395.780	2,382.500		13.280	0.000	
42	2395.780	2,366.080		29.700	0.000	
43	2395.780	2,382.500		13.280	0.000	
44	2395.780	2,365.239		30.541	0.000	
45	2395.780	2,375.118		20.662	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (1/s)	V (m/s)	I (‰)	HL (m)	P (m)
24	25	37.5	105.811	110	0.000	0.000	0.000	0.000	0.000
24	26	50.0	246.807	110	0.000	0.000	0.000	0.000	0.000
26	27	37.5	240.833	110	0.000	0.000	0.000	0.000	0.000
26	28	50.0	288.251	110	0.000	0.000	0.000	0.000	0.000
28	29	37.5	71.523	110	0.000	0.000	0.000	0.000	0.000
28	31	37.5	216.192	110	0.000	0.000	0.000	0.000	0.000
29	30	37.5	203.061	110	0.000	0.000	0.000	0.000	0.000
31	32	37.5	164.821	110	0.000	0.000	0.000	0.000	0.000
33	34	37.5	75.399	110	0.000	0.000	0.000	0.000	0.000
33	39	75.0	192.406	110	0.000	0.000	0.000	0.000	0.000
34	35	37.5	79.446	110	0.000	0.000	0.000	0.000	0.000
34	36	37.5	137.879	110	0.000	0.000	0.000	0.000	0.000
36	37	37.5	10.247	110	0.000	0.000	0.000	0.000	0.000
36	38	37.5	199.456	110	0.000	0.000	0.000	0.000	0.000
39	40	37.5	76.087	110	0.000	0.000	0.000	0.000	0.000
39	41	50.0	45.179	110	0.000	0.000	0.000	0.000	0.000
41	42	37.5	291.533	110	0.000	0.000	0.000	0.000	0.000
41	43	50.0	499.885	110	0.000	0.000	0.000	0.000	0.000
43	44	37.5	164.865	110	0.000	0.000	0.000	0.000	0.000
43	45	37.5	772.496	110	0.000	0.000	0.000	0.000	0.000

------Amanuel <<Case. 2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	32.118	(m)
Node	44	Minimum EHP	3.166	(m)
Line	44	Maximum I	29.844	(‰)
Pump, Decom	0	Maximum V	0.833	(m/s)

Convergence Gap 0.89 (cm)

Calculation 14 (times)

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2395.780	2,387.780		8.000	-6.538	Reservoir Tank
2	2395.442	2,388.420		7.022	0.000	
3	2394.135	2,383.858		10.277	0.000	
4	2393.324	2,383.308		10.016	0.272	
5	2391.779	2,363.538		28.241	0.000	
6	2390.679	2,361.485		29.194	0.272	
7	2391.162	2,359.045		32.118	0.272	
8	2394.842	2,386.000		8.842	0.000	
9	2394.624	2,385.123		9.501	0.000	
10	2392.412	2,375.800		16.612	0.000	
11	2392.135	2,374.125		18.010	0.272	
12	2391.555	2,365.257		26.298	0.272	
13	2390.561	2,385.955		4.606	0.000	
14	2390.368	2,381.832		8.536	0.272	
15	2385.236	2,378.646		6.591	0.000	
16	2384.657	2,371.777		12.880	0.272	
17	2383.018	2,368.373		14.645	0.272	
18	2393.437	2,381.915		11.522	0.000	
19	2392.720	2,379.442		13.279	0.000	
20	2392.646	2,379.859		12.787	0.272	
21	2392.551	2,376.847		15.704	0.272	
22	2392.559	2,382.000		10.559	0.000	
23	2391.377	2,377.818		13.560	0.272	
24	2392.191	2,382.532		9.659	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	100.0	28.598	110	6.538	0.833	11.820	0.338	0.000
2	3	37.5	43.799	110	0.817	0.740	29.844	1.307	0.000
2	8	100.0	64.943	110	5.721	0.729	9.231	0.599	0.000
3	4	37.5	207.736	110	0.272	0.247	3.902	0.811	0.000
3	5	37.5	167.220	110	0.545	0.494	14.085	2.355	0.000
5	6	37.5	282.031	110	0.272	0.247	3.902	1.100	0.000
5	7	37.5	158.173	110	0.272	0.247	3.902	0.617	0.000
8	9	75.0	14.197	110	3.542	0.802	15.418	0.219	0.000
8	18	75.0	223.946	110	2.179	0.494	6.274	1.405	0.000
9	10	37.5	156.993	110	0.545	0.494	14.085	2.211	0.000
9	13	37.5	136.127	110	0.817	0.740	29.842	4.062	0.000
9	33	75.0	225.047	110	2.179	0.494	6.274	1.412	0.000
10	11	37.5	71.098	110	0.272	0.247	3.902	0.277	0.000
10	12	37.5	219.644	110	0.272	0.247	3.902	0.857	0.000
13	14	37.5	49.610	110	0.272	0.247	3.902	0.194	0.000
13	15	37.5	378.050	110	0.545	0.494	14.085	5.325	0.000
15	16	37.5	148.405	110	0.272	0.247	3.902	0.579	0.000
15	17	37.5	568.506	110	0.272	0.247	3.902	2.218	0.000
18	19	37.5	50.906	110	0.545	0.494	14.085	0.717	0.000
18	22	75.0	238.624	110	1.635	0.370	3.683	0.879	0.000
19	20	37.5	19.150	110	0.272	0.247	3.902	0.075	0.000
19	21	37.5	43.526	110	0.272	0.247	3.902	0.170	0.000
22	23	37.5	302.739	110	0.272	0.247	3.902	1.181	0.000
22	24	75.0	139.919	110	1.362	0.308	2.628	0.368	0.000

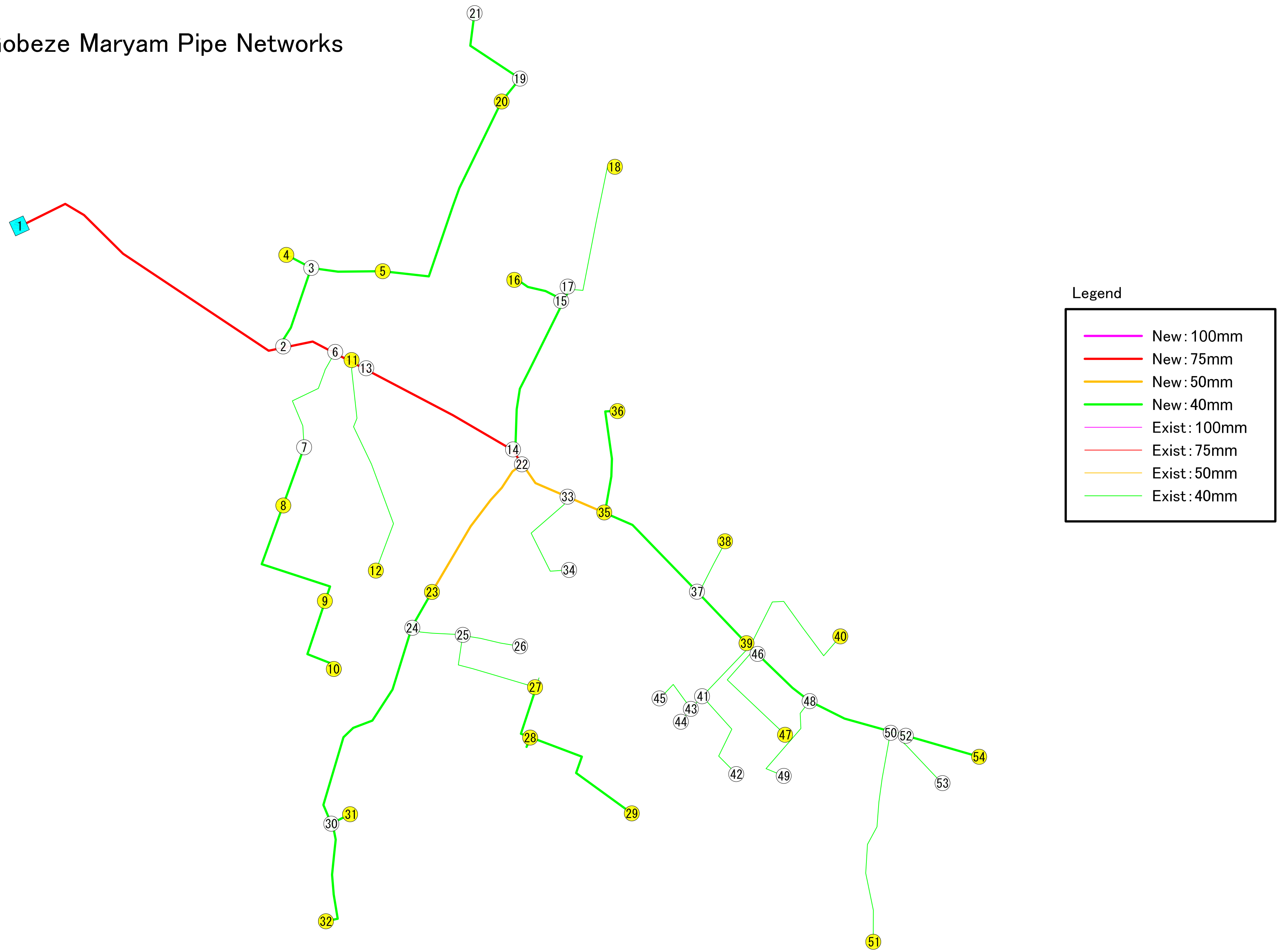
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2391.778	2,382.519		9.260	0.272	
26	2389.100	2,379.000		10.100	0.000	
27	2388.160	2,381.417		6.744	0.272	
28	2386.981	2,378.714		8.267	0.000	
29	2385.974	2,381.880		4.094	0.272	
30	2385.182	2,382.016		3.166	0.272	
31	2386.138	2,380.916		5.222	0.000	
32	2385.495	2,380.916		4.579	0.272	
33	2393.212	2,382.057		11.155	0.000	
34	2390.962	2,383.000		7.962	0.000	
35	2390.652	2,383.000		7.652	0.272	
36	2389.020	2,381.798		7.221	0.000	
37	2388.980	2,381.705		7.274	0.272	
38	2388.241	2,365.052		23.189	0.272	
39	2392.706	2,382.106		10.601	0.000	
40	2392.409	2,383.000		9.409	0.272	
41	2392.140	2,382.500		9.640	0.000	
42	2391.003	2,366.080		24.923	0.272	
43	2388.467	2,382.500		5.967	0.272	
44	2387.824	2,365.239		22.585	0.272	
45	2385.453	2,375.118		10.335	0.272	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
24	25	37.5	105.811	110	0.272	0.247	3.902	0.413	0.000
24	26	50.0	246.807	110	1.090	0.555	12.523	3.091	0.000
26	27	37.5	240.833	110	0.272	0.247	3.902	0.940	0.000
26	28	50.0	288.251	110	0.817	0.416	7.351	2.119	0.000
28	29	37.5	71.523	110	0.545	0.494	14.085	1.007	0.000
28	31	37.5	216.192	110	0.272	0.247	3.902	0.844	0.000
29	30	37.5	203.061	110	0.272	0.247	3.902	0.792	0.000
31	32	37.5	164.821	110	0.272	0.247	3.900	0.643	0.000
33	34	37.5	75.399	110	0.817	0.740	29.843	2.250	0.000
33	39	75.0	192.406	110	1.362	0.308	2.627	0.506	0.000
34	35	37.5	79.446	110	0.272	0.247	3.900	0.310	0.000
34	36	37.5	137.879	110	0.545	0.494	14.085	1.942	0.000
36	37	37.5	10.247	110	0.272	0.247	3.902	0.040	0.000
36	38	37.5	199.456	110	0.272	0.247	3.902	0.778	0.000
39	40	37.5	76.087	110	0.272	0.247	3.902	0.297	0.000
39	41	50.0	45.179	110	1.090	0.555	12.523	0.566	0.000
41	42	37.5	291.533	110	0.272	0.247	3.902	1.138	0.000
41	43	50.0	499.885	110	0.817	0.416	7.348	3.673	0.000
43	44	37.5	164.865	110	0.272	0.247	3.902	0.643	0.000
43	45	37.5	772.496	110	0.272	0.247	3.902	3.014	0.000

Gobeze Maryam Pipe Networks



------Gobeze Maryam <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	58.697	(m)	
Node	53	Minimum EHP	0.000	(m)	
Line	53	Maximum I	0.000	(‰)	
Pump, Decom	1	Maximum V	0.000	(m/s)	
Convergence Gap	0.00 (cm)				
Calculation	2 (times)				

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2243.367	2,243.367		0.000	0.000	Reservoir Tank
2	2243.367	2,205.414		37.953	0.000	
3	2243.367	2,203.382		39.985	0.000	
4	2243.367	2,195.882		47.485	0.000	
5	2243.367	2,193.937		49.430	0.000	
6	2243.367	2,201.626		41.741	0.000	
7	2243.367	2,197.127		46.240	0.000	
8	2243.367	2,200.871		42.496	0.000	
9	2243.367	2,190.450		52.917	0.000	
10	2243.367	2,185.540		57.827	0.000	
11	2243.367	2,198.264		45.103	0.000	
12	2243.367	2,191.000		52.367	0.000	
13	2196.874	2,196.874	46.493	-0.000	0.000	
14	2196.874	2,178.282		18.592	0.000	
15	2196.874	2,170.411		26.463	0.000	
16	2196.874	2,178.906		17.968	0.000	
17	2196.874	2,170.043		26.831	0.000	
18	2196.874	2,172.335		24.539	0.000	
19	2243.367	2,184.670		58.697	0.000	
20	2243.367	2,185.870		57.497	0.000	
21	2243.367	2,192.550		50.817	0.000	
22	2196.874	2,176.768		20.106	0.000	
23	2196.874	2,178.517		18.357	0.000	
24	2196.874	2,179.953		16.921	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75.0	485.203	110	0.000	0.000	0.000	0.000	0.000
2	3	37.5	128.621	110	0.000	0.000	0.000	0.000	0.000
2	6	75.0	84.885	110	0.000	0.000	0.000	0.000	0.000
3	4	37.5	43.447	110	0.000	0.000	0.000	0.000	0.000
3	5	37.5	109.350	110	0.000	0.000	0.000	0.000	0.000
6	7	38.0	178.748	110	0.000	0.000	0.000	0.000	0.000
6	11	75.0	33.324	110	0.000	0.000	0.000	0.000	0.000
7	8	37.5	94.200	110	0.000	0.000	0.000	0.000	0.000
8	9	37.5	229.402	110	0.000	0.000	0.000	0.000	0.000
9	10	37.5	139.146	110	0.000	0.000	0.000	0.000	0.000
11	12	37.5	337.327	110	0.000	0.000	0.000	0.000	0.000
11	13	75.0	16.411	110	0.000	0.000	0.000	0.000	-46.493
13	14	75.0	260.129	110	0.000	0.000	0.000	0.000	0.000
14	15	37.5	247.263	110	0.000	0.000	0.000	0.000	0.000
14	22	75.0	26.377	110	0.000	0.000	0.000	0.000	0.000
15	16	37.5	79.796	110	0.000	0.000	0.000	0.000	0.000
15	17	37.5	11.960	110	0.000	0.000	0.000	0.000	0.000
17	18	37.5	233.157	110	0.000	0.000	0.000	0.000	0.000
5	20	37.5	360.300	110	0.000	0.000	0.000	0.000	0.000
19	20	37.5	44.563	110	0.000	0.000	0.000	0.000	0.000
19	21	37.5	140.791	110	0.000	0.000	0.000	0.000	0.000
22	23	50.0	240.840	110	0.000	0.000	0.000	0.000	0.000
22	33	50.0	88.436	110	0.000	0.000	0.000	0.000	0.000
23	24	37.5	62.282	110	0.000	0.000	0.000	0.000	0.000

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
25	2196.874	2,173.053		23.821	0.000	
26	2196.874	2,162.313		34.561	0.000	
27	2196.874	2,163.321		33.553	0.000	
28	2196.874	2,165.310		31.564	0.000	
29	2196.874	2,158.000		38.874	0.000	
30	2196.874	2,179.502		17.372	0.000	
31	2196.874	2,177.642		19.232	0.000	
32	2196.874	2,182.000		14.874	0.000	
33	2196.874	2,173.196		23.678	0.000	
34	2196.874	2,166.947		29.927	0.000	
35	2196.874	2,169.885		26.989	0.000	
36	2196.874	2,166.942		29.932	0.000	
37	2196.874	2,160.921		35.953	0.000	
38	2196.874	2,160.284		36.590	0.000	
39	2196.874	2,155.720		41.154	0.000	
40	2196.874	2,147.523		49.351	0.000	
41	2196.874	2,152.124		44.750	0.000	
42	2196.874	2,142.124		54.750	0.000	
43	2196.874	2,150.124		46.750	0.000	
44	2196.874	2,148.124		48.750	0.000	
45	2196.874	2,148.124		48.750	0.000	
46	2196.874	2,155.720		41.154	0.000	
47	2196.874	2,147.690		49.184	0.000	
48	2196.874	2,150.480		46.394	0.000	
49	2196.874	2,144.480		52.394	0.000	
50	2196.874	2,146.289		50.585	0.000	
51	2196.874	2,143.564		53.310	0.000	
52	2196.874	2,145.649		51.225	0.000	
53	2196.874	2,140.760		56.114	0.000	
54	2196.874	2,142.502		54.372	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
24	25	37.5	78.635	110	0.000	0.000	0.000	0.000	0.000
24	30	37.5	345.446	110	0.000	0.000	0.000	0.000	0.000
25	26	37.5	95.922	110	0.000	0.000	0.000	0.000	0.000
25	27	37.5	168.380	110	0.000	0.000	0.000	0.000	0.000
27	28	37.5	89.267	110	0.000	0.000	0.000	0.000	0.000
28	29	37.5	216.025	110	0.000	0.000	0.000	0.000	0.000
30	31	37.5	32.041	110	0.000	0.000	0.000	0.000	0.000
30	32	37.5	166.798	110	0.000	0.000	0.000	0.000	0.000
33	34	37.5	171.888	110	0.000	0.000	0.000	0.000	0.000
33	35	50.0	60.878	110	0.000	0.000	0.000	0.000	0.000
35	36	37.5	174.858	110	0.000	0.000	0.000	0.000	0.000
35	37	37.5	188.330	110	0.000	0.000	0.000	0.000	0.000
37	38	37.5	88.012	110	0.000	0.000	0.000	0.000	0.000
37	39	37.5	116.222	110	0.000	0.000	0.000	0.000	0.000
39	40	37.5	234.981	110	0.000	0.000	0.000	0.000	0.000
39	41	37.5	104.456	110	0.000	0.000	0.000	0.000	0.000
39	46	37.5	7.486	110	0.000	0.000	0.000	0.000	0.000
41	42	37.5	162.353	110	0.000	0.000	0.000	0.000	0.000
41	43	37.5	25.812	110	0.000	0.000	0.000	0.000	0.000
43	44	37.5	24.796	110	0.000	0.000	0.000	0.000	0.000
43	45	37.5	75.651	110	0.000	0.000	0.000	0.000	0.000
46	47	37.5	194.022	110	0.000	0.000	0.000	0.000	0.000
46	48	37.5	115.720	110	0.000	0.000	0.000	0.000	0.000
48	49	37.5	157.380	110	0.000	0.000	0.000	0.000	0.000
48	50	37.5	133.185	110	0.000	0.000	0.000	0.000	0.000
50	51	37.5	325.258	110	0.000	0.000	0.000	0.000	0.000
50	52	37.5	23.343	110	0.000	0.000	0.000	0.000	0.000
52	53	37.5	96.490	110	0.000	0.000	0.000	0.000	0.000
52	54	37.5	116.267	110	0.000	0.000	0.000	0.000	0.000

——————Gobeze Maryam <<Case. 2 : Hazen-Williams Formula>>——————

Tank	1	Maximum EHP	44. 776	(m)	
Node	53	Minimum EHP	0. 000	(m)	
Line	53	Maximum I	27. 911	(‰)	
Pump, Decom	1	Maximum V	0. 857	(m/s)	

Convergence Gap 0. 55 (cm)

Calculation 16 (times)

<< Explanatory Notes >>

- Node -
HP: Head Pressure
GL: Ground Level
EHP: Effectual Head Pressure
Qc: Consumption of Water

- Line -
D: Diameter
L: Length of Pipe
Coef: Friction Coefficient
Q: Quantity of Flow
V: Velocity of Flow
I: Hydraulic Gradient
HL: Head Loss
P: Add Pressure

——— NodeData ———

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	2243. 367	2, 243. 367		0. 000	-3. 784	Reservoir Tank
2	2234. 912	2, 205. 414		29. 498	0. 000	
3	2232. 537	2, 203. 382		29. 155	0. 000	
4	2232. 475	2, 195. 882		36. 593	0. 158	
5	2231. 352	2, 193. 937		37. 415	0. 158	
6	2233. 856	2, 201. 626		32. 230	0. 000	
7	2232. 040	2, 197. 127		34. 913	0. 000	
8	2231. 019	2, 200. 871		30. 148	0. 158	
9	2229. 846	2, 190. 450		39. 396	0. 158	
10	2229. 648	2, 185. 540		44. 108	0. 158	
11	2233. 550	2, 198. 264		35. 286	0. 158	
12	2233. 072	2, 191. 000		42. 072	0. 158	
13	2196. 874	2, 196. 874	36. 556	0. 000	0. 000	
14	2194. 976	2, 178. 282		16. 694	0. 000	
15	2193. 711	2, 170. 411		23. 300	0. 000	
16	2193. 598	2, 178. 906		14. 692	0. 158	
17	2193. 694	2, 170. 043		23. 651	0. 000	
18	2193. 364	2, 172. 335		21. 029	0. 158	
19	2229. 446	2, 184. 670		44. 776	0. 000	
20	2229. 509	2, 185. 870		43. 639	0. 158	
21	2229. 246	2, 192. 550		36. 696	0. 158	
22	2194. 828	2, 176. 768		18. 060	0. 000	
23	2192. 507	2, 178. 517		13. 990	0. 158	
24	2190. 769	2, 179. 953		10. 816	0. 000	

——— LineData ———

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	75. 0	485. 203	110	3. 784	0. 857	17. 426	8. 455	0. 000
2	3	37. 5	128. 621	110	0. 631	0. 571	18. 463	2. 375	0. 000
2	6	75. 0	84. 885	110	3. 153	0. 714	12. 433	1. 055	0. 000
3	4	37. 5	43. 447	110	0. 158	0. 143	1. 417	0. 062	0. 000
3	5	37. 5	109. 350	110	0. 473	0. 428	10. 838	1. 185	0. 000
6	7	38. 0	178. 748	110	0. 473	0. 417	10. 161	1. 816	0. 000
6	11	75. 0	33. 324	110	2. 680	0. 607	9. 202	0. 307	0. 000
7	8	37. 5	94. 200	110	0. 473	0. 428	10. 838	1. 021	0. 000
8	9	37. 5	229. 402	110	0. 315	0. 286	5. 115	1. 173	0. 000
9	10	37. 5	139. 146	110	0. 158	0. 143	1. 417	0. 197	0. 000
11	12	37. 5	337. 327	110	0. 158	0. 143	1. 417	0. 478	0. 000
11	13	75. 0	16. 411	110	2. 365	0. 536	7. 298	0. 120	-36. 556
13	14	75. 0	260. 129	110	2. 365	0. 536	7. 298	1. 898	0. 000
14	15	37. 5	247. 263	110	0. 315	0. 286	5. 115	1. 265	0. 000
14	22	75. 0	26. 377	110	2. 050	0. 464	5. 599	0. 148	0. 000
15	16	37. 5	79. 796	110	0. 158	0. 143	1. 417	0. 113	0. 000
15	17	37. 5	11. 960	110	0. 158	0. 143	1. 417	0. 017	0. 000
17	18	37. 5	233. 157	110	0. 158	0. 143	1. 417	0. 330	0. 000
5	20	37. 5	360. 300	110	0. 315	0. 286	5. 115	1. 843	0. 000
19	20	37. 5	44. 563	110	-0. 158	-0. 143	-1. 417	-0. 063	0. 000
19	21	37. 5	140. 791	110	0. 158	0. 143	1. 417	0. 200	0. 000
22	23	50. 0	240. 840	110	0. 946	0. 482	9. 636	2. 321	0. 000
22	33	50. 0	88. 436	110	1. 104	0. 562	12. 820	1. 134	0. 000
23	24	37. 5	62. 282	110	0. 788	0. 714	27. 911	1. 738	0. 000

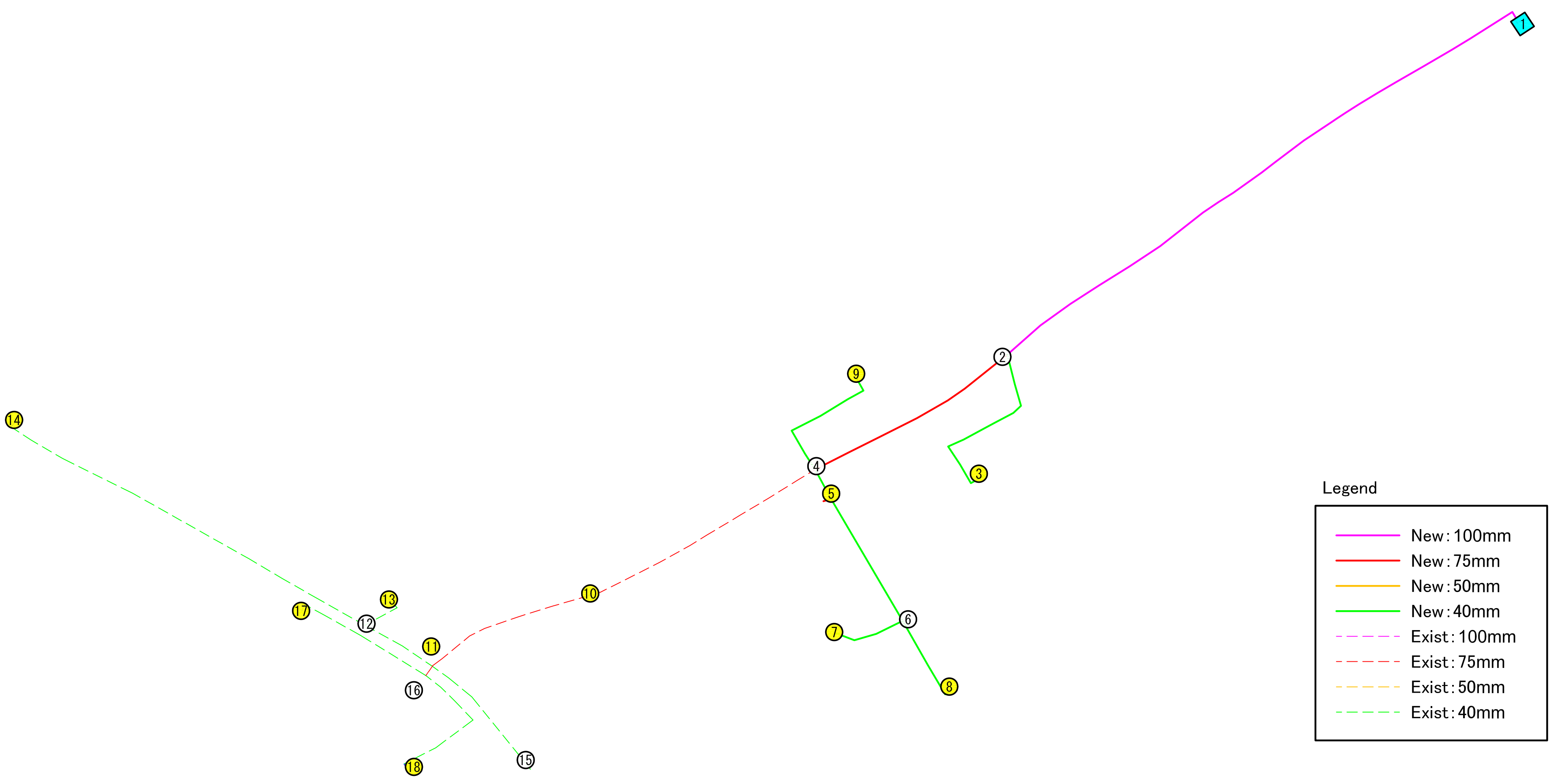
--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (1/s)	Remarks
25	2189. 917	2, 173. 053		16. 864	0. 000	
26	2189. 917	2, 162. 313		27. 604	0. 000	
27	2188. 092	2, 163. 321		24. 771	0. 158	
28	2187. 635	2, 165. 310		22. 325	0. 158	
29	2187. 329	2, 158. 000		29. 329	0. 158	
30	2189. 002	2, 179. 502		9. 500	0. 000	
31	2188. 957	2, 177. 642		11. 315	0. 158	
32	2188. 766	2, 182. 000		6. 766	0. 158	
33	2193. 694	2, 173. 196		20. 498	0. 000	
34	2193. 694	2, 166. 947		26. 747	0. 000	
35	2192. 914	2, 169. 885		23. 029	0. 158	
36	2192. 666	2, 166. 942		25. 724	0. 158	
37	2187. 657	2, 160. 921		26. 736	0. 000	
38	2187. 533	2, 160. 284		27. 249	0. 158	
39	2185. 512	2, 155. 720		29. 792	0. 158	
40	2185. 179	2, 147. 523		37. 656	0. 158	
41	2185. 512	2, 152. 124		33. 388	0. 000	
42	2185. 512	2, 142. 124		43. 388	0. 000	
43	2185. 512	2, 150. 124		35. 388	0. 000	
44	2185. 512	2, 148. 124		37. 388	0. 000	
45	2185. 512	2, 148. 124		37. 388	0. 000	
46	2185. 473	2, 155. 720		29. 753	0. 000	
47	2185. 198	2, 147. 690		37. 508	0. 158	
48	2185. 309	2, 150. 480		34. 829	0. 000	
49	2185. 309	2, 144. 480		40. 829	0. 000	
50	2185. 121	2, 146. 289		38. 832	0. 000	
51	2185. 121	2, 143. 564		41. 557	0. 000	
52	2185. 088	2, 145. 649		39. 439	0. 000	
53	2185. 088	2, 140. 760		44. 328	0. 000	
54	2184. 923	2, 142. 502		42. 421	0. 158	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (1/s)	V (m/s)	I (‰)	HL (m)	P (m)
24	25	37. 5	78. 635	110	0. 473	0. 428	10. 838	0. 852	0. 000
24	30	37. 5	345. 446	110	0. 315	0. 286	5. 115	1. 767	0. 000
25	26	37. 5	95. 922	110	0. 000	0. 000	0. 000	0. 000	0. 000
25	27	37. 5	168. 380	110	0. 473	0. 428	10. 838	1. 825	0. 000
27	28	37. 5	89. 267	110	0. 315	0. 286	5. 115	0. 457	0. 000
28	29	37. 5	216. 025	110	0. 158	0. 143	1. 417	0. 306	0. 000
30	31	37. 5	32. 041	110	0. 158	0. 143	1. 417	0. 045	0. 000
30	32	37. 5	166. 798	110	0. 158	0. 143	1. 417	0. 236	0. 000
33	34	37. 5	171. 888	110	0. 000	0. 000	0. 000	0. 000	0. 000
33	35	50. 0	60. 878	110	1. 104	0. 562	12. 820	0. 780	0. 000
35	36	37. 5	174. 858	110	0. 158	0. 143	1. 417	0. 248	0. 000
35	37	37. 5	188. 330	110	0. 788	0. 714	27. 911	5. 257	0. 000
37	38	37. 5	88. 012	110	0. 158	0. 143	1. 417	0. 125	0. 000
37	39	37. 5	116. 222	110	0. 631	0. 571	18. 464	2. 146	0. 000
39	40	37. 5	234. 981	110	0. 158	0. 143	1. 417	0. 333	0. 000
39	41	37. 5	104. 456	110	0. 000	0. 000	0. 000	0. 000	0. 000
39	46	37. 5	7. 486	110	0. 315	0. 286	5. 115	0. 038	0. 000
41	42	37. 5	162. 353	110	0. 000	0. 000	0. 000	0. 000	0. 000
41	43	37. 5	25. 812	110	0. 000	0. 000	0. 000	0. 000	0. 000
43	44	37. 5	24. 796	110	0. 000	0. 000	0. 000	0. 000	0. 000
43	45	37. 5	75. 651	110	0. 000	0. 000	0. 000	0. 000	0. 000
46	47	37. 5	194. 022	110	0. 158	0. 143	1. 417	0. 275	0. 000
46	48	37. 5	115. 720	110	0. 158	0. 143	1. 417	0. 164	0. 000
48	49	37. 5	157. 380	110	0. 000	0. 000	0. 000	0. 000	0. 000
48	50	37. 5	133. 185	110	0. 158	0. 143	1. 417	0. 189	0. 000
50	51	37. 5	325. 258	110	0. 000	0. 000	0. 000	0. 000	0. 000
50	52	37. 5	23. 343	110	0. 158	0. 143	1. 417	0. 033	0. 000
52	53	37. 5	96. 490	110	0. 000	0. 000	0. 000	0. 000	0. 000
52	54	37. 5	116. 267	110	0. 158	0. 143	1. 417	0. 165	0. 000

Bikolo Pipe Networks



------Bikolo <<Case.1 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	51.220	(m)
Node	17	Minimum EHP	16.200	(m)
Line	17	Maximum I	0.000	(‰)
Pump, Decom	0	Maximum V	0.000	(m/s)

Convergence Gap 0.00 (cm)

Calculation 2 (times)

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	1953.020	1,953.020		0.000	-0.000	Reservoir Tank
2	1953.020	1,936.820		16.200	0.000	
3	1953.020	1,932.430		20.590	0.000	
4	1953.020	1,929.430		23.590	0.000	
5	1953.020	1,929.940		23.080	0.000	
6	1953.020	1,932.130		20.890	0.000	
7	1953.020	1,932.910		20.110	0.000	
8	1953.020	1,932.120		20.900	0.000	
9	1953.020	1,927.710		25.310	0.000	
10	1953.020	1,922.350		30.670	0.000	
11	1953.020	1,917.240		35.780	0.000	
12	1953.020	1,915.370		37.650	0.000	
13	1953.020	1,917.290		35.730	0.000	
14	1953.020	1,901.800		51.220	0.000	
15	1953.020	1,913.790		39.230	0.000	
16	1953.020	1,916.120		36.900	0.000	
17	1953.020	1,912.560		40.460	0.000	
18	1953.020	1,915.450		37.570	0.000	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	100.0	823.886	110	0.000	0.000	0.000	0.000	0.000
2	3	37.5	257.828	110	0.000	0.000	0.000	0.000	0.000
2	4	75.0	296.953	110	0.000	0.000	0.000	0.000	0.000
4	5	37.5	44.415	110	0.000	0.000	0.000	0.000	0.000
4	9	37.5	186.736	110	0.000	0.000	0.000	0.000	0.000
5	6	37.5	186.654	110	0.000	0.000	0.000	0.000	0.000
6	7	37.5	96.106	110	0.000	0.000	0.000	0.000	0.000
6	8	37.5	117.885	110	0.000	0.000	0.000	0.000	0.000
4	10	75.0	346.203	110	0.000	0.000	0.000	0.000	0.000
10	11	75.0	226.819	110	0.000	0.000	0.000	0.000	0.000
11	12	37.5	104.219	110	0.000	0.000	0.000	0.000	0.000
11	15	37.5	189.681	110	0.000	0.000	0.000	0.000	0.000
12	13	37.5	62.816	110	0.000	0.000	0.000	0.000	0.000
12	14	37.5	547.964	110	0.000	0.000	0.000	0.000	0.000
11	16	37.5	14.956	110	0.000	0.000	0.000	0.000	0.000
16	17	37.5	195.039	110	0.000	0.000	0.000	0.000	0.000
16	18	37.5	202.555	110	0.000	0.000	0.000	0.000	0.000

------Bikolo <<Case.2 : Hazen-Williams Formula>>------

Tank	1	Maximum EHP	40.444	(m)
Node	17	Minimum EHP	10.502	(m)
Line	17	Maximum I	30.364	(‰)
Pump, Decom	0	Maximum V	0.747	(m/s)
Convergence Gap	0.72 (cm)			
Calculation	13 (times)			

<< Explanatory Notes >>

- Node -
  - HP: Head Pressure
  - GL: Ground Level
  - EHP: Effectual Head Pressure
  - Qc: Consumption of Water

- Line -
  - D: Diameter
  - L: Length of Pipe
  - Coef: Friction Coefficient
  - Q: Quantity of Flow
  - V: Velocity of Flow
  - I: Hydraulic Gradient
  - HL: Head Loss
  - P: Add Pressure

--- NodeData ---

Node	HP (m)	GL (m)	EHP 1st (m)	EHP 2nd (m)	Qc (l/s)	Remarks
1	1953.020	1,953.020		0.000	-3.025	Reservoir Tank
2	1950.683	1,936.820		13.863	0.000	
3	1949.660	1,932.430		17.230	0.275	
4	1947.817	1,929.430		18.387	0.000	
5	1946.469	1,929.940		16.529	0.275	
6	1943.794	1,932.130		11.664	0.000	
7	1943.412	1,932.910		10.502	0.275	
8	1943.326	1,932.120		11.206	0.275	
9	1947.076	1,927.710		19.366	0.275	
10	1946.520	1,922.350		24.170	0.275	
11	1945.914	1,917.240		28.674	0.275	
12	1944.420	1,915.370		29.050	0.000	
13	1944.171	1,917.290		26.881	0.275	
14	1942.244	1,901.800		40.444	0.275	
15	1945.914	1,913.790		32.124	0.000	
16	1945.699	1,916.120		29.579	0.000	
17	1944.925	1,912.560		32.365	0.275	
18	1944.895	1,915.450		29.445	0.275	

--- LineData ---

Node ST	Node EN	D (mm)	L (m)	Coef C	Q (l/s)	V (m/s)	I (‰)	HL (m)	P (m)
1	2	100.0	823.886	110	3.025	0.385	2.836	2.337	0.000
2	3	37.5	257.828	110	0.275	0.249	3.971	1.024	0.000
2	4	75.0	296.953	110	2.750	0.623	9.651	2.866	0.000
4	5	37.5	44.415	110	0.825	0.747	30.364	1.349	0.000
4	9	37.5	186.736	110	0.275	0.249	3.970	0.741	0.000
5	6	37.5	186.654	110	0.550	0.498	14.331	2.675	0.000
6	7	37.5	96.106	110	0.275	0.249	3.970	0.382	0.000
6	8	37.5	117.885	110	0.275	0.249	3.970	0.468	0.000
4	10	75.0	346.203	110	1.650	0.374	3.748	1.297	0.000
10	11	75.0	226.819	110	1.375	0.311	2.674	0.606	0.000
11	12	37.5	104.219	110	0.550	0.498	14.332	1.494	0.000
11	15	37.5	189.681	110	0.000	0.000	0.000	0.000	0.000
12	13	37.5	62.816	110	0.275	0.249	3.971	0.249	0.000
12	14	37.5	547.964	110	0.275	0.249	3.971	2.176	0.000
11	16	37.5	14.956	110	0.550	0.498	14.332	0.214	0.000
16	17	37.5	195.039	110	0.275	0.249	3.971	0.774	0.000
16	18	37.5	202.555	110	0.275	0.249	3.970	0.804	0.000

資料 7. その他の資料・情報
7-2　試掘調査結果（柱状図）

Site No. 14

Wejel Productive well #1 (BH1)

Well No.	Location	Coordinate (UTM)	Altitude	Town	Zone	State	Country
BH1	Wejel			Wejel	East Gojam	Amhara	Ethiopia

Date: from	to	Drilling:	Equipment Type	Method	Flow	Depth	Depth	Depth	Final Depth
9/11/2011	11/11/2011		TOP-300	DTH		GL -76.0m			GL -76.0m

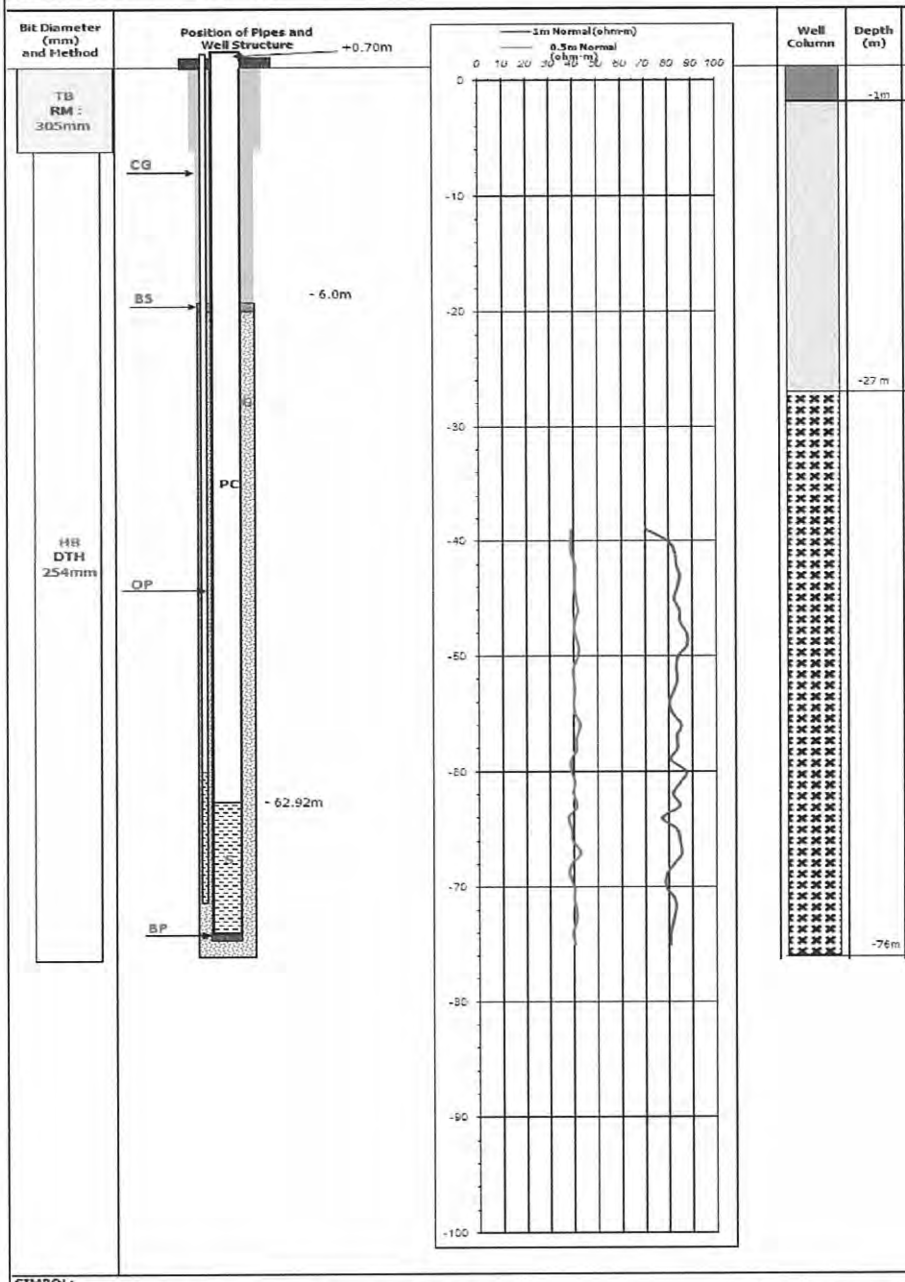
Casing Type:	Size	Inside Dia.	Outside Dia.	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	162.5mm	Screw	+0.75-62.92	63.7m

Screen Pipe:	Material	Diameter	Slot Size	Open Rate	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	1.0mm	10%	Screw	-62.92 - 74.36	11.4m

Observation Pipe	Material	Diameter	Slot Size	Open Rate	Joint Type	Installation depth:	Total Length
	GS	3/4"			Threaded	72.0m	72.0m

Gravel Pakking	Origin	Gravel Size	Location	Volume	Divelopment:	Method	Duration	SWL (m)	Discharge
	Basaltic	ø 2-6mm		2.0m³		Air	5hrs		

Submersible pump: Installation Date:



Depth (m)	Lithology
-1m	Blak Clay
-27 m	Weathered Tuff
-76m	Basalt:- Slightly fractured and slightly weathered. However between 61m and 76m it is highly fractured and watehered and water bearing (Main aquifer)

SIMBOL:

HB = Hammer Bit	CG = Cement Grout	PC = PVC Casing		R M = Rotary with mud water
TB = Tricon Bit	OP = observation pipe	S = Screen		DTH = Drilled with air
	G = Gravel	P = Pump Position		
	BS = Bentonite sealed	B.P.=Bottom Plug		

Site No. 10
Yetmen Productive well #1 (BH1)

Well No.	Location	Coordinate (UTM)	Altitude	Town	Zone	State	Country
BH1	Yetmen			Yetmen	East Gojam	Amhara	Ethiopia

Date: from	to	Drilling :	Equipment Type	Method	Flow	Depth	Depth	Depth	Final Depth
18/11/2011	20/11/2011		TOP-300	DTH		GL -87.0m			GL -87.0m

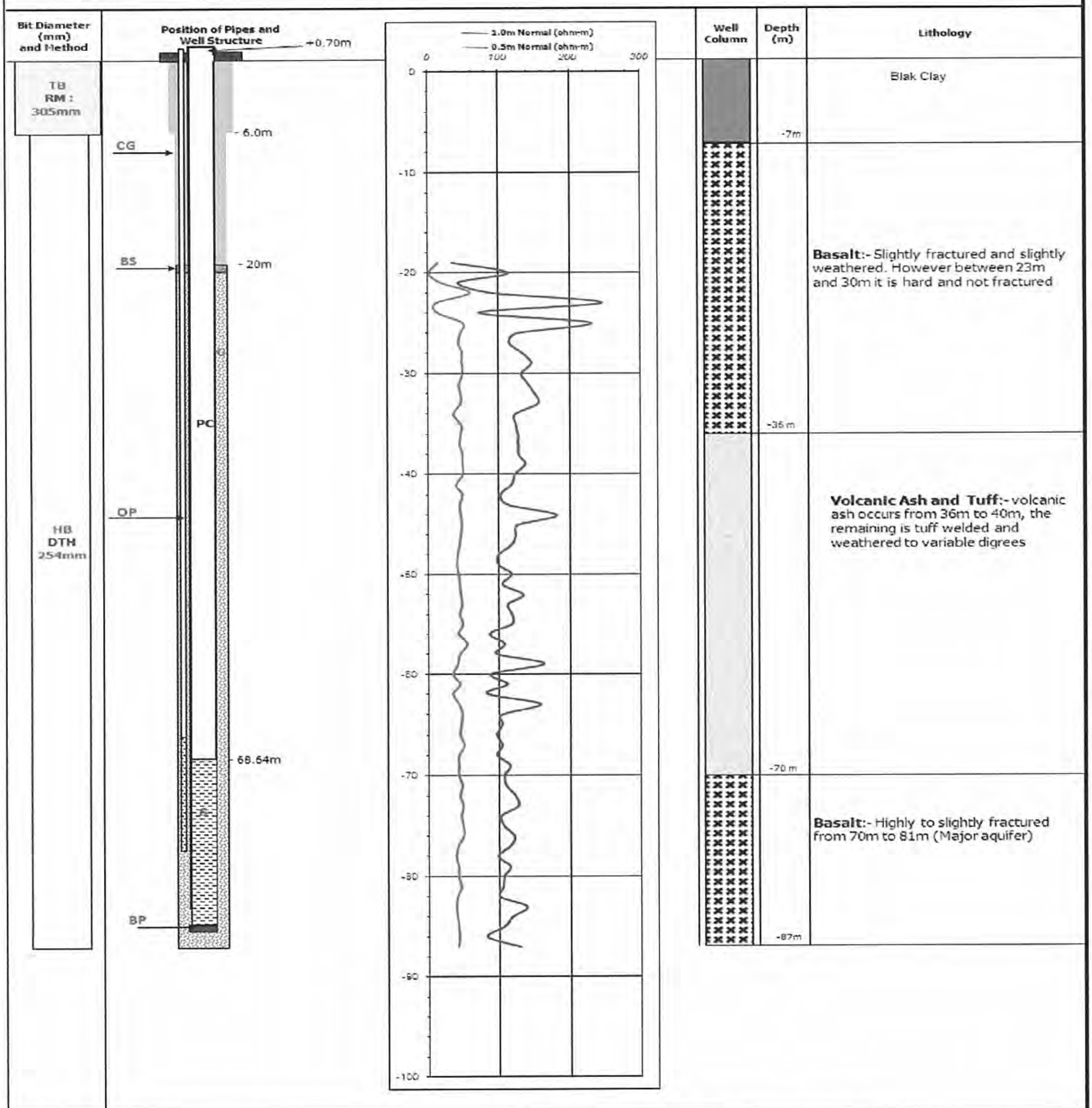
Casing Type :	Size	Inside Dia.	Outside Dia.	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	162.5mm	Screw	+0.75-68.64	69.4m

Screen Pipe :	Material	Diameter	Silot Size	Open Rate	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	1.0mm	10%	Screw	-68.64 - 85.8	17.2m

Observation Pipe	Material	Diameter	Silot Size	Open Rate	Joint Type	Installation depth:	Total Length
	GS	3/4"			Threaded	78.0m	78.0m

Gravel Pakking	Origin	Gravel Size	Location	Volume	Divelopment :	Method	Duration	SWL (m)	Discharge
	Basaltic	ø 2-6mm		2.0 m³		Air	5hrs		

Submersible pump :	Installation Date :



SIMBOL:

HB = Hammer Bit
TB = Tricon Bit

CG = Cement Grout
OP = observation pipe
G = Gravel
BS = Bentonite sealed

PC = PVC Casing
S = Screen
P = Pump Position
B.P.=Bottom Plug

R M = Rotary with mud water
DTH = Drilled with air

Site No. 15

Sede Productive well #1 (BH1)

Well No.	Location	Coordinate (UTM)	Altitude	Town	Zone	State	Country
BH1	Sede			Sede	East Gojam	Amhara	Ethiopia

Date: from	to	Drilling :	Equipment Type	Method	Flow	Depth	Depth	Depth	Final Depth
6/12/2011	24/01/2012		TOP-300	DTH + Mud		GL -87.0m			GL -87.0m

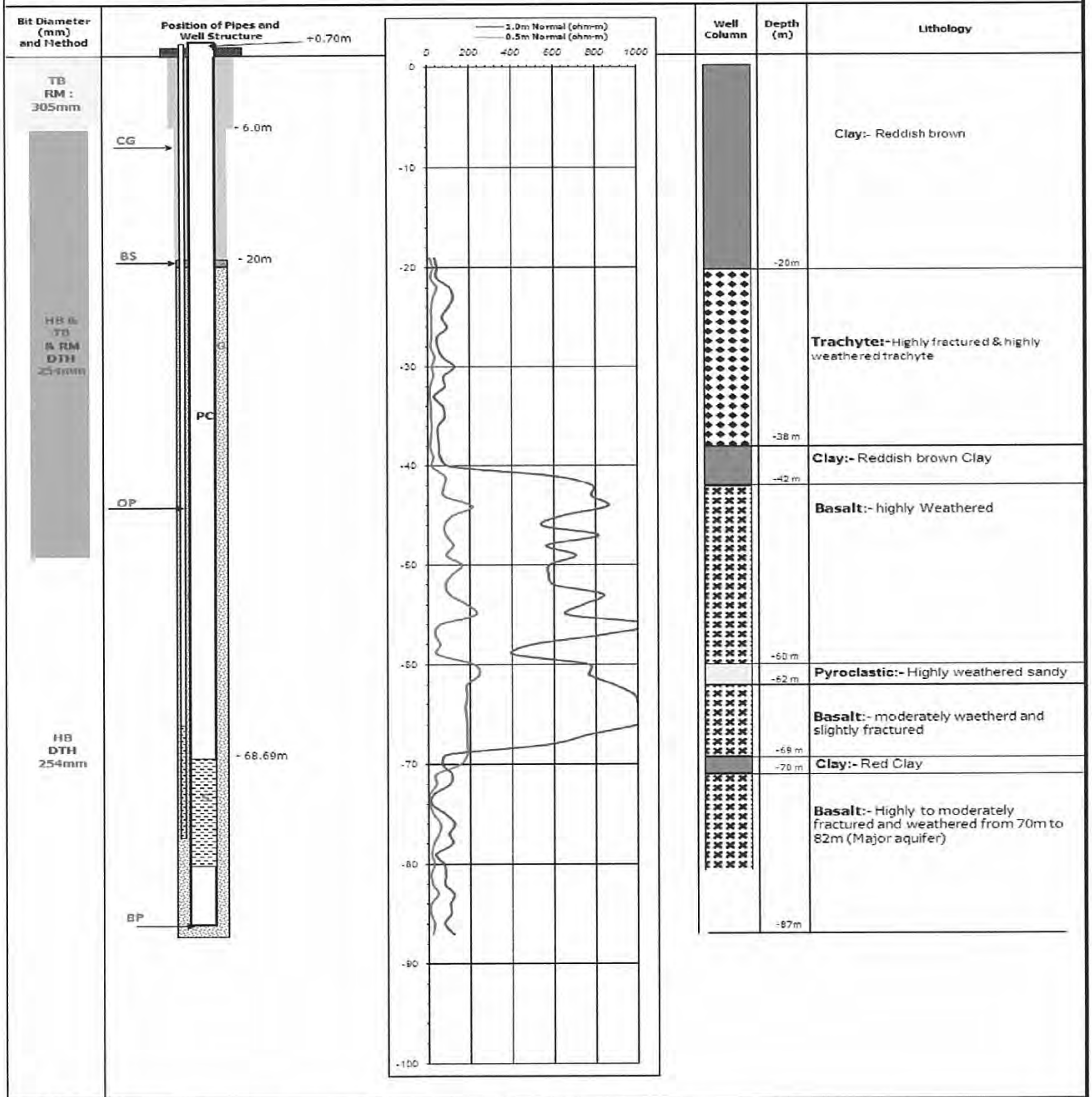
Casing Type :	Size	Inside Dia.	Outside Dia.	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	162.5mm	Screw	+0.75-68.69 -80.13 - 85.9	75.2m

Screen Pipe :	Material	Diameter	Silot Size	Open Rate	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	1.0mm	10%	Screw	-68.69 - 80.13	11.4m

Observation Pipe	Material	Diameter	Silot Size	Open Rate	Joint Type	Installation depth:	Total Length
	GS	3/4"			Threaded	77.0m	77.0m

Gravel Pakking	Origin	Gravel Size	Location	Volume	Divelopment :	Method	Duration	SWL (m)	Descharge
	Basaltic	ø 2-6mm		2.50 m³		Air	6Hs		

Submersible pump : Installation Date : installed



SIMBOL:

HB = Hammer Bit
TB = Tricon Bit
CG = Cement Grout
OP = observation pipe
G = Gravel
BS = Bentonite sealed
PC = PVC Casing
S = Screen
P = Pump Position
B.P.=Bottom Plug
R M = Rotary with mud water
DTH = Drilled with air
DTH & Rotary with mud water

Site No. 16

Dibo Productive well #1 (BH1)

Well No.	Location	Coordinate (UTM)	Altitude	Town	Zone	State	Country
BH1	Dibo			Dibo	East Gojam	Amhara	Ethiopia

Date: from	to	Drilling:	Equipment Type	Method	Flow	Depth	Depth	Depth	Final Depth
23/11/2011	3/12/2011		TOP-300	DTH		GL -80.0m			GL -80.0m

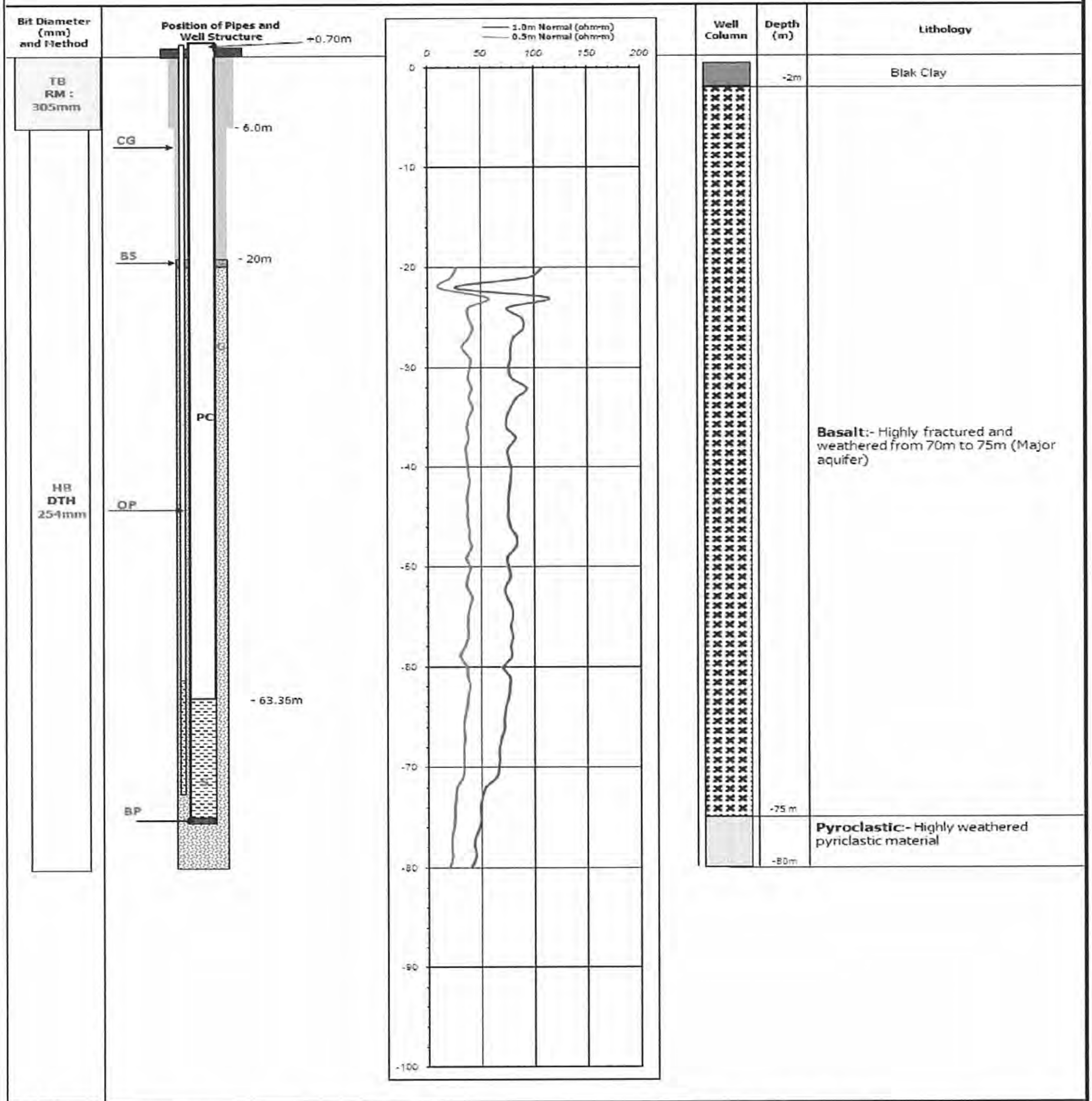
Casing Type:	Size	Inside Dia.	Outside Dia.	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	162.5mm	Screw	+0.75-63.36	64.1m

Screen Pipe:	Material	Diameter	Slot Size	Open Rate	Joint Type	Installation depth:	Total Length
PVC	6"	150.0mm	1.0mm	10%	Screw	-63.36 - 74.8	11.4m

Observation Pipe	Material	Diameter	Slot Size	Open Rate	Joint Type	Installation depth:	Total Length
	GS	3/4"			Threaded	72.0m	72.0m

Gravel Pakking	Origin	Gravel Size	Location	Volume	Divelopment:	Method	Duration	SWL (m)	Discharge
	Basaltic	ø 2-6mm		1.50 m³		Air	6hrs		

Submersible pump: Installation Date :



SIMBOL:

HB = Hammer Bit
TB = Tricon Bit

CG = Cement Grout
OP = observation pipe
G = Gravel
BS = Bentonite sealed

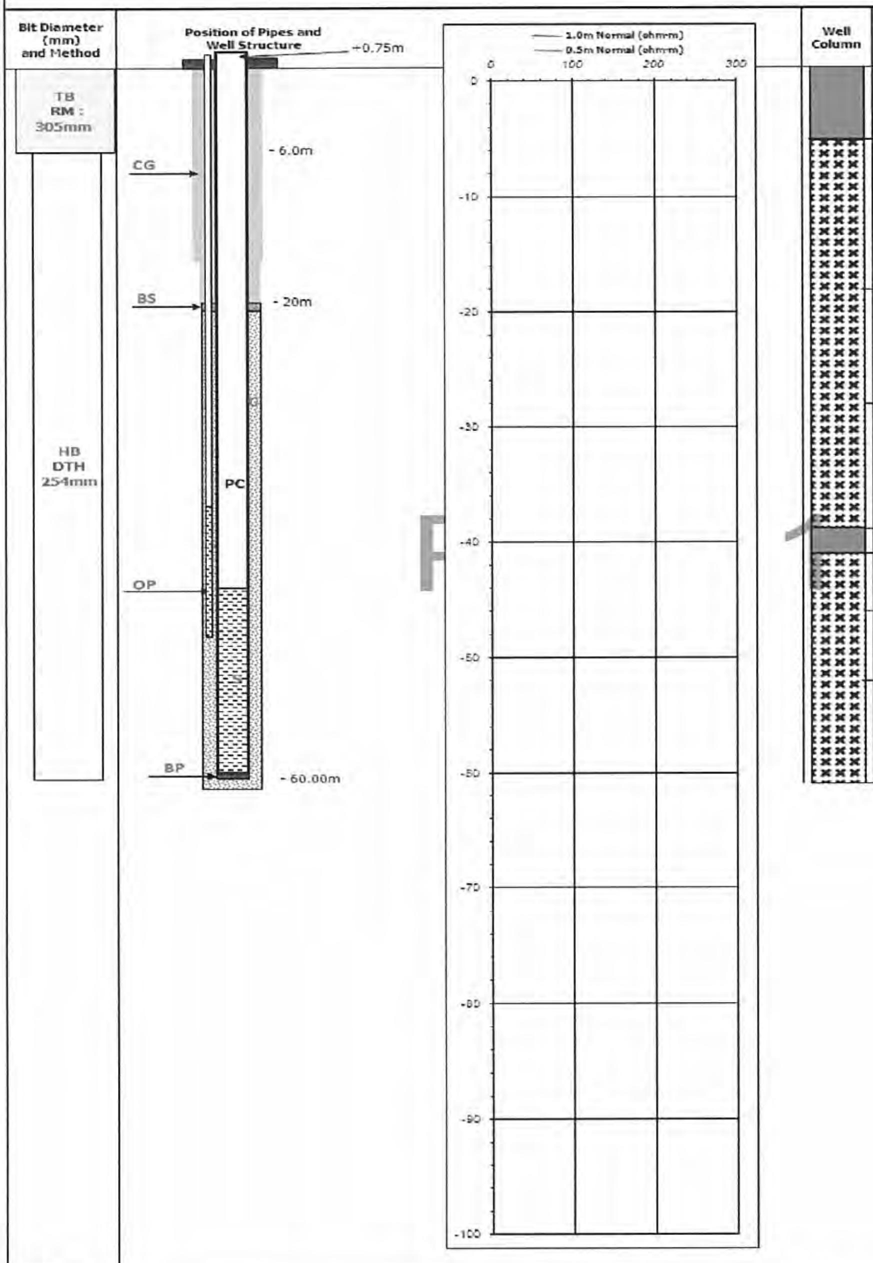
PC = PVC Casing
S = Screen
P = Pump Position
B.P.=Bottom Plug

R M = Rotary with mud water
DTH = Drilled with air

Site No. 12

Lumame Productive well #3 (BH3)

Well No. BH3	**Location** Lumame	**Coordinate (UTM)**	**Altitude**	**Town** Lumame	**Zone** East Gojam	**State** Amhara	**Country** Ethiopia
Date: from 15/05/2012 **to** 23/05/2012	**Drilling :**	Equipment Type TCP-300	Method DTH	Flow	Depth GL -61.0m	Depth / Depth	Final Depth GL -61.0m
Casing Type : PVC	Size 6"	Inside Dia. 150.0mm	Outside Dia. 169.0mm	Joint Type Screw	Installation depth: +0.75-42.34		Total Length 43.1m
Screen Pipe : PVC	Material 6"	Diameter 150.0mm	Slot Size 1.0mm	Open Rate 10%	Joint Type Screw	Installation depth: -42.34 - 60	Total Length 17.2m
Observation Pipe	Material GS	Diameter 3/4"	Slot Size	Open Rate	Joint Type Threaded	Installation depth: -48.0m	Total Length 48.0m
Gravel Paking	Origin Basaltic	Gravel Size ø 2-6mm	Location	Volume 3.0 m³	**Divelopment :** Method Air	Duration 5hr / SWL (m)	Discharge
Submersible pump :	Installation Date :						



Depth (m)	Lithology
-5m	**Clay:**- Brown silty clay
-18m	**Basalt:**- Highly weathered
-28 m	**Basalt:**- Moderately weathered
-39m	**Basalt:**- Fresh and massive
-42 m	**Clay:**- Brown clay
-46 m	**Basalt:**- Moderately weathered and slightly Fractured
-52 m	**Basalt:**- Fractured basalt (Water Bearing)
-61m	**Basalt**:- Highly to slightly fractured from 70m to 81m (Major aquifer)

SIMBOL:

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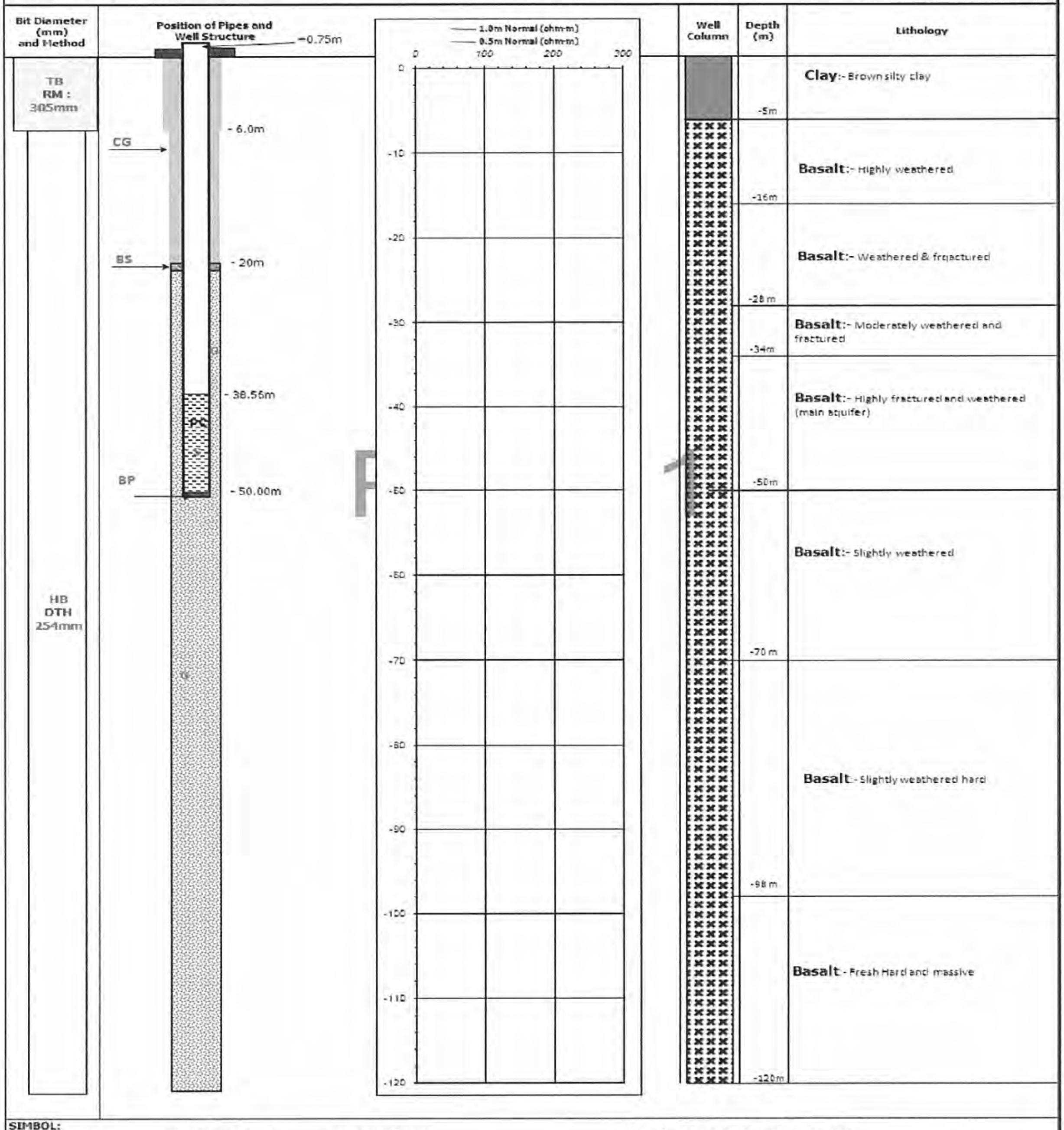
P = Pump Position
B.P.=Bottom Plug

R M = Rotary with mud water
DTH = Drilled with air

Ammanuel Productive well #1 (BH1)

Well No. BH1	**Location** Ammanuel	**Coordinate (UTM)**		**Altitude**	**Town** Ammanuel	**Zone** East Gojam	**State** Amhara	**Country** Ethiopia
Date: from 8/5/2012 **to** 23/05/2012	**Drilling :**	Equipment Type DTH Rotary	Method DTH	Flow	Depth GL -120.0m	Depth	Depth	Final Depth GL -120.0m
Casing Type : PVC	Size 6"	Inside Dia. 150.0mm	Outside Dia. 169.0mm	Joint Type Screw	Installation depth: +0.75- 38.56			Total Length 39.3m
Screen Pipe : PVC	Material 6"	Diameter 150.0mm	Slot Size 1.0mm	Open Rate 10%	Joint Type Screw	Installation depth: -38.56 - 50		Total Length 11.4m
Observation Pipe	Material GS	Diameter 3/4"	Slot Size	Open Rate	Joint Type Threaded	Installation depth: not installed		Total Length
Gravel Pakking	Origin Basaltic	Gravel Size ø 2-6mm	Location	Volume 6.50 m³	**Divelopment :**	Method Air	Duration 8hrs	SWL (m) / Discharge
Submersible pump :	Installation Date :							



SIMBOL:

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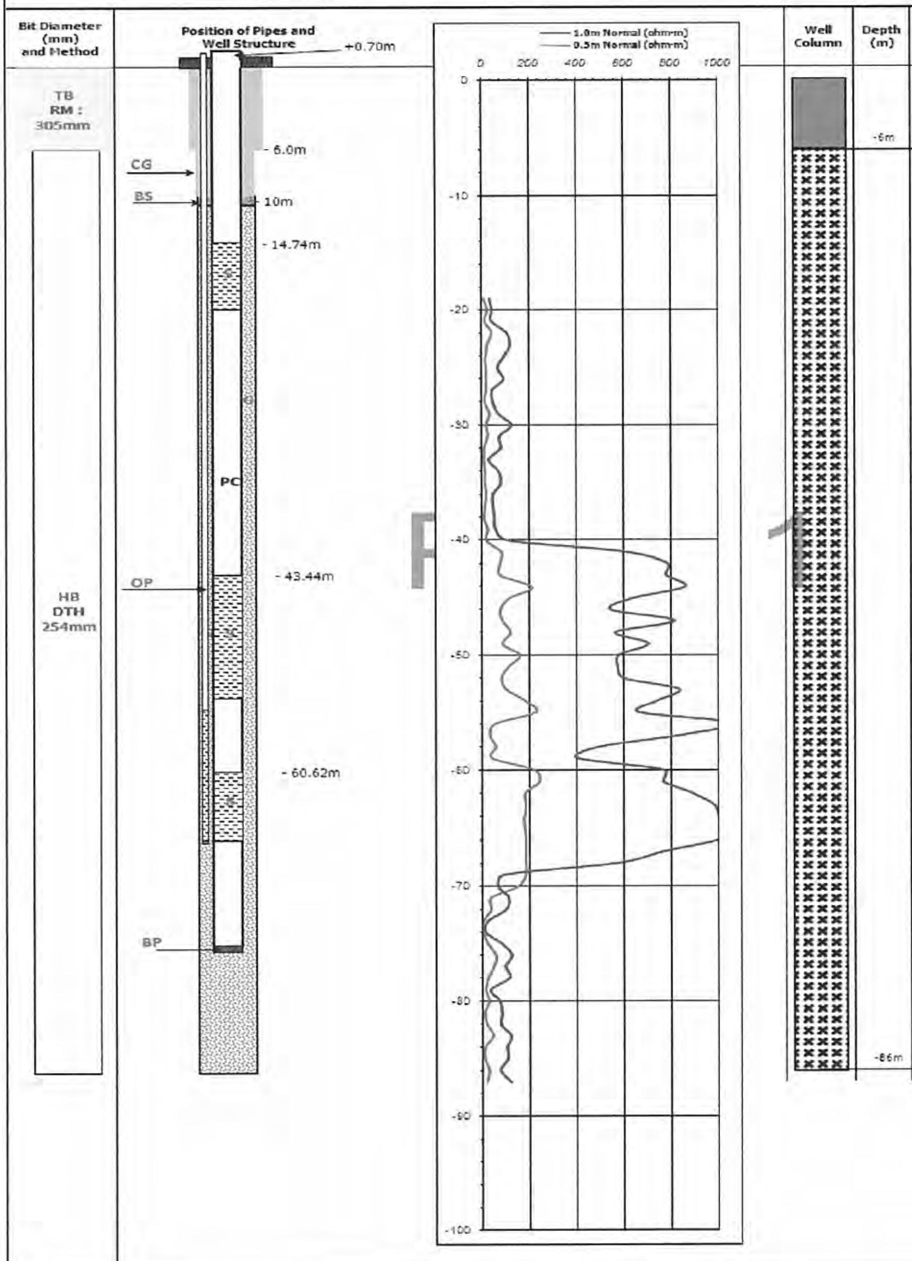
CG = Cement Grout
OP = observation pipe
G = Gravel
BS = Bentonite sealed
PC = PVC Casing
S = Screen
P = Pump Position
B.P.=Bottom Plug
R M = Rotary with mud water
DTH = Drilled with air

Site No. 29

Kunzila well #1 (BH1)

Well No. BH1	**Location** Kunzila	**Coordinate (UTM)**		**Altitude**	**Town** Kunzila	**Zone** East Gojam	**State** Amhara		**Country** Ethiopia
Date: from 13/01/2012 **to** 25/01/2012	**Drilling :**	Equipment Type TOP-300	Method DTH + Mud	Flow	Depth GL -86.0m	Depth	Depth		Final Depth GL -86.0m
Casing Type : PVC	Size 6"	Inside Dia. 150.0mm	Outside Dia. 162.5mm	Joint Type Screw	Installation depth: +0.75-14.74	-20.4 - 43.44	-54.88 - 60.62	-66.32 - 77.8	Total Length 75.2m
Screen Pipe : PVC	Material 6"	Diameter 150.0mm	Slot Size 1.0mm	Open Rate 10%	Joint Type Screw	Installation depth: -14.74 - 20.4	-43.44 - 54.88	60.62 - 66.32	Total Length 11.4m
Observation Pipe	Material GS	Diameter 3/4"	Slot Size	Open Rate	Joint Type Threaded	Installation depth: 77.0m			Total Length 77.0m
Gravel Pakking	Origin Basaltic	Gravel Size ø 2-6mm	Location	Volume 2.50 m³	**Divelopment :**	Method Air	Duration 6Hs	SWL (m)	Discharge
Submersible pump :	Installation Date :								



Depth (m)	Lithology
-6m	Clay:- Reddish brown
-86m	**Basalt**:- Highly weathered 6 to 16 m, water bearing; Highly weathered and fractured 29m to 52m water bearing (Major aquifer) and highly fractured 61m to 65 m water bearing

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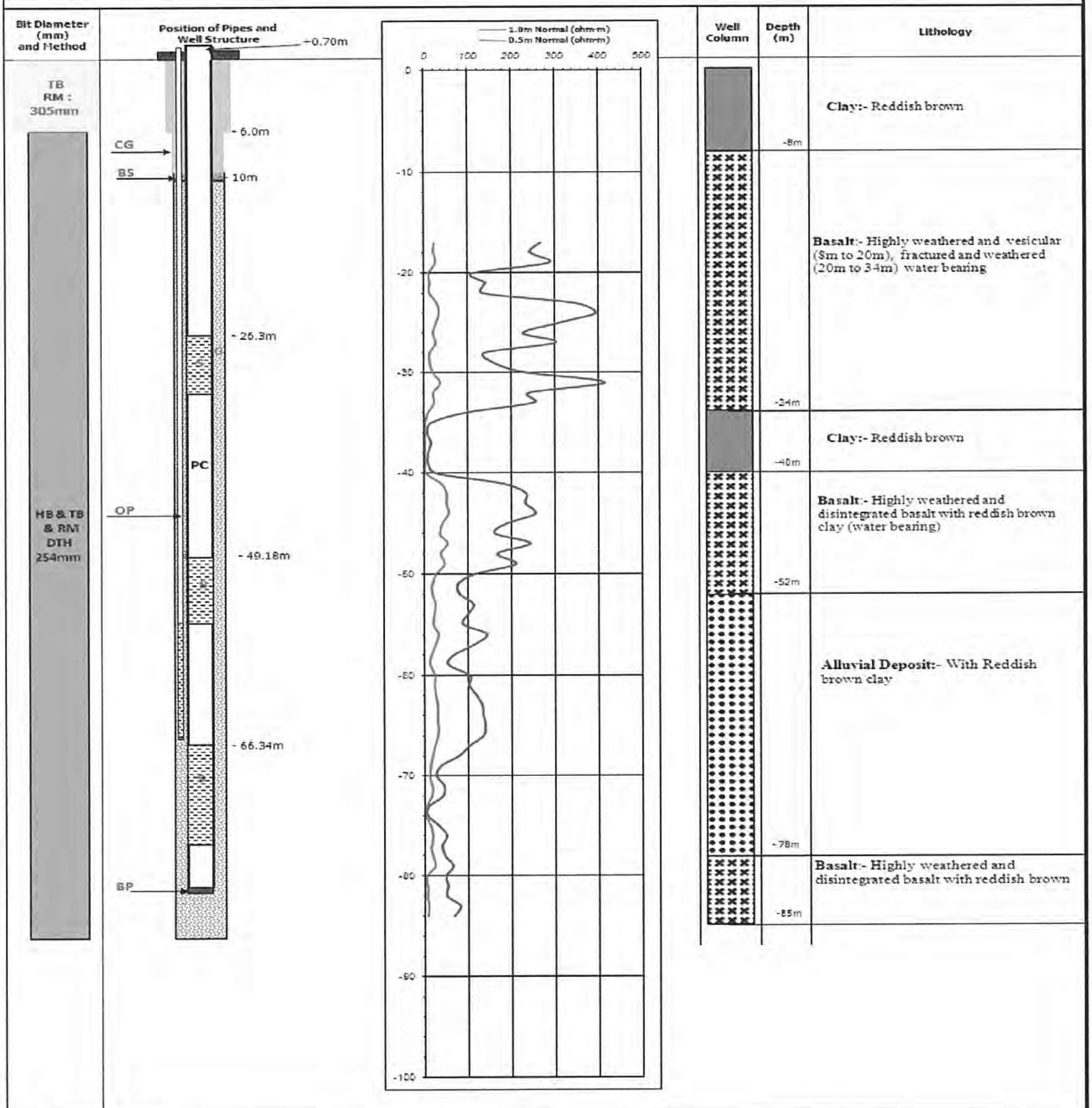
B.P.=Bottom Plug

R M = Rotary with mud water
DTH = Drilled with air
DTH & Rotary with mud water

Site No. 29

Kunzila well #2 (BH2)

Well No. BH2	**Location** Kunzila		**Coordinate (UTM)**		**Altitude**	**Town** Kunzila	**Zone** East Gojam	**State** Amhara	**Country** Ethiopia
Date: from 15/02/2012	**to** 26/02/2012	**Drilling :**	Equipment Type TOP-300	Method DTH + Mud	Flow	Depth GL -85.0m	Depth	Depth	Final Depth GL -85.0m
Casing Type : PVC	Size 6"	Inside Dia. 150.0mm	Outside Dia. 162.5mm	Joint Type Screw	Installation depth: +0.75-26.3	-32.02 - 49.18	-54.9 - 66.34	-77.8 - 83.5	Total Length 61.4m
Screen Pipe : PVC	Material 6"	Diameter 150.0mm	Silot Size 1.0mm	Open Rate 10%	Joint Type Screw	Installation depth: -26.3 - 32.02	-49.18 - 54.9	-66.34 - 77.8	Total Length 22.9m
Observation Pipe	Material GS	Diameter 3/4"	Silot Size	Open Rate	Joint Type Threaded	Installation depth: 77.0m			Total Length 77.0m
Gravel Pakking	Origin Basaltic	Gravel Size ø 2-6mm	Location	Volume 2.50 m³	**Divelopment :**		Method Air	Duration 6Hs / SWL (m)	Discharge
Submersible pump :	Installation Date :								



SIMBOL:

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OP = observation pipe
G = Gravel
BS = Bentonite sealed

PC = PVC Casing
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P = Pump Position
B.P.=Bottom Plug

R M = Rotary with mud water
DTH = Drilled with air
DTH & Rotary with mud water

Site No. 29
Kunzila BH4

Well No.	Location	Coordinate (UTM)	Altitude	Town	Zone	State	Country
BH4	Kunzila			Kunzila	East Gojam	Amhara	Ethiopia

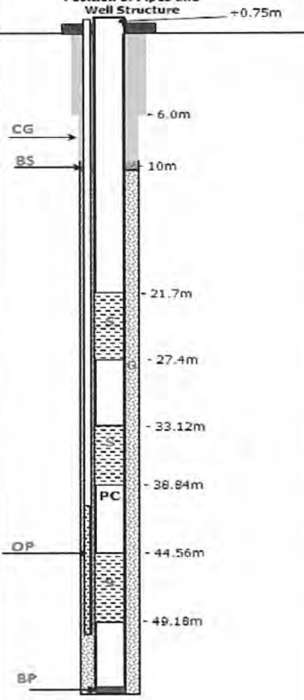
Date: from 15.06.2012	**to** 3/7/2012	**Drilling :**	Equipment Type TOP-300	Method DTH	Flow	Depth GL -62.0m	Depth	Depth	Final Depth GL -62.0m
Casing Type : PVC	Size 6"	Inside Dia. 150.0mm	Outside Dia. 169.0mm	Joint Type Screw	Installation depth: +0.75-21.68	-27.4 - 33.12	-38.84 - 44.56	-50.28 - 56	Total Length 39.6m
Screen Pipe : PVC	Material 6"	Diameter 150.0mm	Silot Size 1.0mm	Open Rate 10%	Joint Type Screw	Installation depth: -21.67 - 27.4	-33.12 - 38.84	44.56 - 50.28	Total Length 17.2m
Observation Pipe	Material GS	Diameter 3/4"	Silot Size	Open Rate	Joint Type Threaded	Installation depth: 52.0m			Total Length 52.8m
Gravel Pakking	Origin Basaltic	Gravel Size ø 2-6mm	Location	Volume 2.50 m³	**Divelopment :**	Method Air	Duration 8Hs	SWL (m)	Discharge
Submersible pump :	Installation Date :								

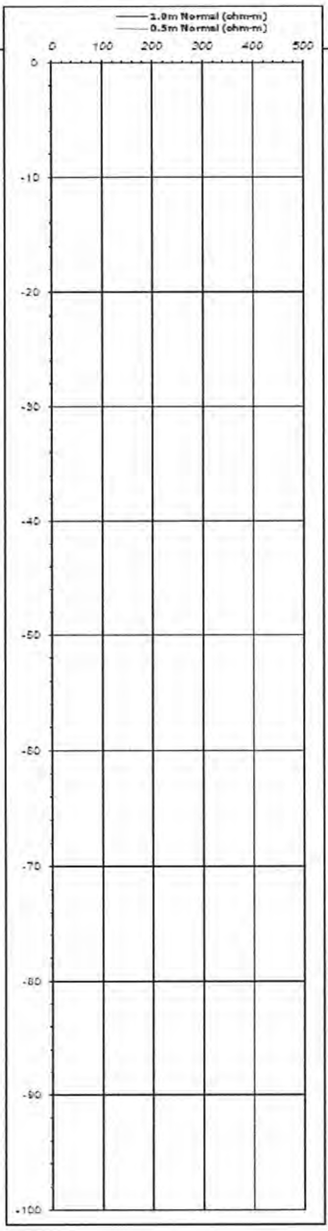
Bit Diameter (mm) and Method

TB RM : 305mm

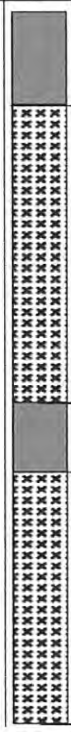
HB DTH 254mm

Position of Pipes and Well Structure





Well Column



Depth (m)	Lithology
-8m	Clay:- Reddish brown
-34m	Basalt:- weathered vescicular basalt (8m to 17m), red ash(scoria) with vesicular basalt (17 to 20m) and fractured basalt (20m to 34m) water bearing
-40m	Clay:- Reddish brown
-62m	Basalt:- Highly weathered and disintegrated basalt with reddish brown clay (little water)

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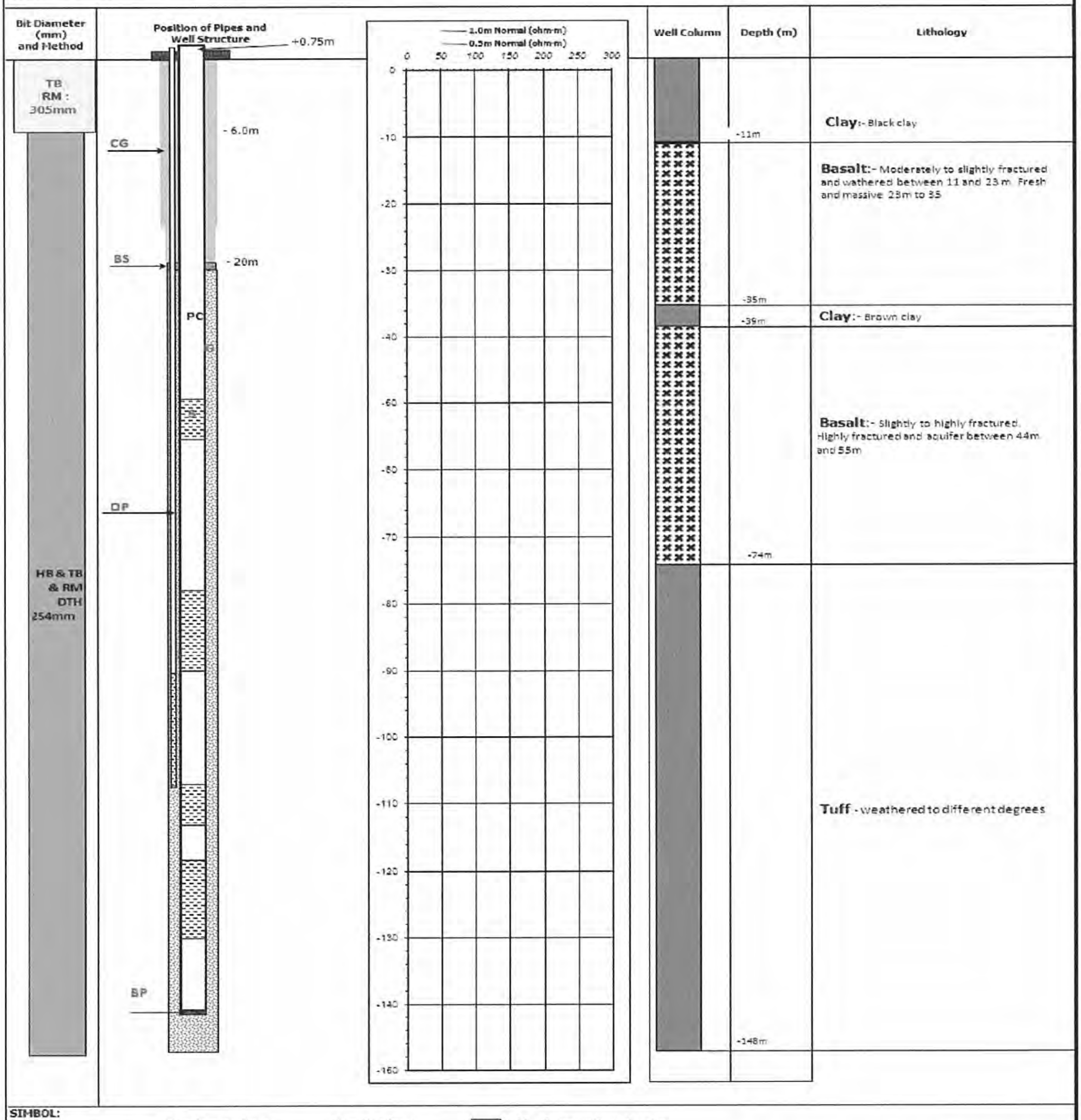
DTH = Drilled with air
DTH & Rotary with mud water

Lumame well #2 (BH2)

Well No. BH2	**Location** Lumame	**Coordinate (UTM)**		**Altitude**	**Town** Lumame	**Zone** East Gojam	**State** Amhara	**Country** Ethiopia
Date: from 15/01/2012 **to** 26/03/2012	**Drilling:**	Equipment Type TOP-300	Method DTH	Flow	Depth GL -147.0m	Depth	Depth	Final Depth GL -147.0m
Casing Type: PVC	Size 6"	Inside Dia. 150.0mm	Outside Dia. 169.0mm	Joint Type Screw	Installation depth: +0.75-49.98	-55.7 - 78.58 -90 - 107.18	-112.9 - 118.62 -130 - 141.5	Total Length 107.2m
Screen Pipe: PVC	Material 6"	Diameter 150.0mm	Slot Size 1.0mm	Open Rate 10%	Joint Type Screw	Installation depth: -49.98 - 55.7 -78.58 - 90	-107.18 - 112.9 -118.62 - 130	Total Length 34.3m
Observation Pipe	Material GS	Diameter 3/4"	Slot Size	Open Rate	Joint Type Threaded	Installation depth: +0.75-107.25		Total Length 109.0m
Gravel Pakking	Origin Basaltic	Gravel Size ø 2-6mm	Location	Volume 3.0 m³	**Divelopment:**	Method Air	Duration 20Hs / SWL (m)	Discharge
Submersible pump:	Installation Date:							



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DTH & Rotary with mud water