13th IWA
Specialized Conference on
Small Water and Wastewater
Systems

5th IWA
Specialized Conference on
Resources-Oriented Sanitation

THE AMERICAN UNIVERSITY IN CAIRO
الجامعة الأمريكية بالقاهرة

SERVING THE UNSERVED

A Sustainable Sanitary System to Serve the Remote and Deprived Hamlets

By

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Outline

1) Introduction
2) Problem Identification
3) Solution Design
    1) 1st Solution
    2) 2nd Solution
4) Conclusion
5) Recommendation

INTRODUCTION

- Focusing on Hamlets - less than 5000 capita-
- 3170 Village & 26,540 hamlets without proper wastewater system

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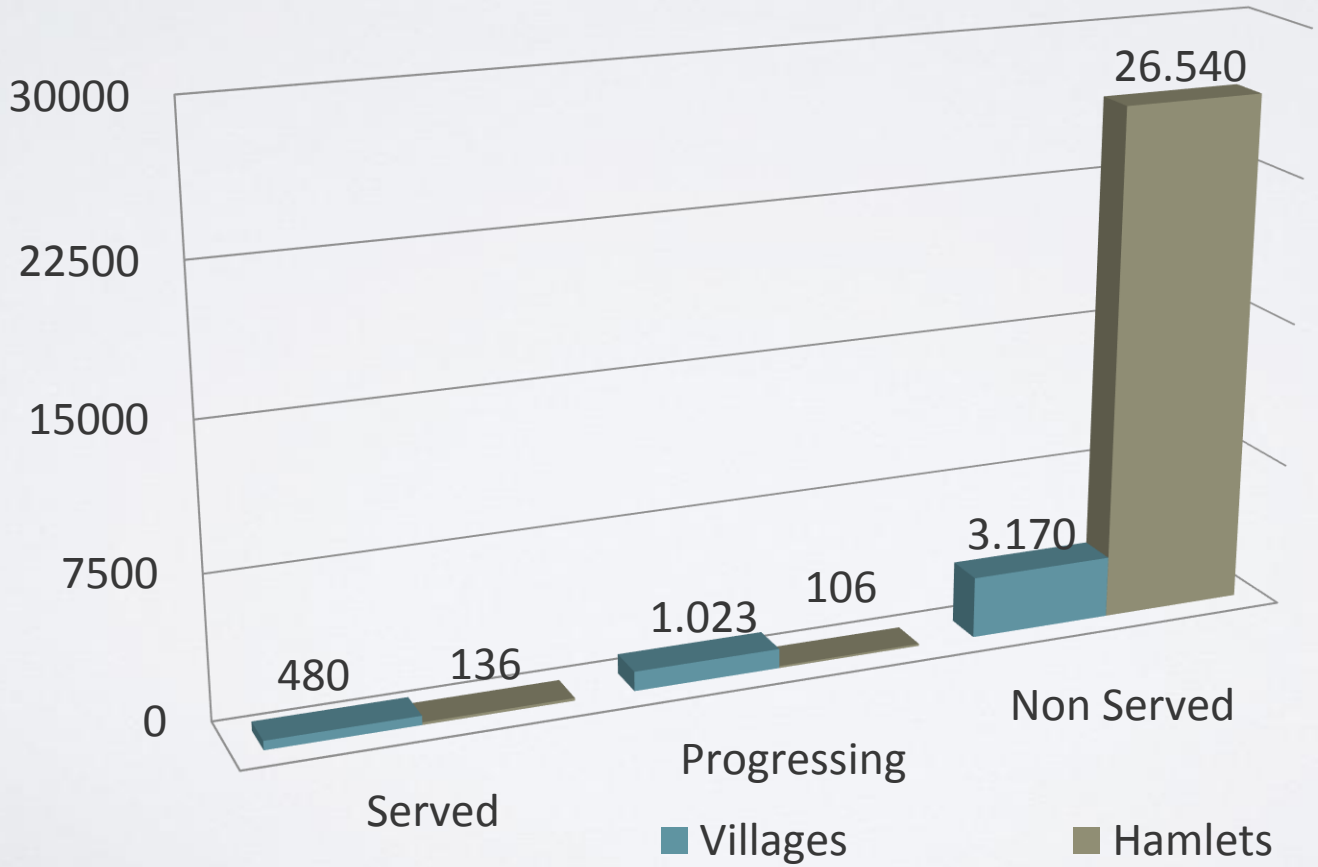
50,000,000 People



Problem Identification

- Centralized System
  - High Cost Erection and Maintenance
  - Less beneficiaries
  - Lack of Skilled Labor
- Open Disposal Trenches
  - Energy Shortage
  - Contaminate and increase groundwater table
  - Threats health and surrounding environment

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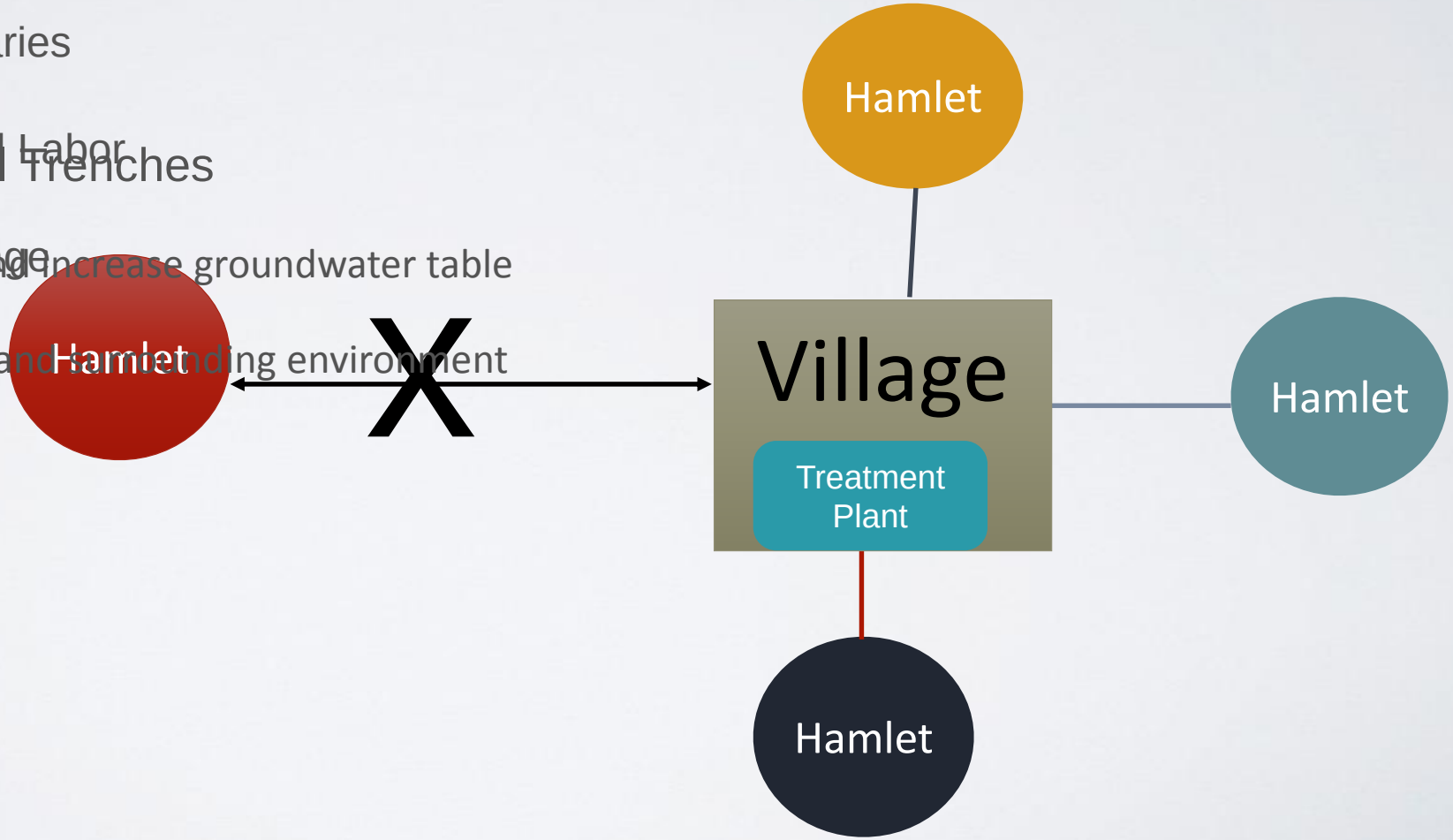

Design of small scale and Sewage Collection system for Hamlets in Egypt

DESIGN REQUIREMENTS

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- Cost Effective
- Low Energy Consumption
- Sustainable System and Environmentally Friendly
- Low Maintenance

PROTOTYPE HAMLET

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- Al Gozaira, Ismalia Governorate
- Surrounded Two Water Bodies
  - Al Rayah Drain
  - Irrigation Tertiary Canal
- Current Population 1,138 Capita
- Total Area 100,000 m2
- Normal Growth Rate 3.5%
- Sewage Flow is 85 l/c/d

Tackling The Problem

- Adequate Systems

1. Conventional System
2. Shallow System
3. Septic Tank

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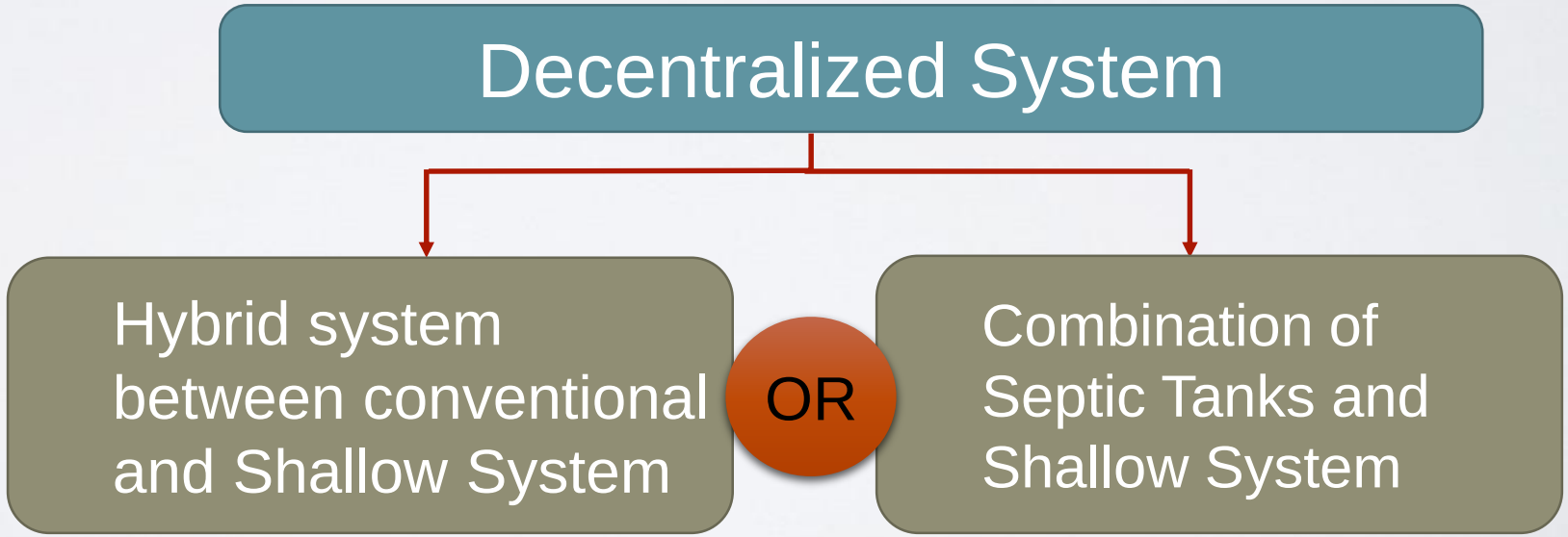

SOLUTION DESIGN CRITERIA

Criteria	Conventional System	Shallow System	Alternative Solution With Septic Tank
Pipes Alignment	Middle of the street	Middle of the Street	Middle of the Street
Min. Street Width	More than 3 m	Less than 3 m	Any
Min. Diameter	200 mm	150 mm	50 mm
Min. Cover	1 m	0.5 m	0.5 m
Min. Slope	3.25 m/km	3.5 m/km	0 m/km
Min. Velocity	0.6 m/s	0.6 m/s	-
Max.Velocity	2.5 m/s	2.5 m/s	2.5 m/s
Pipes Connection	Manhole	Inspection Chamber	Inspection Chamber and Inspection Ports

1st Solution: Combination between Shallow system and Conventional System

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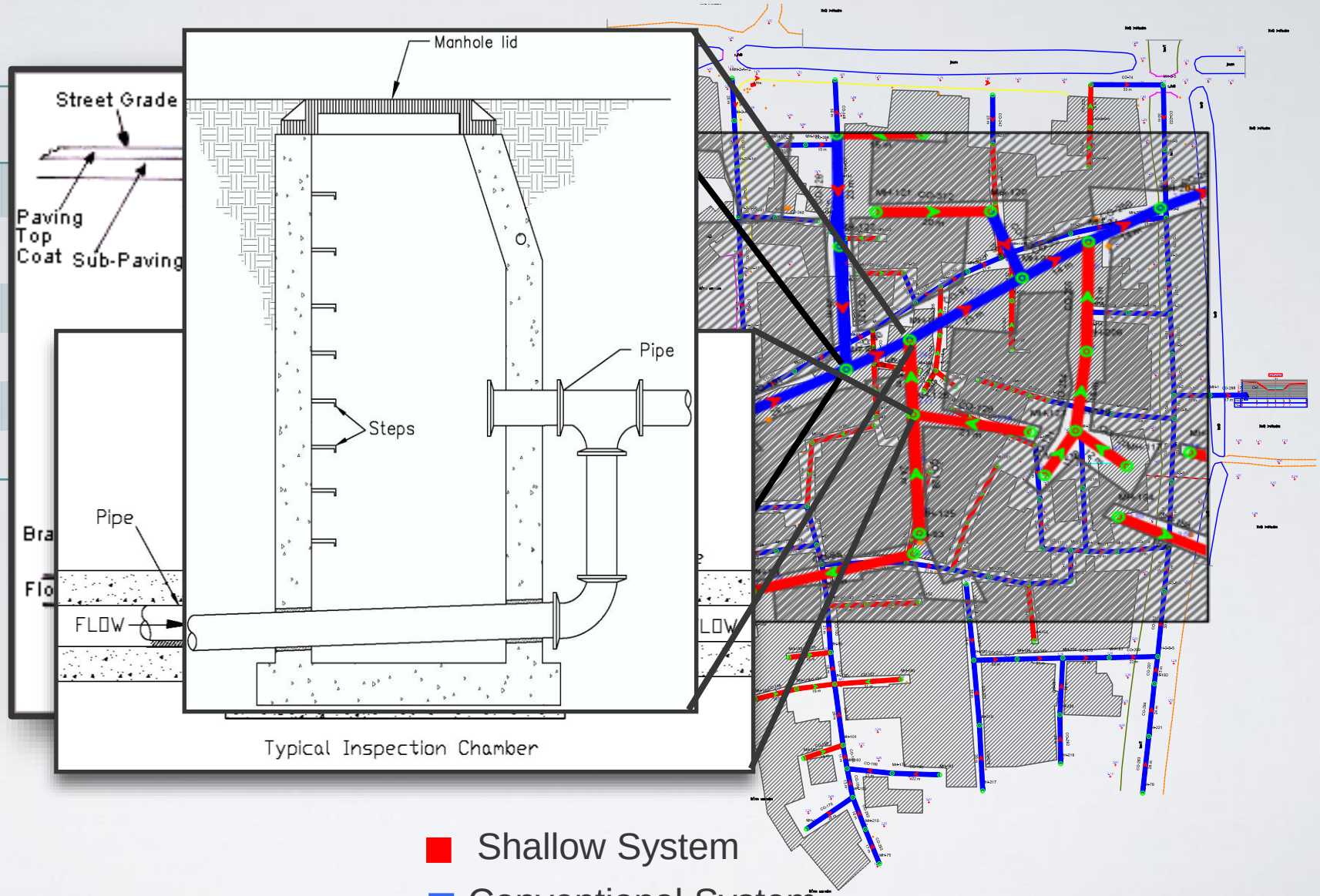
Criteria
Min. Street Width
Min. Diameter
Min. Cover
Min. Slope
Min. Velocity
Max.Velocity



1st Solution: Combination between Shallow system and Conventional System

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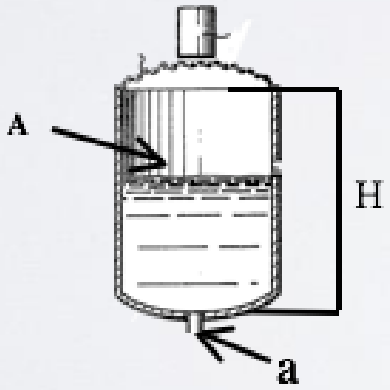
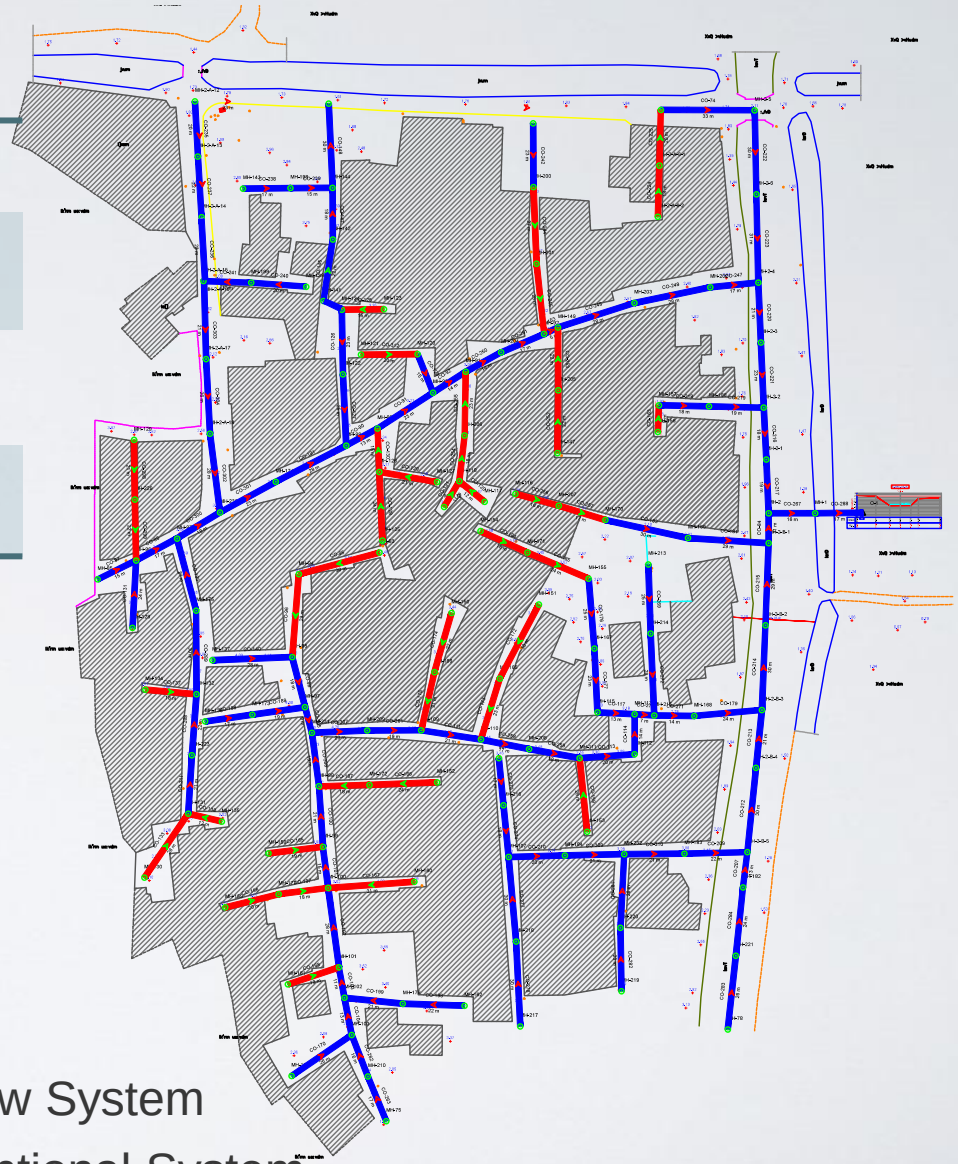
Diameters	150 mm for the shallow & 200 mm for the conventional
Covers	0.5 to 1.5 in Shallow & 1 m to 5 m for Conventional
Velocities	0.29 m/s to 0.91 m/s in all the system
Slopes	5 to 20 m/km





Shallow System

Conventional System

2nd Solution: Combination of Septic Tanks and Shallow System

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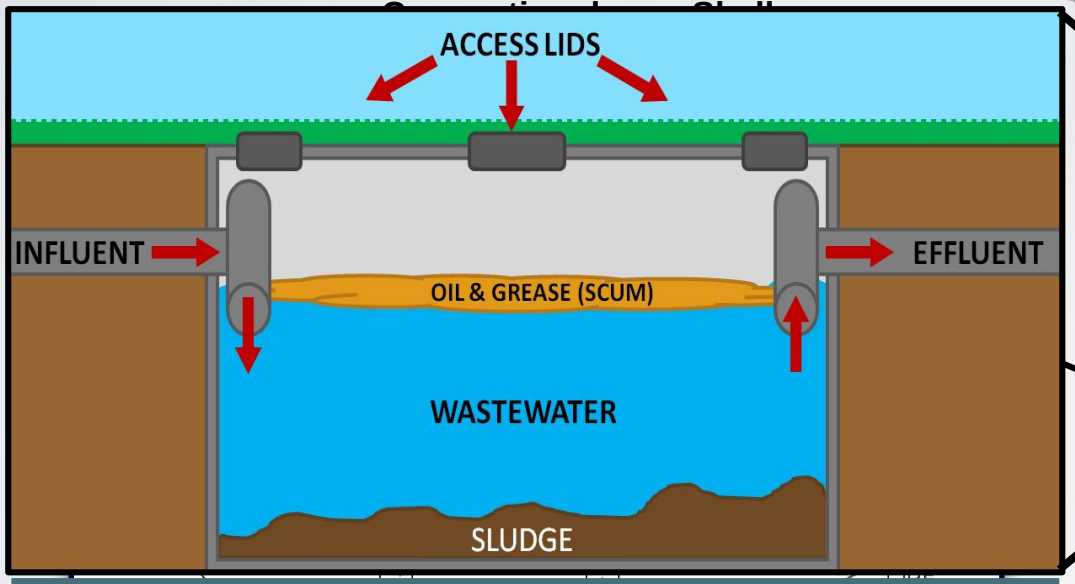
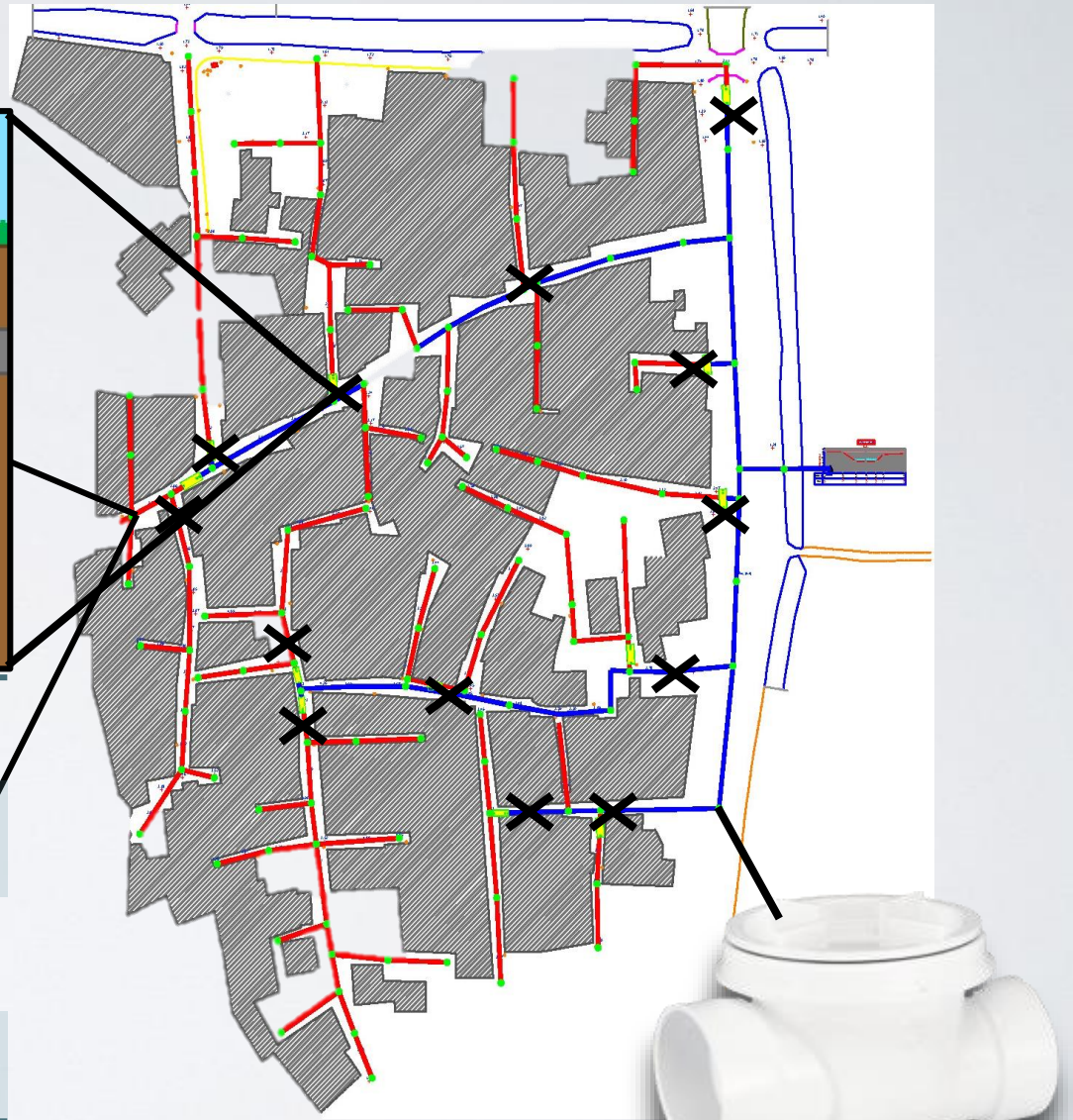


Diameters	150 mm for the shallow & 50, 100 & 150 mm for Septic
Covers	0.5 to 1.5 m in the shallow and 1 to 3.5 m in the Septic
Velocities	0.3 m/s to 1.95 m/s in all the system
Slopes	3.25 to 20 m/km



- Shallow System
- 50 – 100 – 150 mm

COST ANALYSIS

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Solution 1 - Shallow and Conventional System			
Name	**Quantity**	**Unit Cost**	**Cost**
150 mm Pipes	581 m	EGP400.00	EGP232,400.00
200 mm pipe	2279 m	EGP500.00	EGP1,139,500.00
Inspection Chamber	28	EGP800.00	EGP22,400.00
Manholes	75	EGP3,000.00	EGP225,000.00
Drop Manholes	9	EGP5,600.00	EGP50,400.00
Excavation	2008 m^2	EGP19.00	EGP38,152.00
Total Cost	**EGP1,707,852.00**		

Solution 2 - Alternative System			
Name	**Quantity**	**Unit Cost**	**Cost**
50 mm Pipes	946 m	EGP200.00	EGP189,200
100 mm pipe	405 m	EGP300.00	EGP121,500
150 mm pipe	1470 m	EGP400.00	EGP588,000.00
Septic Tanks	13	EGP16,023.00	EGP208,299.00
Inspection Chamber	122	EGP800.00	EGP97,600.00
Inspection Ports	17	EGP300	EGP5,100
Excavation	1718	EGP19.00	EGP32,642.00
Total Cost	**EGP1,242,341.00**		

CONCLUSION

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2nd solution is Efficient and Effective solution for hamlets in Egypt, due to:

- Cost Effective
- Low Energy Consumption
  - Gravity Sewer
- Sustainable System and Environmentally Friendly
  - Effluent Reuse in Agriculture as fertilizers
- Low Maintenance
  - Septic Tank de-suldged every 6 month to two years

Recommendation

- The System should be applied to solve the lack of sanitation in small communities
- One person costs around EUR 40 - 80 and can be served up to 10 years at least

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Thank you

Any Questions?