Pressure Sewer Solutions Pty Ltd

PLANNING, DESIGN & IMPLEMENTATION OF PRESSURE SEWER

Our Understanding and Experience Provides Certainty

P.S. SOLUTIONS

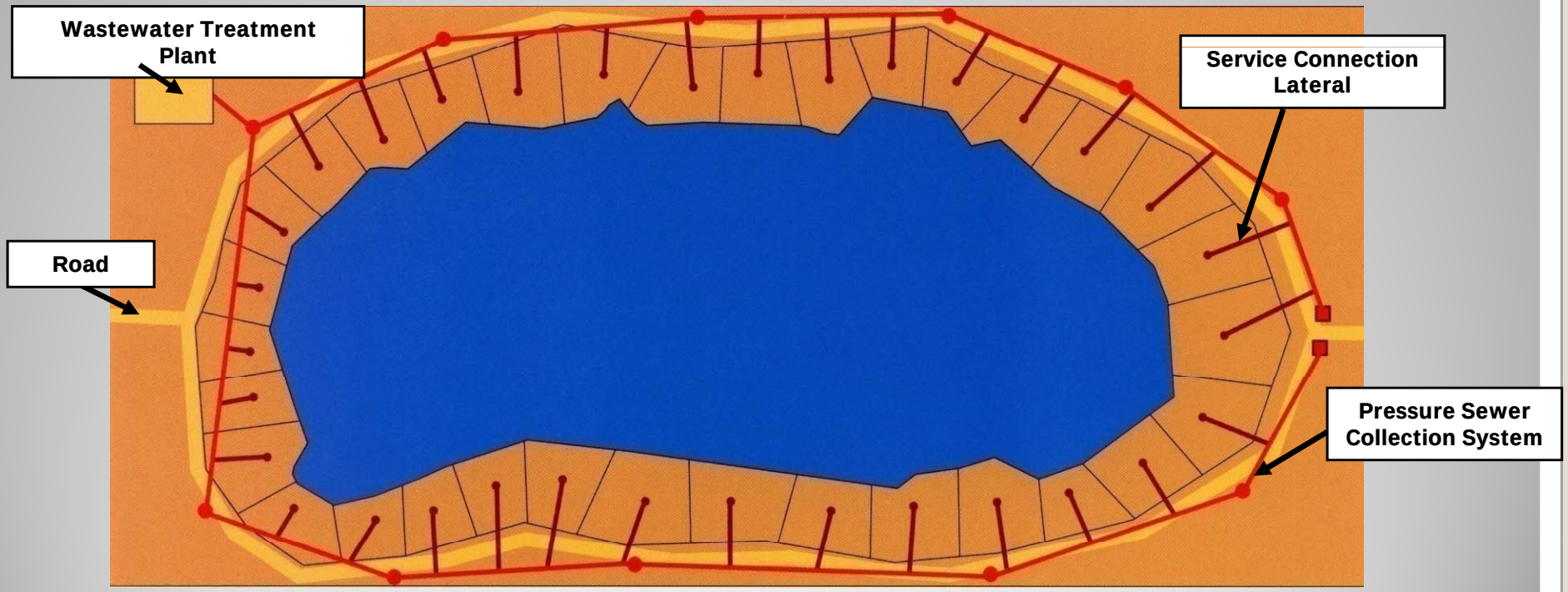
eone SEWER SYSTEMS

Pressure Sewer Design

The Key Elements Toward Saving Time & Money for Your Customers

Pressure Sewer

- A sanitary sewer system that utilizes a network of grinder pumps to transport wastewater through small diameter pipes to a collection and treatment system.
- A grinder pump is a submersible pump designed to reduce wastewater particulate to a slurry through the use of a grinding mechanism



Typical lakefront pressure sewer system

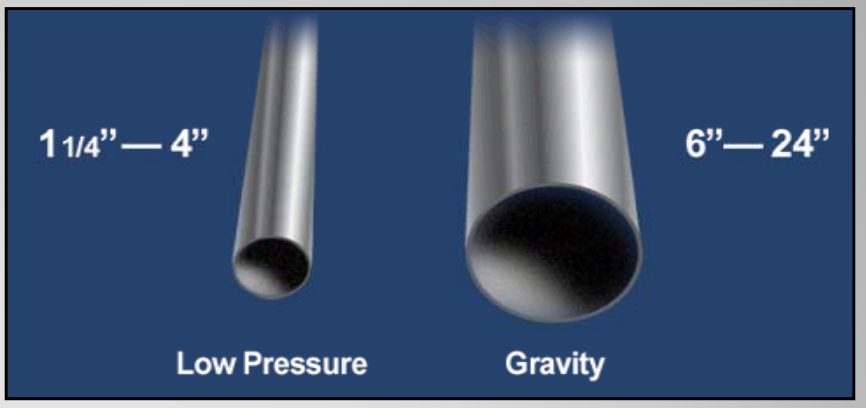
Gravity sewers require big equipment, major excavation and lift stations

Pressure Sewers do not rely on limitations of gravity

- Wastewater is pumped through small diameter pipes following the contour of the land, set in shallow trenches just below the frost line
- Lift stations are minimized or eliminated in virtually every installation
- Waste treatment plants for these systems are less costly to build since the system is closed to infiltration and solid sizes and minimized.

Infrastructure Development Costs are Lower

- Major excavation is eliminated
- Labor and material costs can be dramatically reduced
- Environmental disruption and restoration are minimized
- Time to complete construction is reduced



Typical Pipe Size Ranges

Pressure Sewers Provide…

- An economical solution to geo-technically challenging environmental conditions where gravity sewers may be impractical if not impossible

- *Examples include*:
  - Rocky soil
  - Hilly terrain
  - Shallow bedrock
  - High water tables
  - Long flat terrain
  - Slow growth areas
  - Existing structures/roads

Pressure Sewers: A Proven Technology

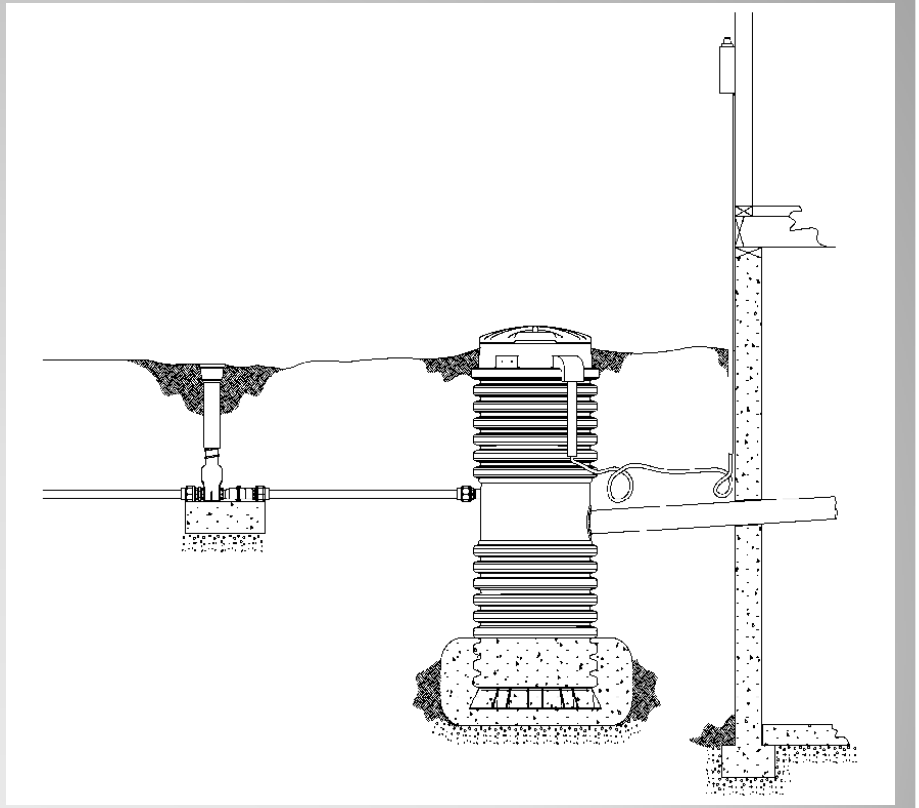
- First used in the early 1970's
- Provides daily service to millions of users worldwide
- Demonstrated excellent performance, high reliability and low Operating and Maintenance costs

Typical Residential Installation

- A grinder pump station is located in the yard or basement of each home
- Wastewater flows into the station from the building's sewer line (typically 4")
- The basin contains a grinder pump, level sensors, valves and discharge piping

Typical Residential Grinder Pump Site Components

- A pressure sewer collection line is laid along the edge of the roadway, following the contour of the land
- The pressure sewer collection line delivers the wastewater to a central treatment system, manhole, or force main
- Wastewater may be transported several thousand feet to a discharge point at a higher elevation



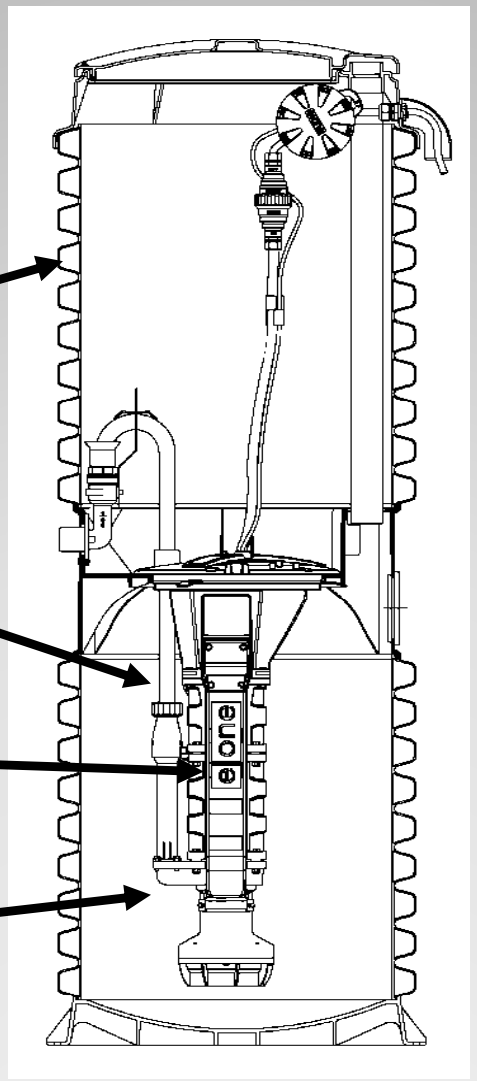
Residential Grinder Pump Package

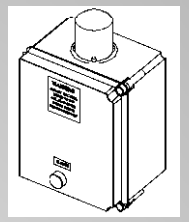
Basin

Piping / Valves

Level Sensors

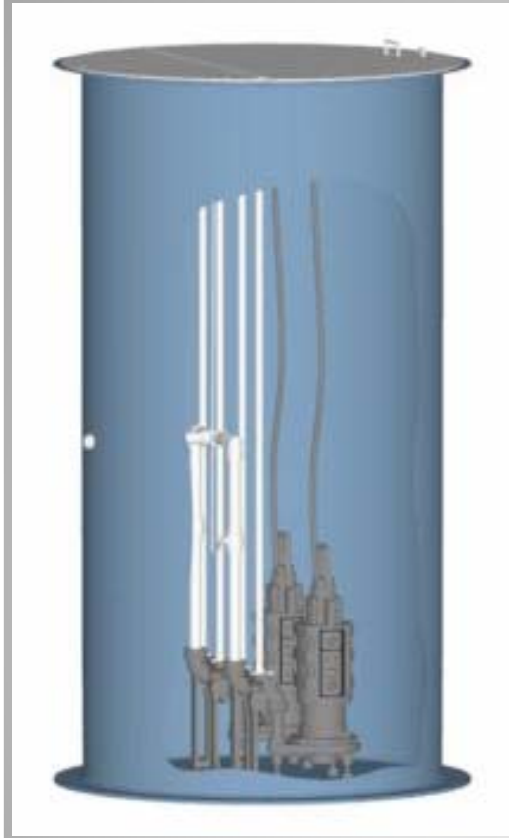
Grinder Pump





Pump Control
and/or Alarm Panel

Typical Commercial Station



- Larger pump station basin for added storage capacity
- Two submersible grinder pumps to provide redundancy
- The control panel will include an alarm and an alternator to run each pump every other cycle
- *Note:* Code requirements may be more stringent for commercial stations than for residential stations.

Operating costs

- Operating costs for a typical residential station can be less than $3.00 per month*
- ** Based on 10 cents per Kilowatt Hour and 300 Gallons per day*

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Pressure Sewerage Projects
A Selection of Design Issues

(Keep It Simple, PSS is Different, Not Difficult)

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Design Introduction

- Design considerations - ins and outs of design
- Performance profile a systems will achieve

Design Considerations

Design Parameters Development

- Masterplan layout development e.g. Existing and ultimate property numbers, Future Sewer Areas etc.
- Dwelling occupation profile e.g. Vacation houses
- Non residential loadings e.g. Commercial properties and point loads
- Storm allowance (I&I)
- Peak instantaneous flows determination methodology, average day peak and after power outage flows. Property discharge rate = 757 l/d/dwelling (~200 gal / day)

Design Considerations

Design Parameters Development (cont)

- System hydraulic analysis methodology and friction loss factors
- Downhill pumping considerations
- Air management (buoyancy and odor)
- Downstream capacity requirement for systems normal operation and after power outage flows
- Wastewater flow velocities
- Max pump TDH and pump product selection

Design Considerations

Site Considerations

- Environmental, cultural and geotechnical project issues
- Main locations and property easement issues
- Future mains extensions
- Electricity quality - low and high voltage

Design Considerations

Property Considerations

- Community management plan
- Property plumbing & electrical standards and upgrades
- Project connection rate e.g. backlog vs. development – long or slow connection period
- General trade waste issues e.g. Grease arrestors
- Swimming pool backwash

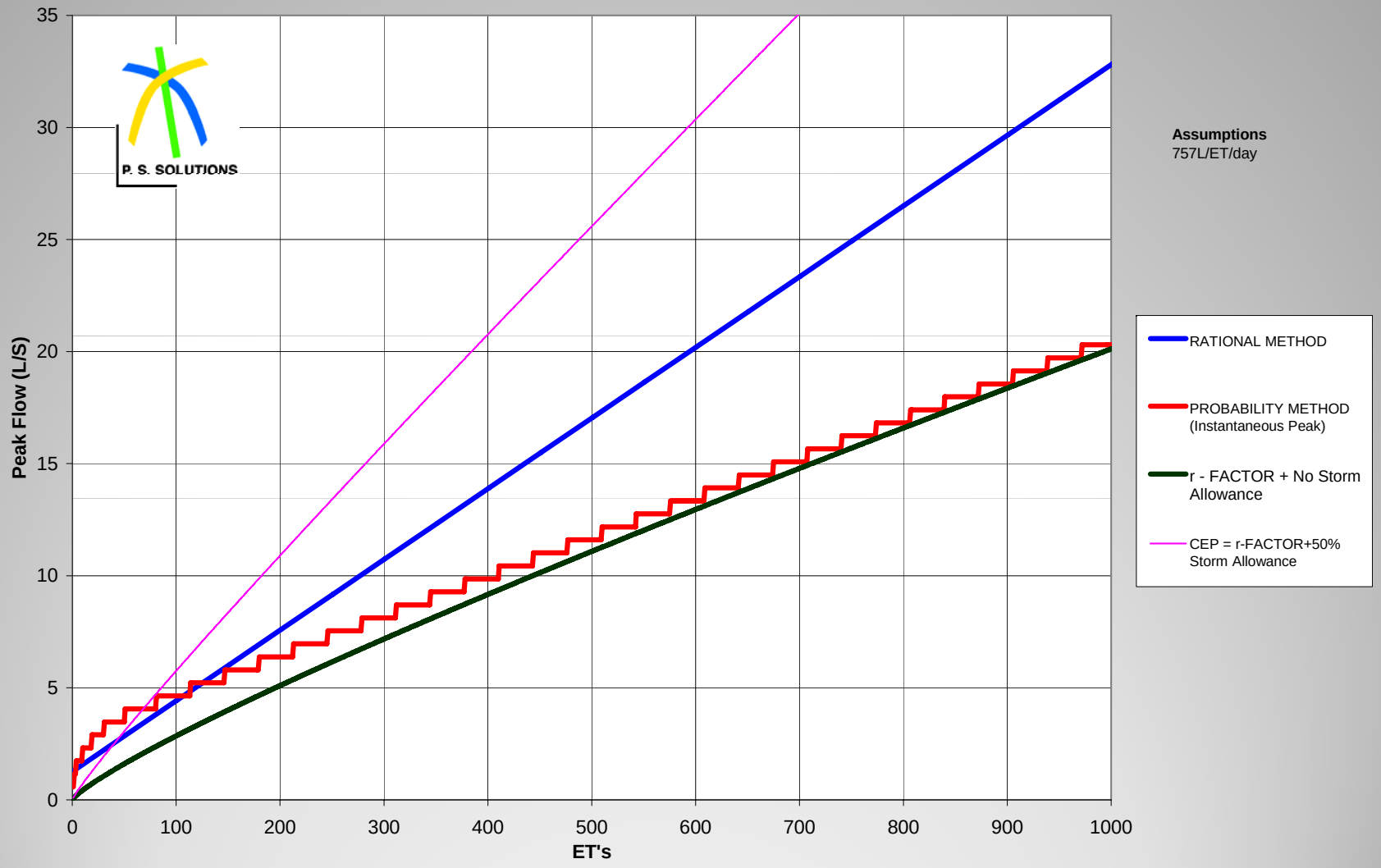
Design Considerations

Other Issues To Consider

- Construction Methodologies
- Construction Materials Selection
- Commissioning Plan
- Authorities standards, requirements and charges
- Systems operators criteria and service structure should be designed into the system

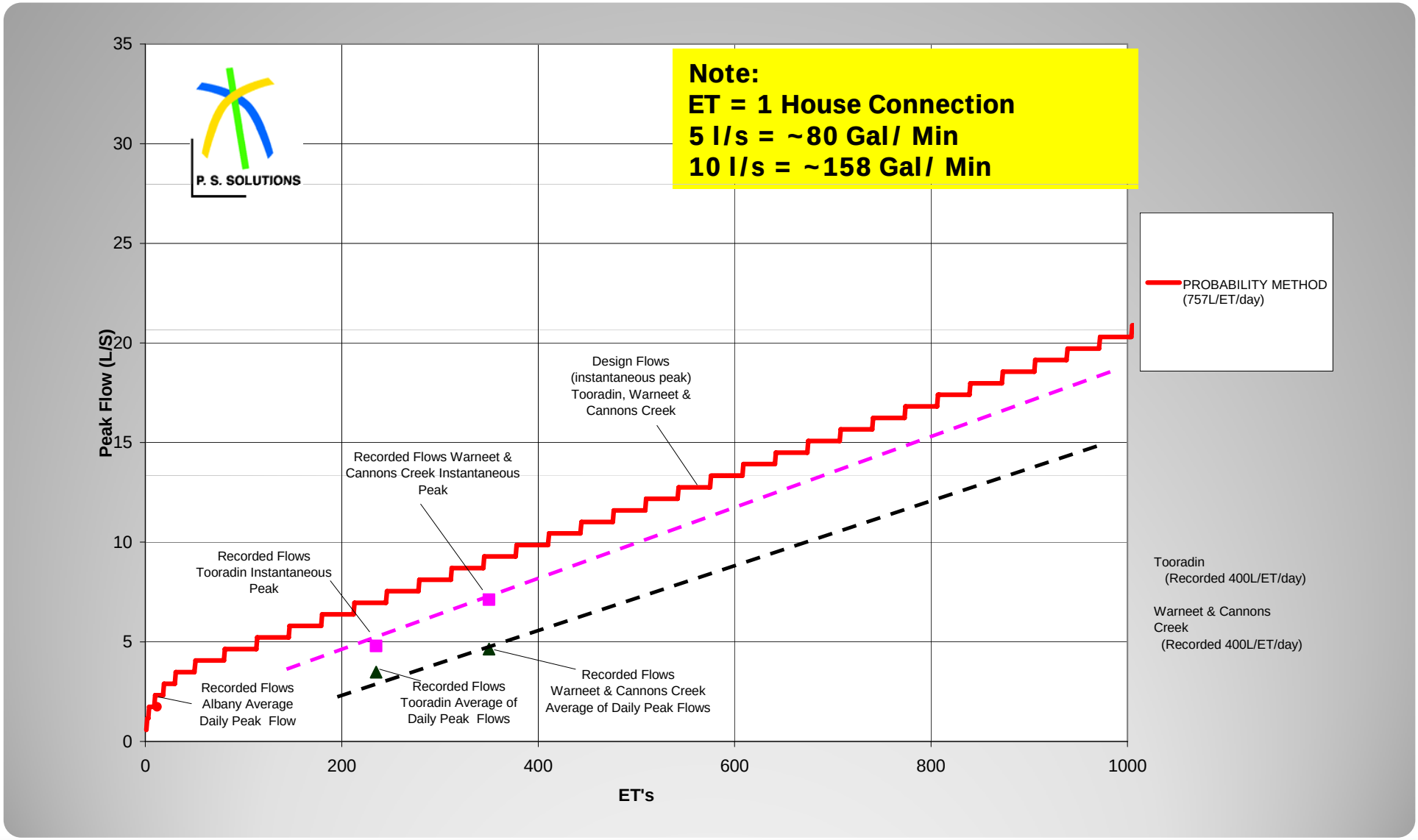
Peak Flow Calculation Methods

(Peak Instantaneous Flows Determination Methodology)



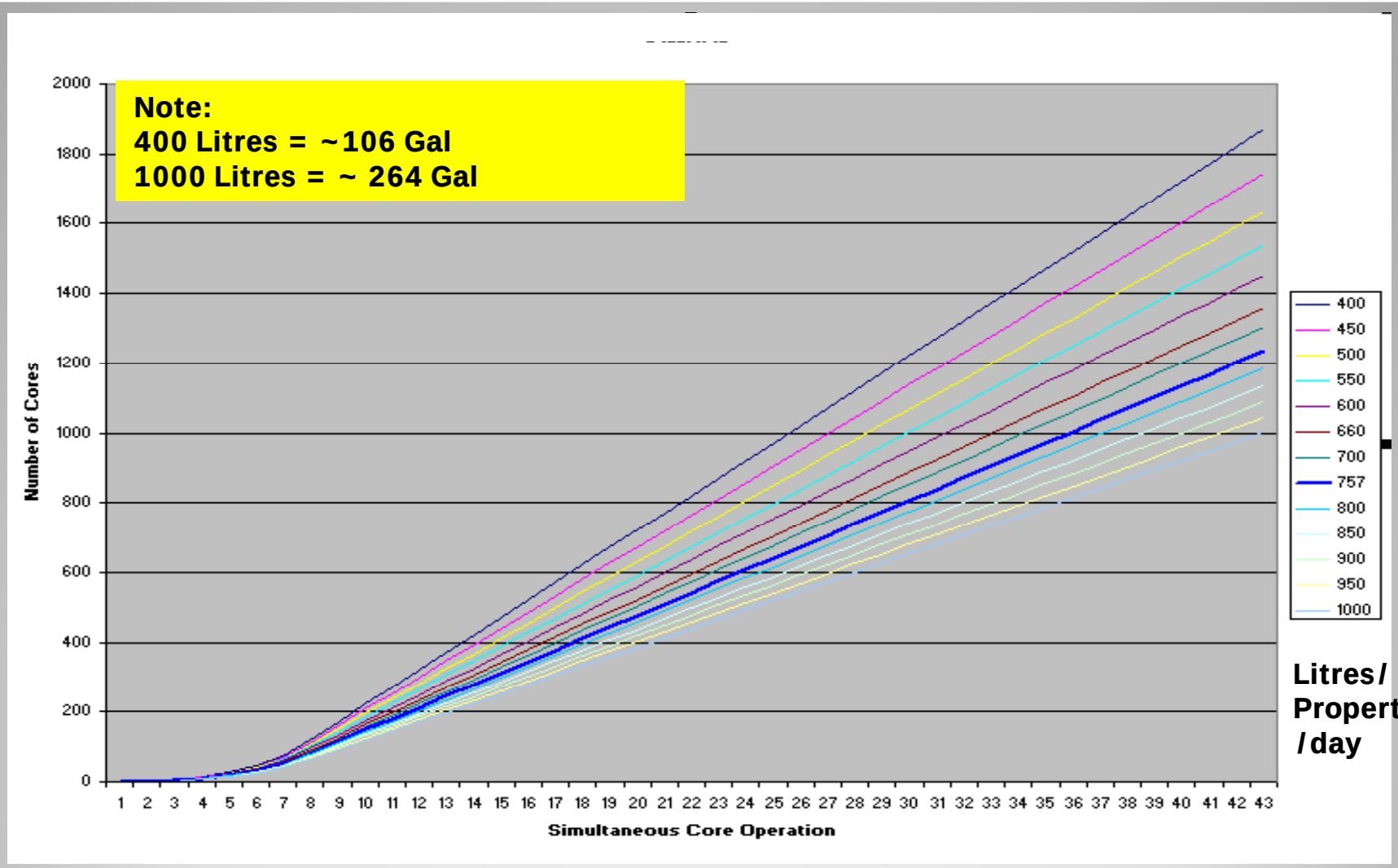
Sewage Flows

(Peak Instantaneous Flows Determination Methodology)



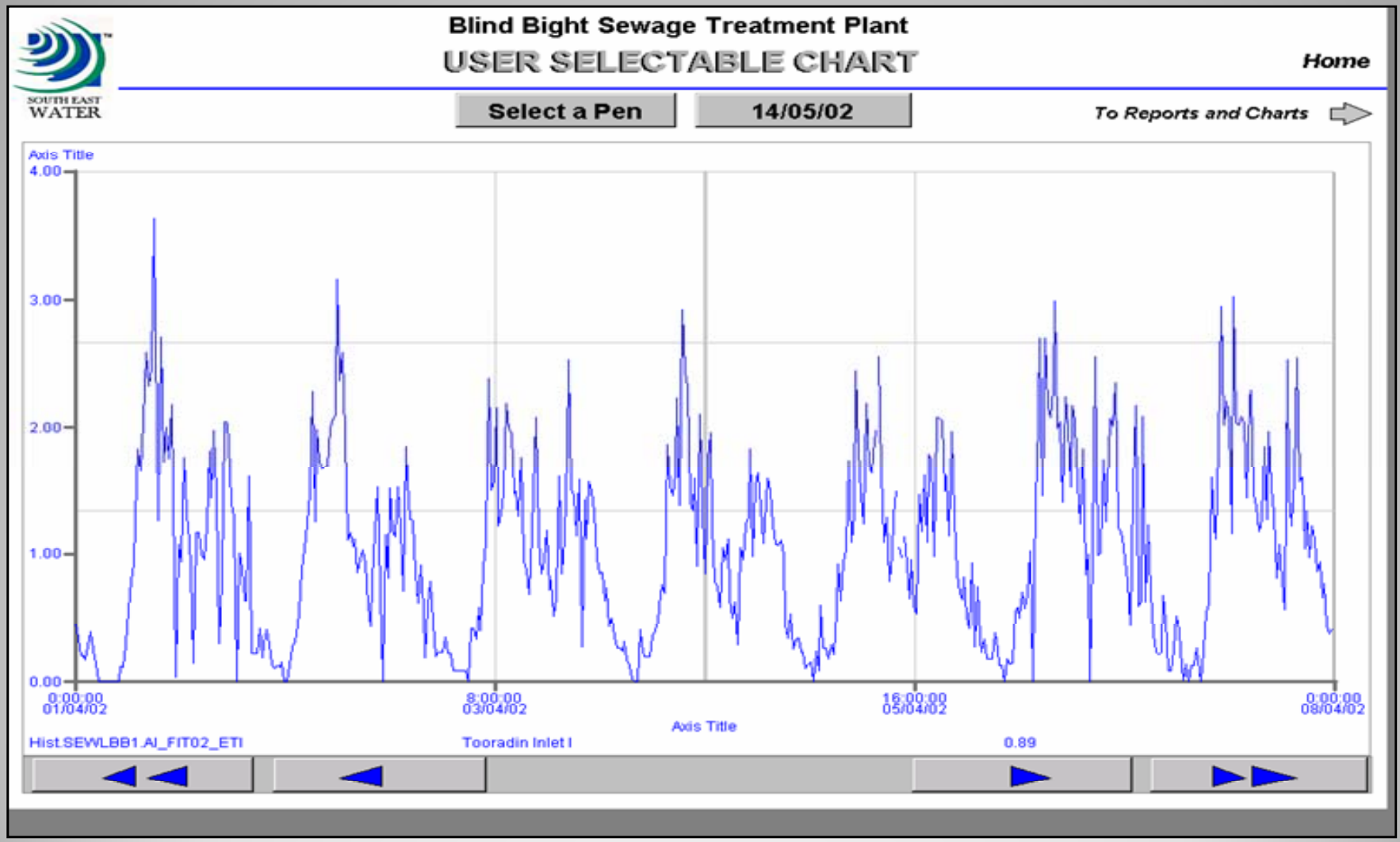
Pressure Sewer Solutions P/L
Peak Flow Calculation Method

(Peak Instantaneous Flows Determination Methodology)



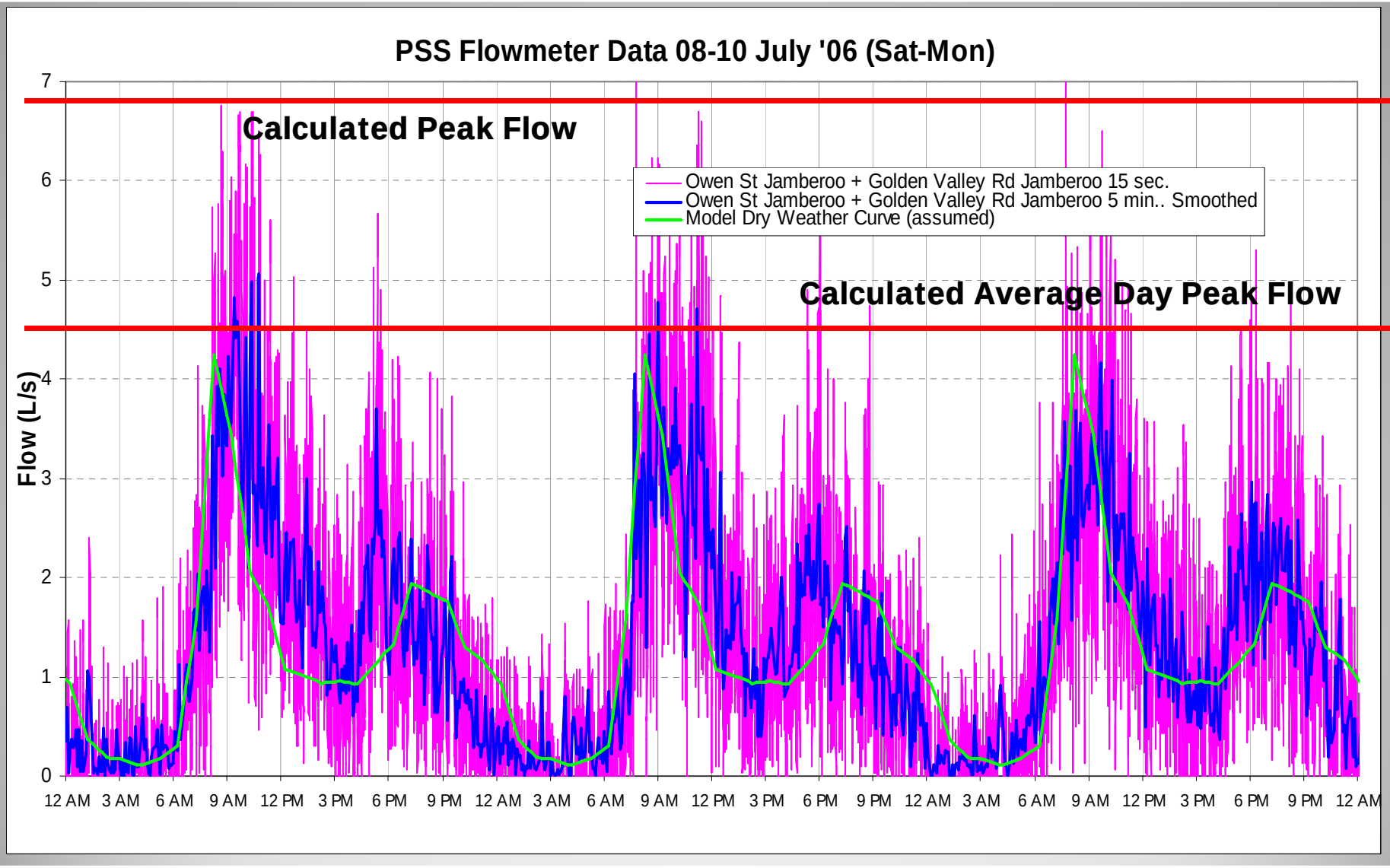
Weekly Flow to WWTP

(Downstream capacity requirement)

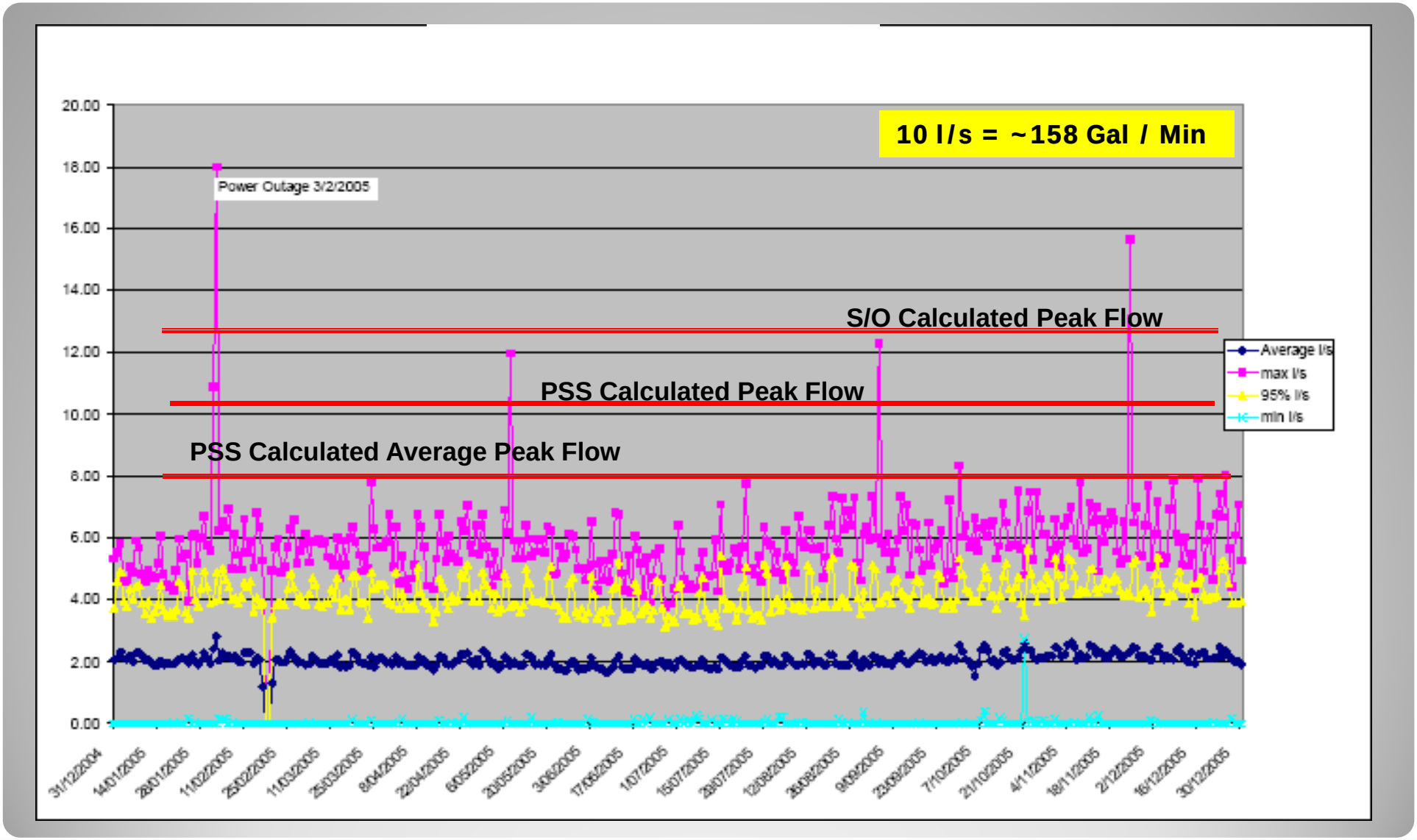


Suburban Community 3 Days of Flow

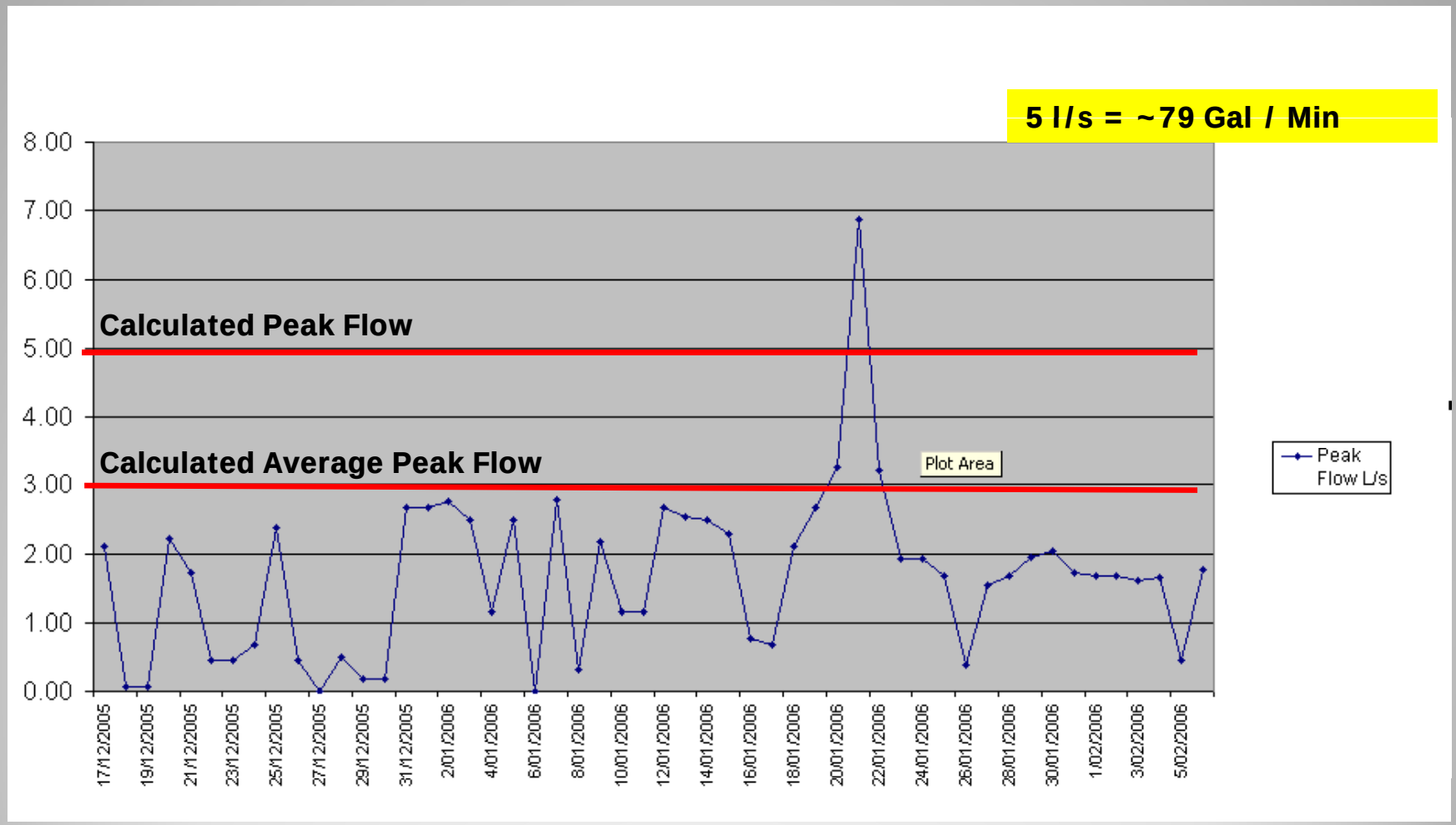
4 l/s = ~63 Gal / Min



Vacation Community A
12 Months of Flow Data



Vacation Community B
2 Months of Flow



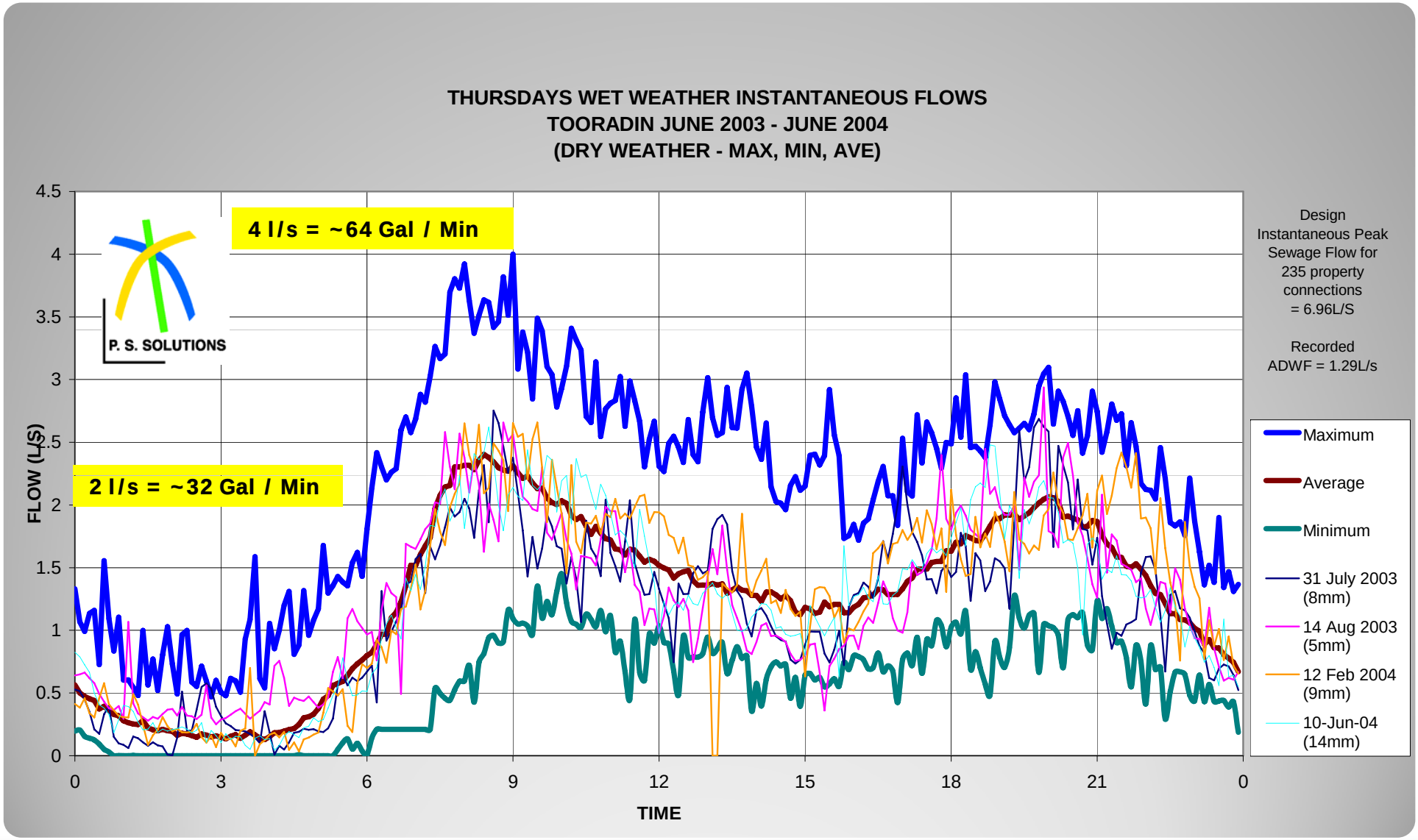
General Trade Waste Issues

- Food Shop - Wastewater pre treatment must be assessed.
- This existing food shop **grease arrestor** is too small therefore inadequate treatment for connection to any sewerage system and will shorten the life of your pump unit if connected.

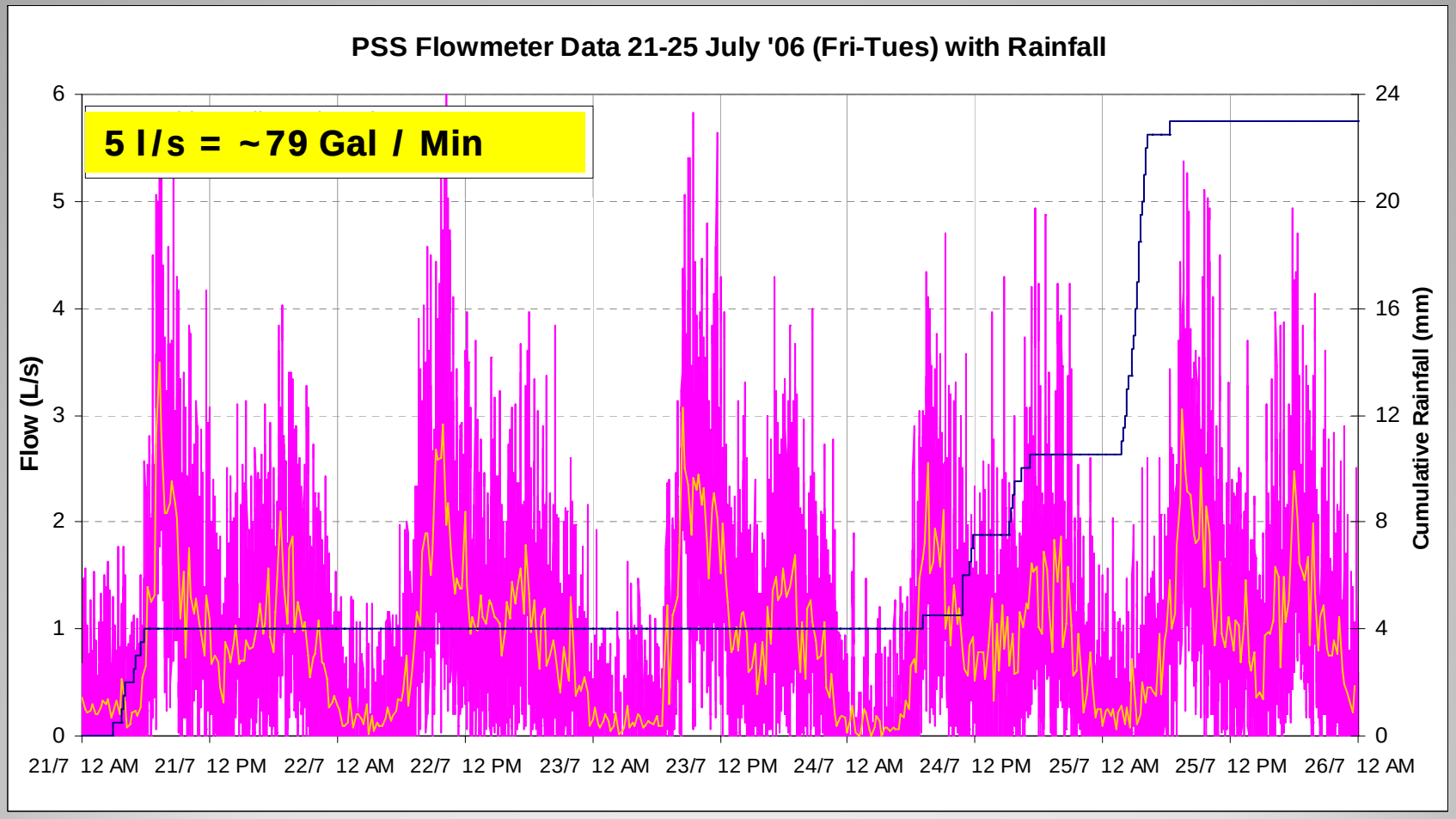
Inflow and Infiltration

- Does it happen in a pressure sewer system?
- How is it managed and eliminated?

Wet Flow – Does It Happen?

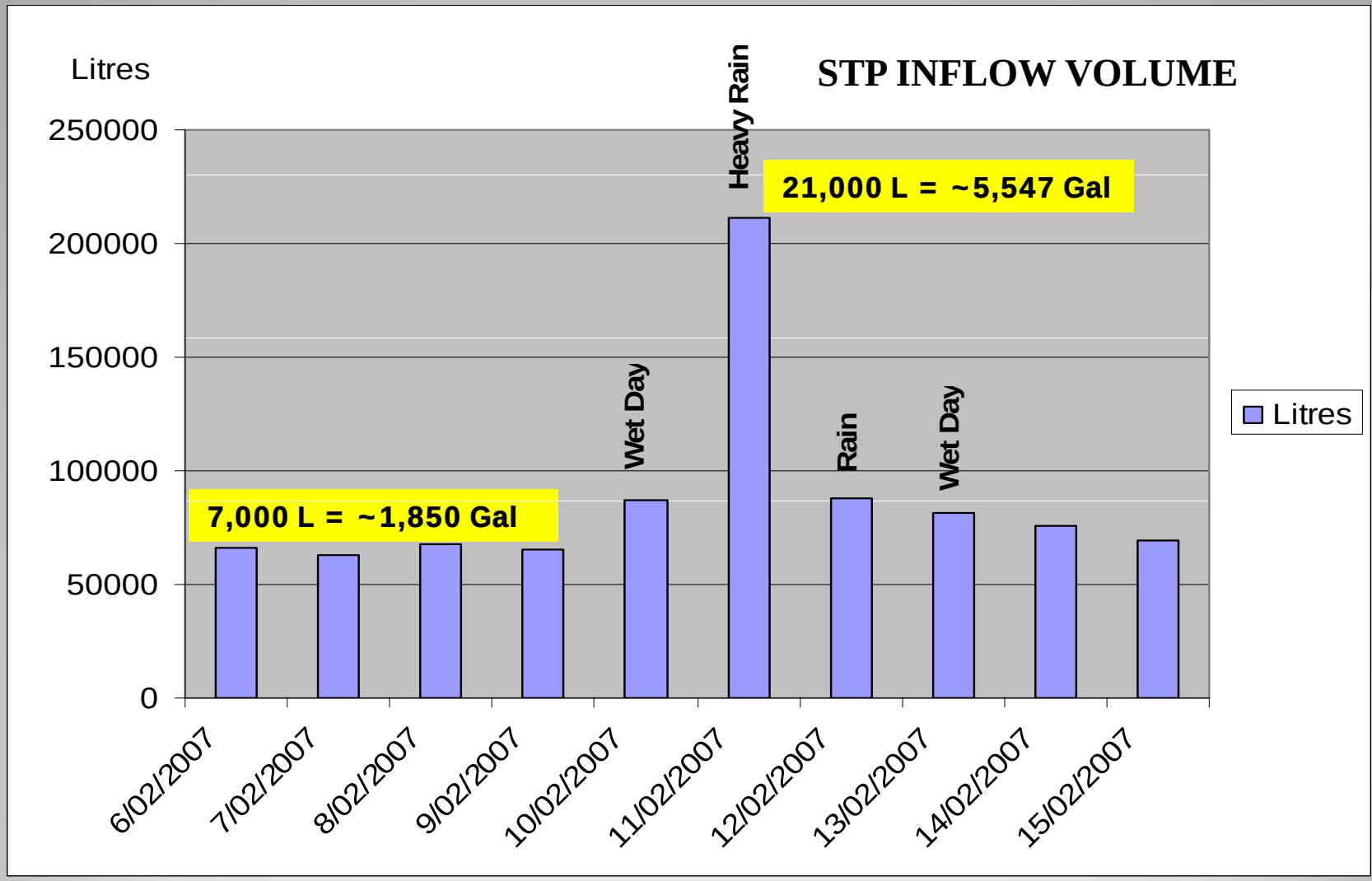


Wet Weather Flow



"Rainfall events graph indicates no noticeable increase in flows during rainfall. A check of the downstream transfer sewage pumping station showed that other larger rainfall events during the last half of 2007 did not show any noticeable wet weather flows" — 16/4/07 A. Bovis, Sydney Water Corporation.

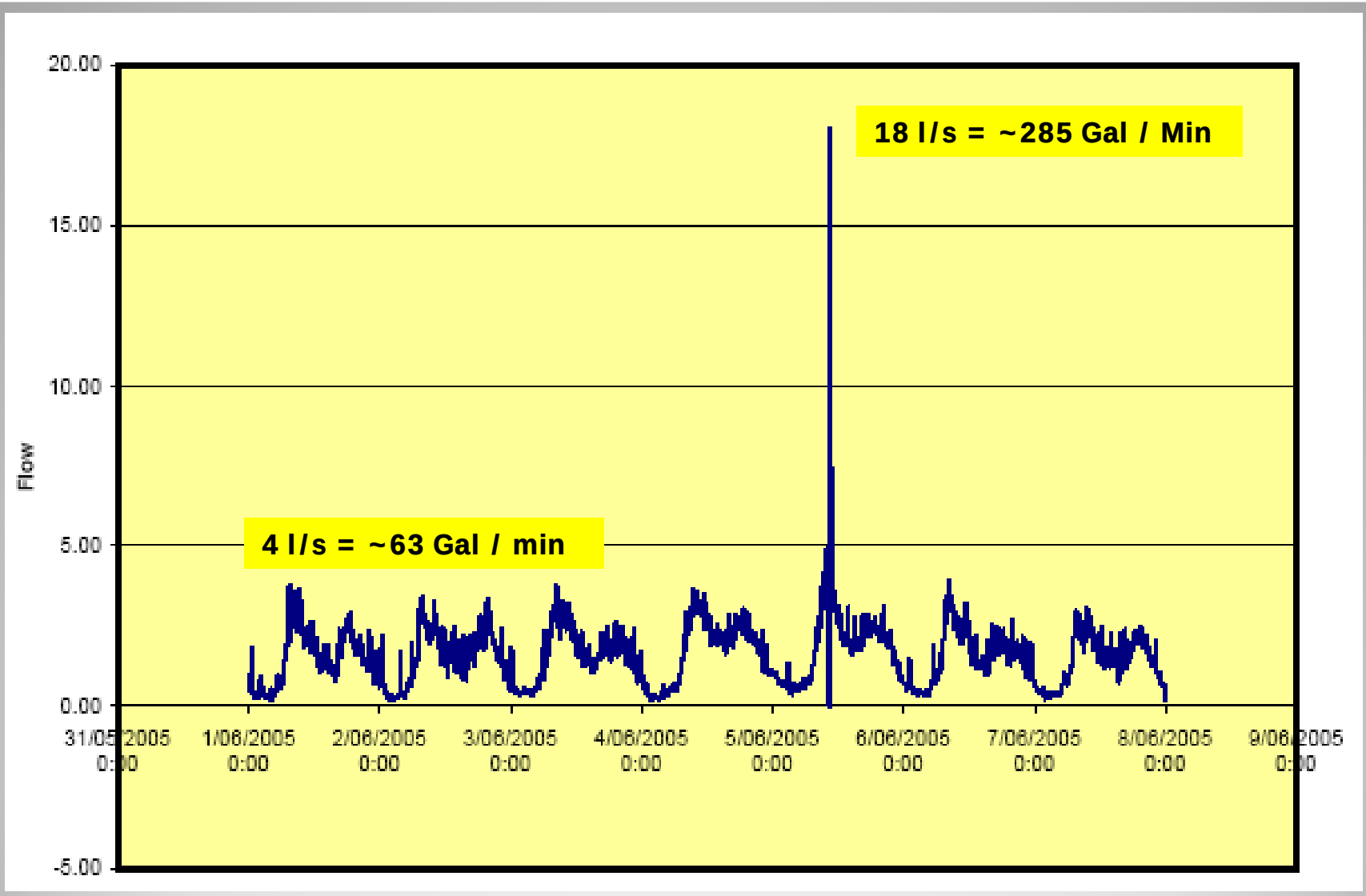
Wet Flow – Does It Happen?



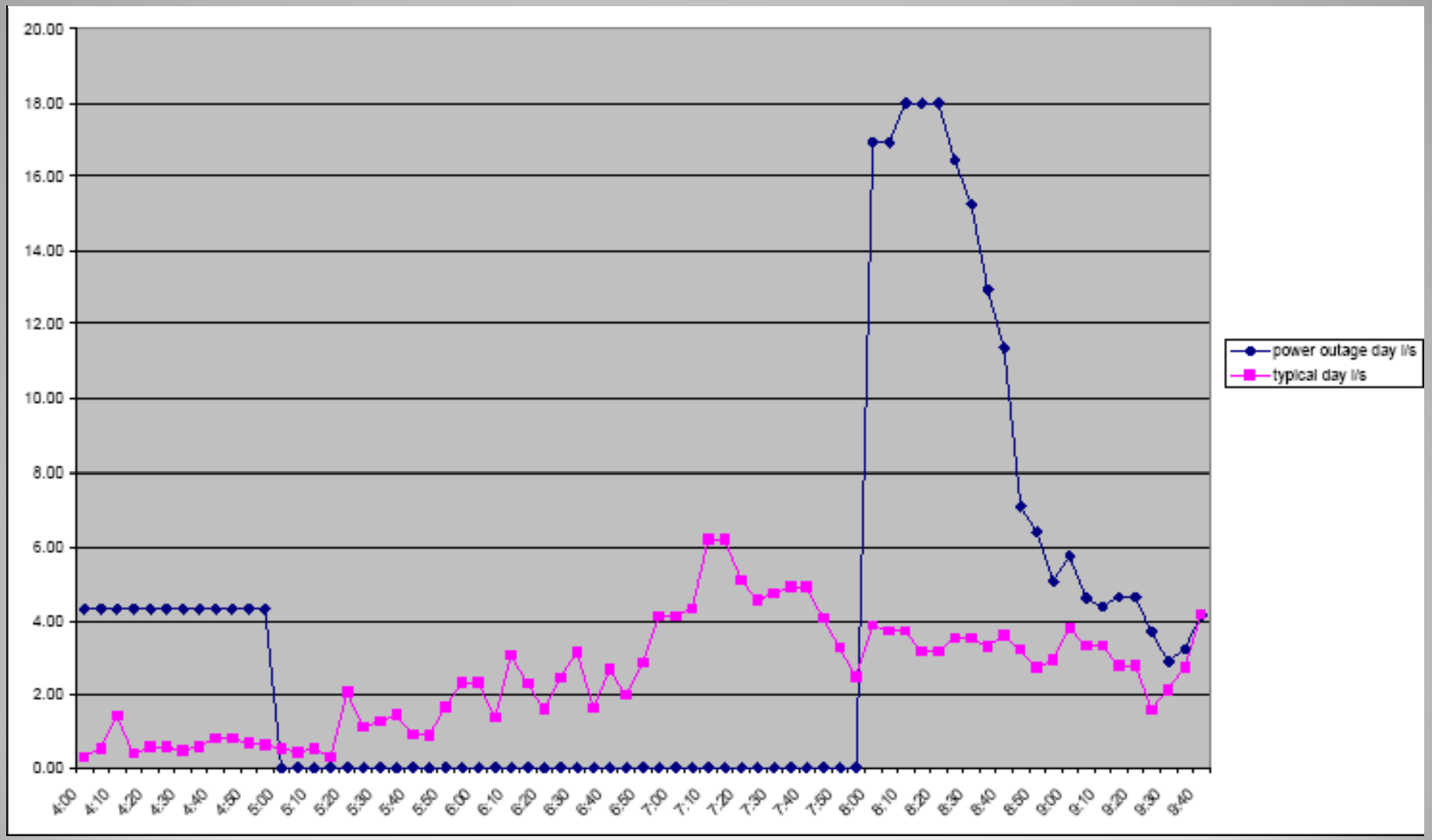
After Power Outage Flows

- What does it mean to a systems design and operation?

After Power Outage Flows



After Power Outage Flows



Air Management

- What is it?
  - Buoyancy Head
  - Moving and expelling air within the system

Moving Air In Pipes

(Downhill Pumping Considerations)

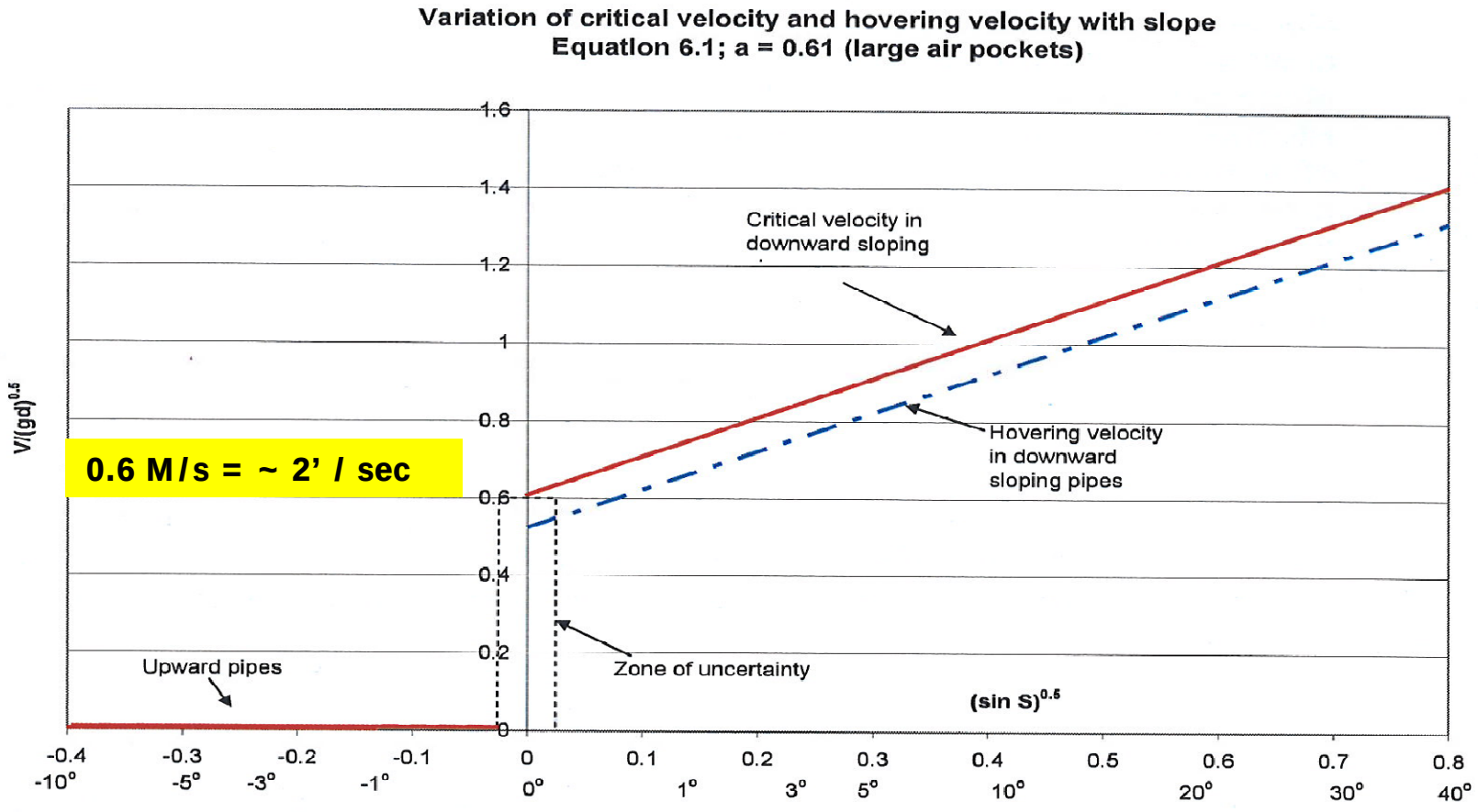


Figure 6.3 General variation of critical velocity with pipe slope

Referenced From Wallingford Institute Air in Pipes Study

Odor & Corrosion Issues and Control

Odor needs to be considered in the following context.

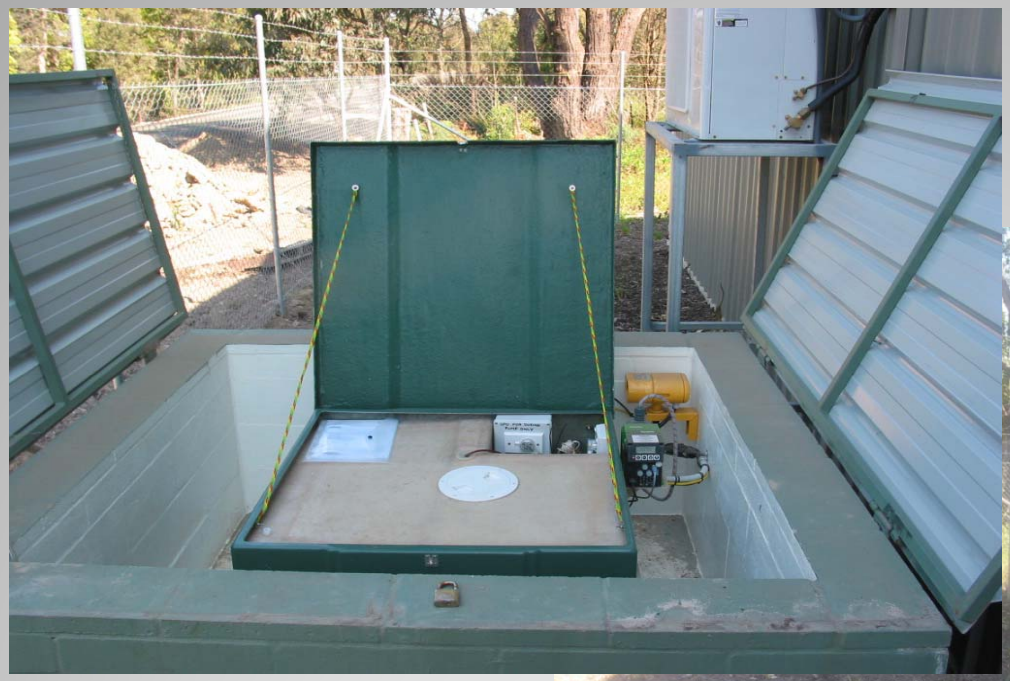
- Whilst sewerage is under pressure in the main odor will not be released.
- When the pressure line is discharged to the atmosphere (liquid and gas phase) hydrogen sulphide may be released.
- May be odorous and corrosive to system components.

Odor & Corrosion Issues and Control

- Methods of odor management involve the following:
  - Design system with short wastewater retention time in pipe
  - Discharge wastewater to location where odor wont be detected
  - Chemical dosing into the wastewater flow
  - Scrubbing the gas phase release or high level vent
  - Flushing water into the main
  - Selection of non-corrosive materials and protecting other surface structures

Odor Control Facility

Odor Control Facility



Air Scrubber

Conclusion

- Consider issues such as:
  - Peak wastewater flow calculation methods and understand where the systems performance boundaries are.
  - Type of projects e.g. urban residential, vacation community etc.
  - Storm allowance (I & I)
  - After power outage flows
  - Air management
  - Trade waste treatment

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