Why Redevelop Your Well and Why Specific Capacity?

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Contents

- Types of Common Water Well Designs
- Water Well Terminology/Specific Capacity
- Groundwater and Water Well Terms
- Groundwater Flow into the Well Screen
- Entrance Velocity
- Presentation Follows AWWA A100-06 Standard

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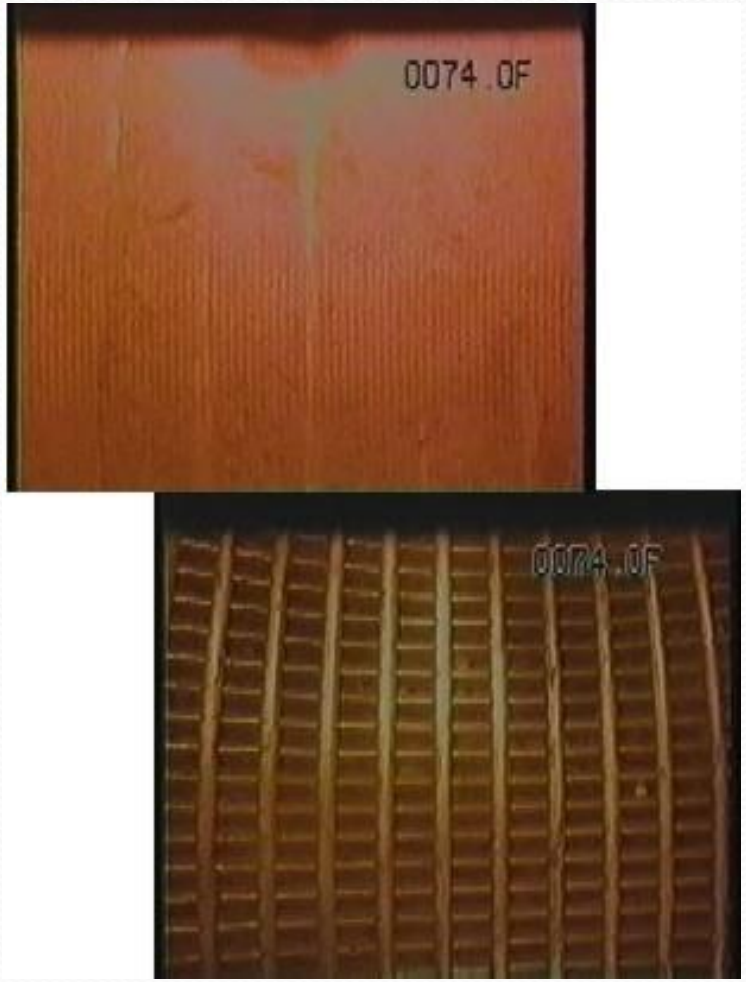
What is the Problem?

Before…



...After

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Water Well Design

Design of a Water Well Depends Upon:

1. Well location (Sect. 4.2);
2. Well materials (Sect. 4.3);
3. Proper installation (Sect. 4.7); and
4. Well development (Sect. 4.8).

Need to Achieve:

Efficient and Dependable Well with a Long Service Life

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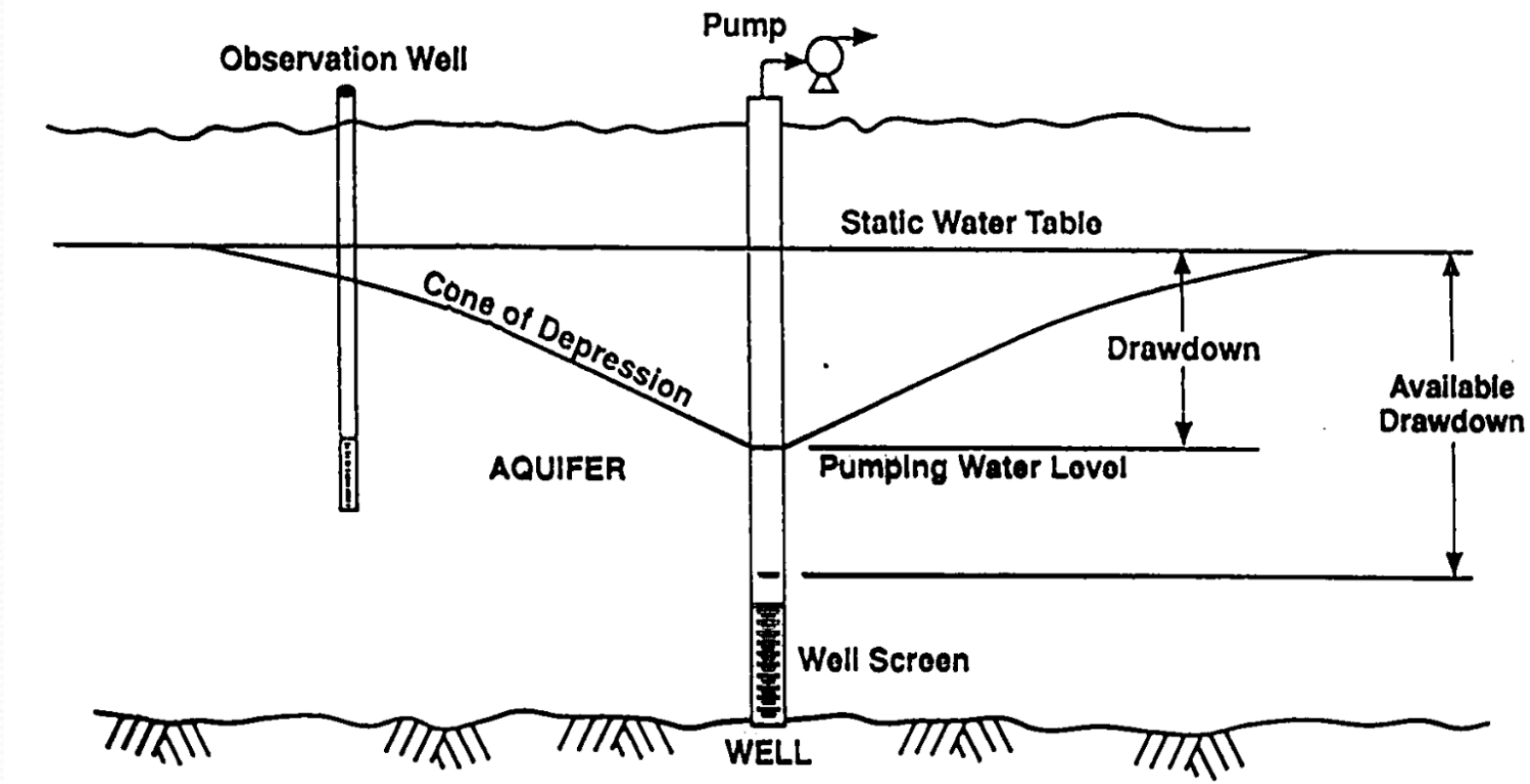
Water Well Terminology



Specific Capacity = Pumping Rate/Drawdown

Well Yield = Specific Capacity x Available Drawdown

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Water Well Terminology/Specific Capacity

***Specific Capacity**:* The ratio of the discharge rate to the unit of drawdown it produces, measured inside the well (gallons per minute per foot [liters per minute per meter] of drawdown) (Sect. 3 Definitions.)

Example:

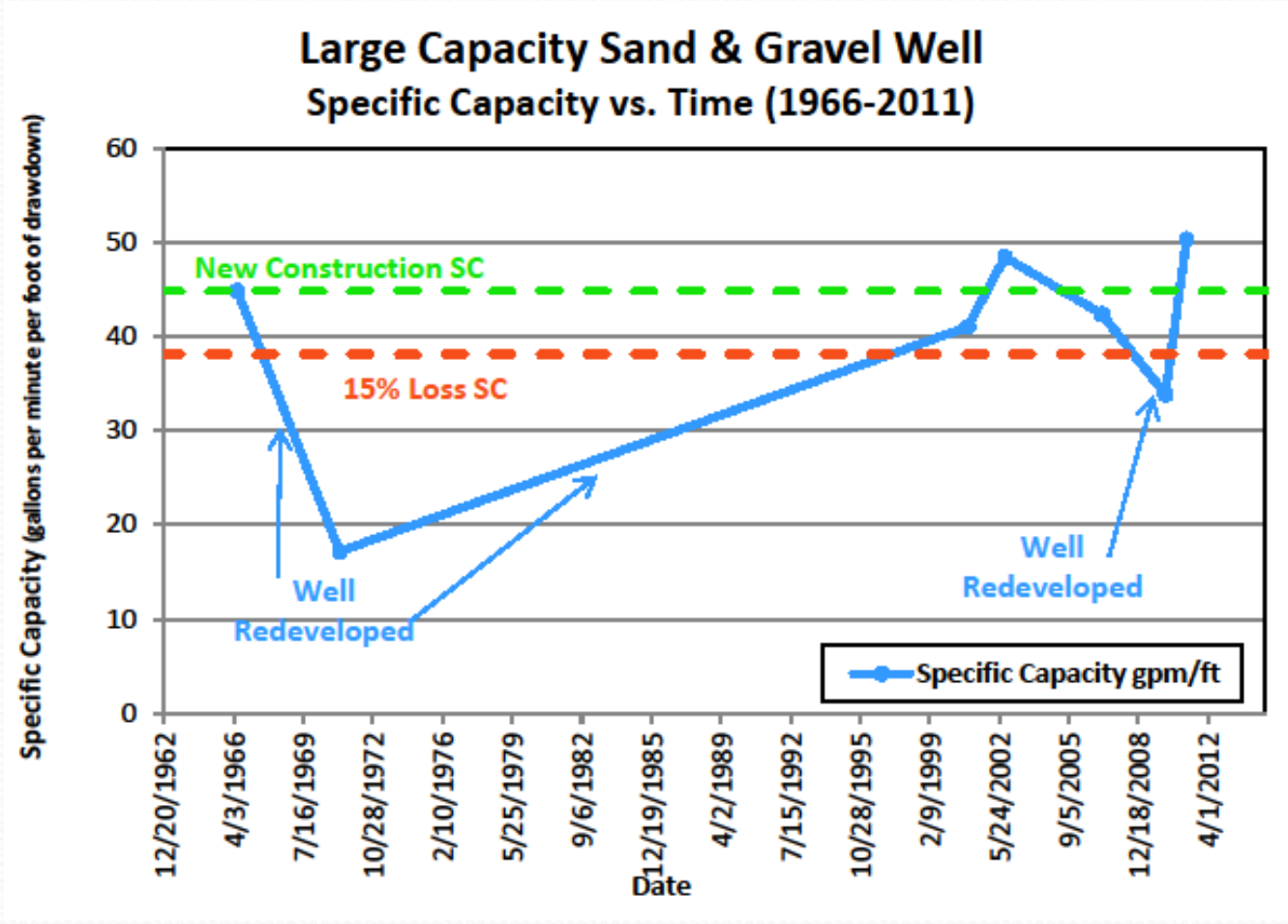
Specific Capacity (SC) = Q/DD

Where Q = discharge rate [gallons per minute (gpm)]
DD = drawdown [foot (ft)]

Q = 100 gpm/10 feet

Q = 10 gpm/ft

Water Well Terminology/Specific Capacity



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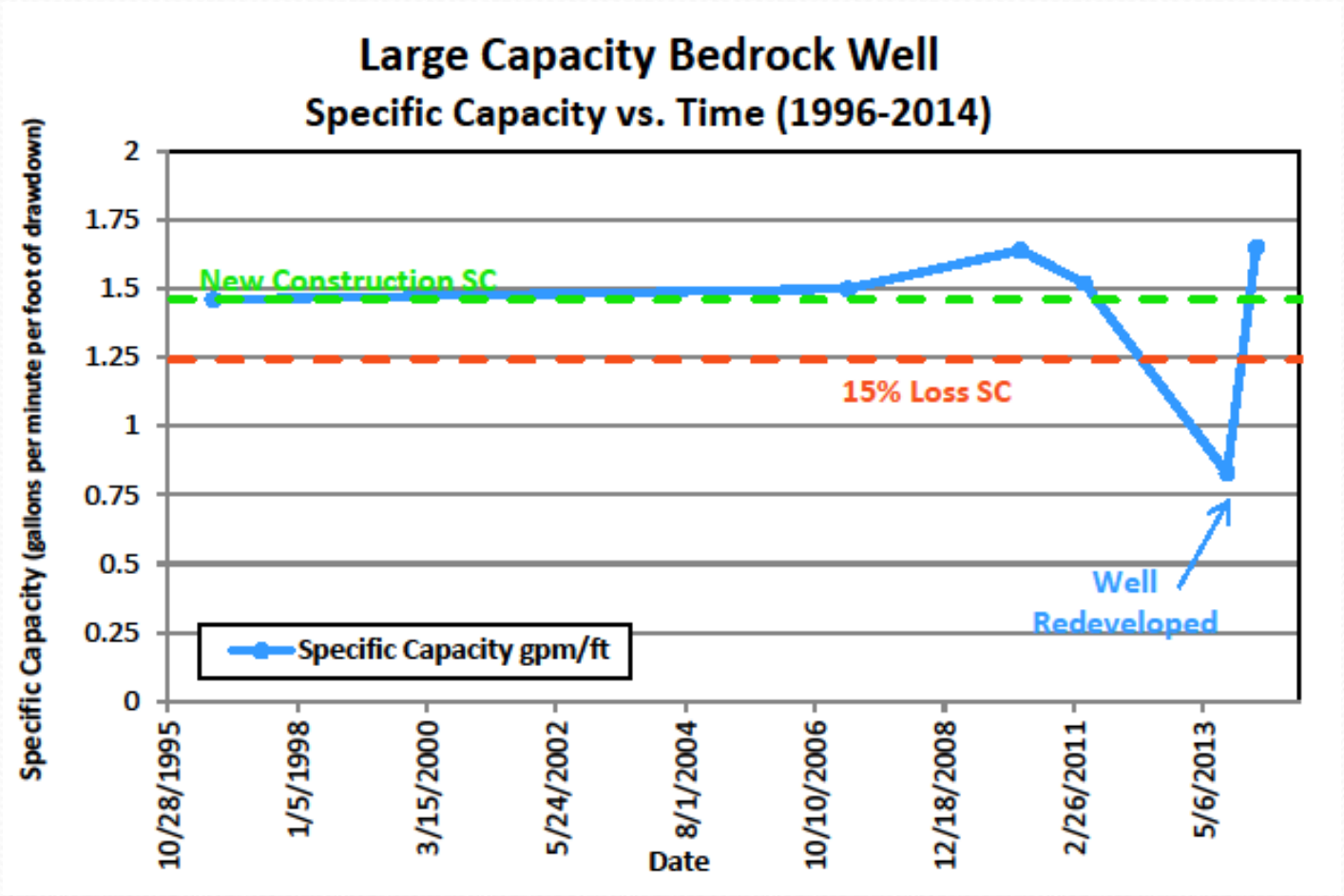
Water Well Terminology/Specific Capacity



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Water Well Construction

Maximize Development during Construction of the Well so that in the Future when the Well has to be Redeveloped it can be returned…

- **To The Original *Specific Capacity or Better***

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Questions?

Types of Common Groundwater Supply Wells

Common Types of Well Construction

- Open Borehole Bedrock
- Naturally Developed
- Gravel-packed
  - Single gravel pack
  - Multiple gravel pack

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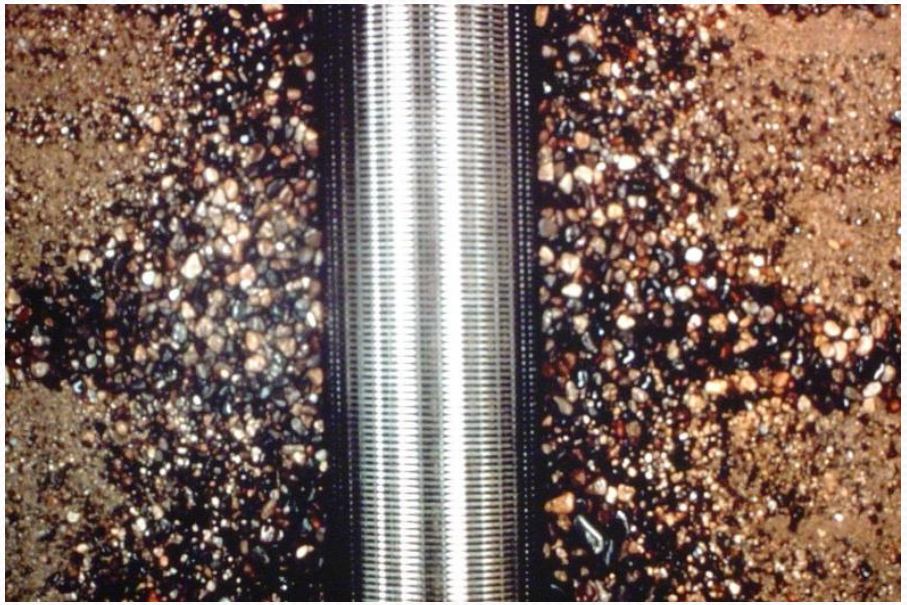
Types of Common Groundwater Supply Wells

Geologic Settings

- Sand and Gravel Deposits (Stratified Drift)
- Fractured Crystalline Bedrock



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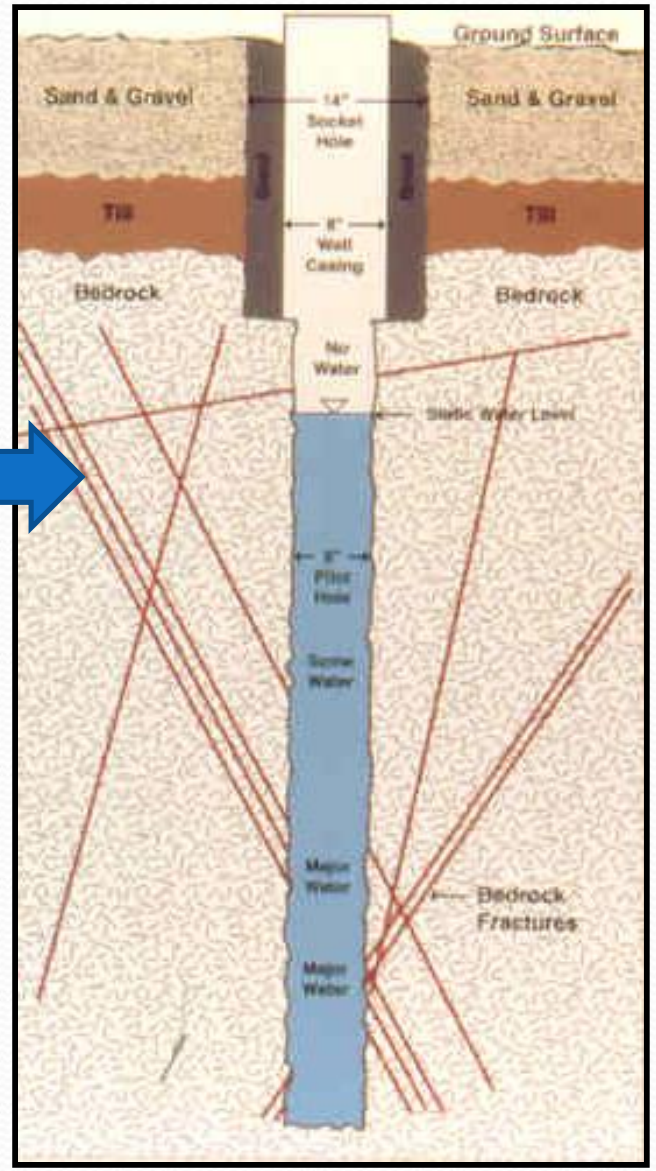
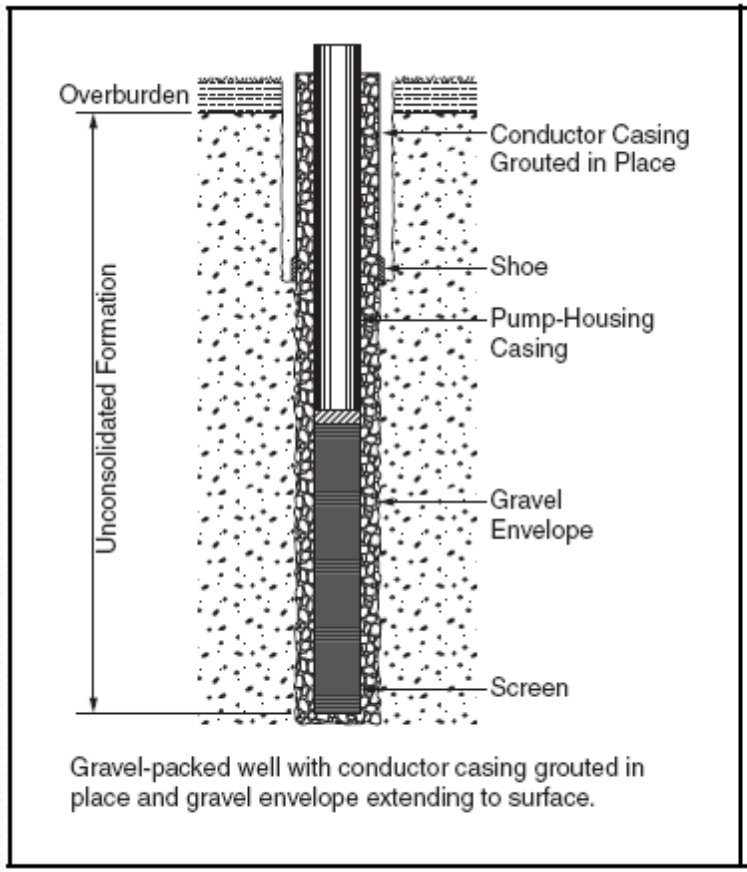
Types of Common Groundwater Supply Wells

Flow of groundwater is along fractures in crystalline bedrock which can be primary cooling fractures or secondary structural (tectonic) features.

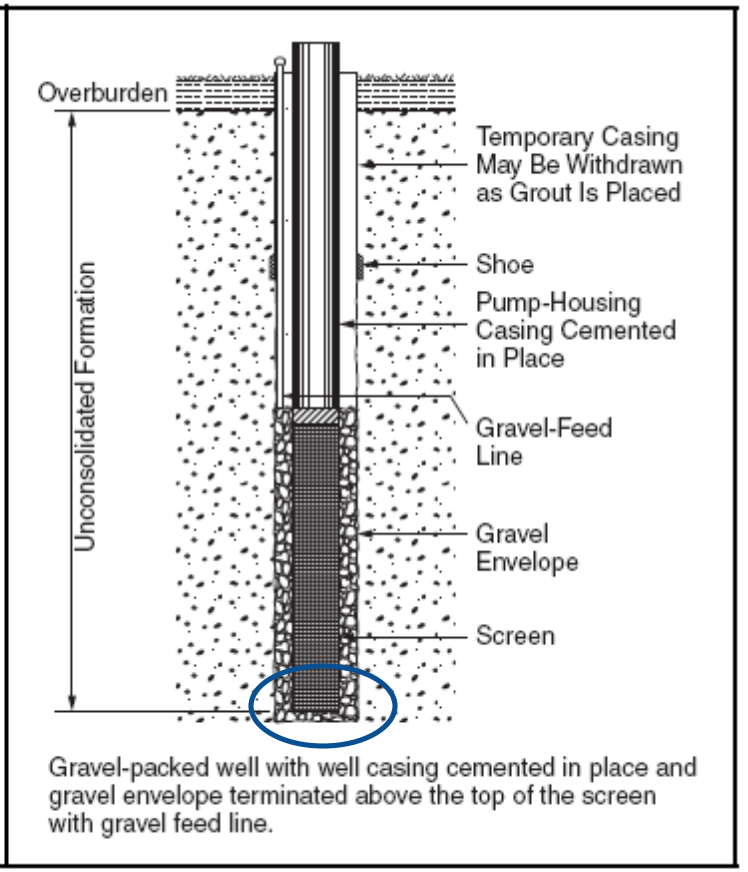


Types of Common Groundwater Supply Wells



Gravel-packed well with conductor casing grouted in place and gravel envelope extending to surface.

Figure J.1 Type 1



Gravel-packed well with well casing cemented in place and gravel envelope terminated above the top of the screen with gravel feed line.

Figure J.2 Type 2

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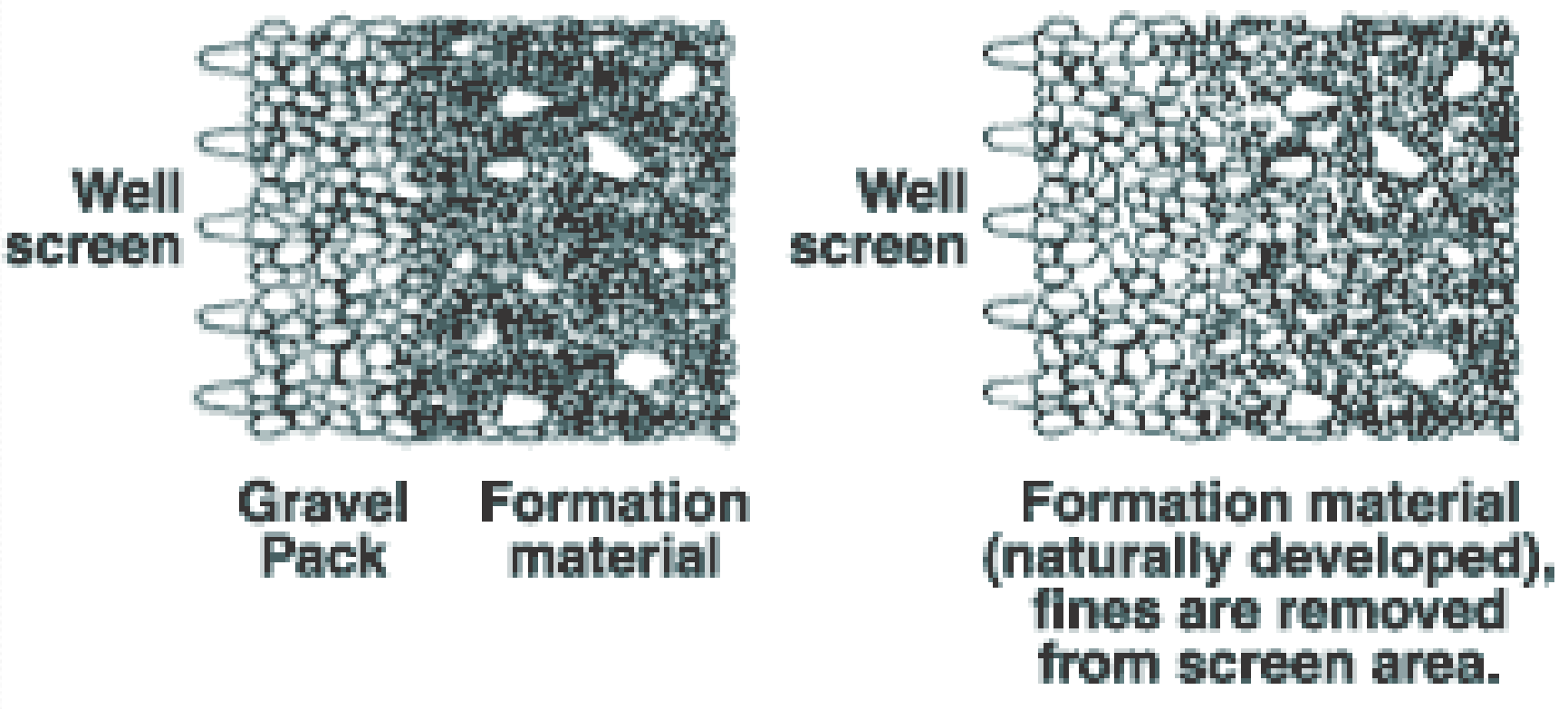
Naturally or Gravel-Developed Well



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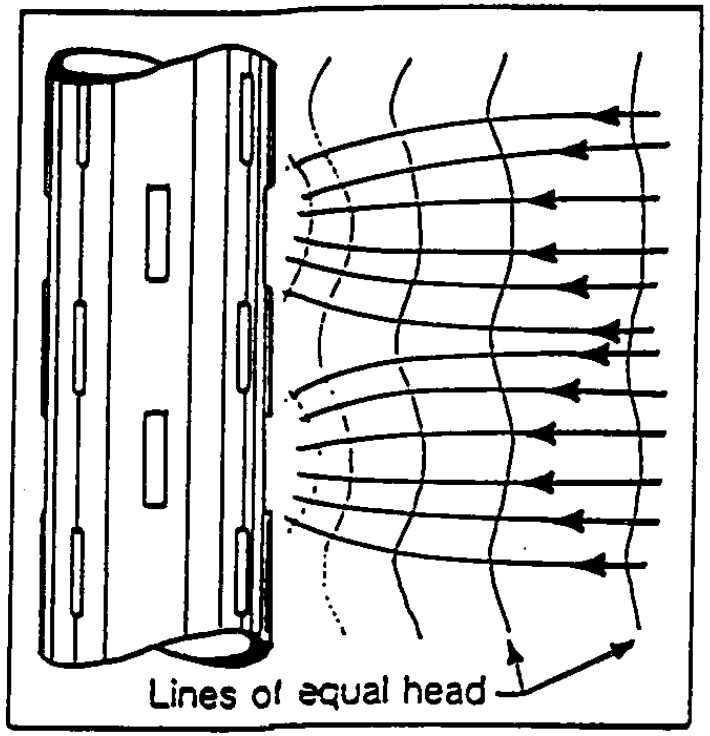
Groundwater Flow into the Well Screen

Want to **Minimize**:

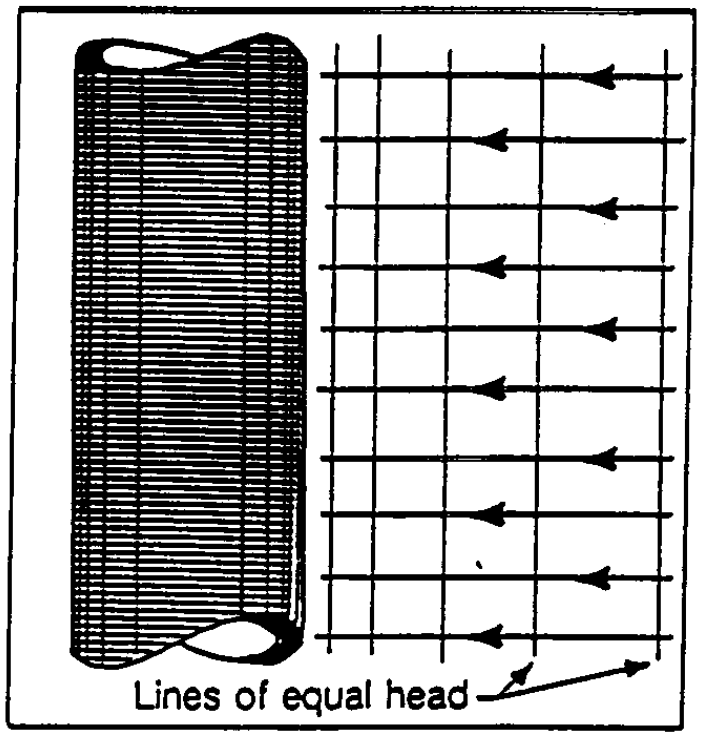
- Turbulence around well screen
- Large pressure changes
- Precipitation of iron, manganese, and calcium deposits
- Entrance of particulates into the well
- Release of gases dissolved in groundwater

Groundwater Flow into the Well Screen: Laminar Flow

Slotted Pipe



Continuous-slot Screen



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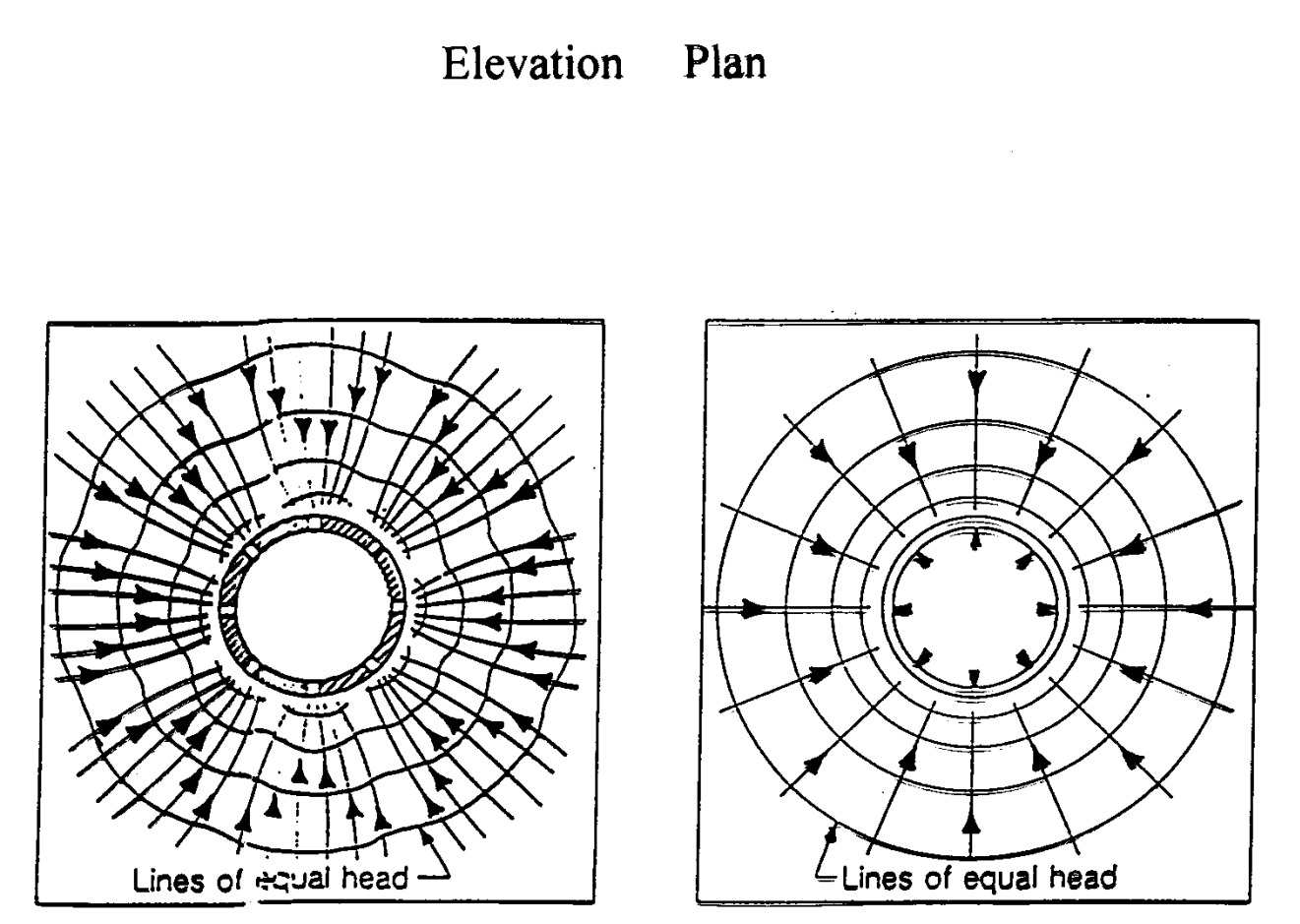
Groundwater Flow into the Well Screen: Laminar Flow



Groundwater Flow into the Well Screen: Entrance Velocity

Entrance Velocity (Appendix L AWWA A100-06)

- Velocity at which water passes through the well screen
- Function of:
  - Well screen diameter and length;
  - Slot size; and
  - Pumping rate.

Entrance Velocity can be modified by increasing the length of screen if there is available drawdown in aquifer or increase diameter of screen

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Groundwater Flow into the Well Screen: Entrance Velocity

Entrance Velocity (V) = $\frac{\text{Well Yield (Q)}}{\text{Total Area of Screen Openings (A)}}$

Entrance Velocity Range of Values:

0.1 to 1.5 ft/sec

Why is Entrance Velocity important?

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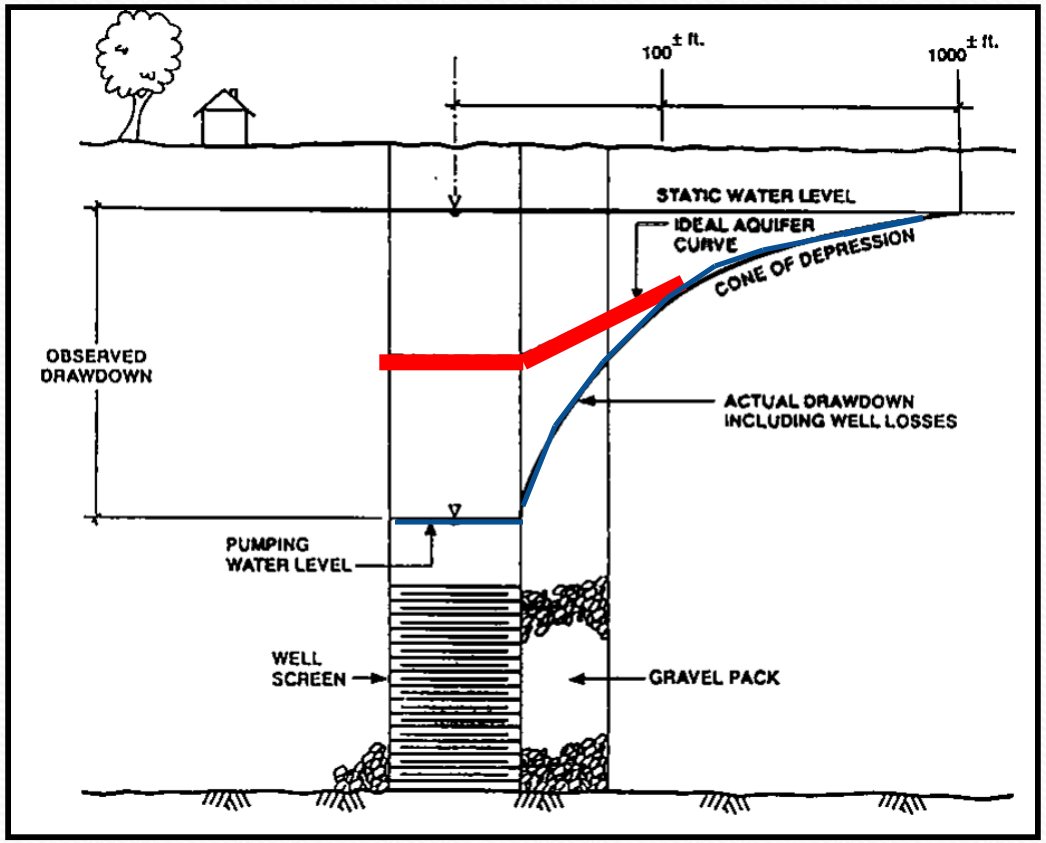
Groundwater Flow into the Well Screen: Minimize Well Losses

Our goal is to…



…Minimize Well Losses and Maximize Specific Capacity

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Summary

- Types of Well Design and Construction
- Groundwater Flow into the Well Screen
- Entrance Velocity
- Specific Capacity of Well

What's to Come?

This webinar has been an introduction on how to locate and test wells and why it is necessary to maintain their health in order to have a long service life of 75 + years.

In the rest of this webinar series we will explore:

- how and why wells loose efficiency,
- methods to re-develop them (sand and gravel and bedrock), and
- several case studies that explore the costs associated with well re-development

We encourage you to participate in the rest of this series, and look forward to seeing you at the next webinar. Thank you.

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