

Three bright yellow lemons are arranged on a white, textured surface. One lemon is at the top, another is to the left, and a third is at the bottom right. The text is overlaid on the lemons.

# **Caveat Emptor**

**Let the buyer beware!**

**The Need For Inspection During Construction**

**All Photographs MDE or C Wallis  
Unless Noted**

# I Need To Build A Dam

- I am:
  - A private owner
  - A developer who will transfer ownership to a:
    - Homeowner's Association
    - Local Government
  - A Government Agency
  - A Business/Commercial Entity

# Contracts

- To build my dam I will enter into contracts with:
  - An **engineer** to design, prepare contract documents (plans, specs, special provisions(contract between owner and builder), obtain permits, administer bidding, manage and inspect the construction, prepare As-Builts, and certify the construction to the owner and permitting agencies.
  - A **contractor** to obtain materials and perform the work.
- My needs include:
  - Schedule
  - Control of Costs
  - Control of Quality
  - Management of liability
  - Management of risk

# Contract Items

- Lump Sum
- Line Items
- Contingency Items
- Change Orders
- Shop Drawings
- Force Account (Time and Materials)
- Permit Compliance

# Project Schedule – Contractor

- Mobilization
- Submission of:
  - Material Sources
  - Shop Drawings
- Install E&S Controls (Likely Sediment Basin)
- Clear and Grub Site
- Earthwork
- Installation of Utilities and Drainage System
- Build any Structures or Paved Areas
- Stabilize Site (and Convert Sediment Basin to SWM Facility)

# Inspection – The Hardest Job

- Must know the plans and specs, often including national or proprietary specs that may be reference in the contract documents
- Must know permit conditions
- Must understand the contractor's methods and means
- Be prepared for the contractor to work in a different area than previously discussed the day (or hour) before
- Must speak up immediately if work is inadequate, unacceptable, or failing
- Must not supervise the contractor, can only **accept or reject**
  - You can not inspect work you supervise, Inspection is QA/QC
- Must not slow the contractor down

# Conflicts in Contract Documents

- Priority order of documents should be listed in Special Provisions
- Access to engineer for resolution
- Hidden obstacles
- Contingency Items

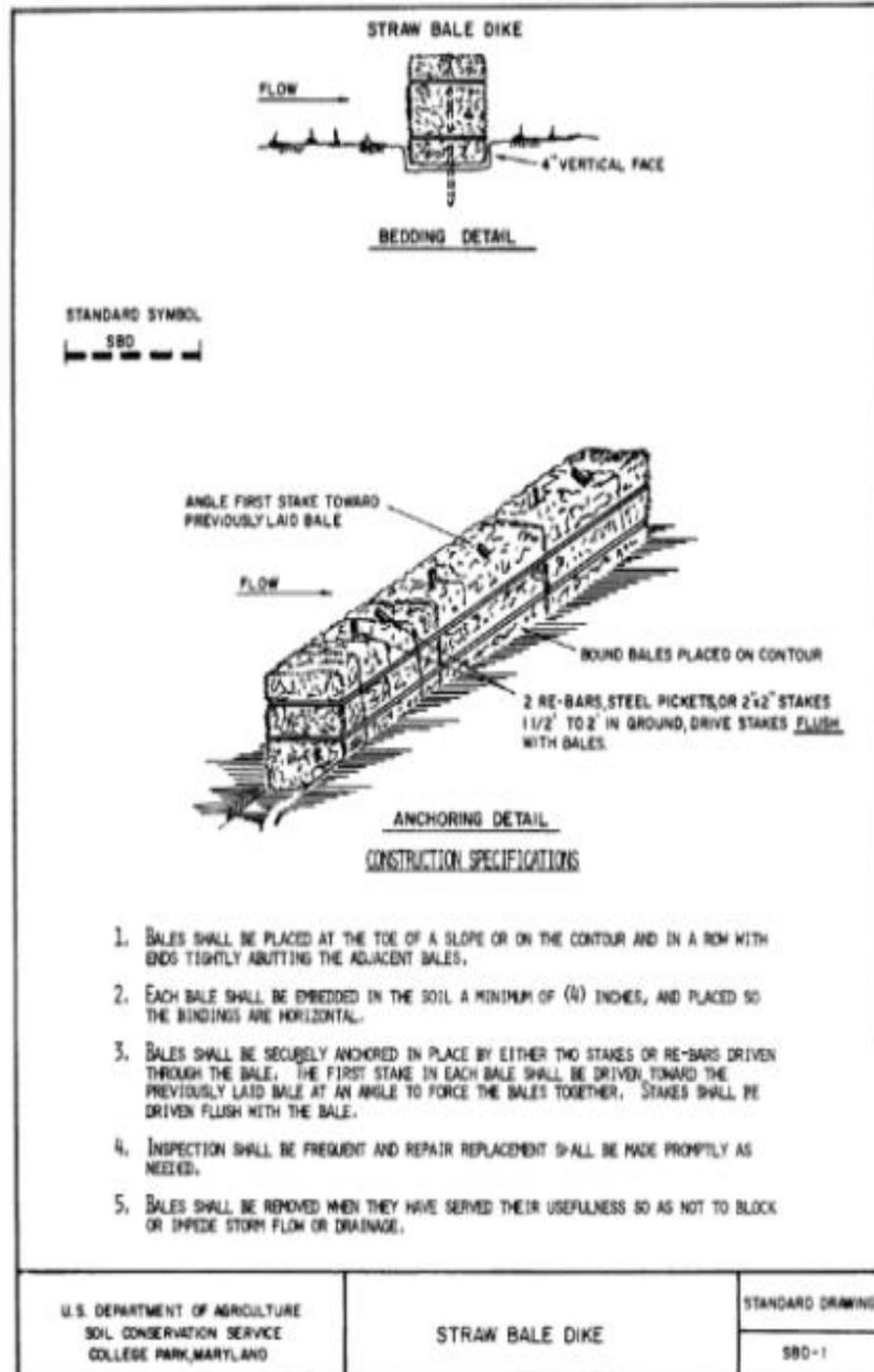
# Conflict Between Plan Sheets

- **Two objects can not occupy the same place at the same time**  
Example Sediment trap in the location of a bridge abutment
- Specialization of disciplines – overlap of areas – can't do both at the same time
- **Constructability (this is contractor's area of expertise):**
  - On subdivisions, the number of lots is the driver
  - Utility excavations/relocations can involve deep excavations
  - Substructures, foundations
  - Size of trench narrower than standard equipment
  - Access of equipment
  - Groundwater (construct in the dry)

# Before Work Begins

- Walk the site
- Take Photographs:
  - Of the project site
  - Looking offsite
- Have a Pre-Construction Meeting

# Stakeout



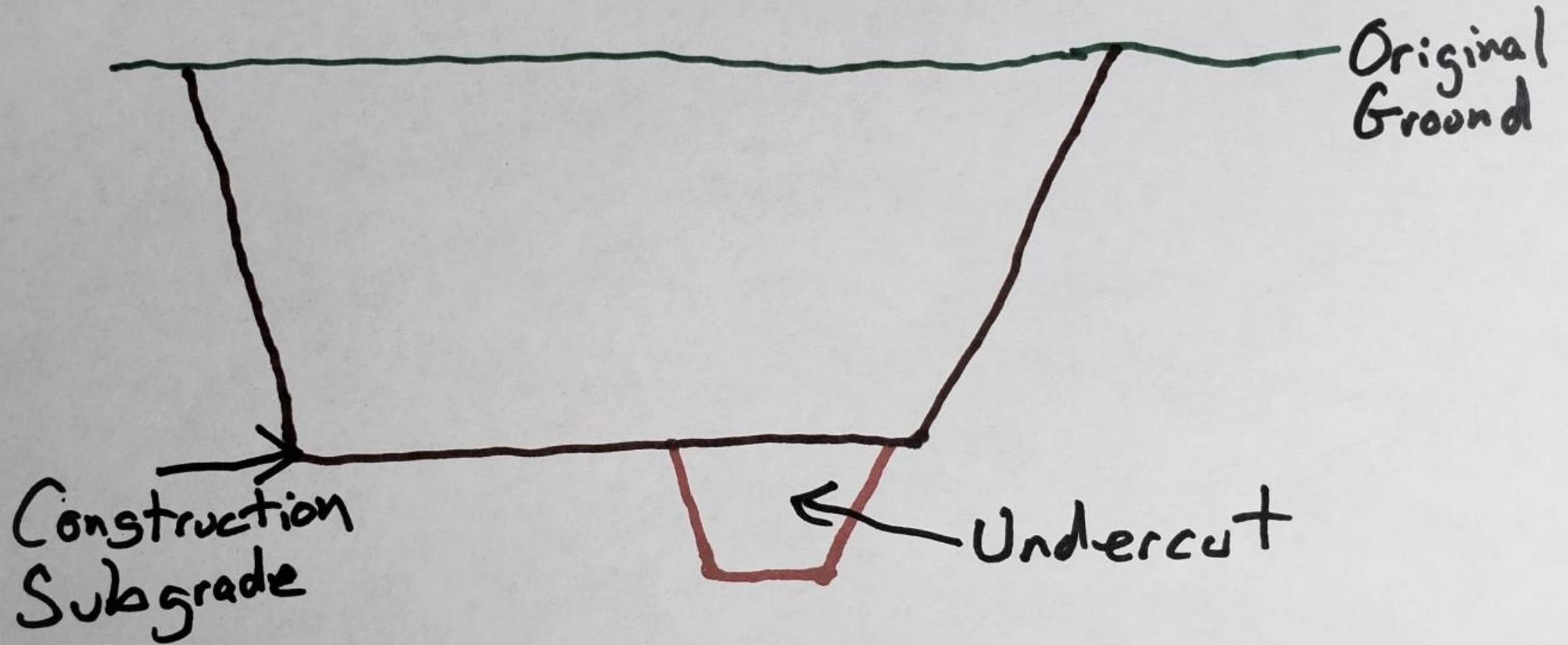
What You See Is What You Get





# Earthwork





# Excavation – Construction Subgrade

- Undercutting
- Stability
- Pumping – Proof rolling





*Sand*



*Silt*



*Clay*

Photo  
NRCS

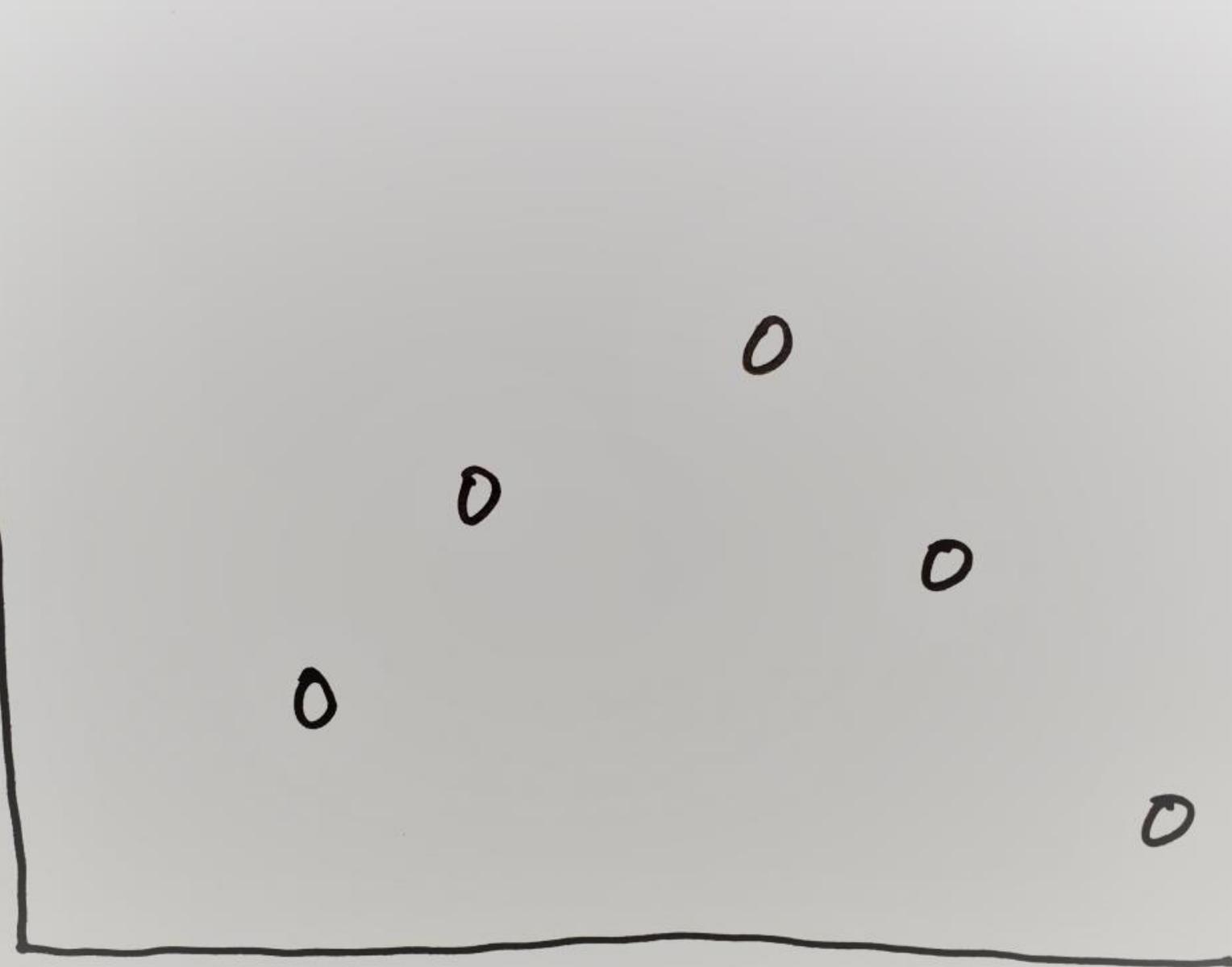
# Proctors & Compaction

- Standard & Modified
- Curves
- Moisture Content
- Lift thickness
- Compaction Effort
- Compaction Testing
  - Sand Cones
  - Nuclear Density Gauges



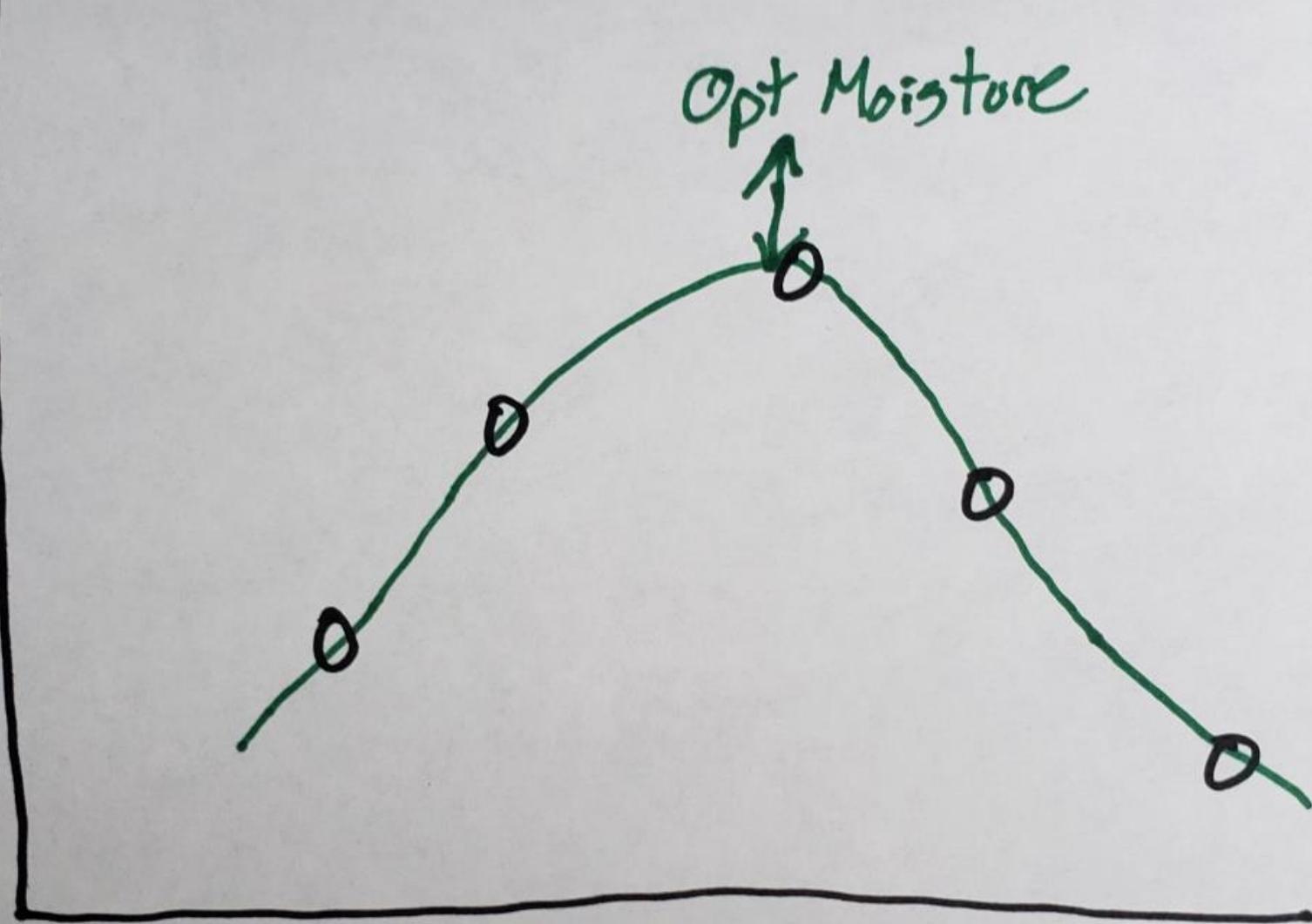
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Dry  
Density  
(pcf)



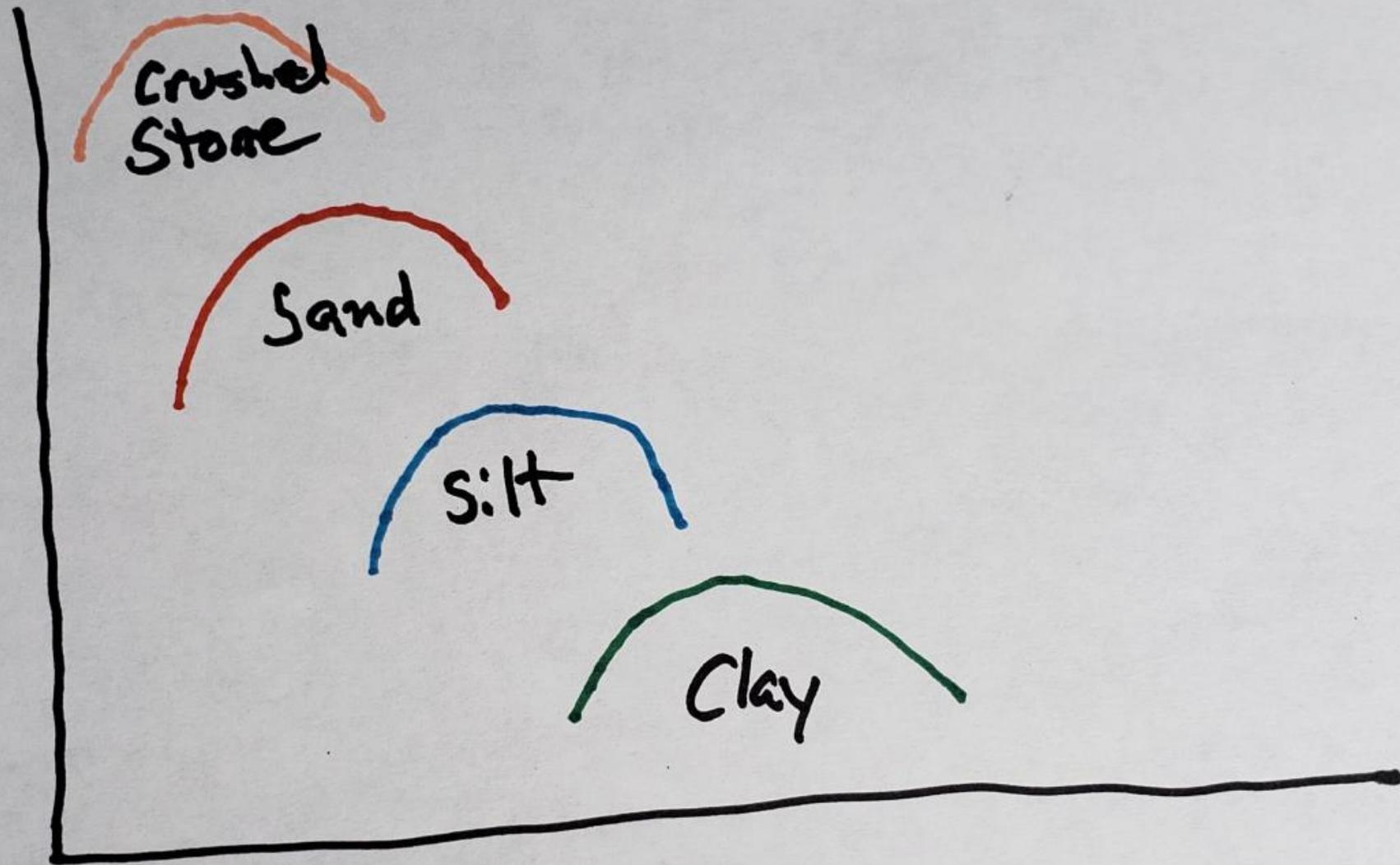
Moisture (%)

Dry  
Density  
(pcf)



Moisture (%)

Dry  
Density  
(pcf)



Moisture (%)





# Keying In When Excavating In Existing Dam





# Shoring and Bracing













# Cofferdams





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# Spillways

- Principal                      ASTM C-361 Concrete Pipe
  - Concrete Cradle
  - Placed on natural ground
  - Riser controlled inlet
  - Weir Walls
- Emergency                      Natural Ground, Flat Level Section
- Typically Constructed Off Line, In the dry
- Drainage then directed carefully thru new spillway
- Remainder of Dam constructed



Photo: SMC LLC





10  
11  
12

# Concrete

- Ingredients
  - Cement
  - Water
  - Coarse Aggregate
  - Fine Aggregate
  - Air Entrainment
  - Admixtures

# Hydraulic Cement

- Pozzolans/Flyash
- Portland
  - Type I Normal Use
  - Type II Moderate Sulfate Resistance
  - Type III High Early Strength
  - Type IV Low Heat of Hydration
  - Type V High Sulfate Resistance

# Mixing / Batching

- Plant
- Time stamp
- Adding water once mixed
- Admixtures

# Testing

- Slump
- Air Entrainment
  - Roll-a-meter
  - Pressure
- Temperature
- Unit Weight
- Cylinders
  - 7 Day
  - 28 Day



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# Curing & Cold/Hot Weather Measures



# Placement

- Vibration





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Segregation



Cracks, Spalling, Honeycombs, Cold Joints



Reinforcing Steel









Waterstops



# Filter Diaphragms, Toe Drains, & Seepage

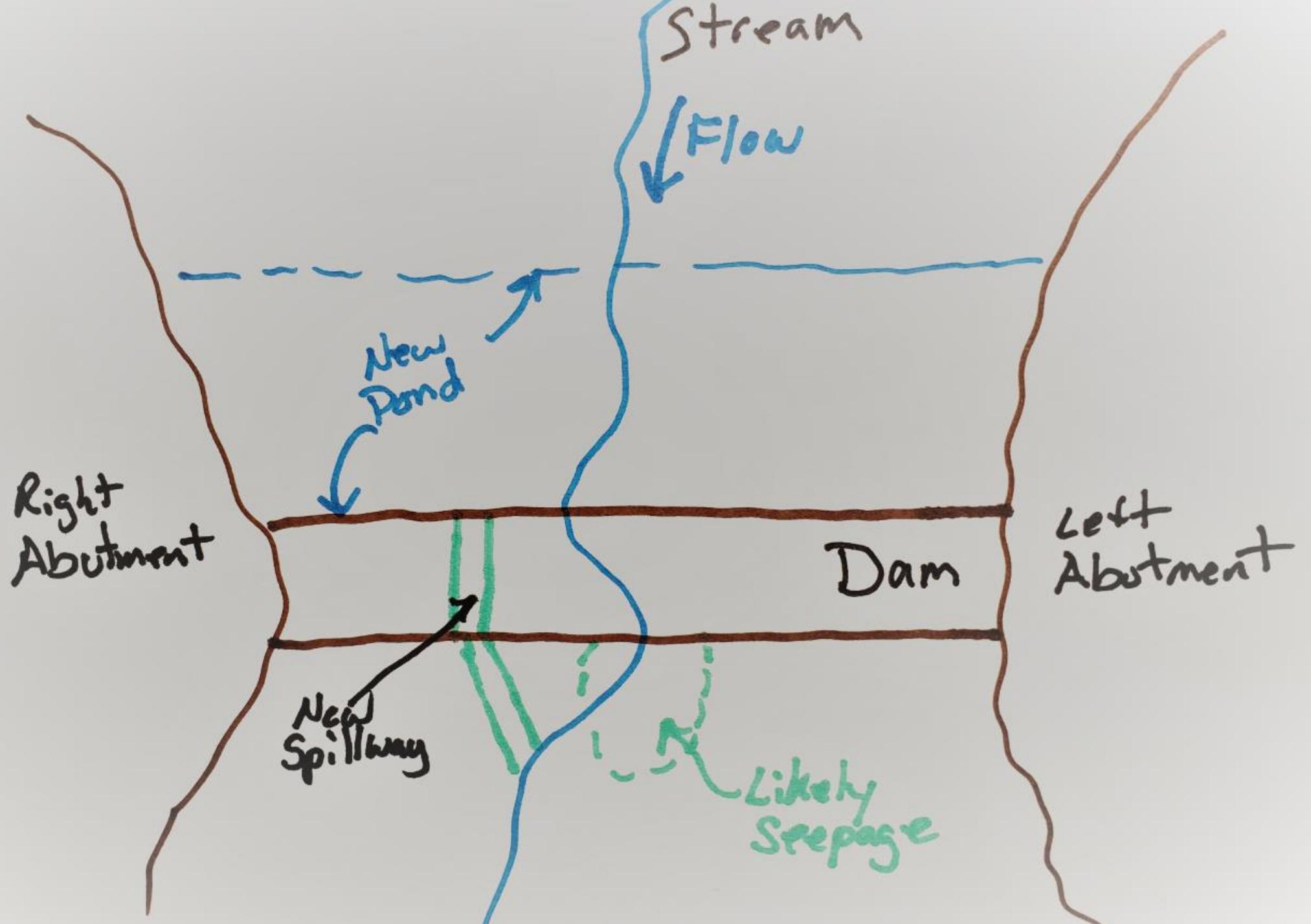






# There Are NO Springs in Dams!

- Signs of Seepage
  - Flowing water thru the embankment
  - Soft Spots
  - Areas of exceptional vegetative growth
- Downstream Boils
- **First Filling**
- Whirlpools in the impounded reservoir
- Original Stream (Diverted to new spillway) will have slightly different geology than adjacent land and likely contribute to seepage after dam is built over it



# Emergency Spillways



# Landscaping



# Dam Removal





Connecting Pre-Cast Sections (Not Desirable)





# Sliplining





# Grouting



# Jack and Bore



# Political Considerations



# Constructability





# Final Thoughts

- Don't Assume People Read the Permit
- Don't Assume the Contractor Will Follow the Plans
- We Are All Creatures of Habit
  - Contractor Will Say "I've Done It This Way For Years, Now You're Telling Me I'm Doing It Wrong"
- If Something Is Critical, Unique; It Must Be **BOLD** On The Plans
- Test and operate any valves and gates
- Substantial Completion
- Punch Lists
- As-Builts

What's in Your Pond?



What You See is What You Get!

# Questions?