CE 3372 WATER SYSTEMS DESIGN

LECTURE 23: EPA SWMM– STORAGE NODES AND DETENTION BASINS

PURPOSES

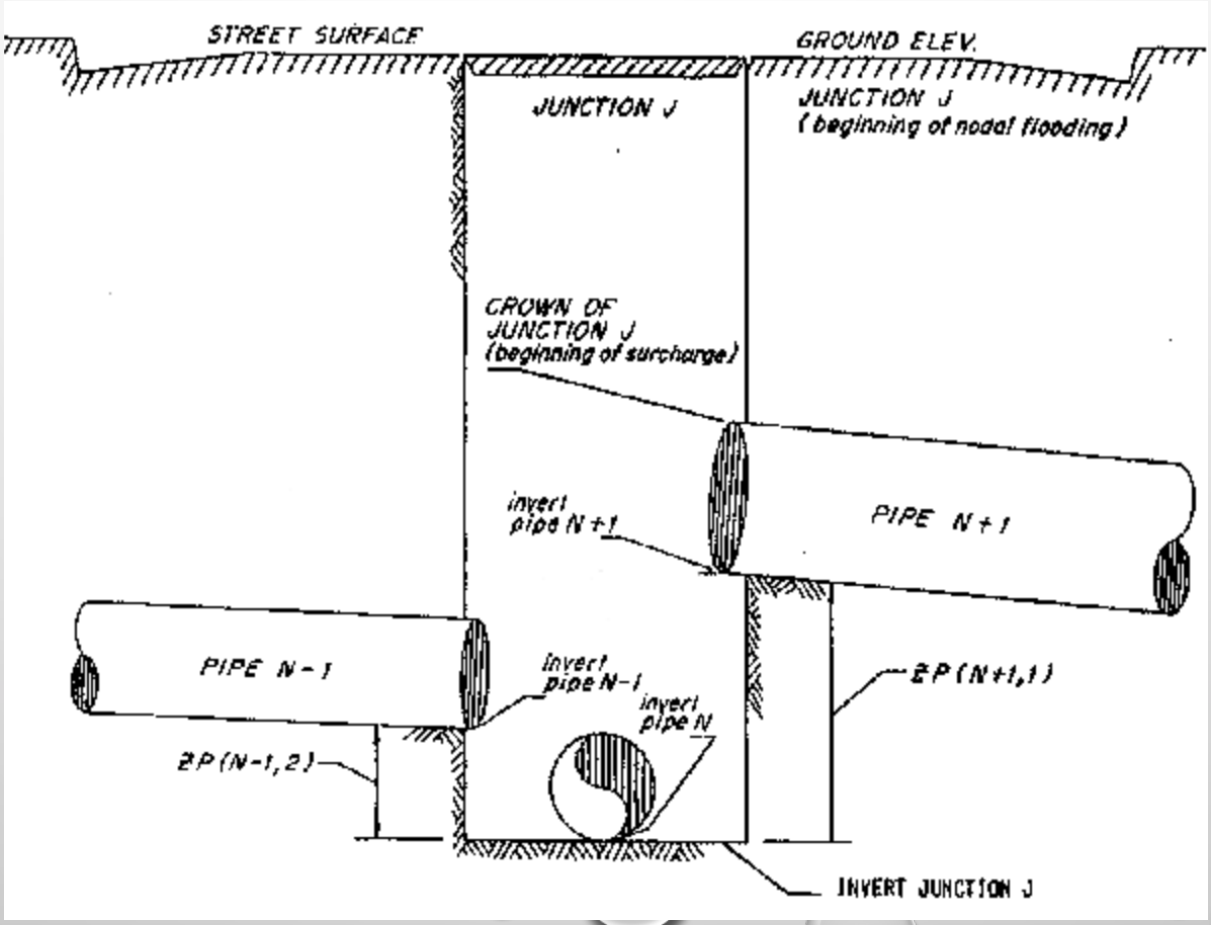
- DETENTION BASIN
- STORAGE NODE

JUNCTION (NODE)

- ORDINARY JUNCTION CONNECTS HYDRAULIC ELEMENTS (LINKS)
- JUNCTION ATTRIBUTES ARE:
  - INVERT ELEVATION (ELEVATION OF THE BOTTOM OF THE NODE)
  - MAX ELEVATION (ELEVATION OF TOP OF NODE)
    - SET TO LAND SURFACE TO PLOT PROFILE GRADE LINE IN SWMM
    - SET TO LAND SURFACE + ADDED DEPTH FOR DUAL (SURFACE+SUBSURFACE DRAINAGE)
- WHEN PROGRAM RUNS, DEPTH AT THE NODE IS COMPUTED, BUT THERE IS NO STORAGE (NODE HAS ZERO AREA)

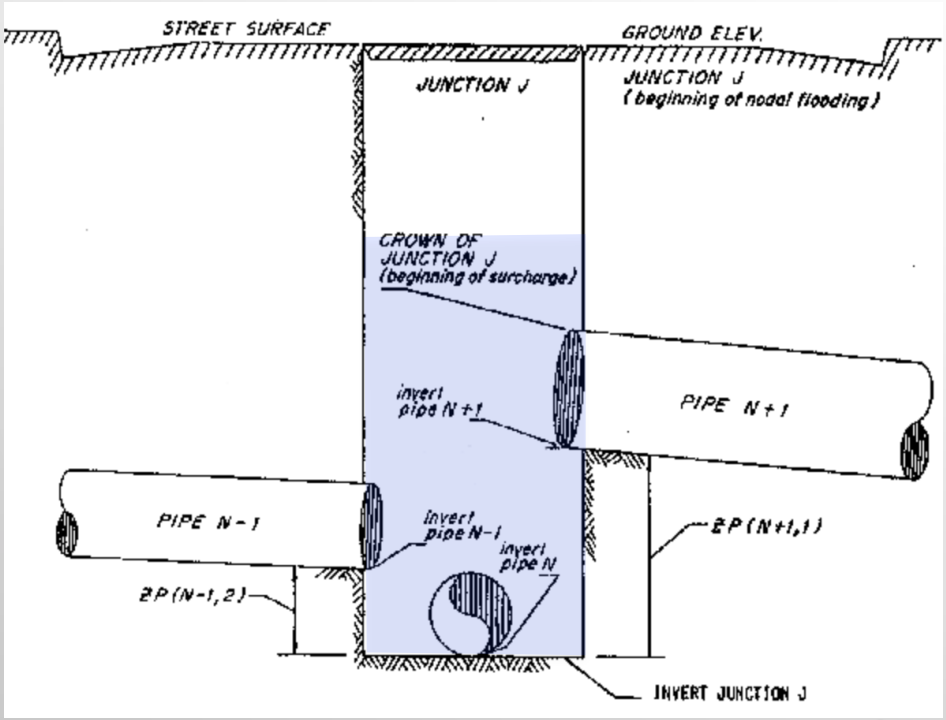
JUNCTION (NODE)

- ORDINARY JUNCTION JUST CONNECTS PIPES N-1, N, AND N+1

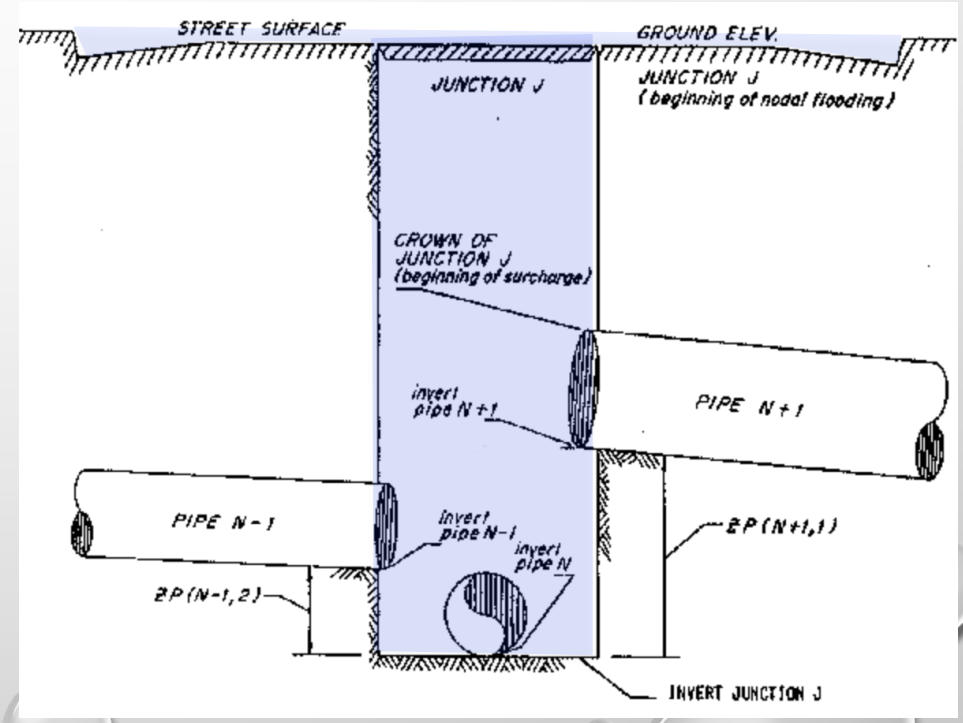


JUNCTION (NODE)

- IF FLOODING OCCURS, IT IS ONLY CONSIDERED WHEN HGL IS ABOVE NODE MAX. DEPTH

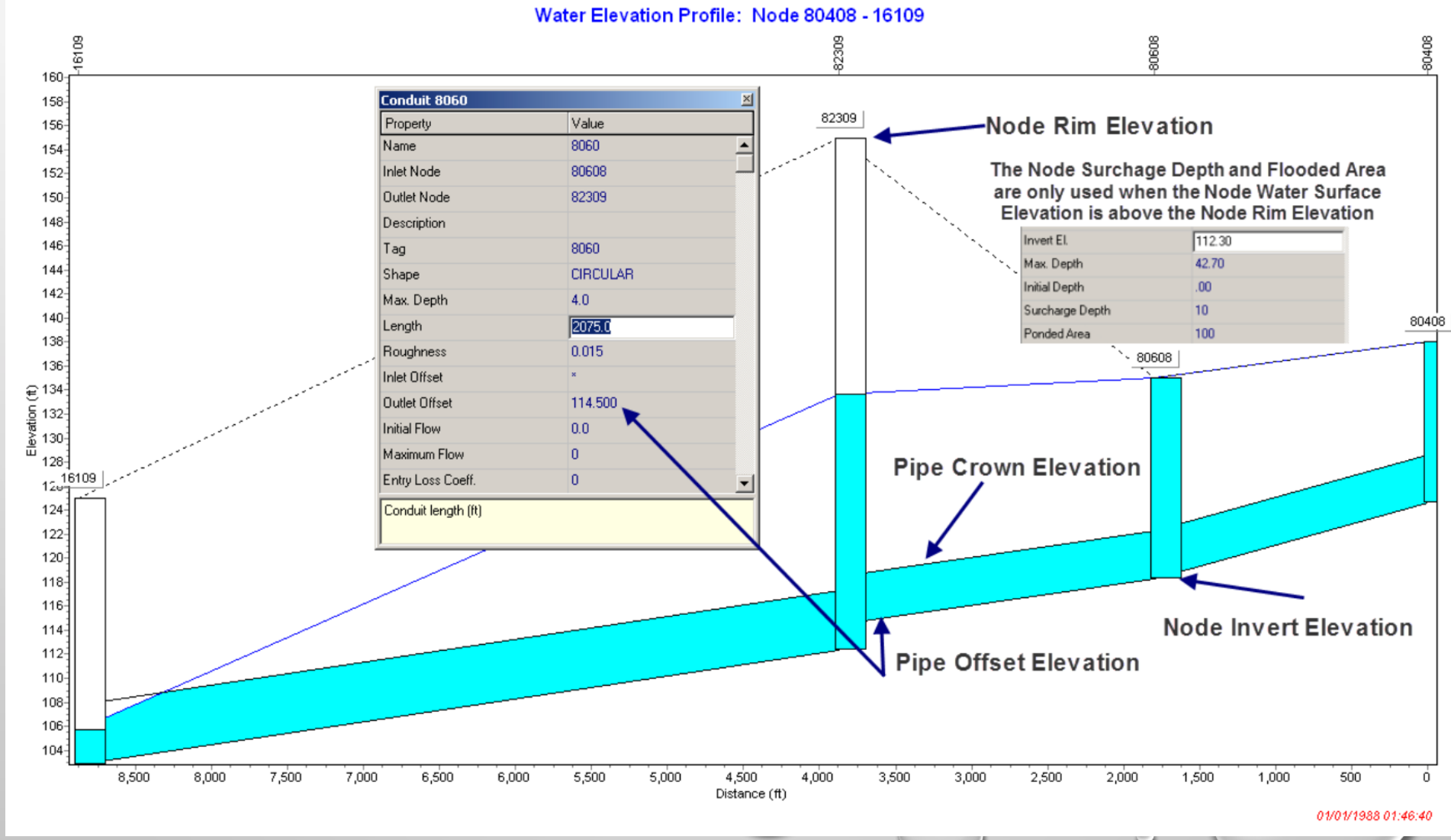


Node not flooded; pipes are surcharged



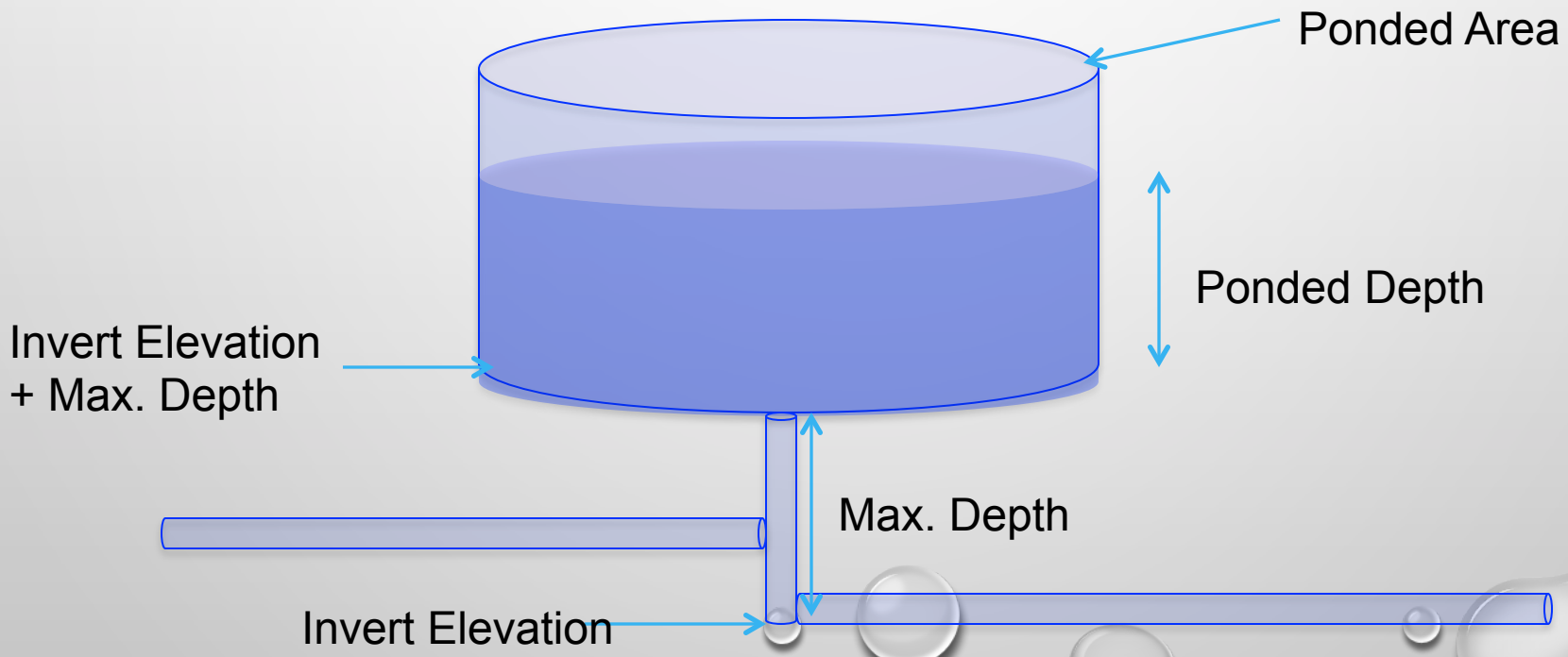
Node flooded; pipes are surcharged

FLOODING ORDINARY NODE



JUNCTION (NODE)

- FLOODED NODE ATTRIBUTES:
  - HOW DEEP IS THE FLOODING ALLOWED (SURCHARGE DEPTH) ABOVE THE TOP OF THE NODE
  - WHAT IS THE PONDED AREA DURING SURCHARGE – TREATS THE NODE AS A VERTICAL WALL STORAGE TANK



STORAGE UNIT (NODE)

- A STORAGE NODE EXPLICITLY CONSIDERS STORAGE IN THE NODE – INCLUDING (IF DATA ARE CORRECTLY SUPPLIED) THE SUB-GRADE PORTION OF THE NODE
- STORAGE NODE ATTRIBUTES
  - SAME AS AN ORDINARY NODE +
  - DEPTH-AREA RELATIONSHIP
    - TABULAR
    - FUNCTIONAL

STORAGE UNIT (NODE)

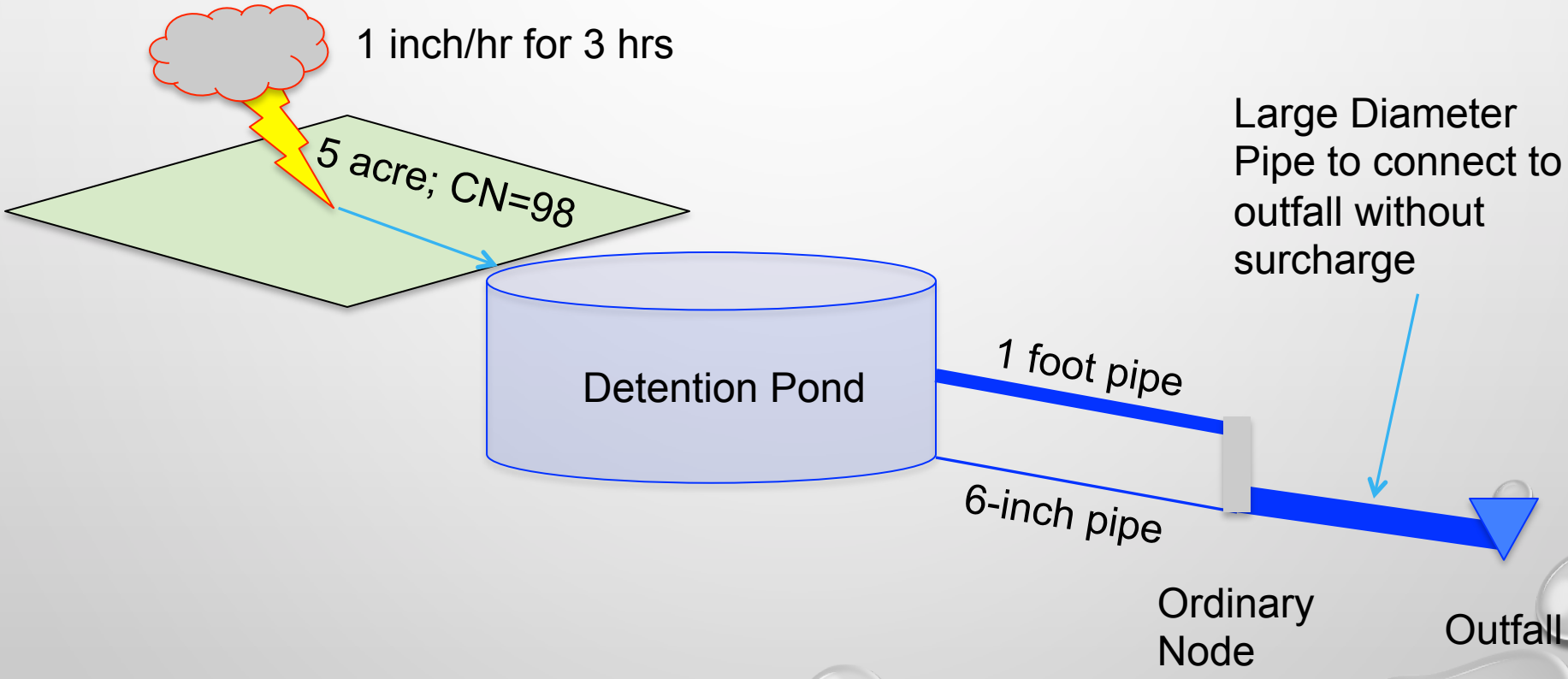
- USEFUL FOR:
  - DETENTION PONDS
  - MODELING MULTIPLE LEVEL INLET/OUTLET HYDRAULICS
    - RISER INLET
    - OUTLET THAT HAS PORTION THROUGH A PIPE, A PORTION OVER A WEIR (OR ANOTHER PIPE AT DIFFERENT ELEVATION)

EXAMPLE

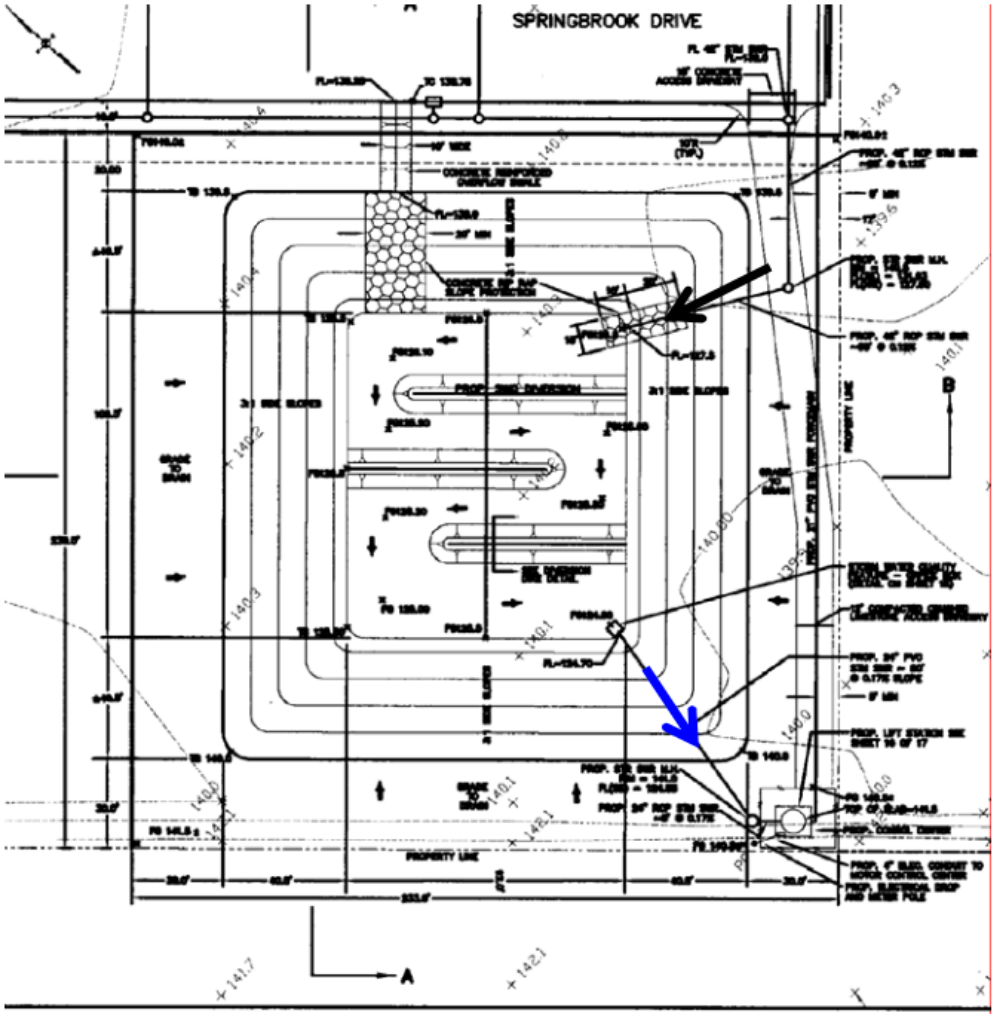
- CONSIDER A DETENTION POND THAT DRAINS A 5-ACRE PARKING LOT, THEN DISCHARGES TO A NEARBY RECEIVING STREAM
- USE SWMM TO APPROXIMATE THE HYDRAULICS
  - SUB-CATCHMENT, HIGH CN (98) TO REPRESENT THE PARKING LOT
  - 1-INCH/HOUR STORM FOR 3 HOURS
  - ALL FLOW PASSES THROUGH THE DETENTION POND BEFORE EXITING TO A STREAM THROUGH A 6-INCH PIPE AT THE INVERTS, AND A 1-FOOT PIPE AT 2-FEET ABOVE BASIN BOTTOM

EXAMPLE

- SCHEMATIC OF THE SYSTEM



DETENTION POND DRAWING



PLAN VIEW PROPOSAL DETENTION AND STORM WATER QUALITY POND

Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

DEPTH-AREA

- USE THE DRAWING TO DETERMINE THE DEPTH-AREA OF THE POND
  - PICK AN ELEVATION (DEPTH)
  - FIND POOL AREA FOR THAT ELEVATION (DEPTH)
  - RECORD THE DEPTH AND THE AREA (IN ACRES USUALLY)

DEPTH-ELEVATION

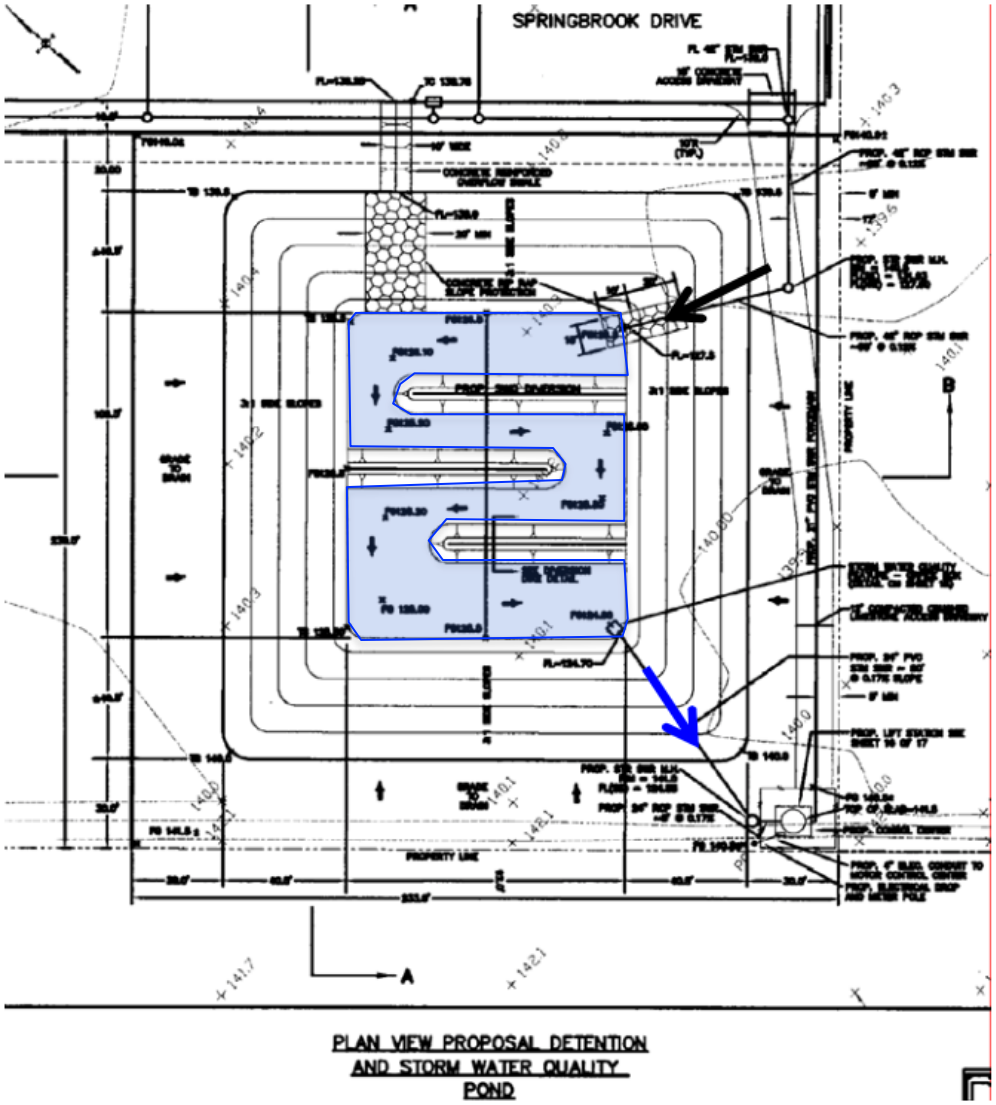


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 140 ft.
- Depth = 0.5 ft.
- Pool Area = 0.25 acres

DEPTH-ELEVATION

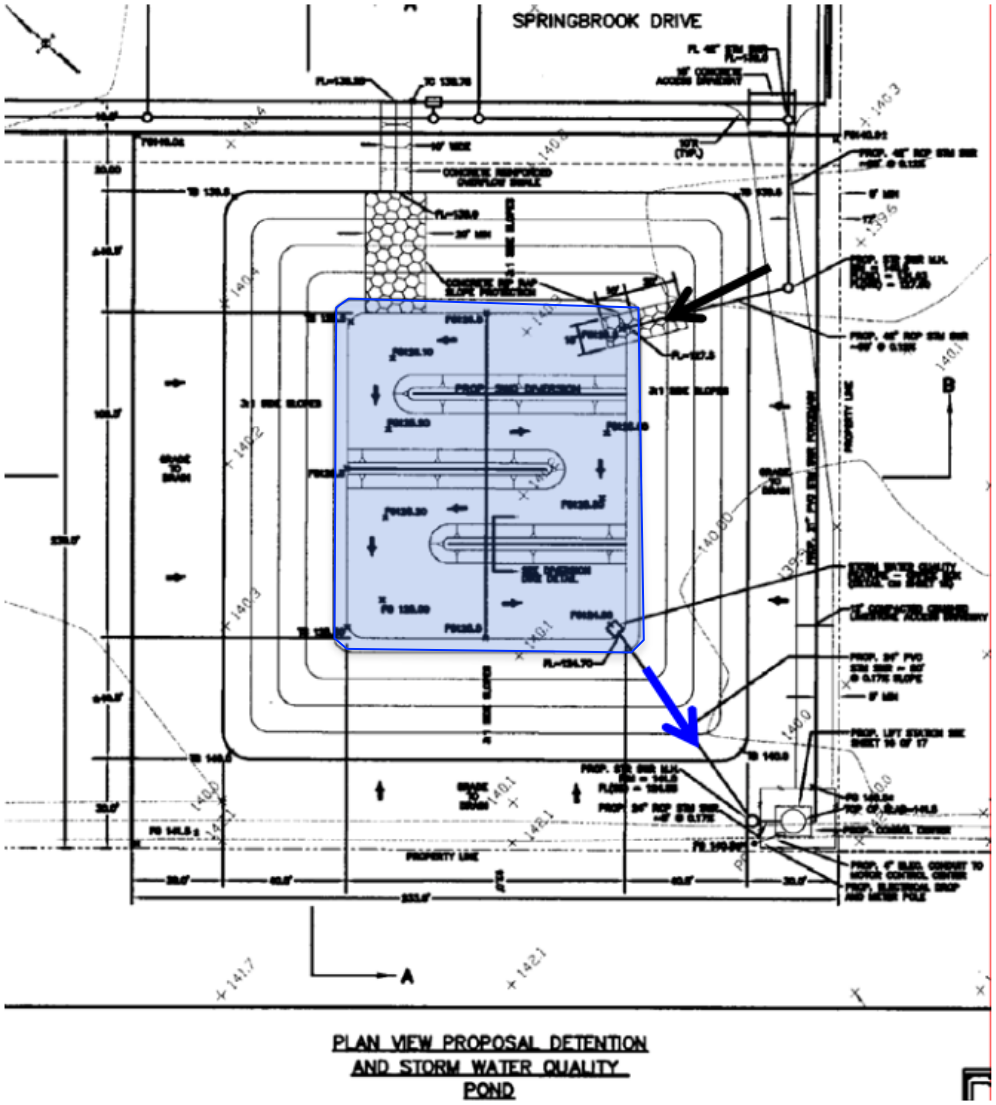


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 141 ft.
- Depth = 1.5 ft.
- Pool Area = 0.35 acres

DEPTH-ELEVATION

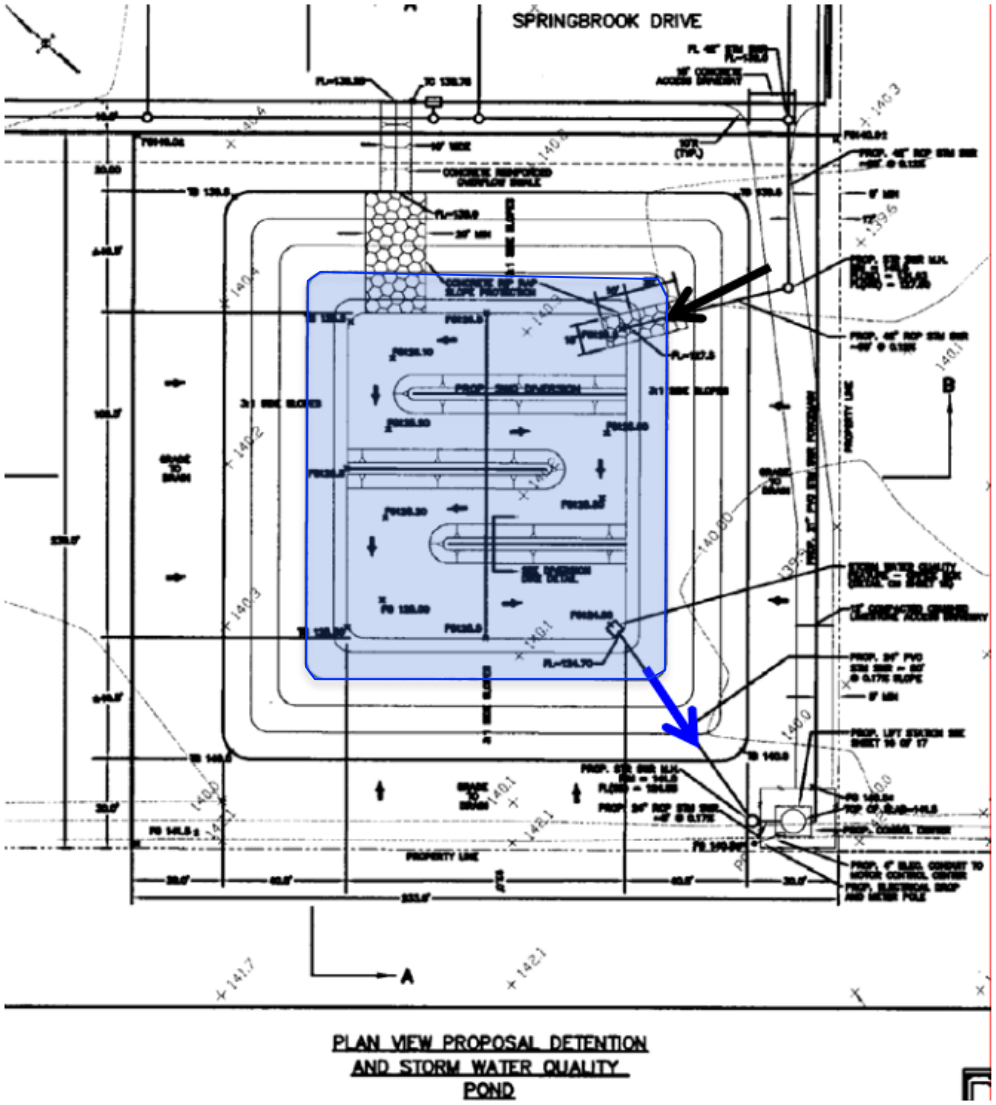


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 142 ft.
- Depth = 2.5 ft.
- Pool Area = 0.55 acres

DEPTH-ELEVATION

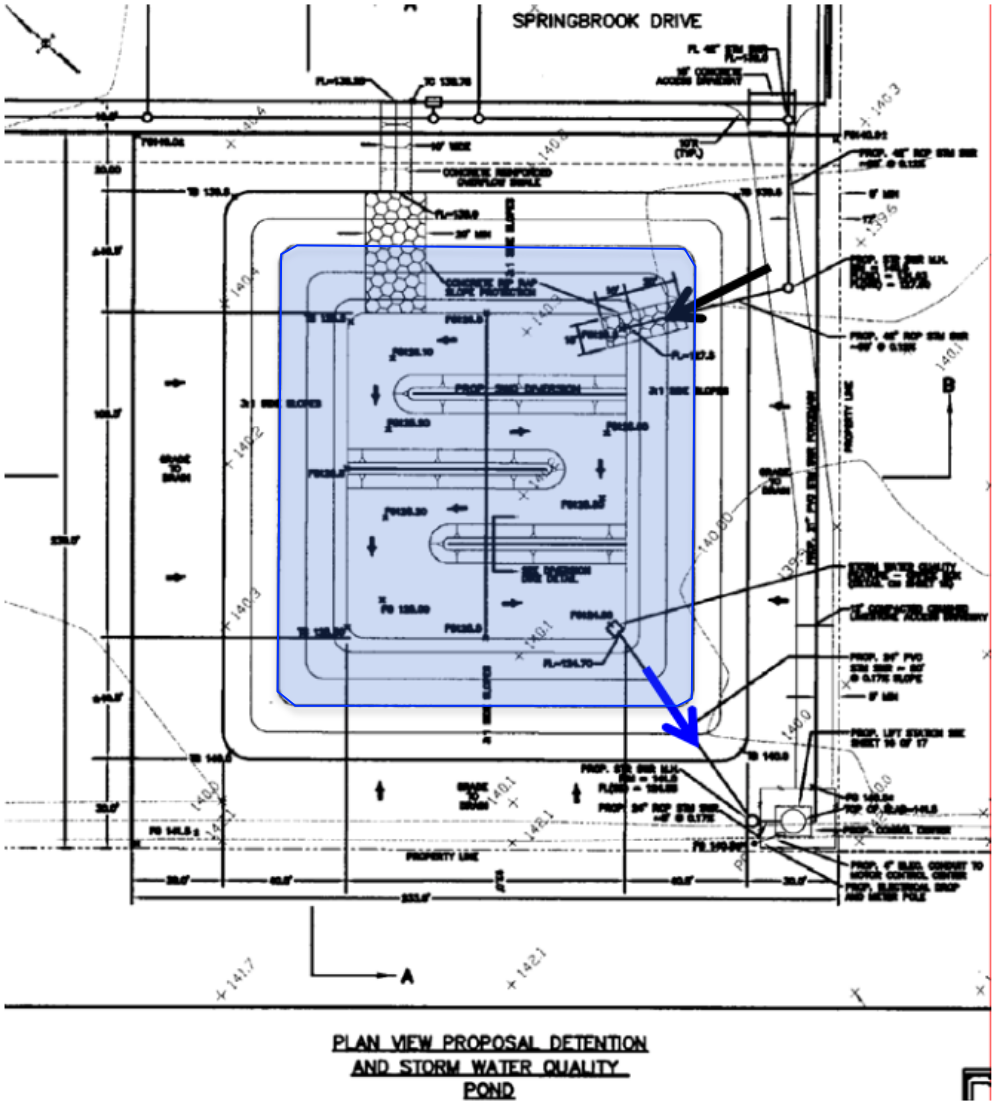


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 143 ft.
- Depth = 3.5 ft.
- Pool Area = 0.70 acres

DEPTH-ELEVATION

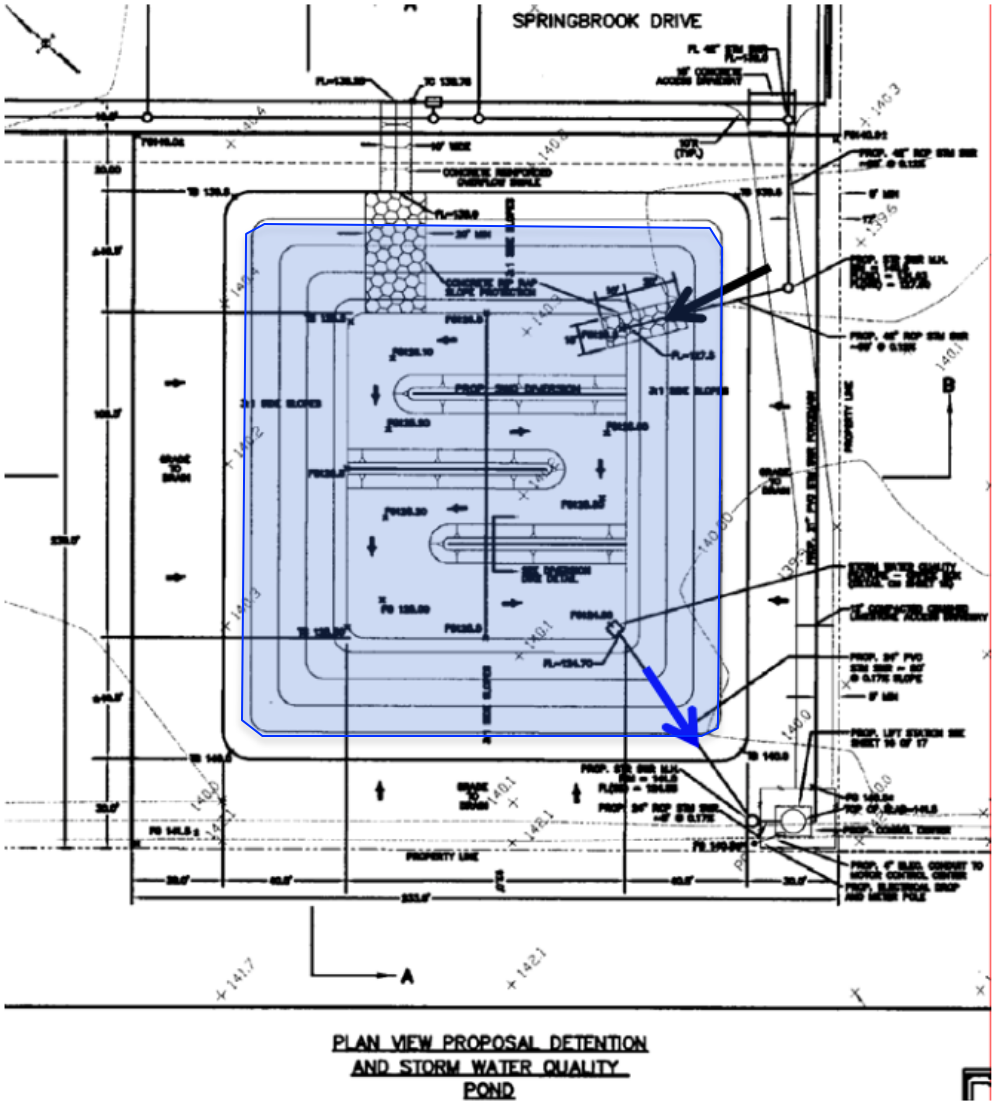


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 144 ft.
- Depth = 4.5 ft.
- Pool Area = 0.90 acres

DEPTH-ELEVATION

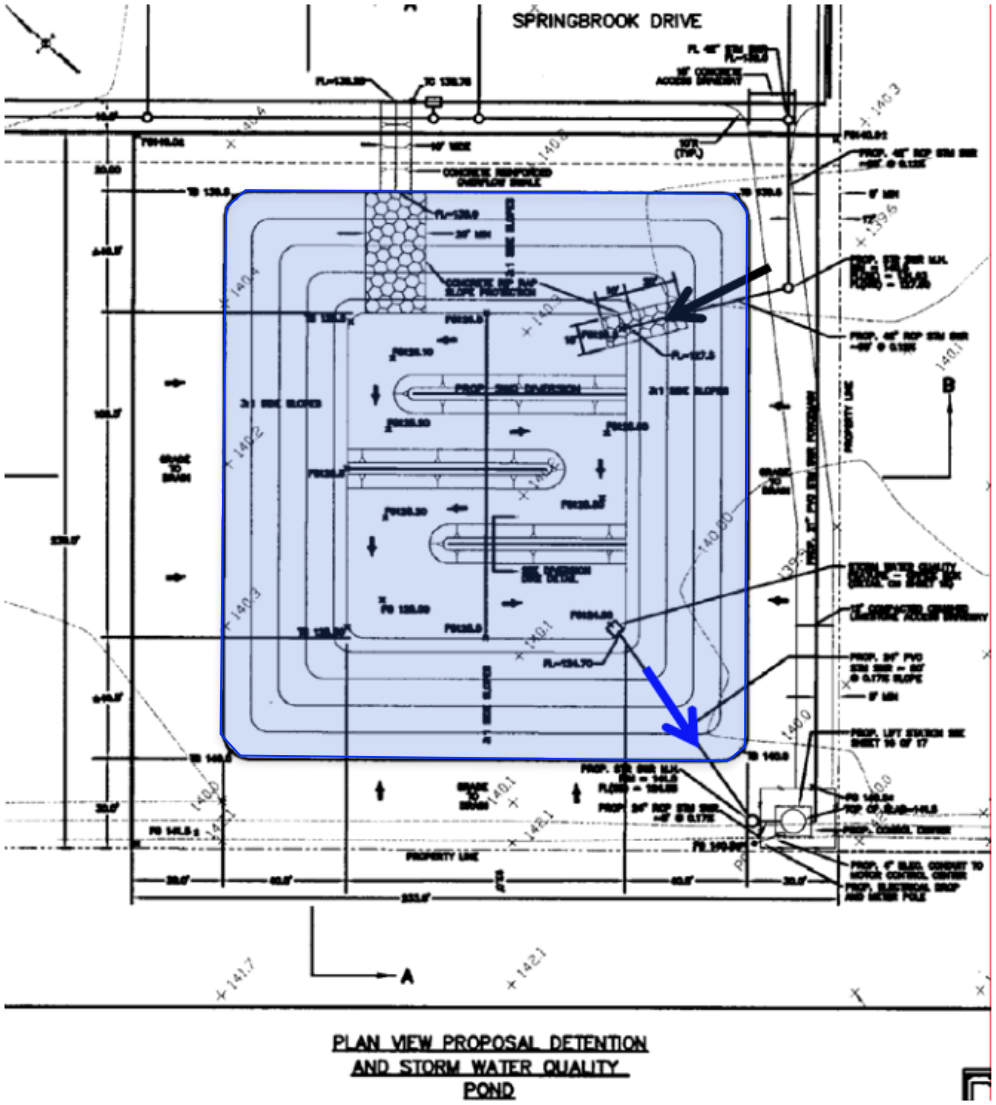


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 145 ft.
- Depth = 5.5 ft.
- Pool Area = 1.20 acres

DEPTH-ELEVATION

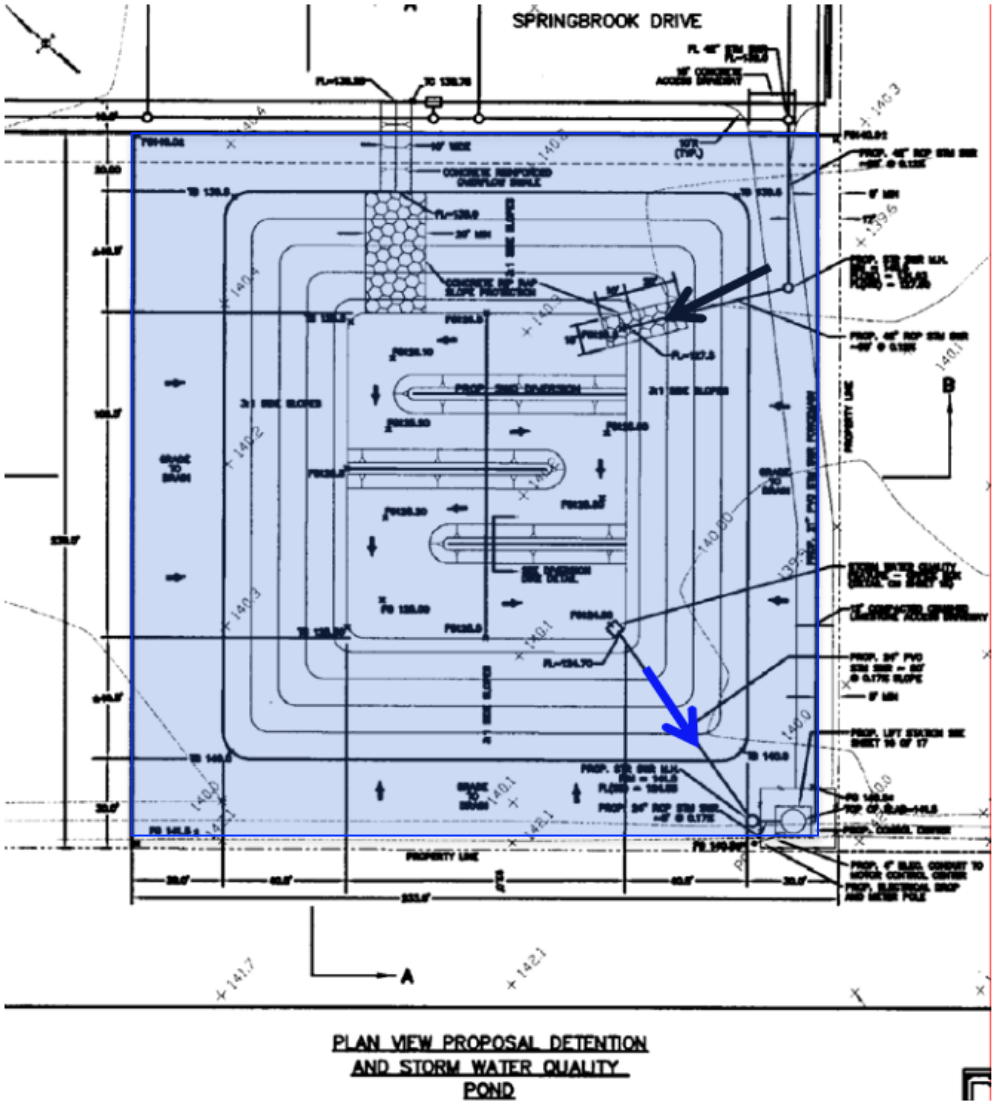
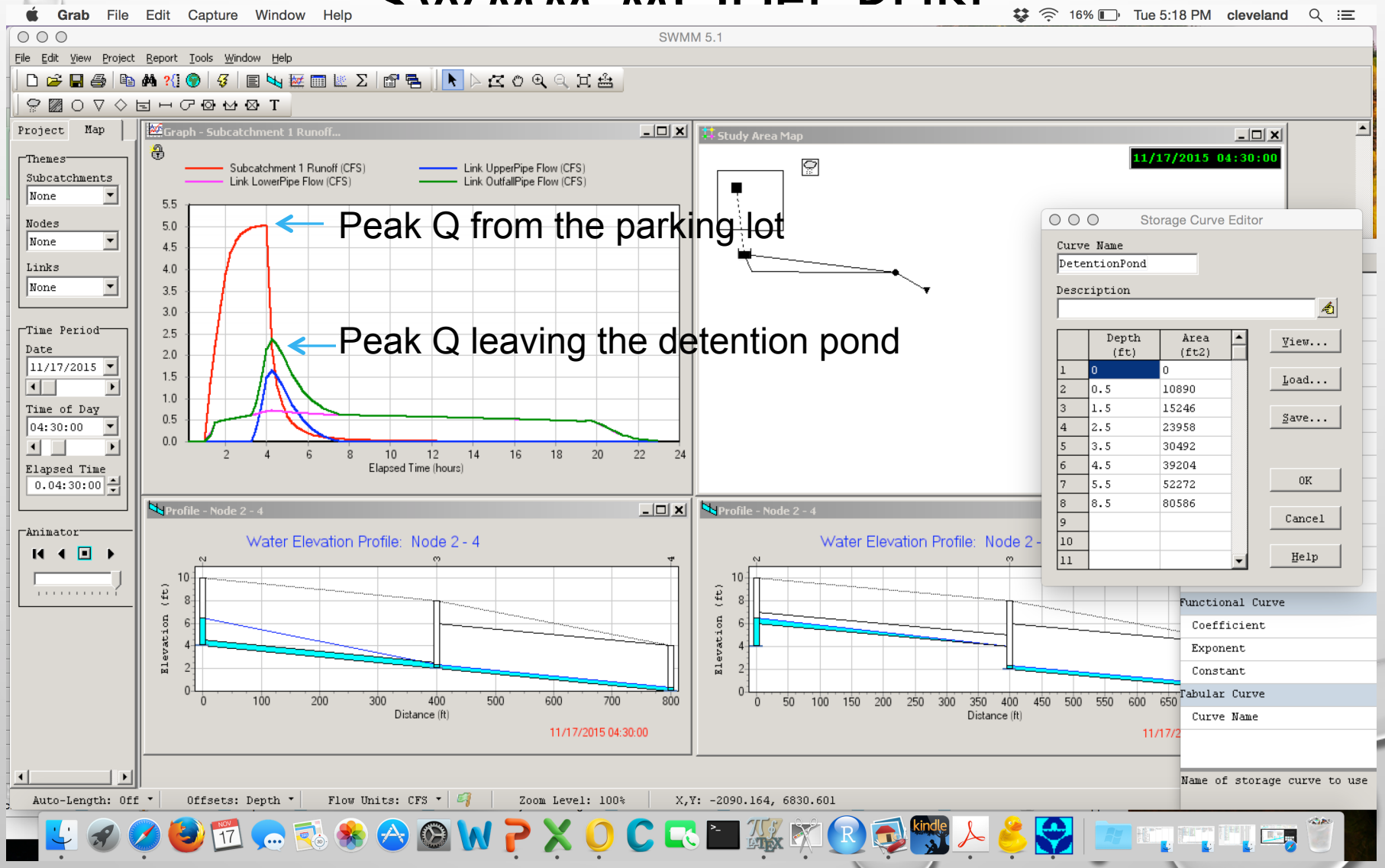


Figure 5. 36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

- Pool elevation = 148 ft.
- Depth = 8.5 ft.
- Pool Area = 1.85 acres

Any deeper and we are inundating off-site property

SWMM MODEL RUN



NEXT TIME