

CE 3372 WATER SYSTEMS DESIGN

LECTURE 23: EPA SWMM– STORAGE NODES AND
DETENTION BASINS

PURPOSES

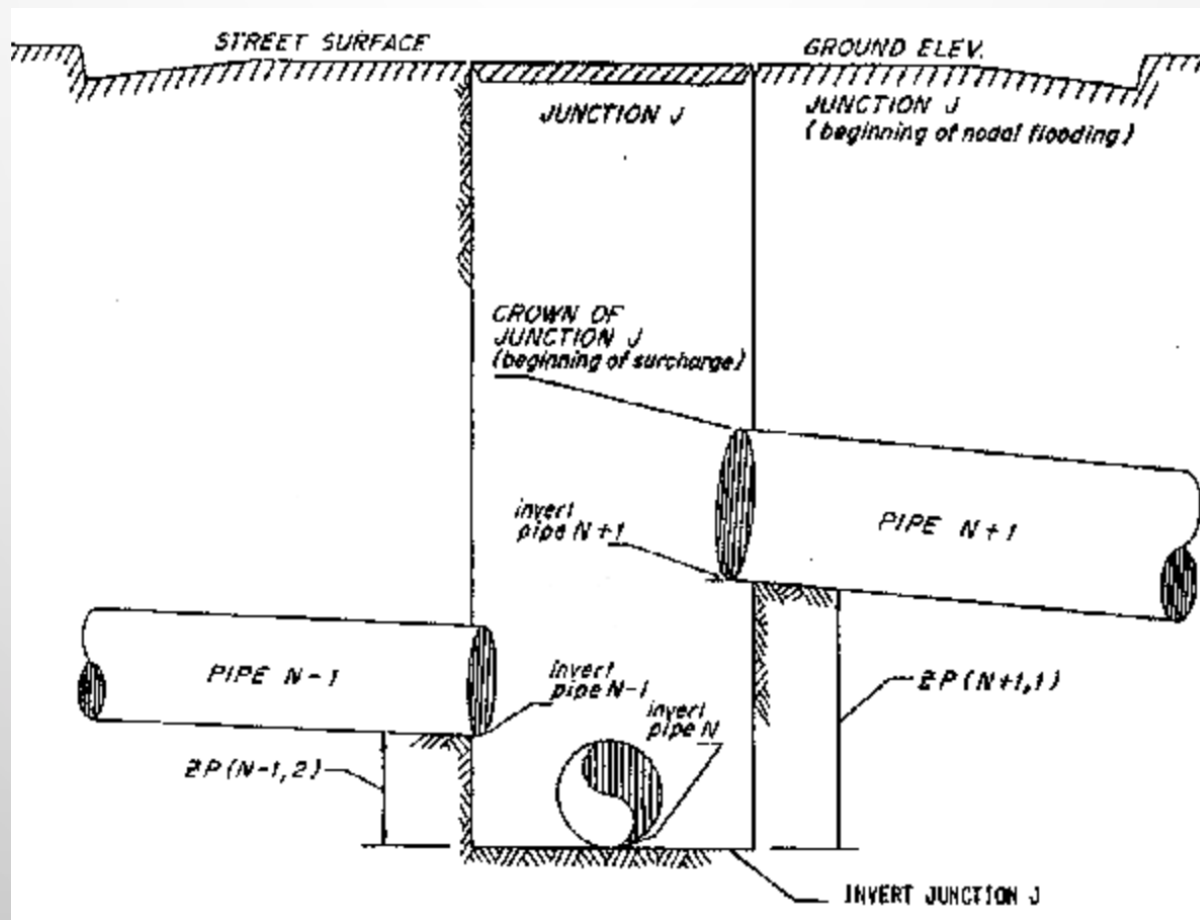
- DETENTION BASIN
- STORAGE NODE

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)

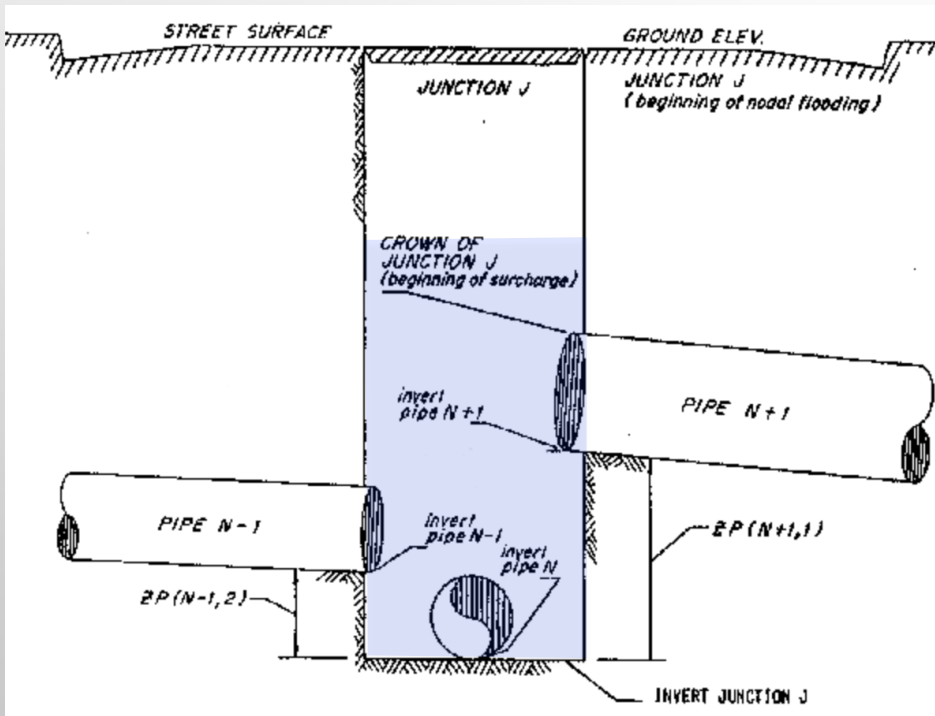
JUNCTION (NODE)

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

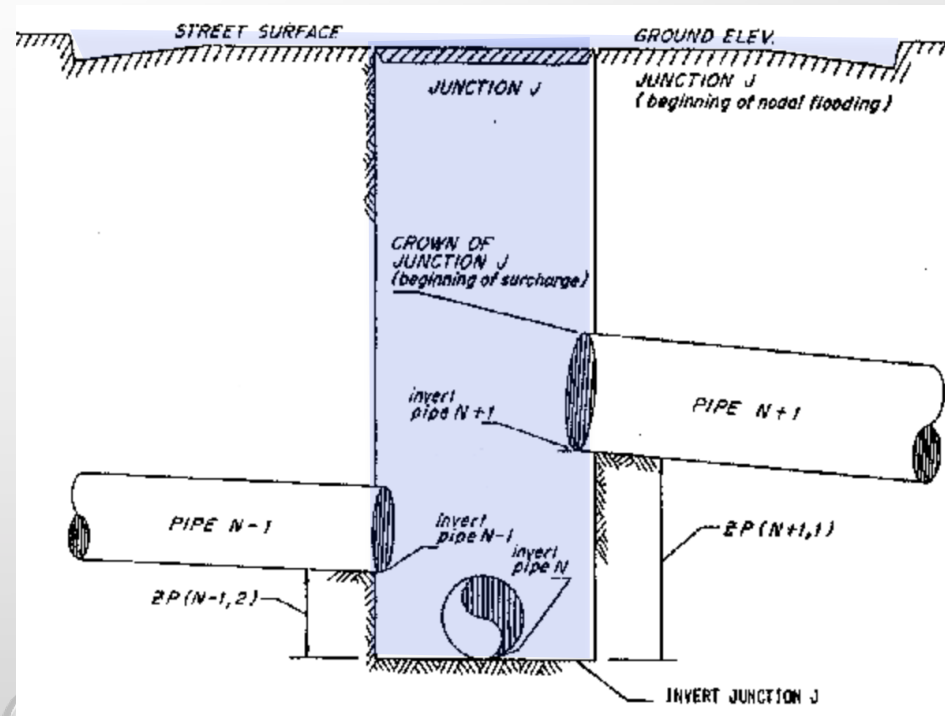


JUNCTION (NODE)

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



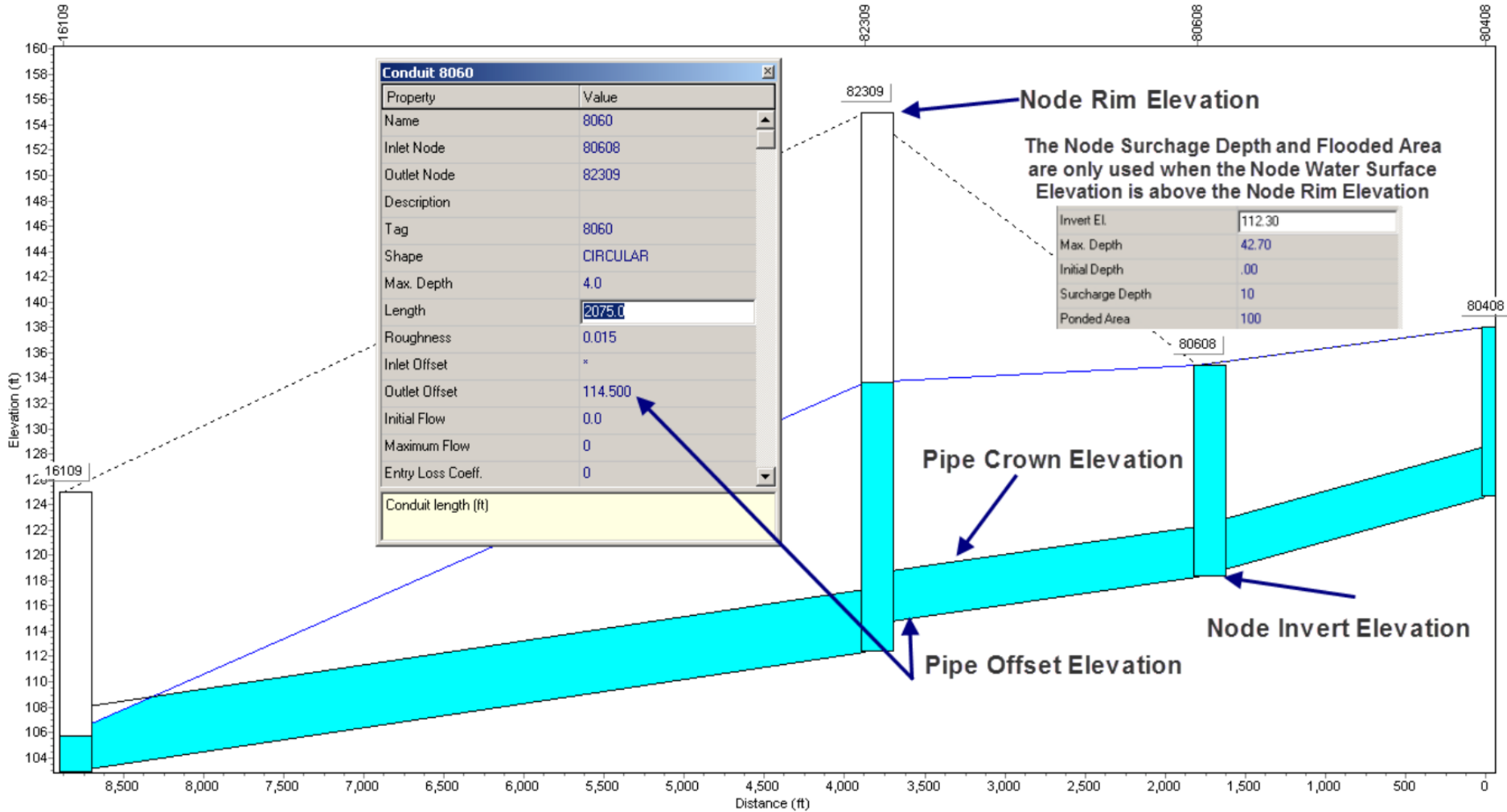
Node not flooded; pipes are surcharged



Node flooded; pipes are surcharged

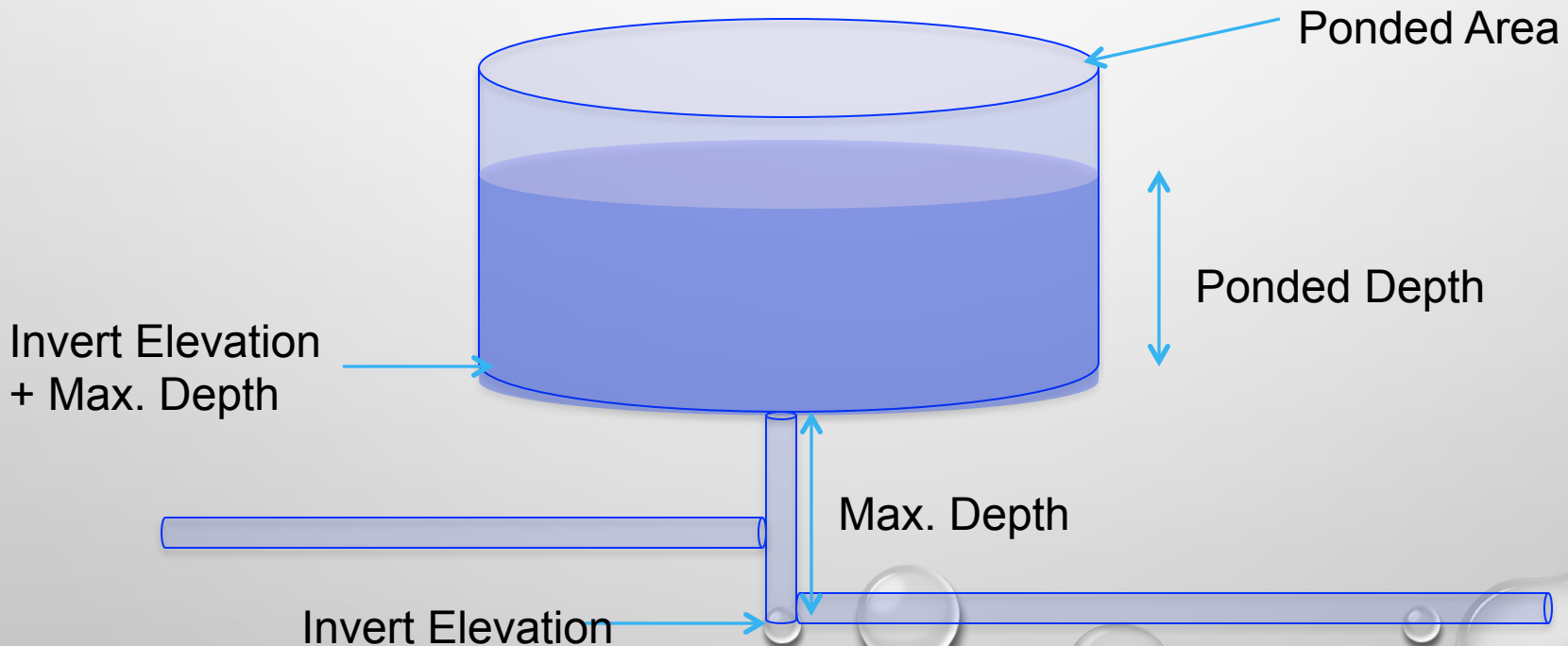
FLOODING ORDINARY NODE

Water Elevation Profile: Node 80408 - 16109



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)

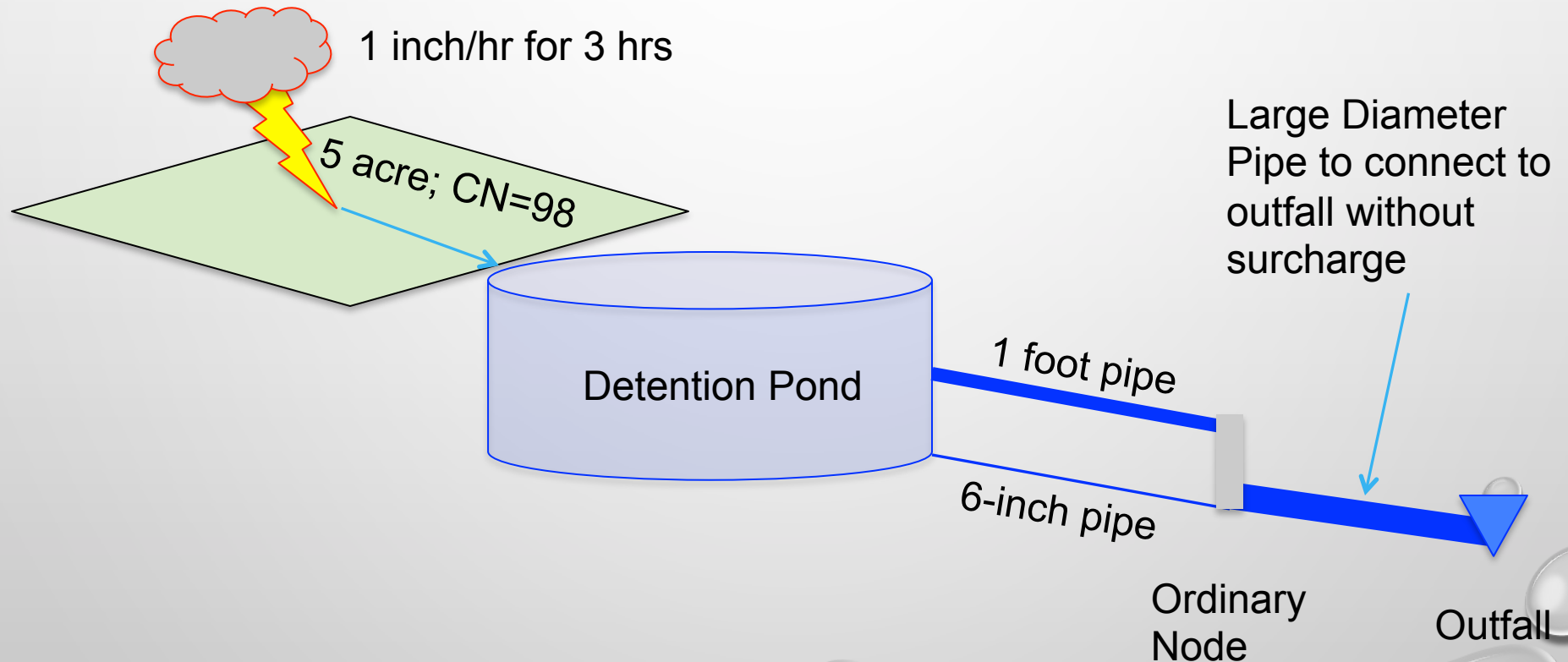
- USEFUL FOR:
 - DETENTION PONDS
 - MODELING MULTIPLE LEVEL INLET/OUTLET HYDRAULICS
 - RISER INLET
 - OUTLET THAT HAS PORTION THROUGH A PIPE, A PORTION OVER A WEIR (OR ANOTHER PIPE AT DIFFERENT ELEVATION)

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

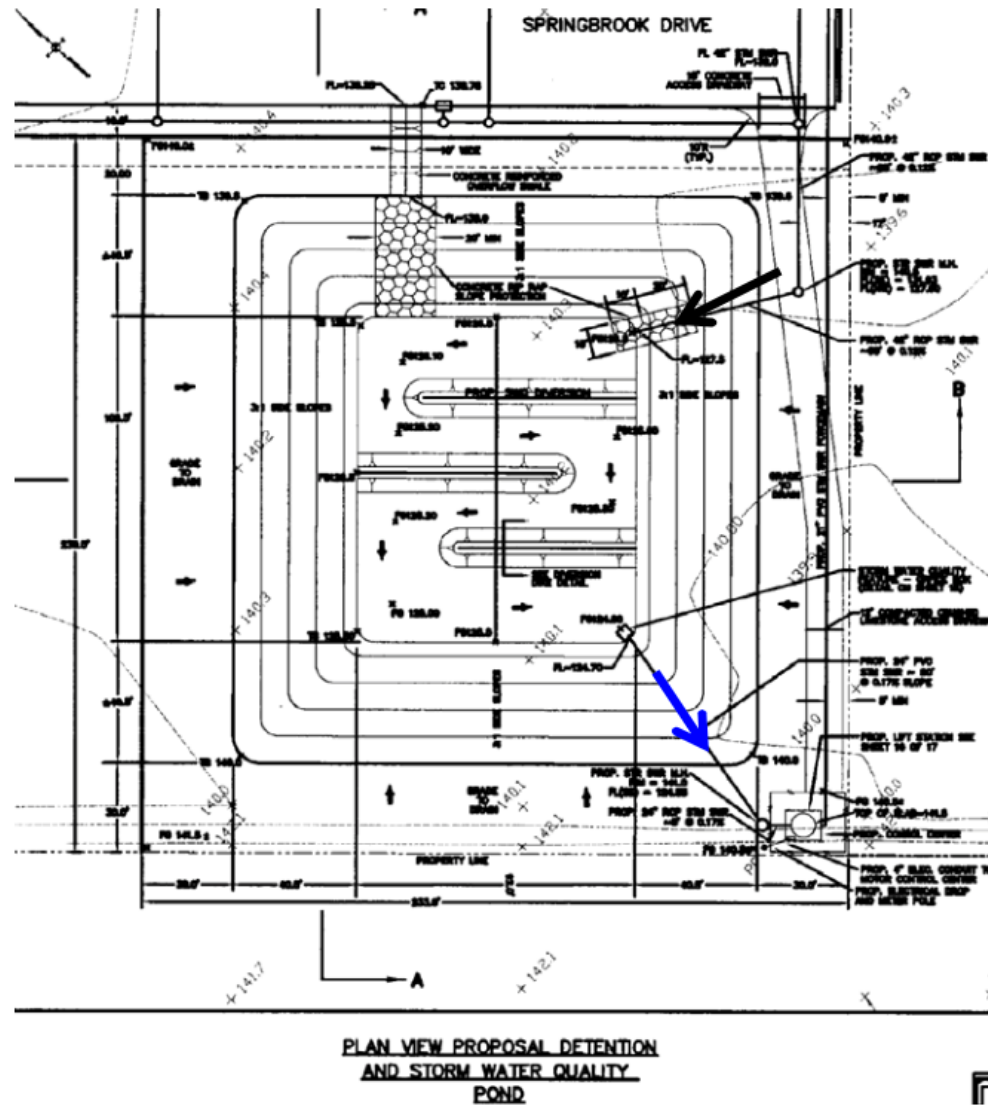
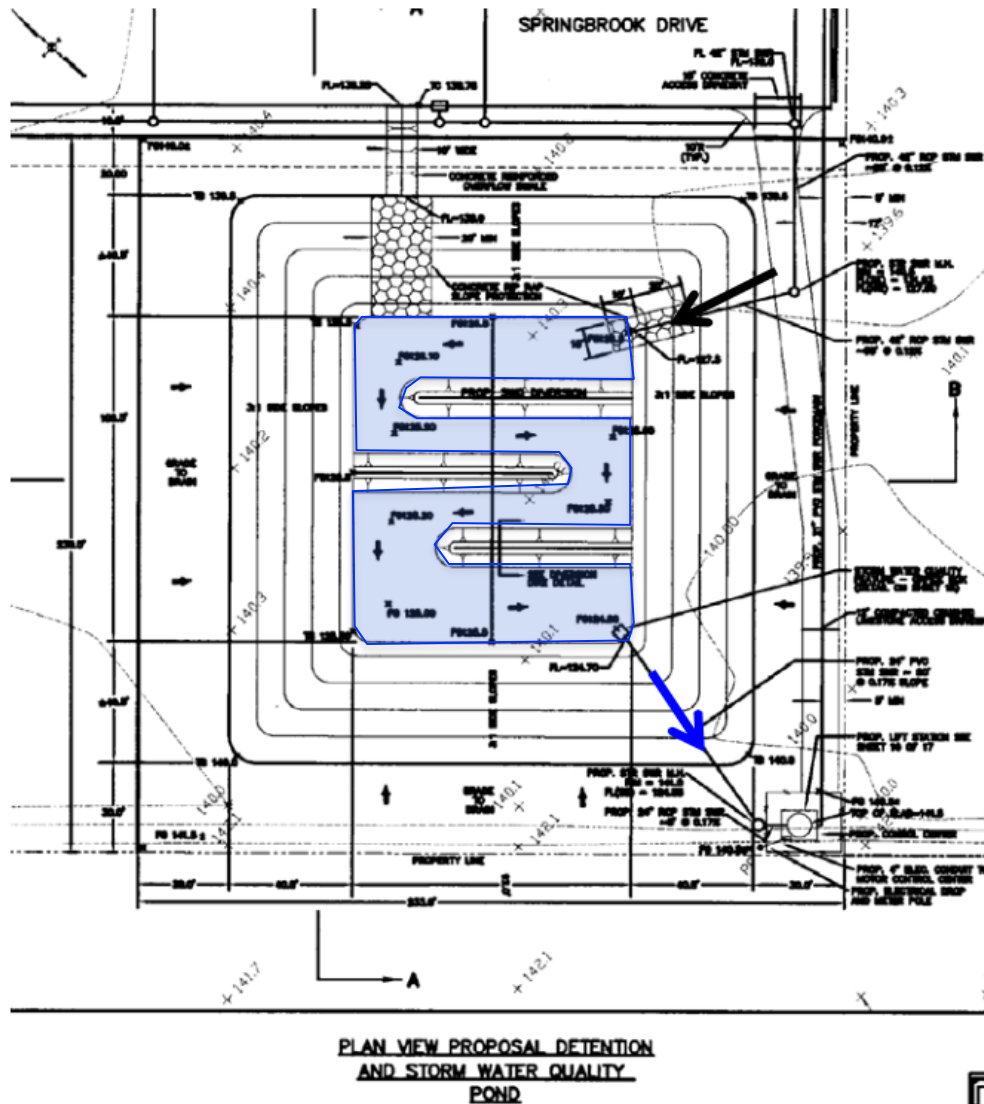


Figure 5.36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

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)

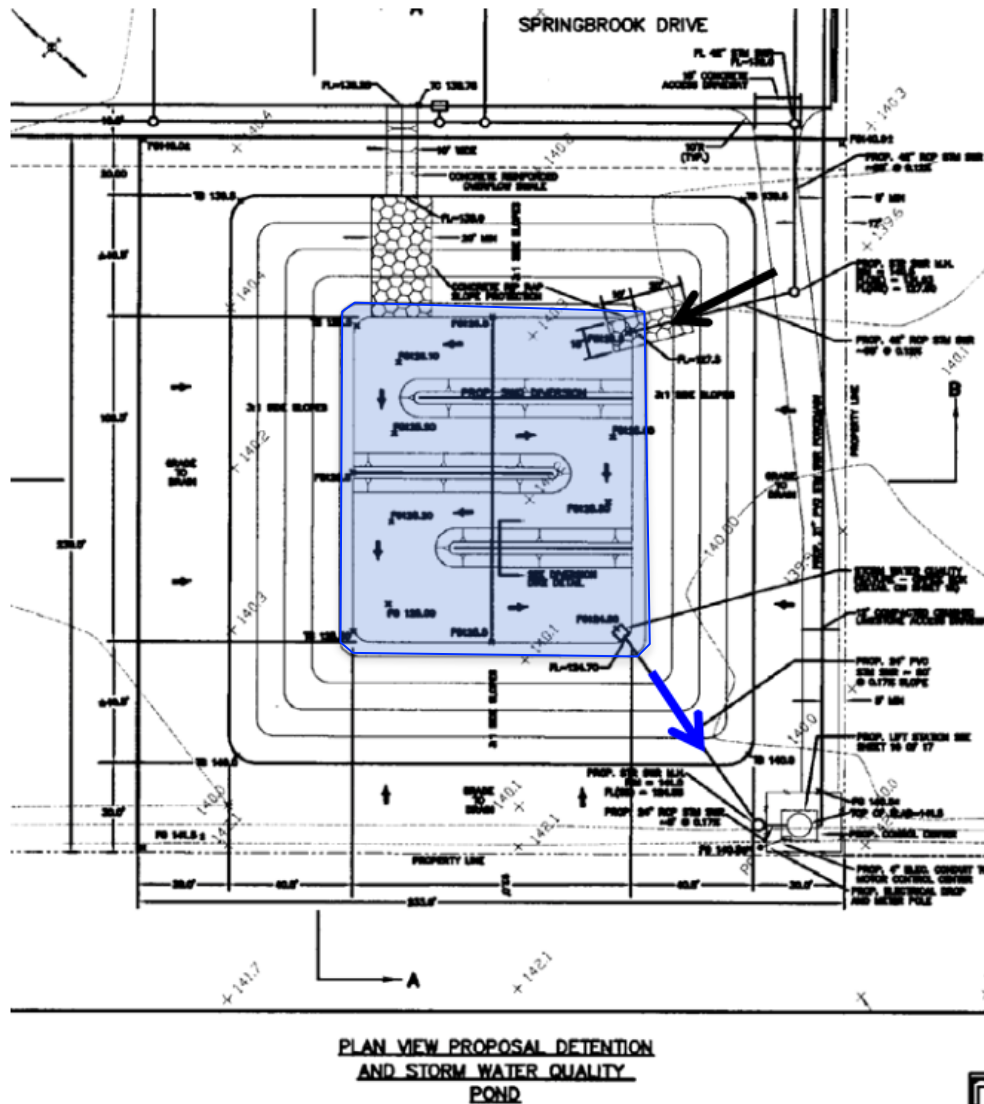
DEPTH-ELEVATION



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

Figure 5.36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

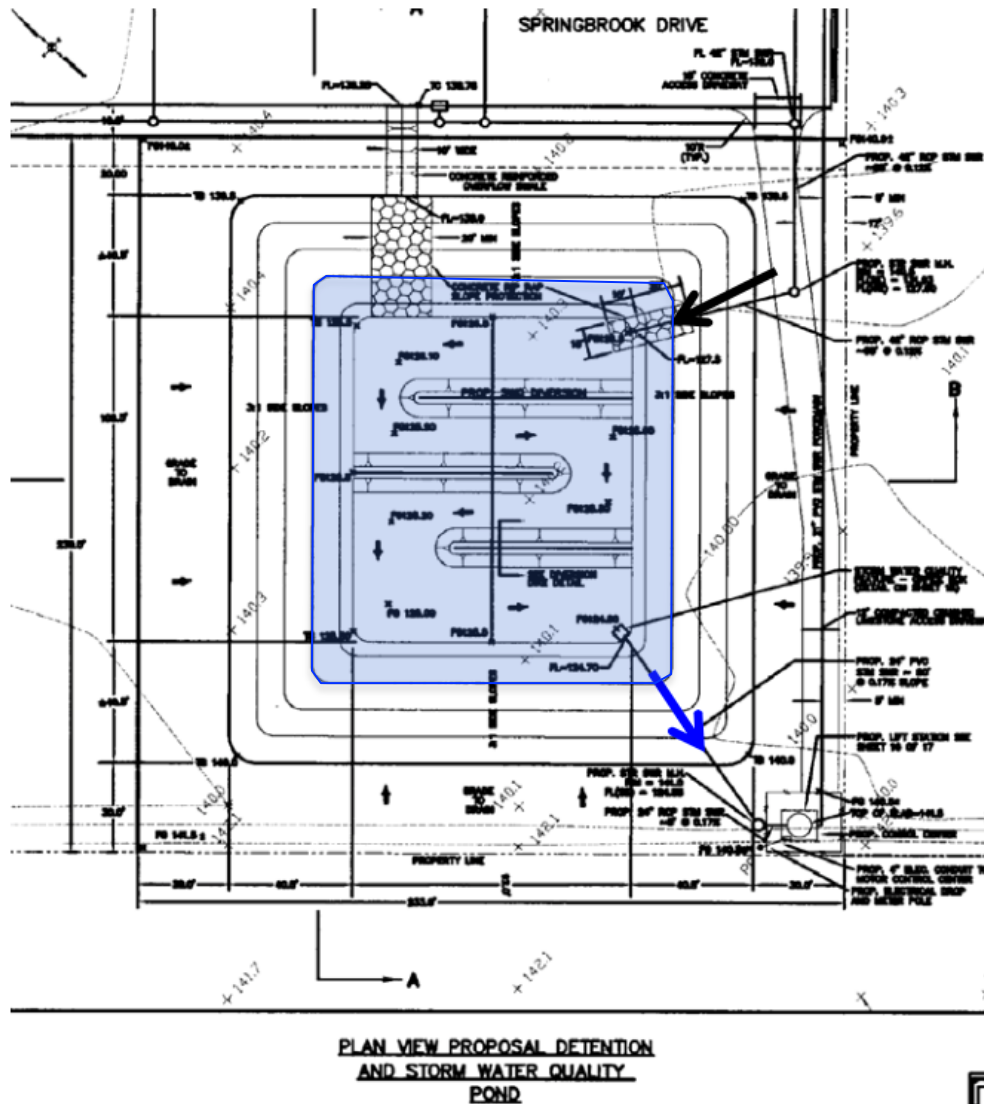
DEPTH-ELEVATION



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

Figure 5.36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

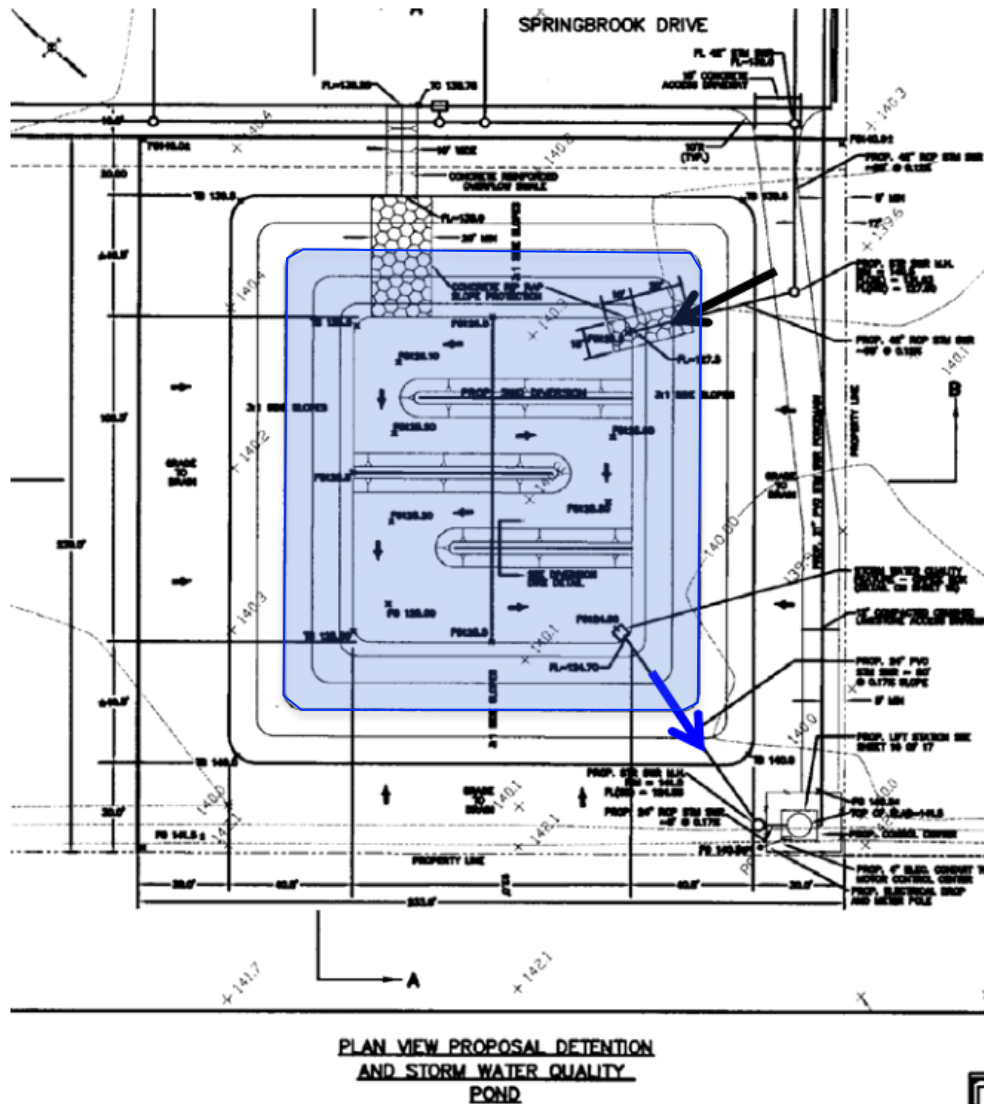
DEPTH-ELEVATION



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

Figure 5.36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

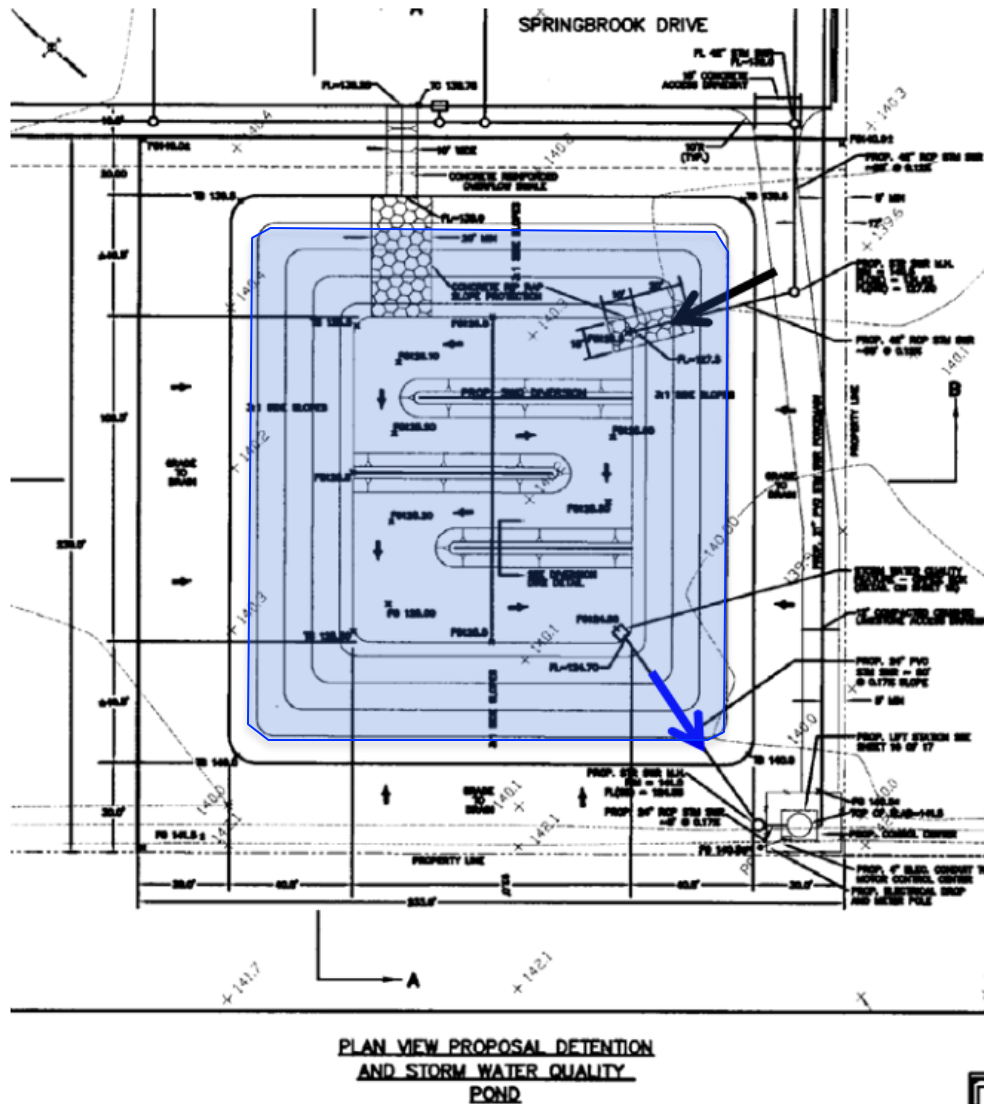
DEPTH-ELEVATION



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

Figure 5.36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

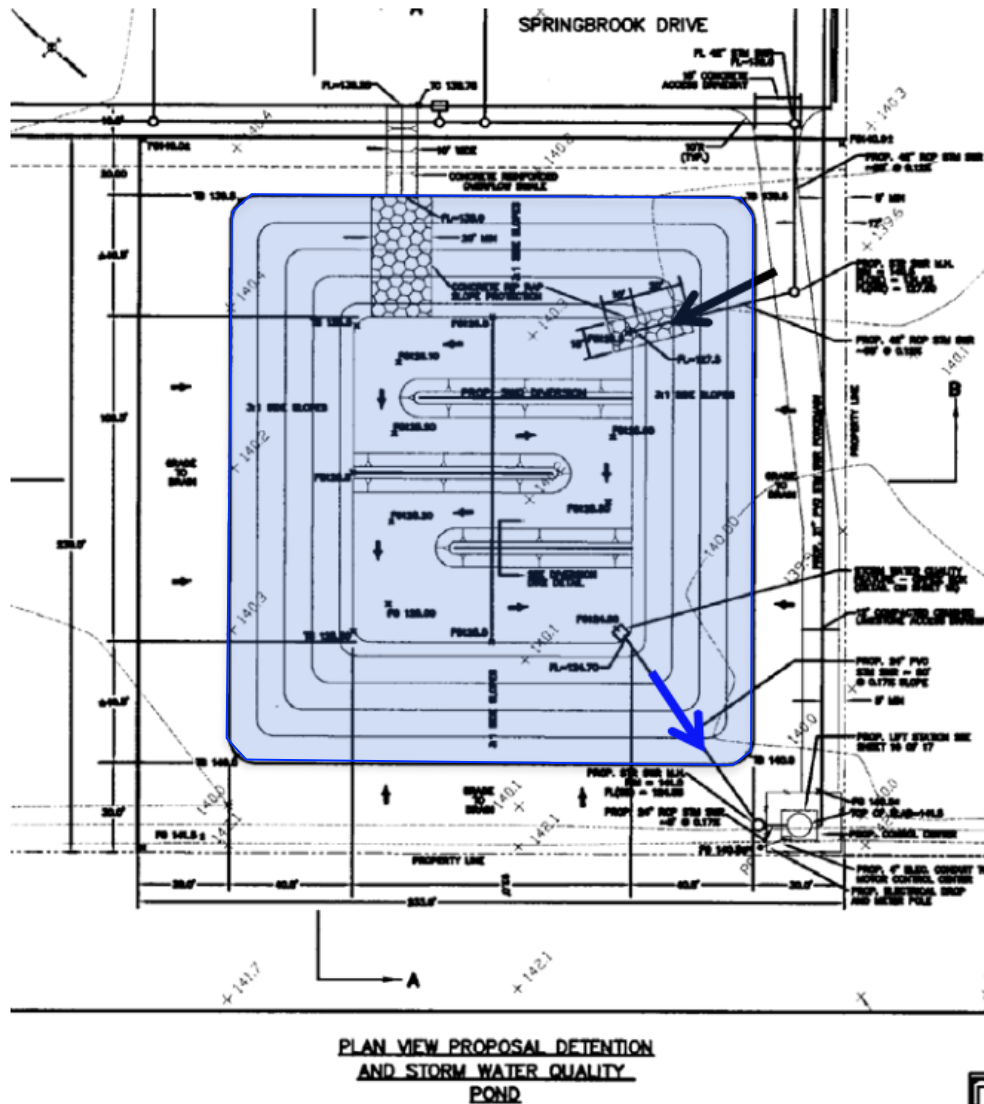
DEPTH-ELEVATION



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

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

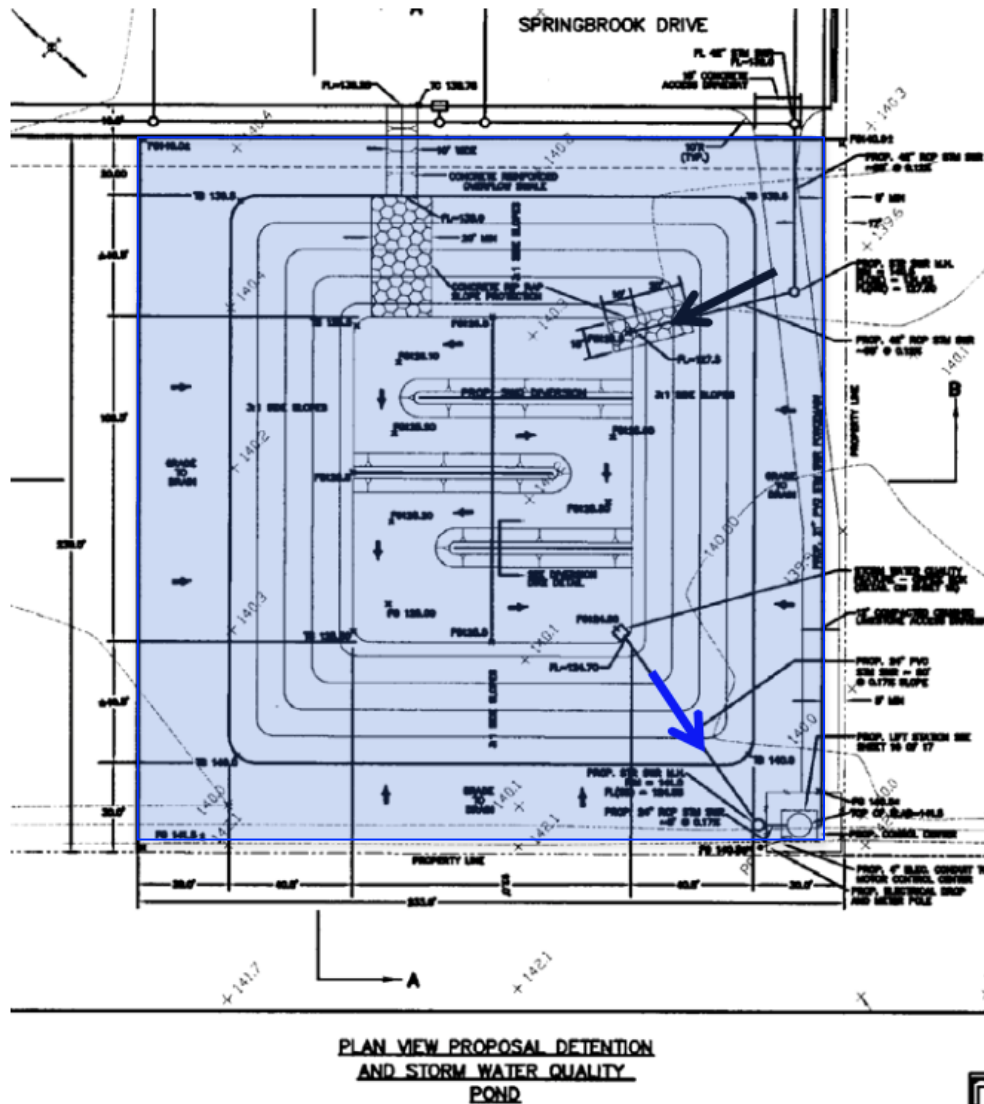
DEPTH-ELEVATION



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

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

DEPTH-ELEVATION



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

Any deeper and we are inundating off-site property

Figure 5.36 Engineering Drawing for Permit 8-262-4 (Harris County) SWQ Pond

SWMM MODEL DI INI

SWMM 5.1

File Edit View Project Report Tools Window Help

Graph - Subcatchment 1 Runoff...

Study Area Map

11/17/2015 04:30:00

Storage Curve Editor

Curve Name: DetentionPond

Description:

	Depth (ft)	Area (ft2)
1	0	0
2	0.5	10890
3	1.5	15246
4	2.5	23958
5	3.5	30492
6	4.5	39204
7	5.5	52272
8	8.5	80586
9		
10		
11		

Functional Curve
Coefficient
Exponent
Constant
Tabular Curve
Curve Name
Name of storage curve to use

Profile - Node 2 - 4

Water Elevation Profile: Node 2 - 4

11/17/2015 04:30:00

Profile - Node 2 - 4

Water Elevation Profile: Node 2 - 4

11/17/2015 04:30:00

Auto-Length: Off Offsets: Depth Flow Units: CFS Zoom Level: 100% X,Y: -2090.164, 6830.601



The image features a light gray background with several realistic water droplets of various sizes scattered in the corners. The droplets have highlights and shadows, giving them a three-dimensional appearance. The text "NEXT TIME" is centered in the upper half of the image.

NEXT TIME