# Reclaiming the Former Coastal Refinery
# El Dorado, Kansas

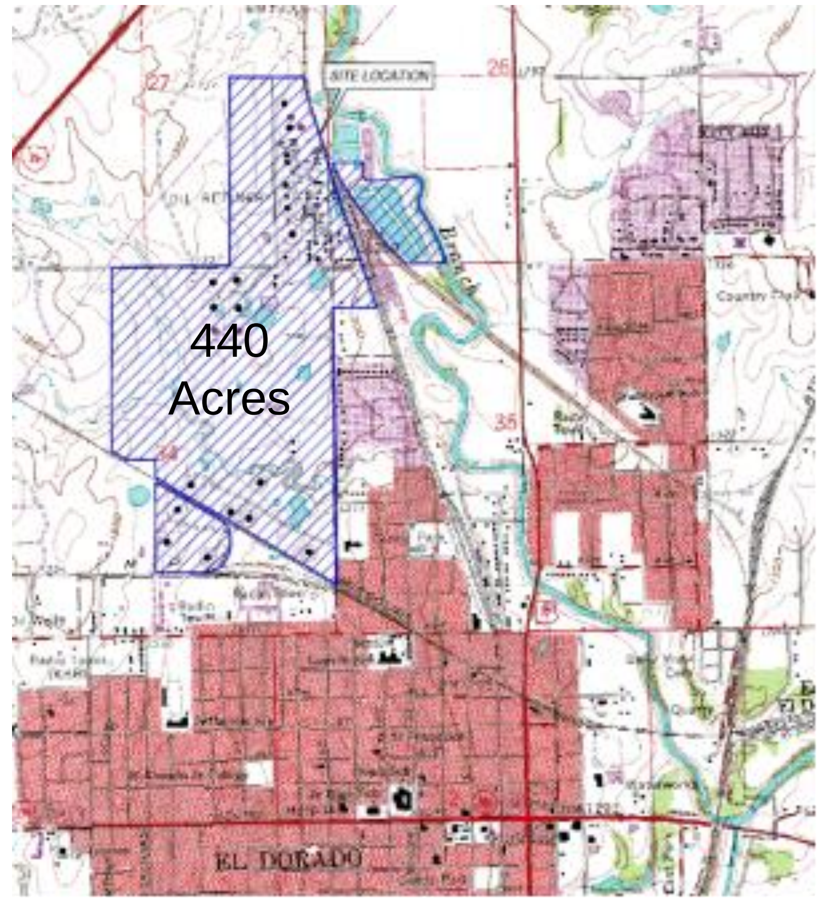
KINDER MORGAN

MWH

BUILDING A BETTER WORLD

# Location


Kansas
N E B R A S K A
I O W A
M O
C O
40°
38°
Atchison
Leavenworth
Manhattan
Topeka
Kansas City
Junction City
Lawrence
Olathe
Hays
Salina
K A N S A S
Emporia
McPherson
Great Bend
Hutchinson
Newton
Garden City
Dodge City
Wichita
Pittsburg
Coffeyville
O K L A H O M A
T X
102°
100°
0 50 100 mi
0 50 100 km


SITE LOCATION
440
Acres
EL DORADO

# Late 1980's

# Site Use History

- **Refinery Built:** 1917
- **Fina Oil and Chemical Company:** 1950s-1977
- **Pester Refining Company:** 1977-1985
- **Coastal Refining Company:** 1986-2001
  - Petroleum refining operations ceased in 1993
- **El Paso Bought Coastal:** 2001
  - Asphalt blending operations until 2004
- **Kinder Morgan Bought El Paso:** 2012

# 2004 Challenges

- Prior slow progress toward remediation
- Community eye-sore / brownfield
- Full pipes, equipment, & ponds – process wastes
- Petroleum seeps discharging to a river on east side
- Asphalt pit and piles on the west side
- Tar spring in the Main Process Area (MPA)
- Long operational history
- Site Investigation (SI) gaps

# Strategy – The Usual Process

- Phase I: Demolition, Seep Interceptor Trench (as IRM) and Site Investigation (SI)
- Phase II: Complete site-specific Risk Assessment (RA)
- Phase III: Corrective Action Study (CAS)
- Phase IV: Corrective Action Decision (CAD) and Corrective Action Plan (CAP)
- Phase V: Implement All/Long-Term Remedies

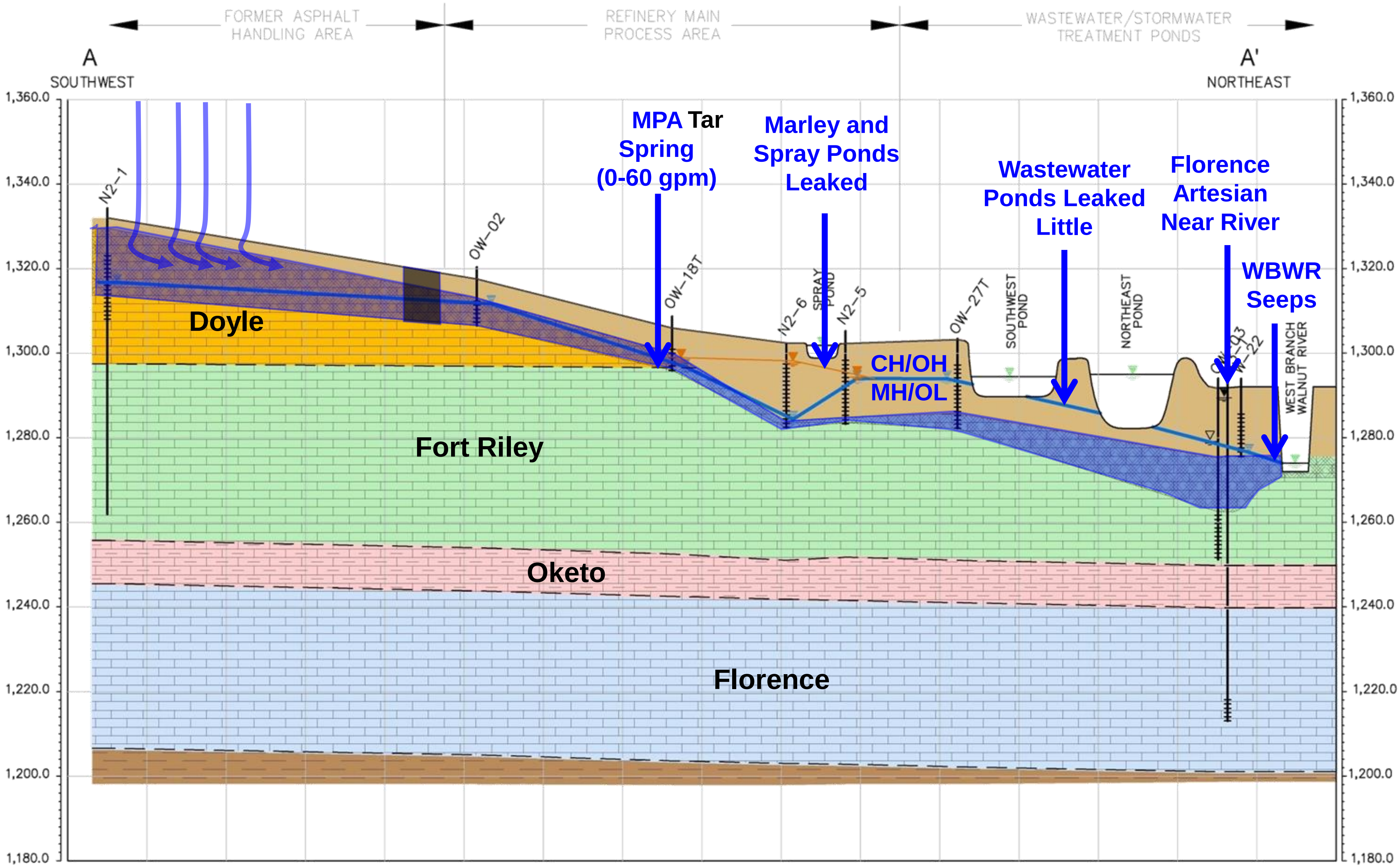
# Demolition 2004-2006

# Post-Demolition

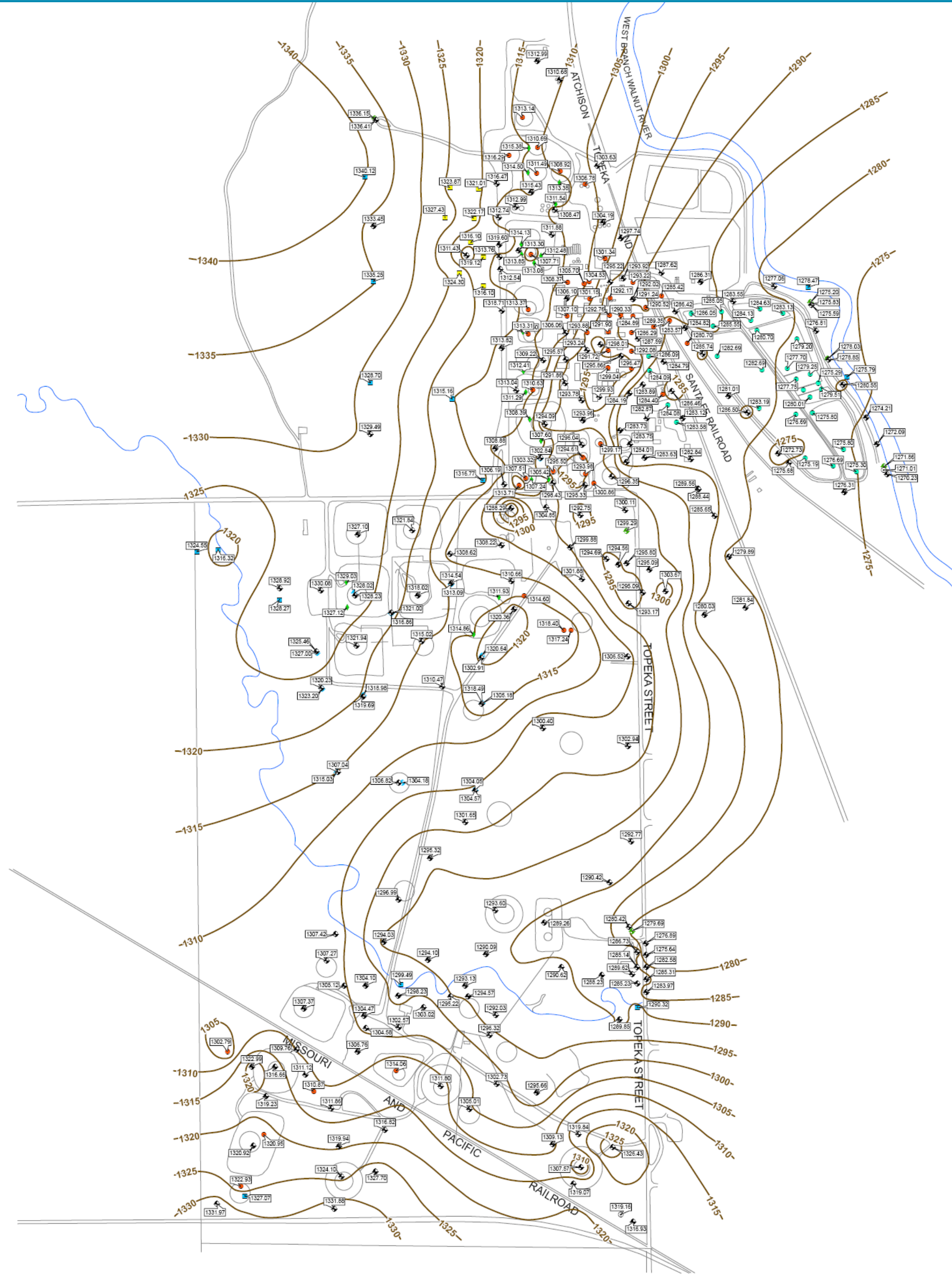

Post-Demolition
2009/05/06

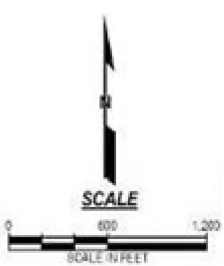
# 2006 – 2008
# Phase III Site Investigation (SI)
# & Conceptual Site Model (CSM)

# Hydrogeology

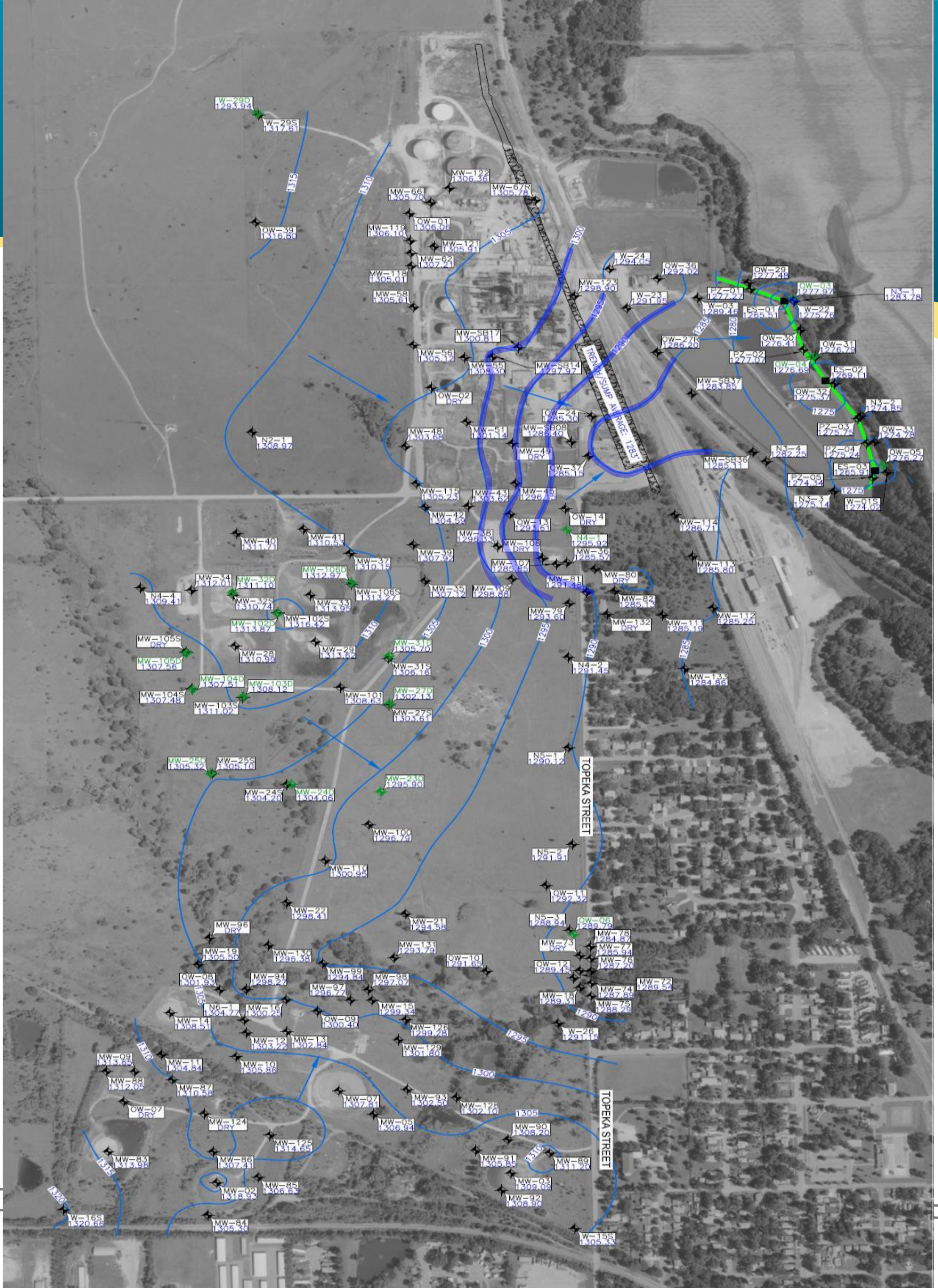


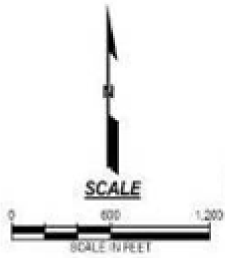
# Bedrock


WEST BRANCH WALNUT RIVER
ATCHISON TOPEKA AND SANTA FE RAILROAD
TOPEKA STREET
MISSOURI AND PACIFIC RAILROAD

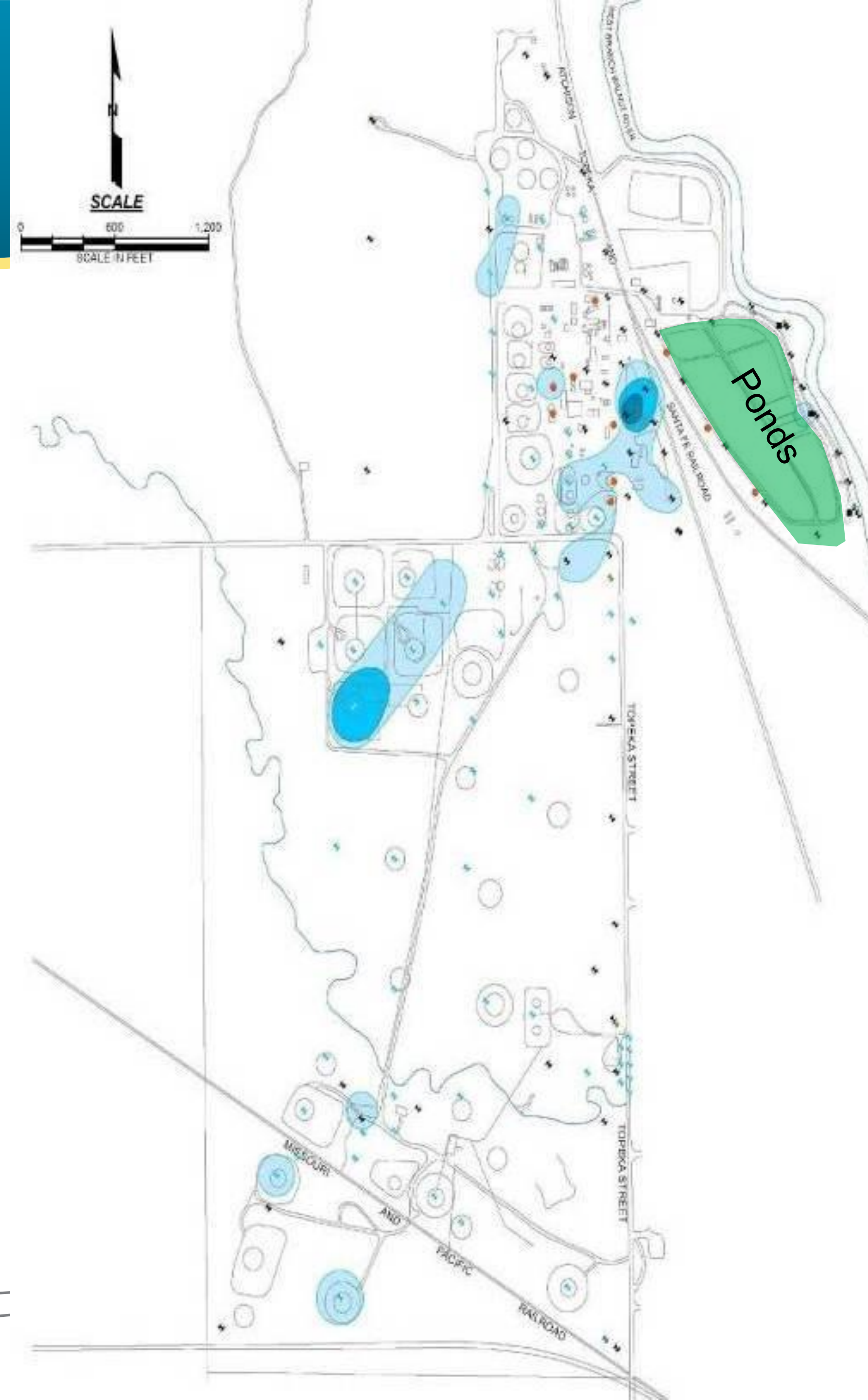

SCALE
0
600
1,200
SCALE IN FEET

# Shallow Groundwater



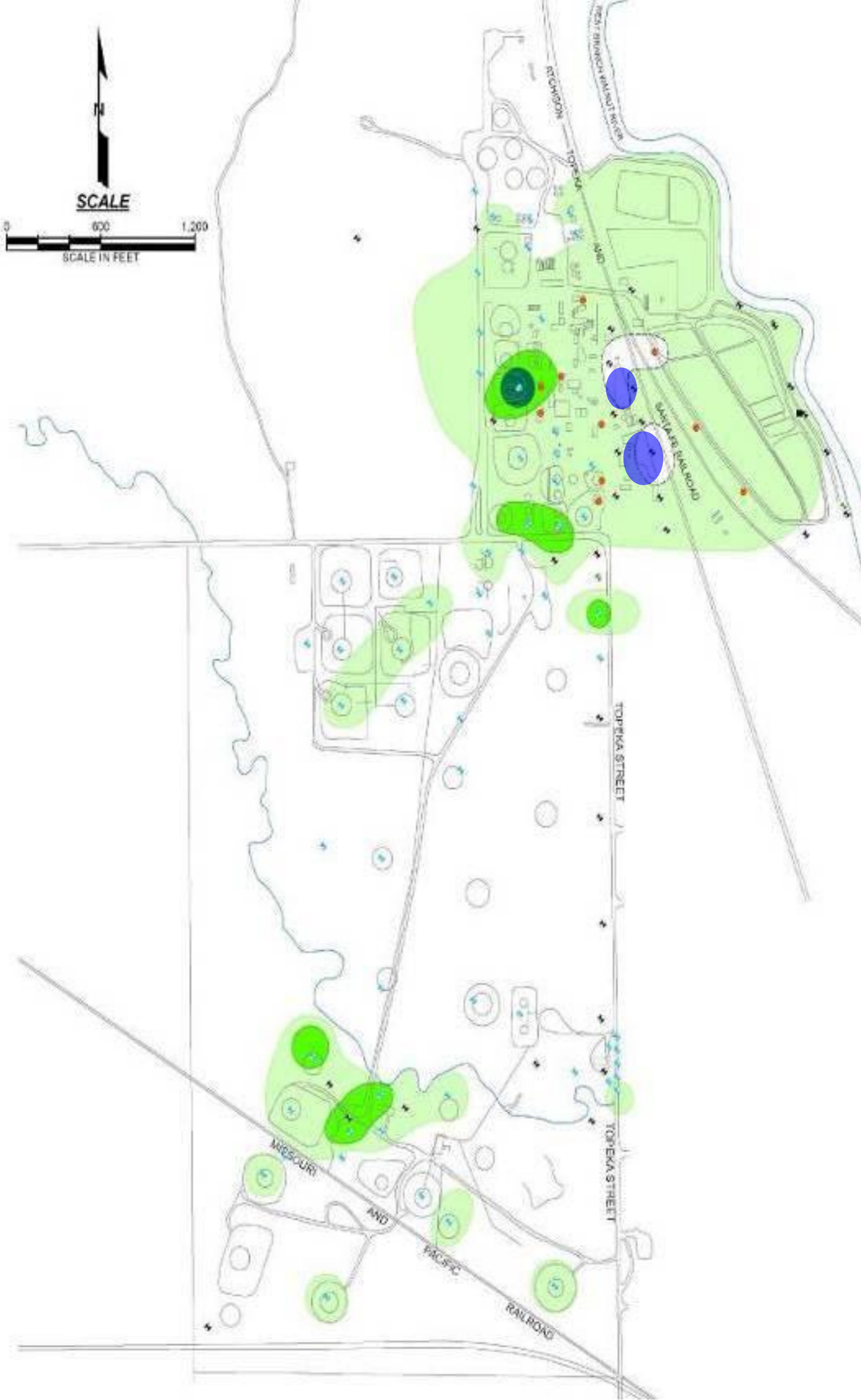



# LNAPL


SCALE
0
600
1,200
SCALE IN FEET
Ponds
TOPEKA STREET
MISSOURI
AND
PACIFIC
RAILROAD

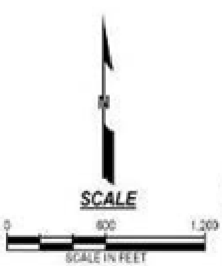

SHADED REGIONS:
LNAPL THICKNESS <0.01 FEET
LNAPL THICKNESS 0.01-1 FEET
LNAPL THICKNESS >1-5 FEET
LNAPL THICKNESS >5 FEET
SCALE
0
600
1,200
SCALE IN FEET

# Benzene

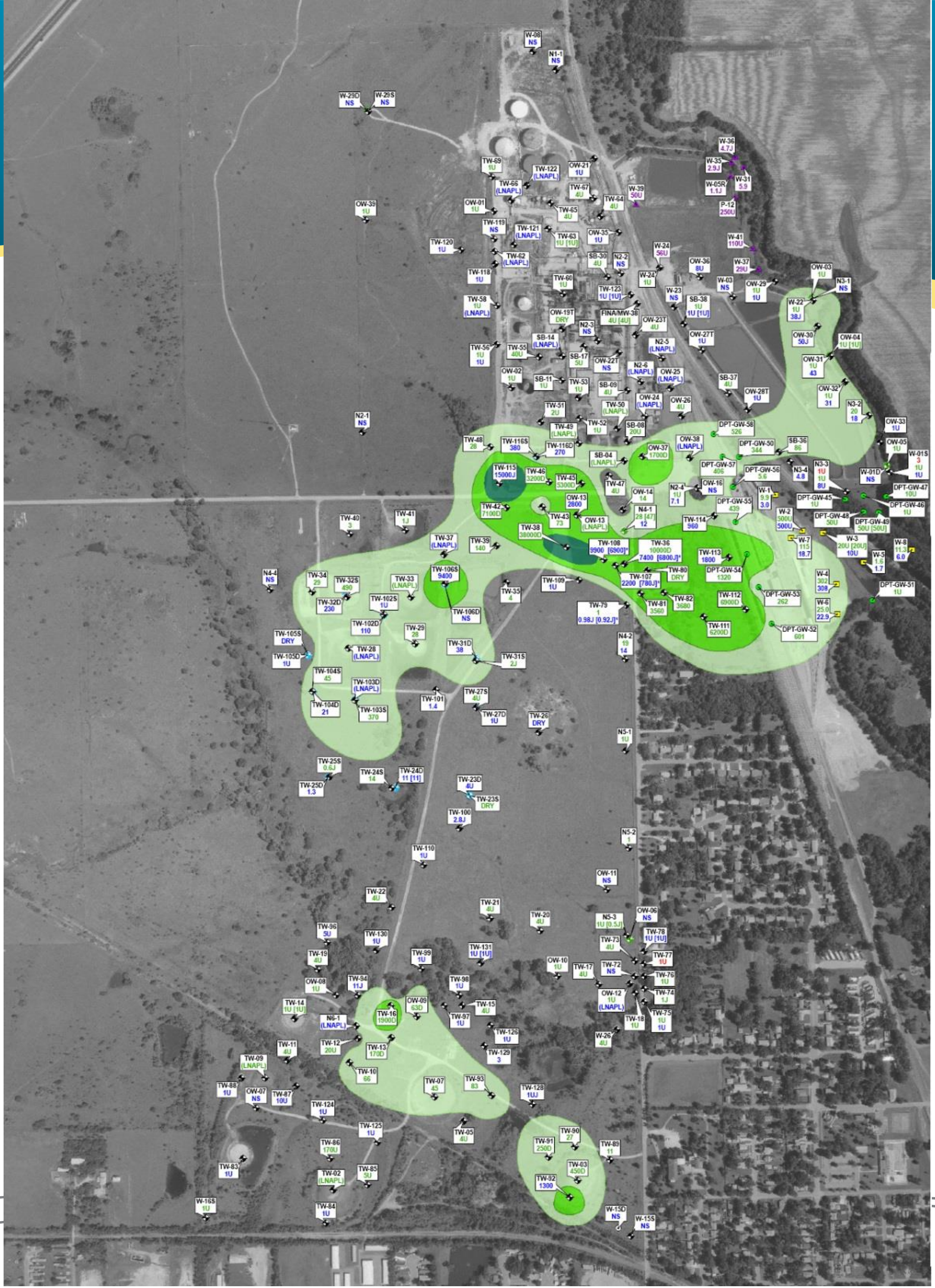



**SHADED REGIONS:**

- BENZENE <5 ug/L
- BENZENE 5 - 1,000 ug/L
- BENZENE 1,000 - 10,000 ug/L
- BENZENE >10,000 ug/L

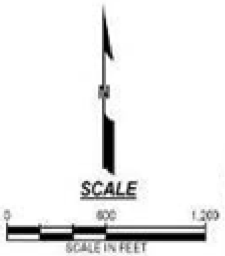


# MTBE



**SHADED REGIONS:**

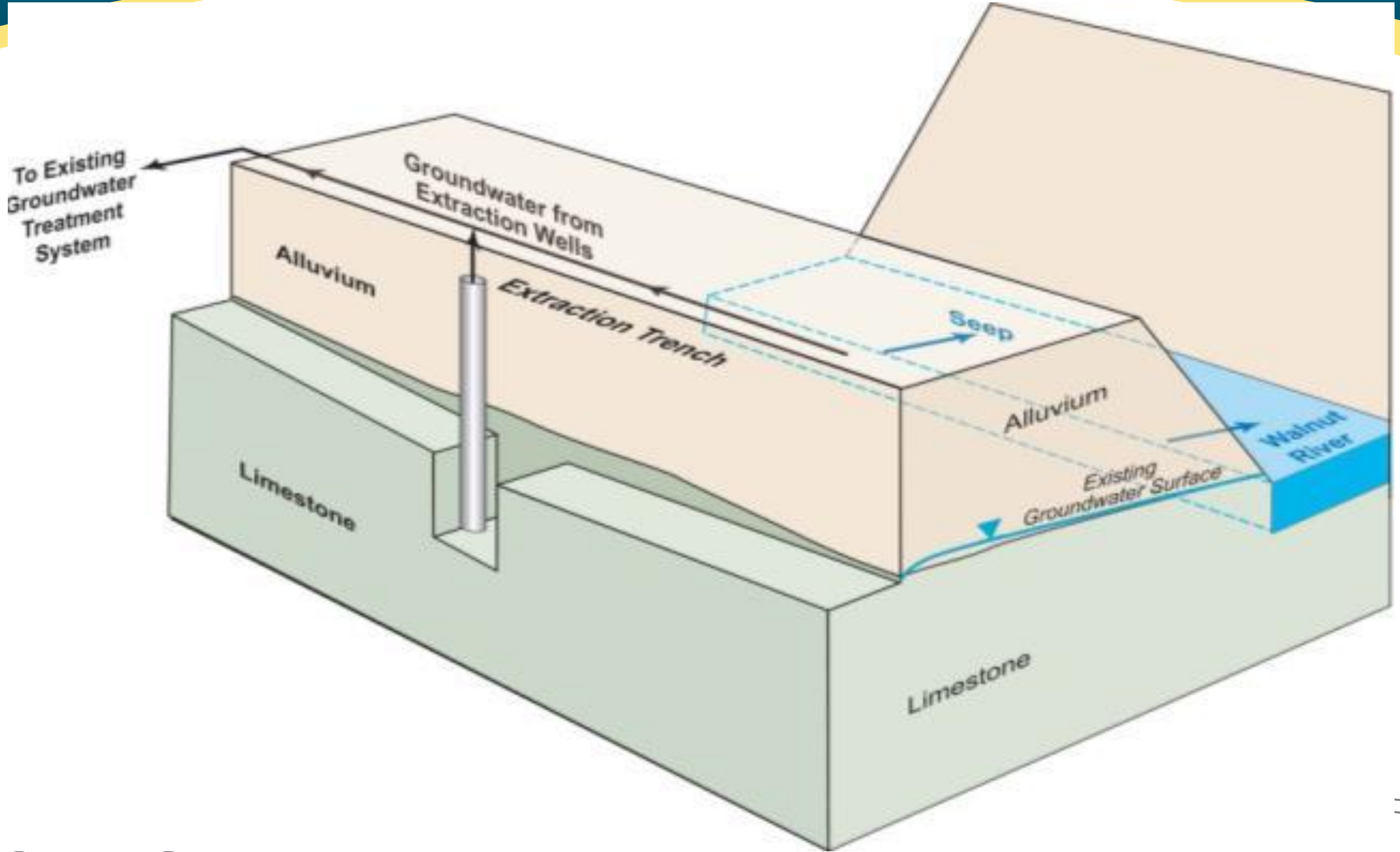
- MTBE <20 ug/L
- MTBE 20 - 1,000 ug/L
- MTBE >1,000 - 10,000 ug/L
- MTBE >10,000 ug/L



# 2006

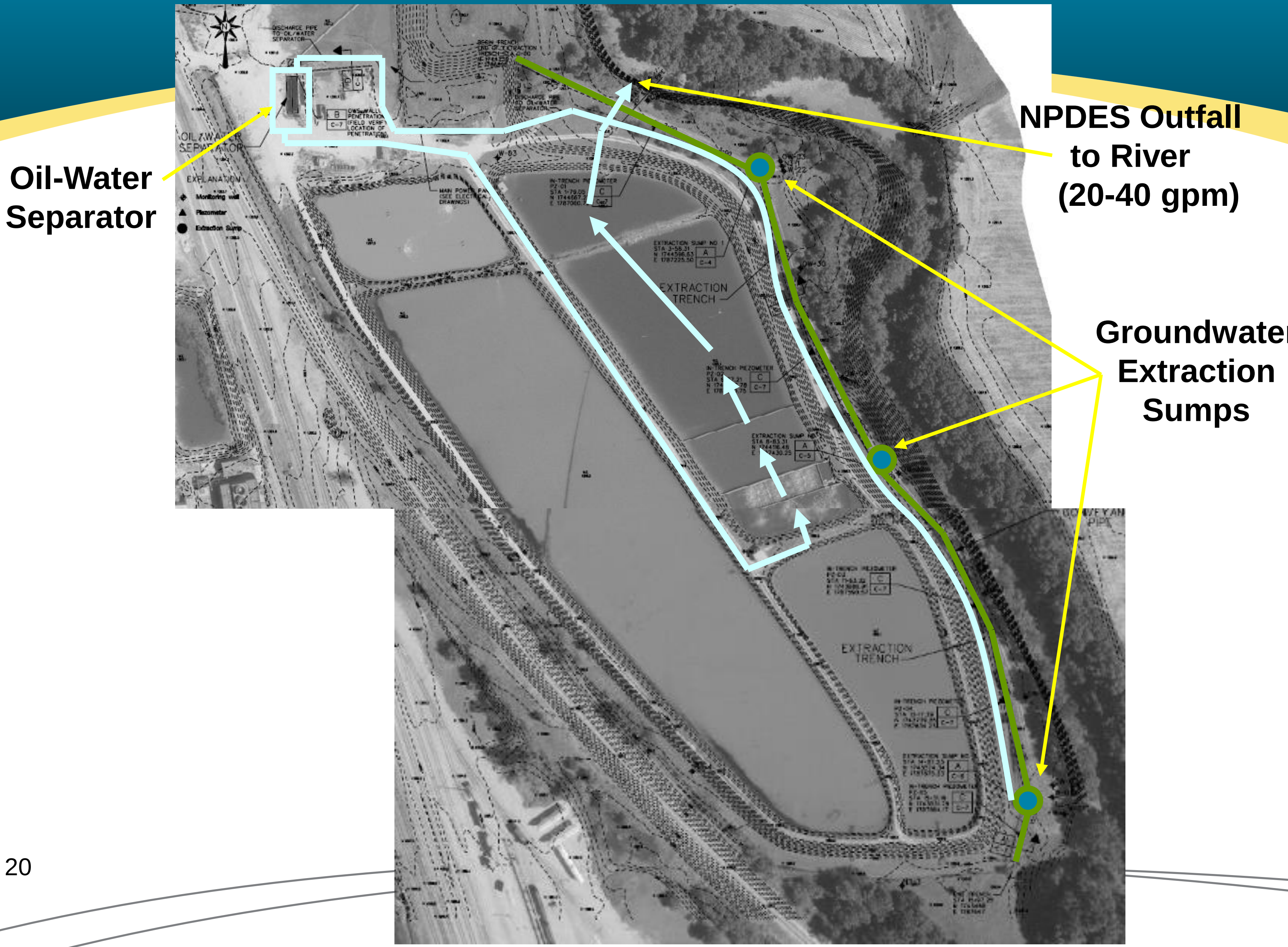
# Seep Interceptor Trench (IT)

# Seep IT Conceptual Approach



# Seep Interceptor Trench


# Seep Interceptor Trench



# Plan was Progressing When In 2008 KDHE BOW Required Pond Closure by End of 2012

# Waste Water Pond Use

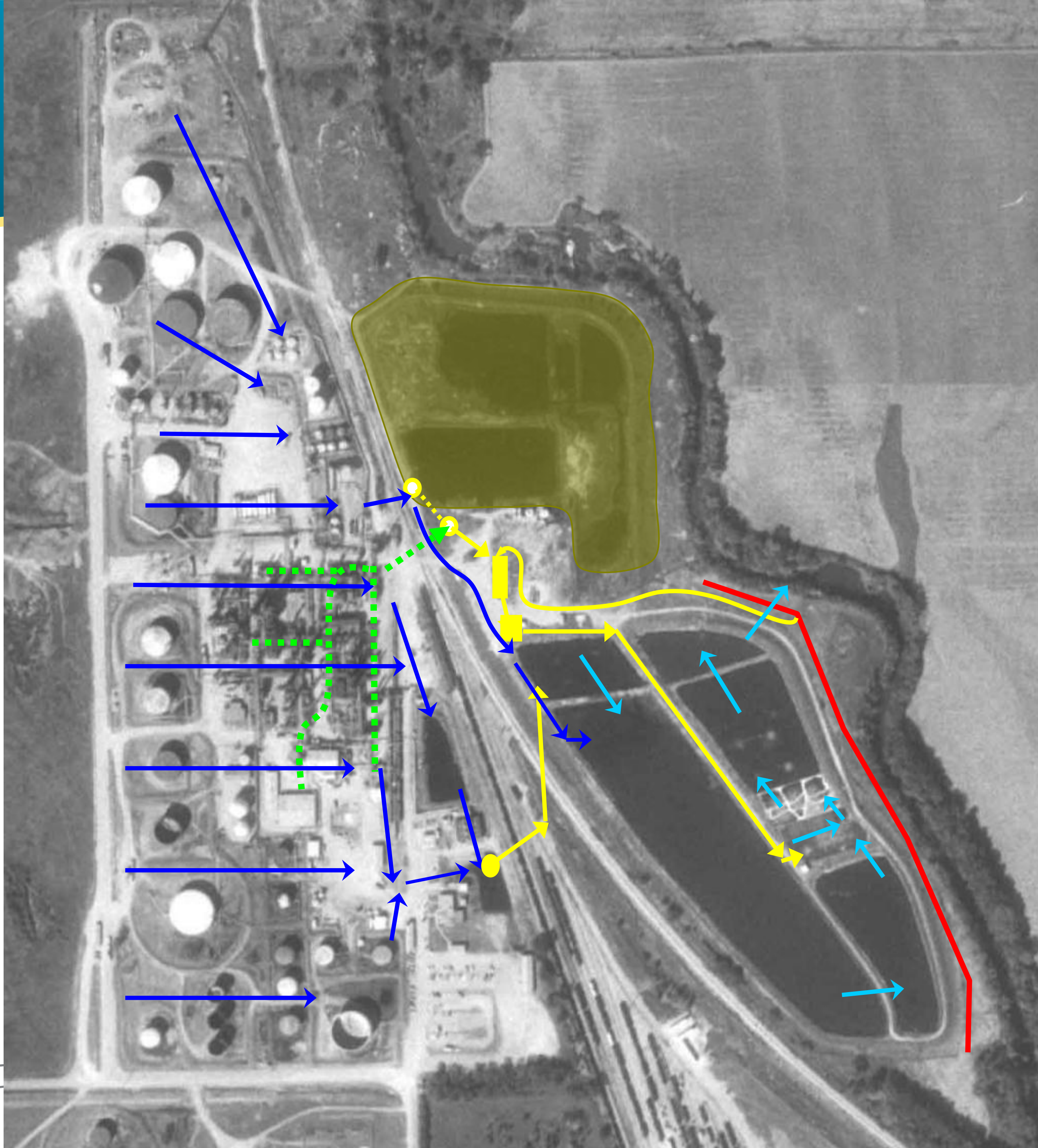
Surface Water

Pumped / Pipe

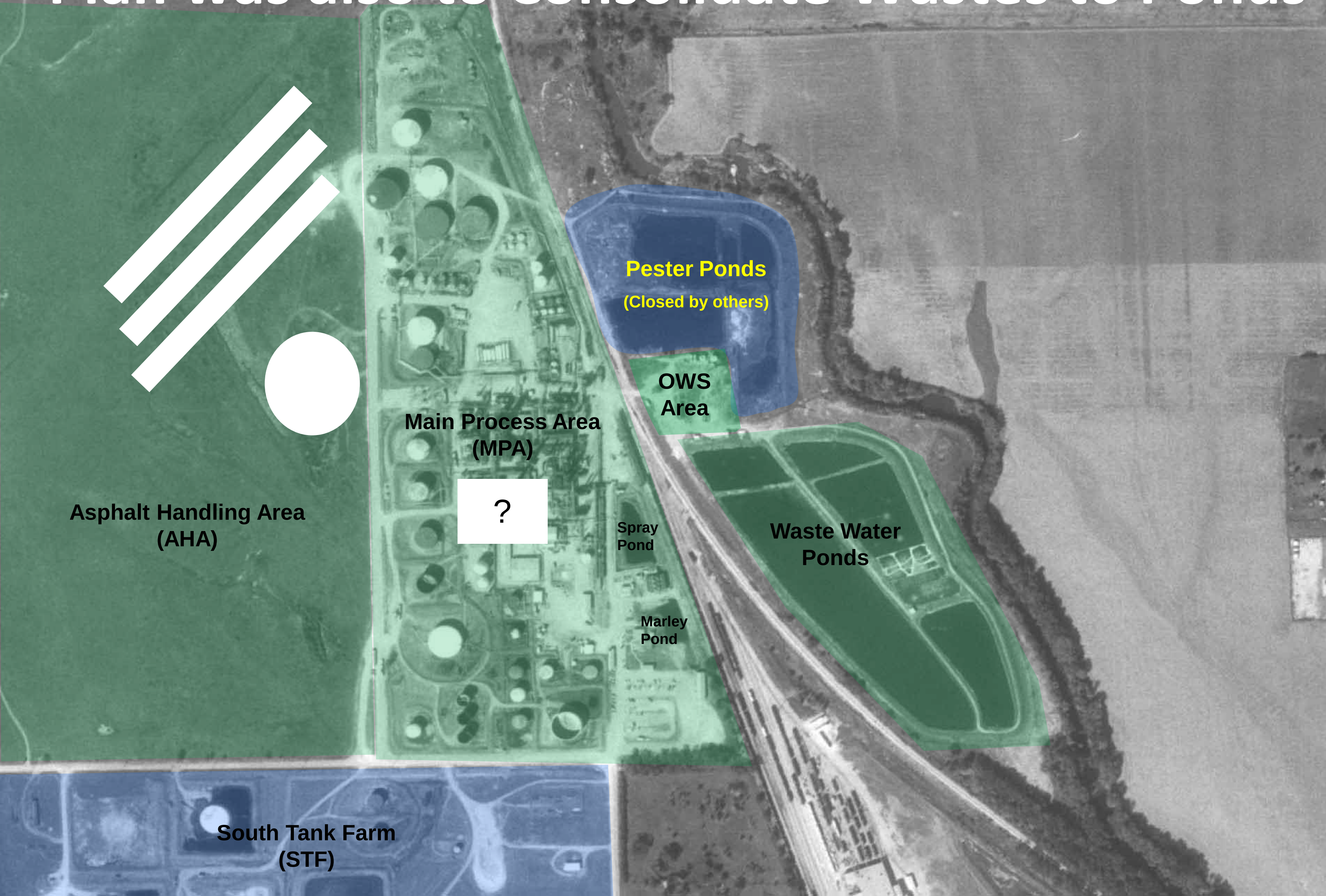
Pond

Process Sewers

Interceptor Trench



# Plan was also to Consolidate Wastes to Ponds



# Strategy 2.0
# 3-Years of Interim Remedial Measures

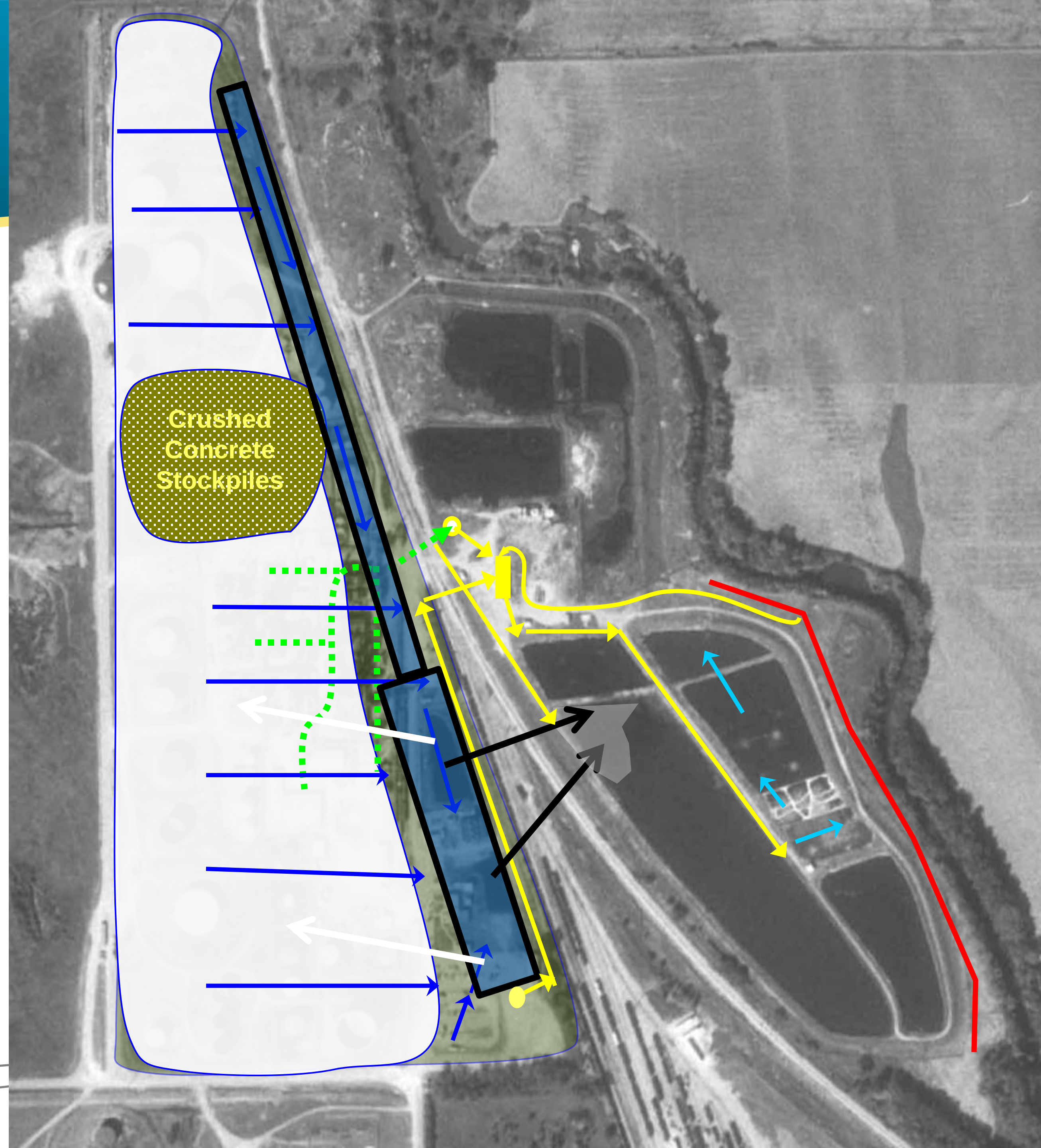
# 2010

1. **Plug Process Sewers, Stormwater Sewers** and Firewater Piping & Grade for Stormwater Surface Flow

2. **Complete MPA Demolition:** Remove Buildings Concrete to 2-foot Depth Wastes to West Pond Consolidate Lead-Impact Soil Grade to drain

3. **Crush Concrete:** Stockpile for later use in Wetlands and Roads as Recycled Crushed Concrete (RCC)

4. **Construct MPA Stormwater Channel and Basin**
   - Sediment to West Pond
   - Soil landfarmed 30,000 cy
   - Stormwater & Groundwater to East Ponds



# Concrete Demolition and Crushing

# MPA Basin & Recovery Trench Construction


# 2011


Surface Water

Pumped / Pipe

Pond

Interceptor Trench

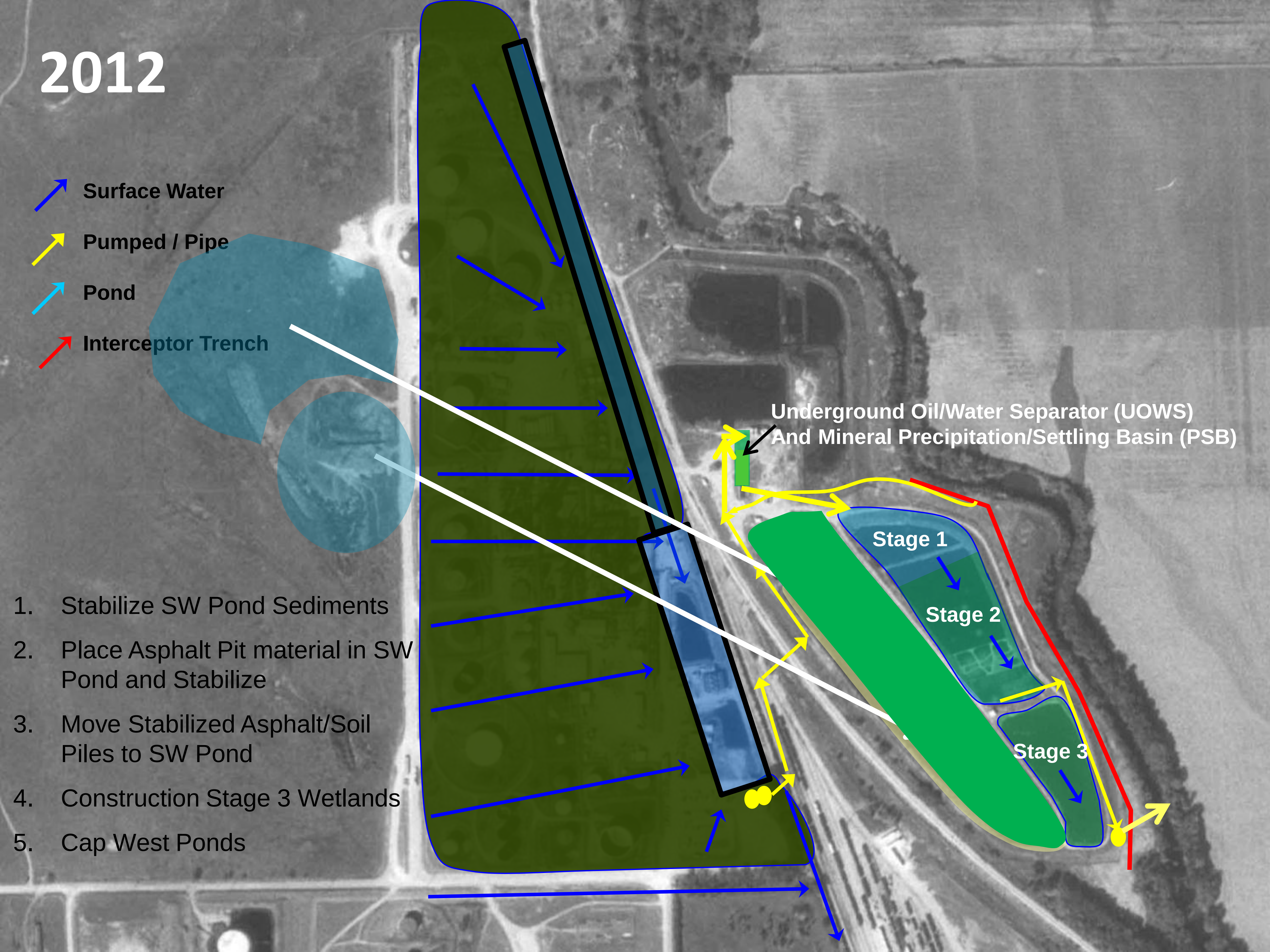
1. Clean and Enhance SE Pond
2. Construction and Demolition (C&D) Material to NW Pond
3. Install new UOWS, Cascade Aerator, and Settling Basin
4. Construct Wetlands Stage 1 & 2 (Sludge to West Ox Pond)
5. Plant and Flood Wetlands

# NE Ponds Sediment Removal

# Demolition of NE Pond Structures

# Late Summer 2011

# 2012




1. Stabilize SW Pond Sediments
2. Place Asphalt Pit material in SW Pond and Stabilize
3. Move Stabilized Asphalt/Soil Piles to SW Pond
4. Construction Stage 3 Wetlands
5. Cap West Ponds


April 2012


June 2012

# Pneumatic Off-loading Dust Control


| PC | FS | |
|---|---|---|
| 700 tons | 2,400 tons | Total |
| 1.5% | 13.5% | Initial more soily mix |
| 5.0% | 13.5% | For really goopy stuff + 25% AHA Material |

# Stabilization:  Excavator Mixing



36

# Stabilized Mix

25,000 cy of Sediment & 30,000 cy of Soily Waste (AHA & MPA) = 55,000 bcy

# Asphalt Handling Area (AHA) Pit ~1986

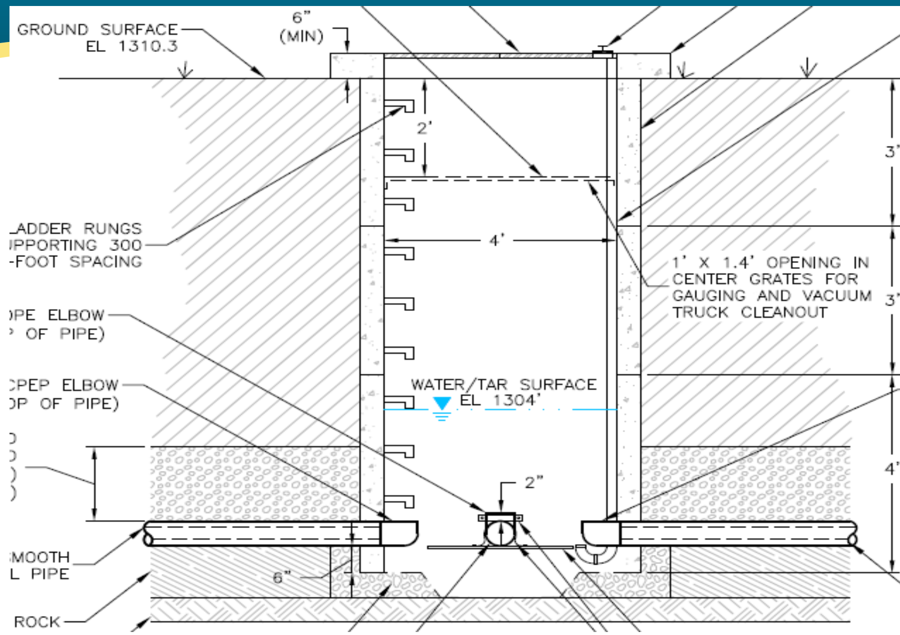
# AHA Excavation

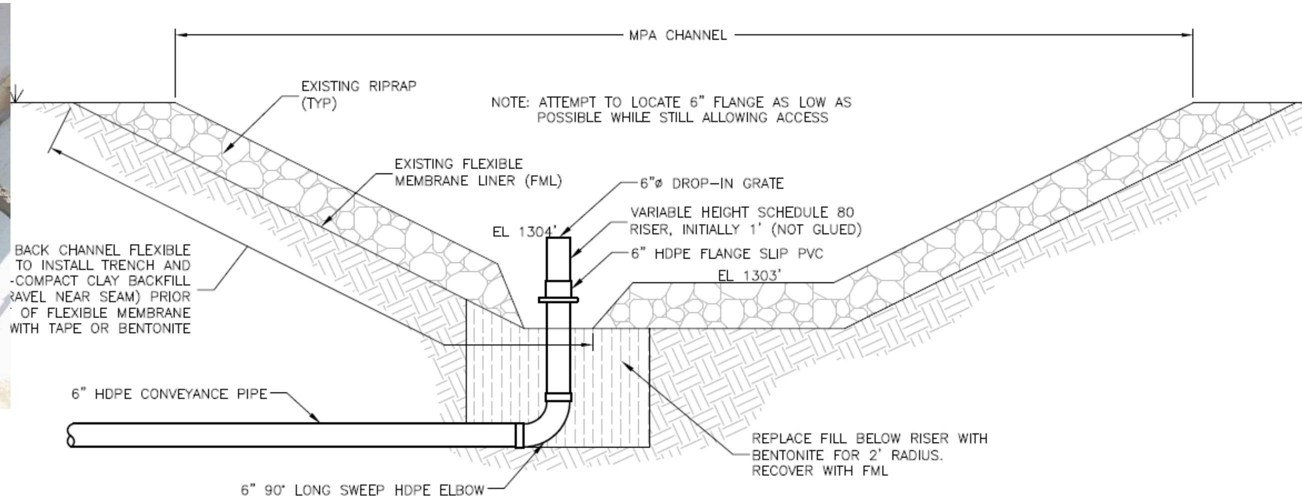
# MPA Spring

# Lesson Learned: It's Hard to Plug a Spring

- **You may be able to short-term, but water will find a way and we should have planned on it.**
  - After a dry 2011, MPA Spring (cat cracker footing) reappeared in Spring 2012
  - What do you do with a "forever" but intermittent spring with 0.96 SG tar globules & dissolved-phase?

# MPA Tar Spring Sump and Conveyance

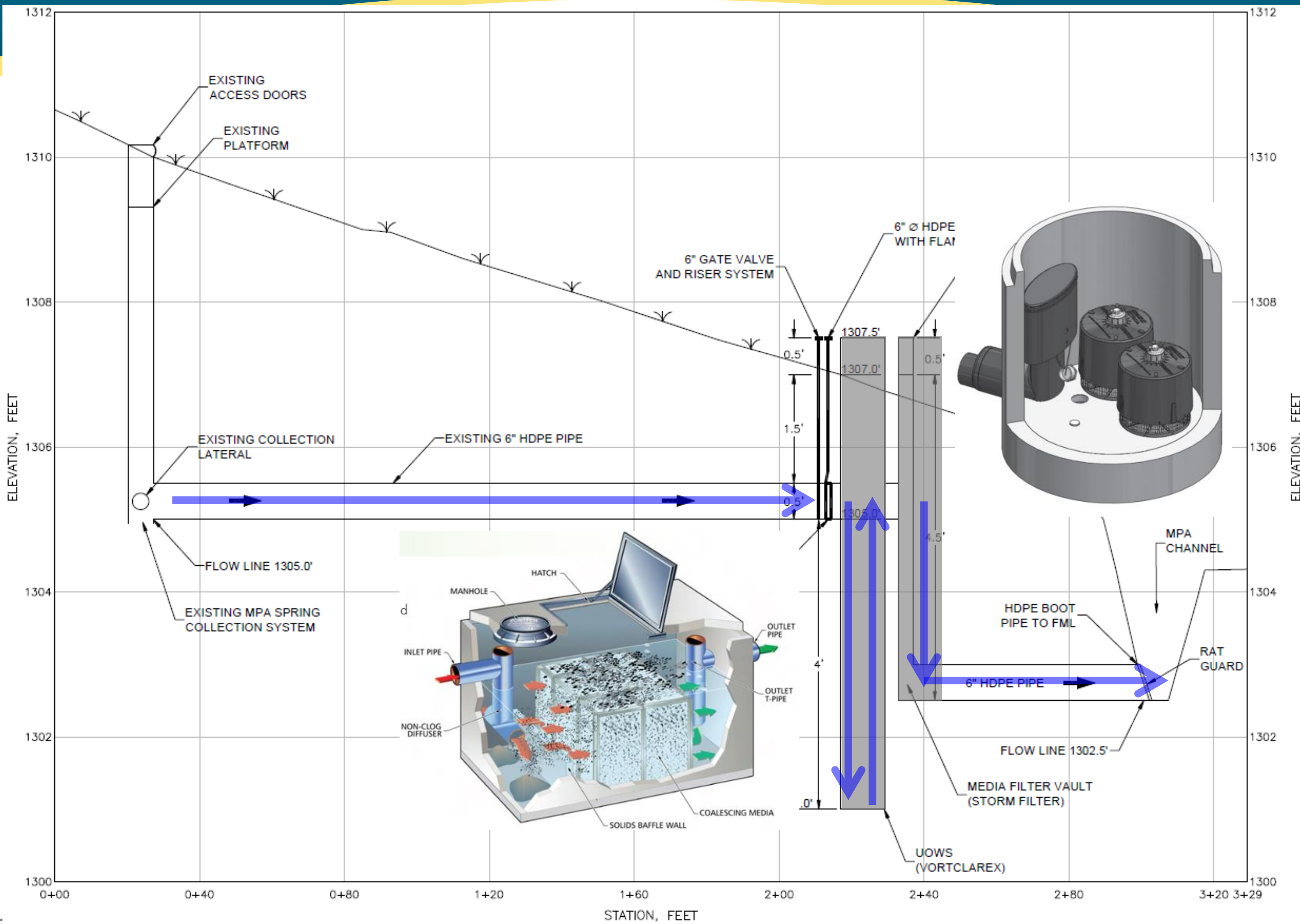


# Spring Didn't Flow Until Spring of 2013


# Tiny Tar Specs

# Contingency Spring UOWS and GAC/OCM



# Site Tour

# Wetland UOWS and Cascade Aerator

# Cap Slope Into Wetlands

# Stage 2 (2012)

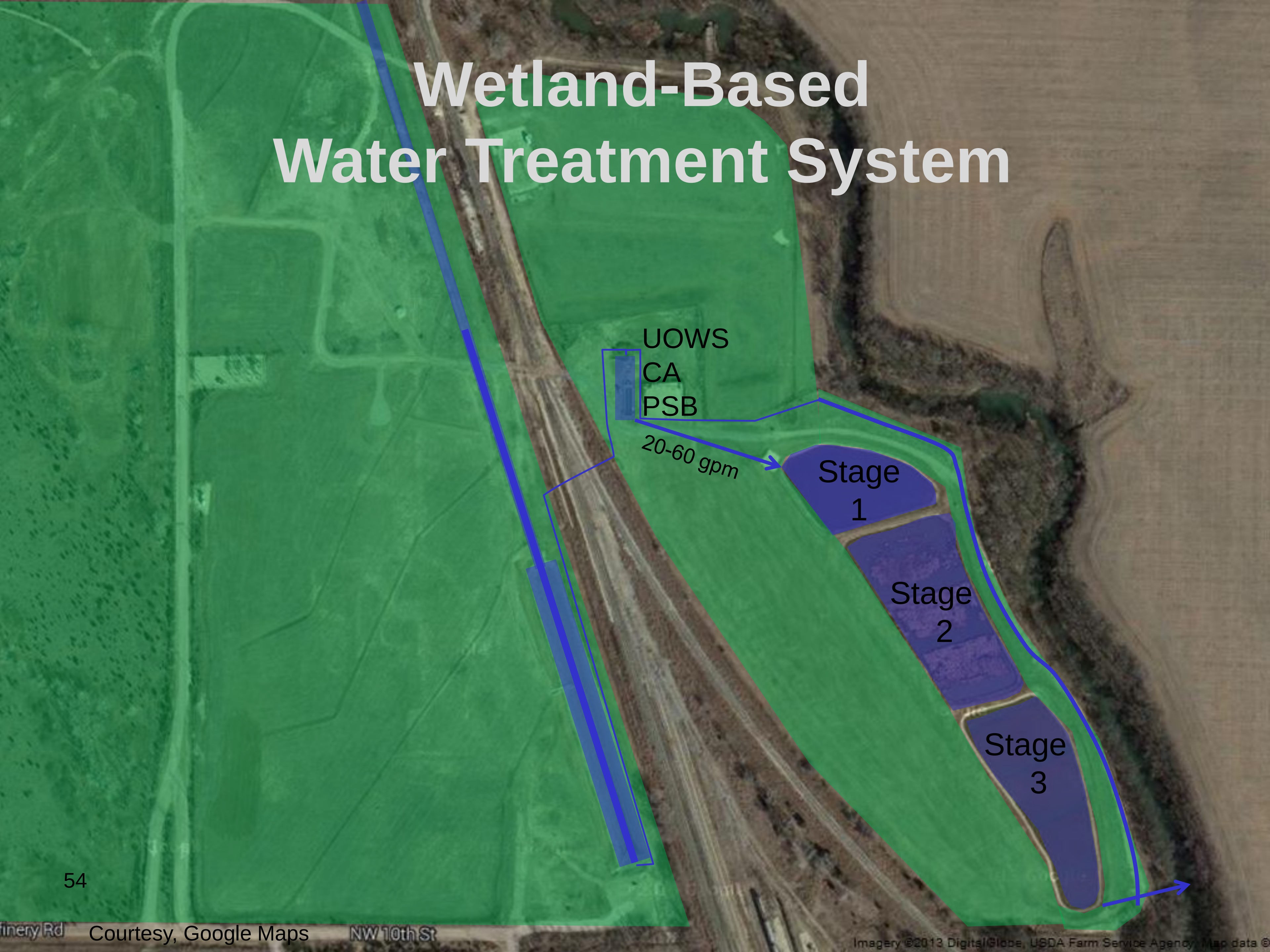
# Stage 3

# MPA

# MPA Basin


AHA
06.07.2013 10:50

# Wetland-Based Water Treatment System

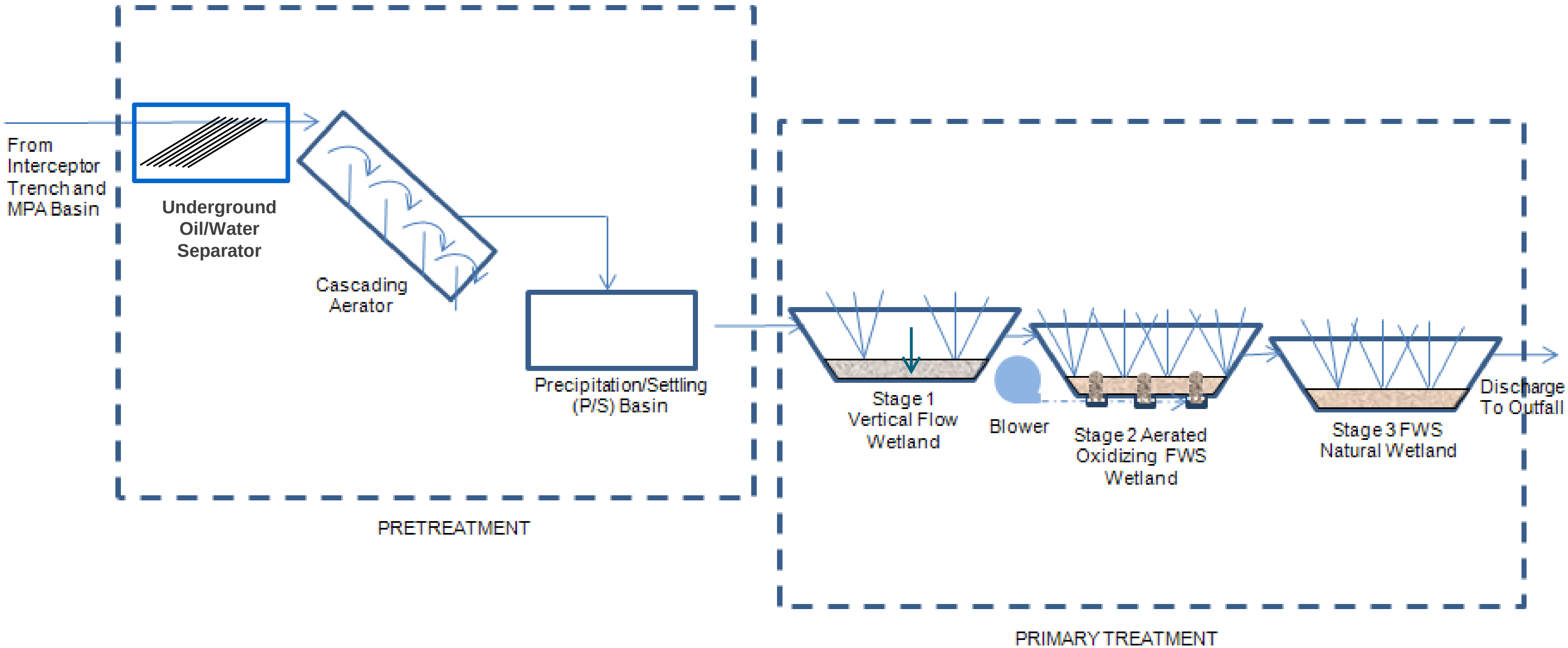



Courtesy, Google Maps

# Why Wetlands?

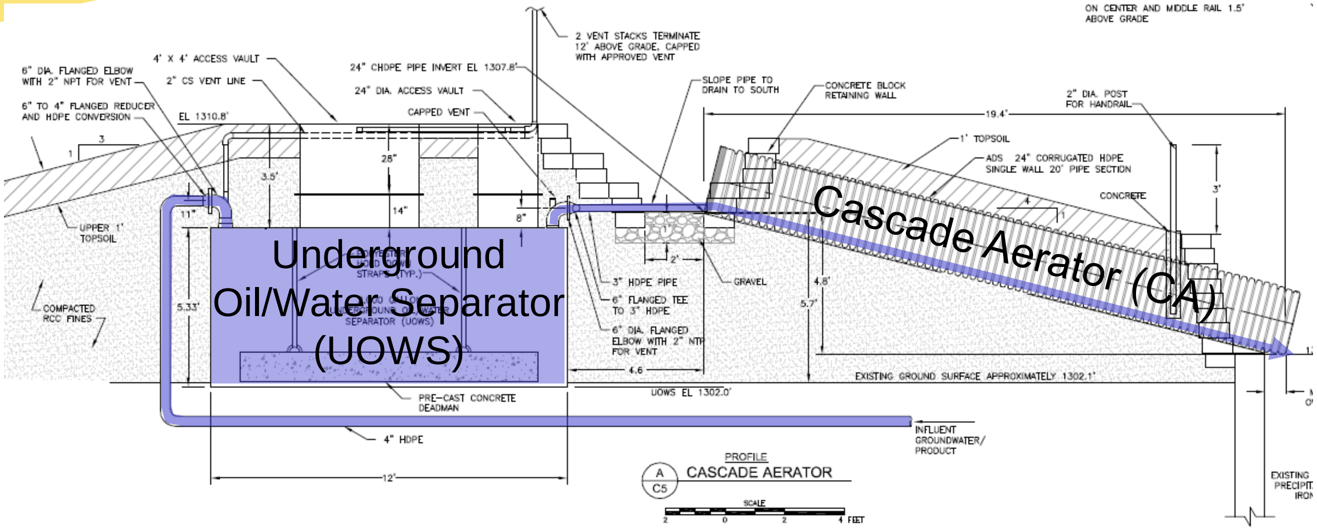
- Duration
  - Long-Term Groundwater Treatment Need
- Desirable
  - Low Energy (Green)
  - Low O&M (Cost)
  - Reliable/Robust (Not Easily or Quickly Upset)
- Site-Specific Factors
  - Low-Lying Land Not Likely to be Redeveloped
  - Existing Ponds Could be Cut Down to Size
  - Gravity Flow Possible
  - Lots of “Waste Concrete” Could be Recycled

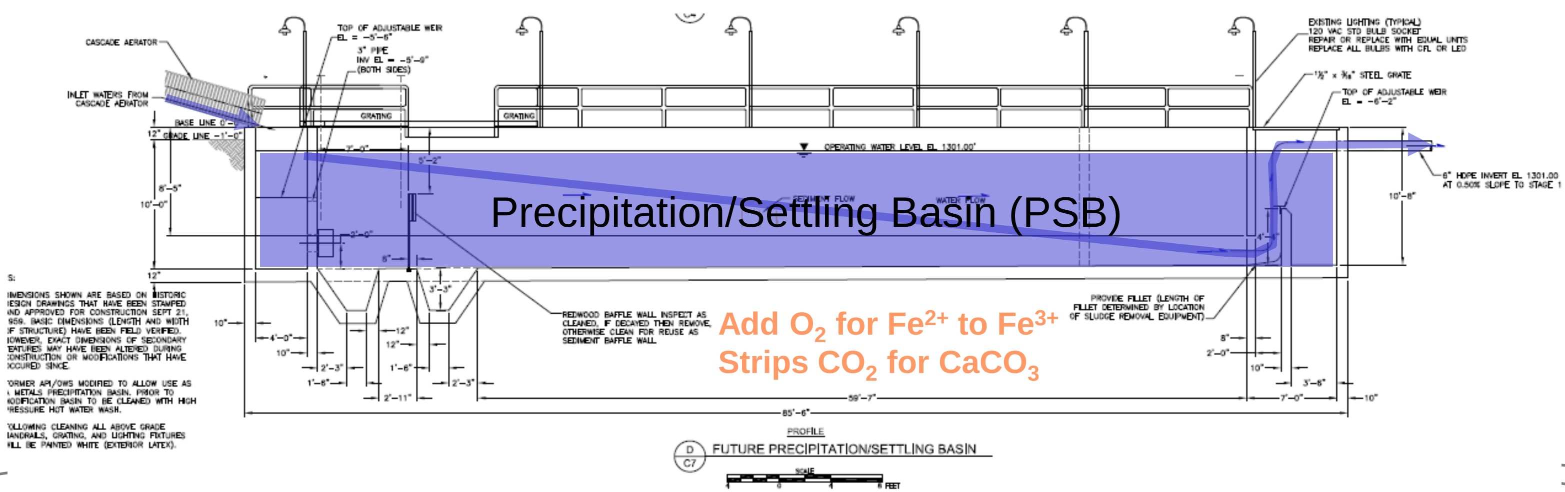
# Gravity Flow Schematic




*Concept by Naturally Wallace Consulting, LLC*

# Pretreatment




Add $O_2$ for $Fe^{2+}$ to $Fe^{3+}$

Strips $CO_2$ for $CaCO_3$

# UOWS, Cascade Aerators, Settling Basin



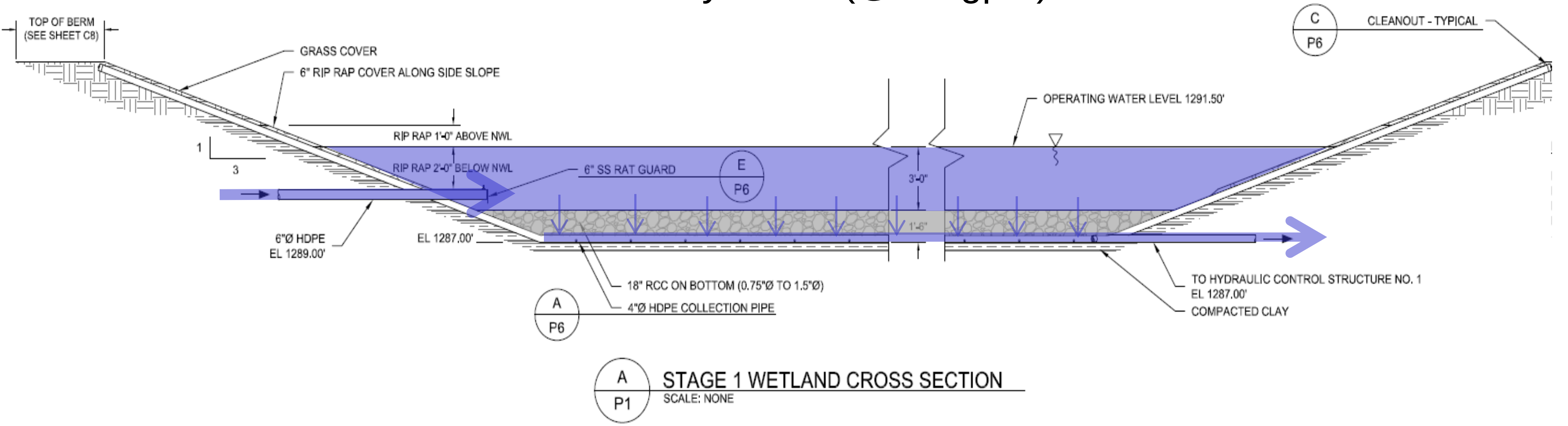

# Wetland Treatment Processes

- Volatilization
- Biodegradation – Pond/Aqueous Phase
- Sorption to Soil/Plants with Subsequent…
- Phytoremediation processes including
  - **Phytosequestration:** Immobilizing compounds (e.g., metals) in the rhizosphere
  - **Rhizodegradation:** Biodegradation of contaminants in the rhizosphere
  - **Phytoextraction:** Contaminants taken up into the plant matter
  - **Phytodegradation:** Degradation that occurs as part of photosynthetic processes
  - **Phytovolatilization:** Contaminants taken up and transpired (e.g., volatilized)

Summer
Winter

# Stage 1 Cross-Section

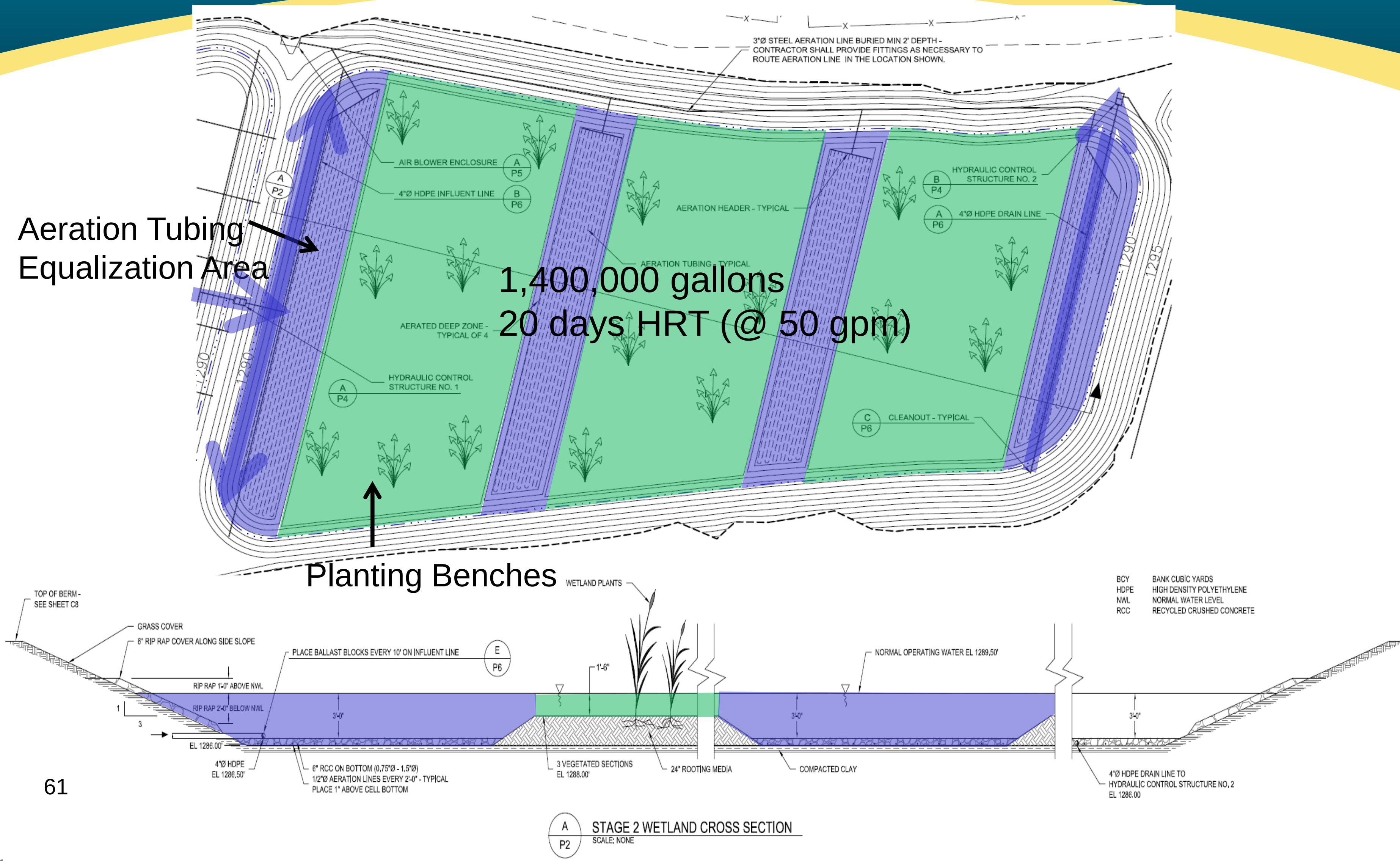
1,400,000 gallons
20 days HRT (@ 50 gpm)




## Contingency Anaerobic (in the absence of oxygen)

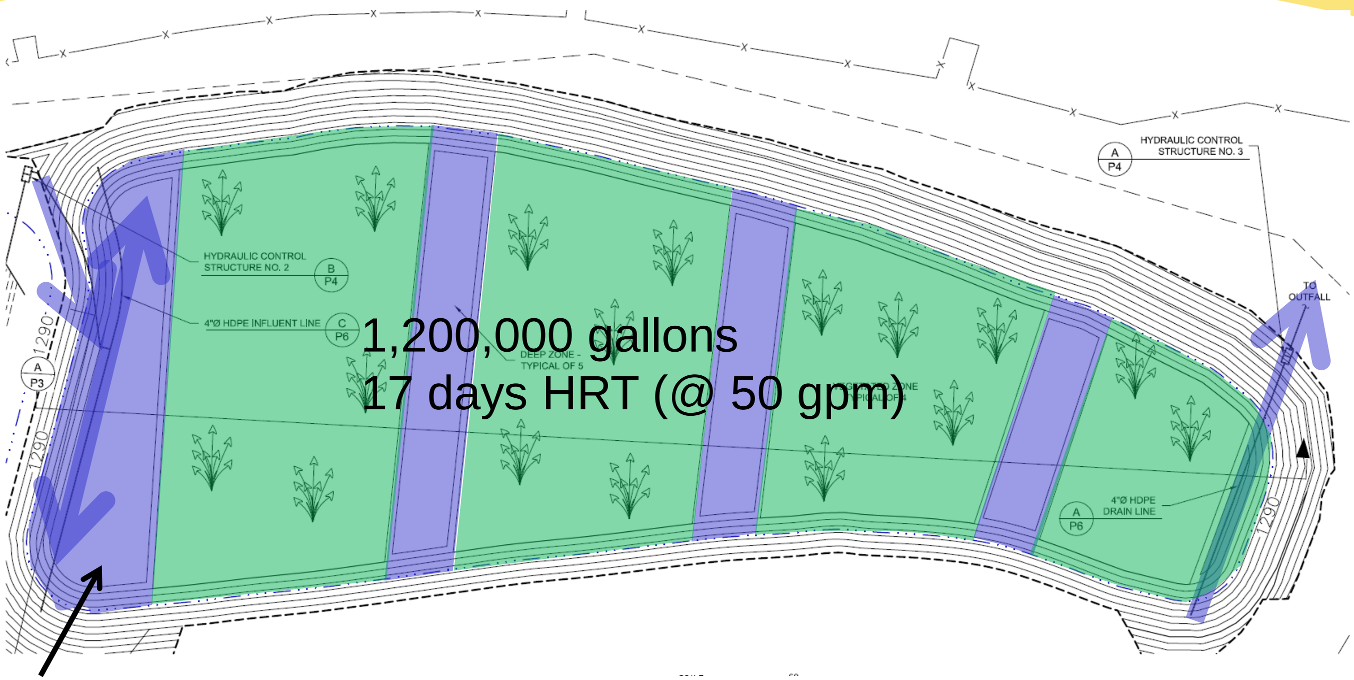
- Organic mulch layer with plants could be installed, but
- CVOCs have been sufficiently low to not require

# Stage 2

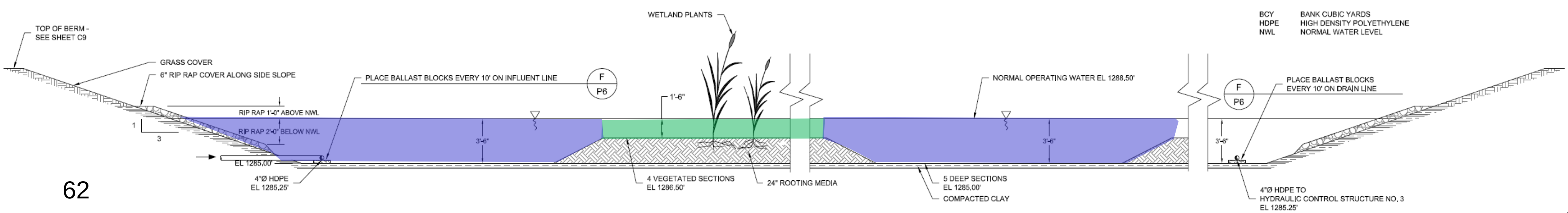


Aeration Tubing
Equalization Area
1,400,000 gallons
20 days HRT (@ 50 gpm)
Planting Benches
3"Ø STEEL AERATION LINE BURIED MIN 2' DEPTH - CONTRACTOR SHALL PROVIDE FITTINGS AS NECESSARY TO ROUTE AERATION LINE IN THE LOCATION SHOWN.
AIR BLOWER ENCLOSURE
4"Ø HDPE INFLUENT LINE
AERATION HEADER - TYPICAL
AERATION TUBING - TYPICAL
HYDRAULIC CONTROL STRUCTURE NO. 2
4"Ø HDPE DRAIN LINE
AERATED DEEP ZONE - TYPICAL OF 4
HYDRAULIC CONTROL STRUCTURE NO. 1
CLEANOUT - TYPICAL
WETLAND PLANTS
TOP OF BERM - SEE SHEET C8
GRASS COVER
6" RIP RAP COVER ALONG SIDE SLOPE
PLACE BALLAST BLOCKS EVERY 10' ON INFLUENT LINE
RIP RAP 1'-0" ABOVE NWL
RIP RAP 2'-0" BELOW NWL
EL 1286.00'
4"Ø HDPE EL 1286.50'
6" RCC ON BOTTOM (0.75"Ø - 1.5"Ø)
1/2"Ø AERATION LINES EVERY 2'-0" - TYPICAL
PLACE 1" ABOVE CELL BOTTOM
3 VEGETATED SECTIONS EL 1288.00'
24" ROOTING MEDIA
COMPACTED CLAY
NORMAL OPERATING WATER EL 1289.50'
4"Ø HDPE DRAIN LINE TO HYDRAULIC CONTROL STRUCTURE NO. 2 EL 1286.00
BCY BANK CUBIC YARDS
HDPE HIGH DENSITY POLYETHYLENE
NWL NORMAL WATER LEVEL
RCC RECYCLED CRUSHED CONCRETE
STAGE 2 WETLAND CROSS SECTION
SCALE: NONE

# Stage 3




No Aeration Tubing

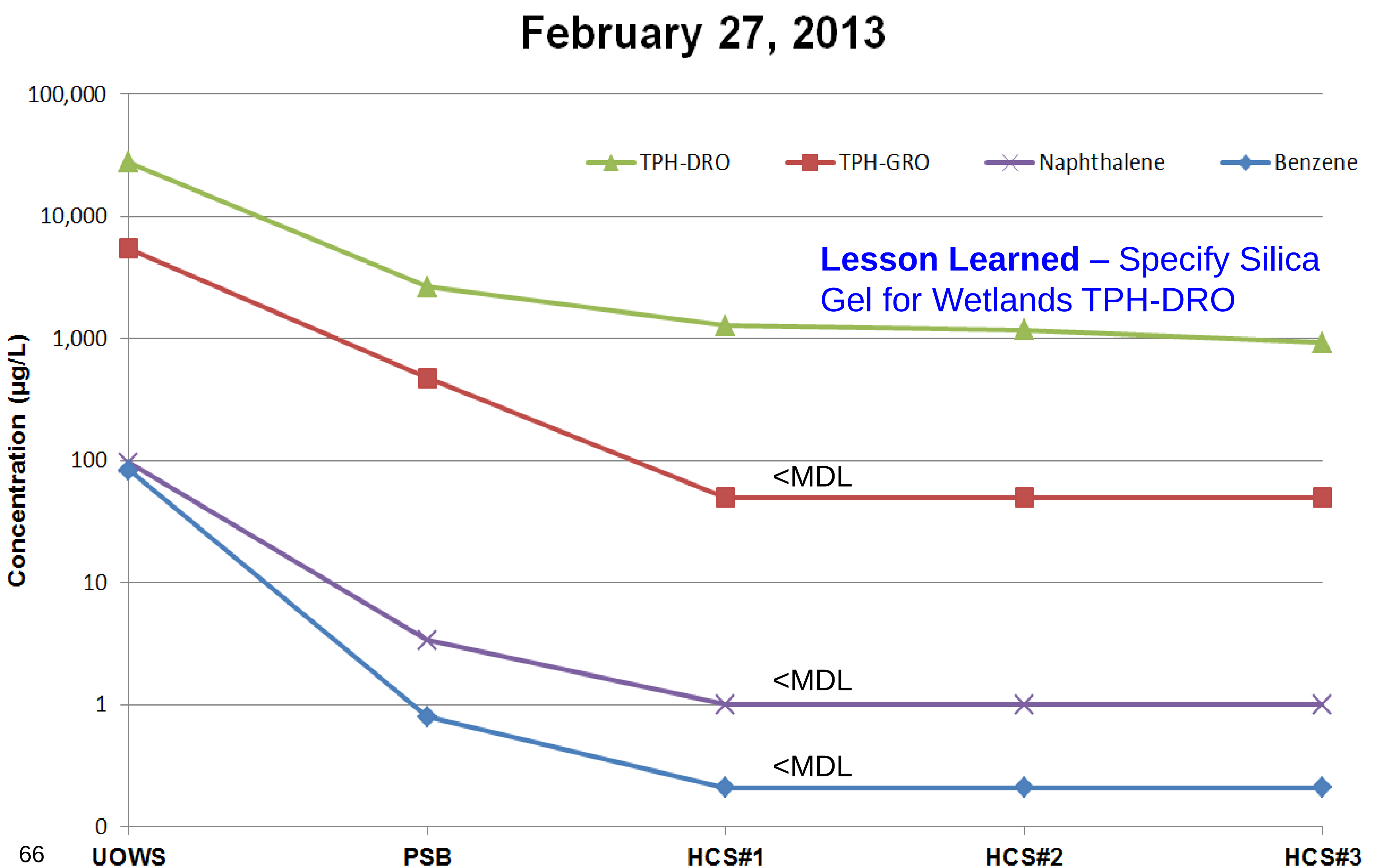


# Stage 1 and 2 Wetland Construction


# Stage 2 Wetland Planting


# Only Mechanical Component
## *other than 4 extraction well pumps*

# System Performance



# Muskrats and Water Treatment Wetlands Lessons Learned *(If Time Permits)*

# Early June 2014: Stage 3

# August 2014: What Happened?

# Muskrats (*Ondatra zibethicus*) in treatment wetlands

*Robert H. Kadlec*[a,*], *John Pries*[b], *Heather Mustard*[b]

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Treatment wetlands
Control
Damage
Exclusion

A B S T R A C T

Muskrat grazing can change treatment wetlands from being densely vegetated to a patchwork of open and emergent areas. Muskrats consume a portion of the annual net primary productivity, primarily rhizomes, but their mounds represent a greater share of this production. Densities of 20 or more animals per ha have been found, which can destroy the majority of the macrophyte standing crop in a given year. At such an exacerbated scale, muskrat herbivory may be termed as an "eatout," and is evidenced by the removal of essentially all emergent plant parts. Destruction of the wetland vegetative infrastructure may create an attendant loss of some water quality functions, but may not harm others. The integrity of berms may be threatened by burrowing. Impacts on wetland hydraulics are also possible. In all cases, loss of the emergent vegetation has been viewed with dismay by owners, wetland practitioners, regulators and the general public. Several case histories are reviewed to illustrate the breadth and severity of muskrat damage. Muskrat control is given scant attention in existing treatment wetland literature, which provides very limited information on potential muskrat problems, or on the means to control them. Controls include trapping, shooting, poisoning, hazing, and exclusion in order to protect the wetland from excessive vegetation destruction by these rodents. This paper summarizes available muskrat controls, as well as their effectiveness. While many of these approaches have had a limited effect on deterring these industrious creatures, there are some methods that have proven to be effective over the long run, and should be considered in wetland design.

# O&M Guy Becomes A Fur-Harvester

Kansas Department of Wildlife, Parks and Tourism

Search: Go

KDWPT Info | State Parks | Reservations | Hunting | Fishing | Tourism | Boating | Services | License/Permits

KDWPT / Hunting / Applications and Fees / **Furharvester**

## Furharvester Licenses and Fees

**LICENSES & FEES**

A furharvester license is required to hunt, trap, or pursue (run) furbearers, or to sell their pelts unless exempt by Kansas law. A furharvester license is required to trap coyotes, and a hunting license is required to hunt them. The same license required to take coyotes is required to sell their pelts. Unlicensed, non-participating observers may accompany a licensed furharvester but may not assist in carrying or using equipment, controlling dogs, or otherwise assisting with furharvesting activities.

Persons under 16 years old may purchase a junior furharvester license at a discounted price.

Persons born on or after July 1, 1966 must complete the course before harvesting furbearers in the state on lands other than their own.

**Furharvester: All Resident Furharvester Licenses can be purchased online or at any licensed agent.**

- **Resident Furharvester:** $20.50
- **Resident Junior Furharvester:** $12.50
- **Nonresident Furharvester:** $252.50

**Fur Dealer Permits and Lifetime** may only be purchased at the Pratt Operations Office .

**Resident Fur Dealer**: $102.50

**Nonresident Fur Dealer:** $402.50

**Lifetime Furharvester** (Resident only **):** $442.50

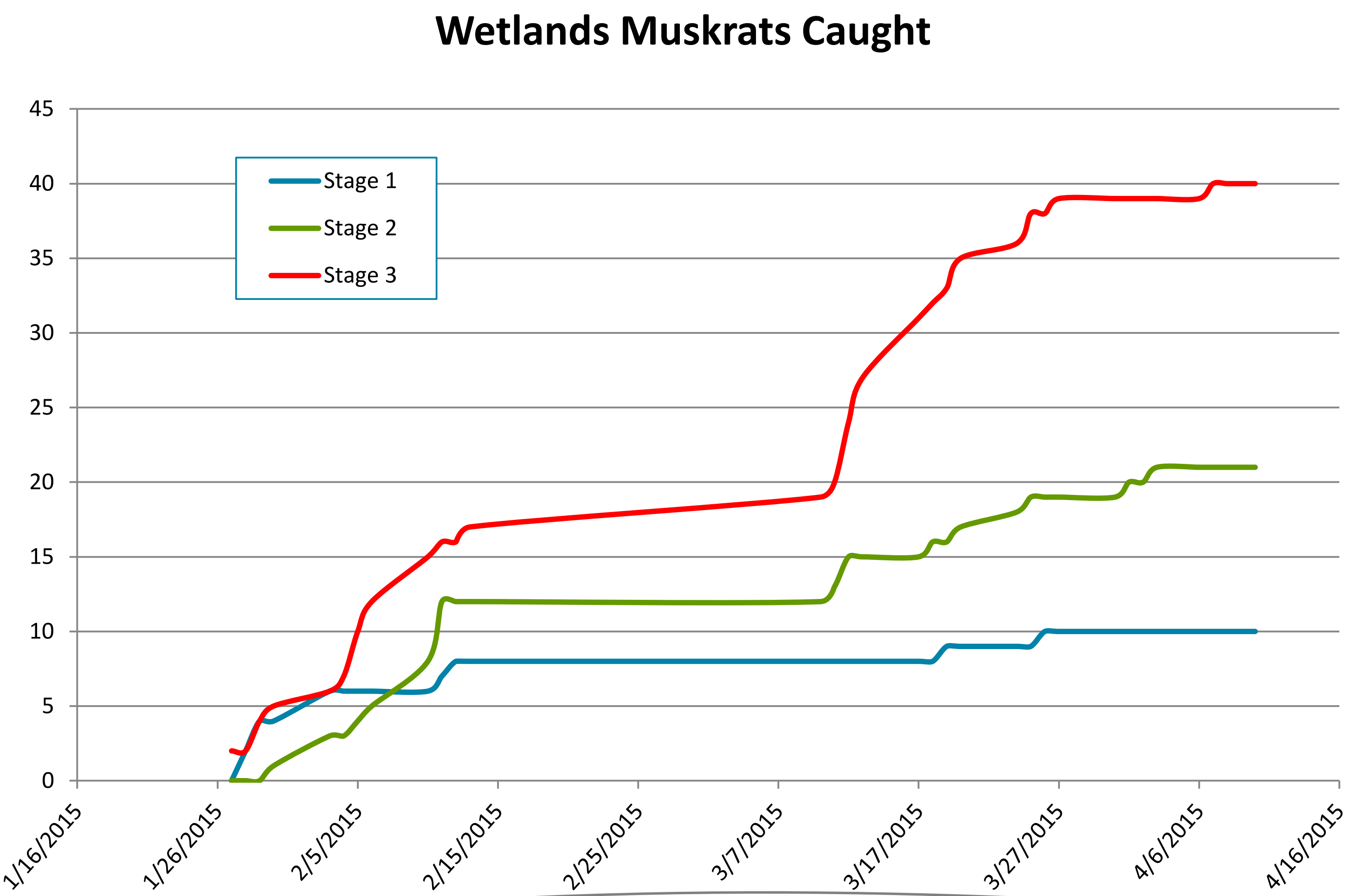
**Hunting Menu**

- About Kansas Hunting
- Where to Hunt in Kansas
- When to Hunt
- Big Game Information
- Turkey Information
- Hunter Education
- Hunting Programs
- Furharvesting
- Special Hunts Information
- Upland Birds

**Hunting Quick Links**

- 2015 Spring Hunting Atlas
- Turkey Check-in
- Wild About Kansas
- Public Land Newsletter Requests
- KDWPT Jobs
- Public Wildlife Areas
- Deer FAQ
- Sunrise - Sunset Table
- Deer Check In
- Upland Bird Forecast

# Cleaner Water = More Muskrats (not dumb)



# Future Plans

## Corrective Action Study (CAS) Proposes:

- Phytoremediation for Main Process Area (MPA)
- 2 additional Interceptor Trenches (ITs) for STF plume
- LNAPL gauging/skimming with Transmissivity (T) & Natural Source Zone Depletion (NSZD)
- Long Term Monitoring (LTM) & Monitored Natural Attenuation (MNA)
- Environmental Use Controls (EUCs) & Soil-Waste Management Plan (SWMP)

# Thank You
# Questions?

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