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# NexusPark: Stormwater Management in a Wellhead Protection Area

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# Agenda

- Project Background
- History of the Project Site
- Overview of City of Columbus Wellhead Protection
- Applicable Stormwater Regulations
- Meeting with All Jurisdictional Authorities Streamlines Solutions
- Design Implementation
- Summary of Current Regulations
- Conclusion

# Project Background

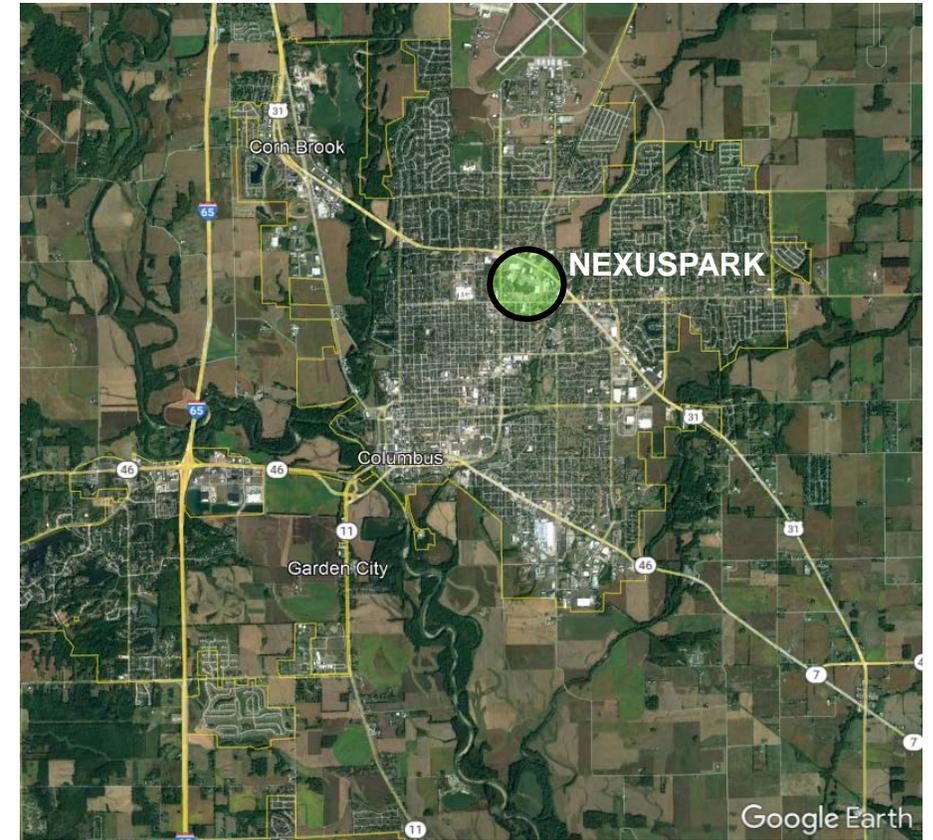
- “NexusPark is a partnership between the Columbus Parks and Recreation Department, City of Columbus, and Columbus Regional Health to refurbish the former Fair Oaks Mall into a community sport, recreation, and wellness space in the heart of Columbus, Indiana.” –nexuspark.org



Source: Map Data: Google Earth, 2019



Source: Map Data: Google Earth, 2019



Source: Map Data: Google Earth, 2019

# Project Background



Source: Map Data: Google Earth, 2019



Source: Rendering by MKSK

# Project Background



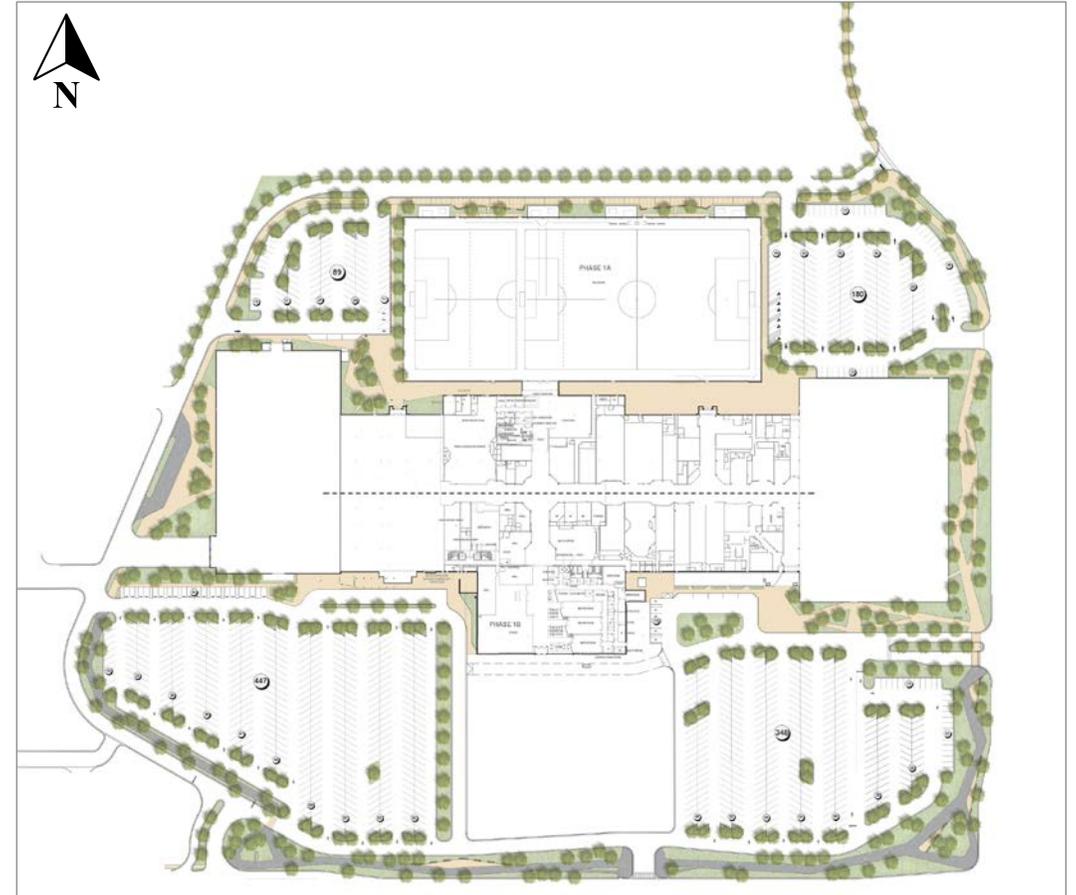
Source: Map Data: Google Earth, 2019



Source: Rendering by MKSK

# Project Background

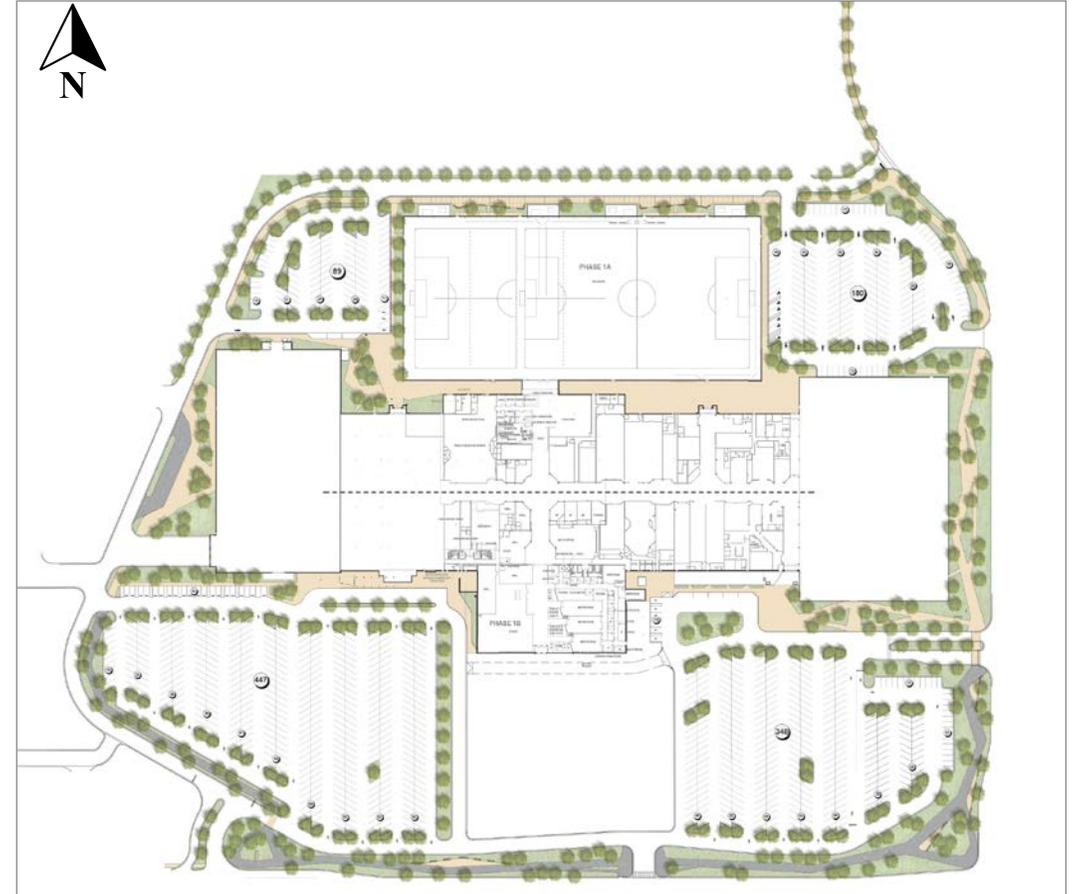
- Project design objectives
  - Addition of fieldhouse structure
  - Renovation of interior spaces for health and wellness
  - Enhance site aesthetics and create a sense of place
- Site design objectives
  - Creation of open park space
  - Adding to the city's existing trail network
  - Maximize parking counts
  - Limit total site costs



Source: Rendering by MKSK

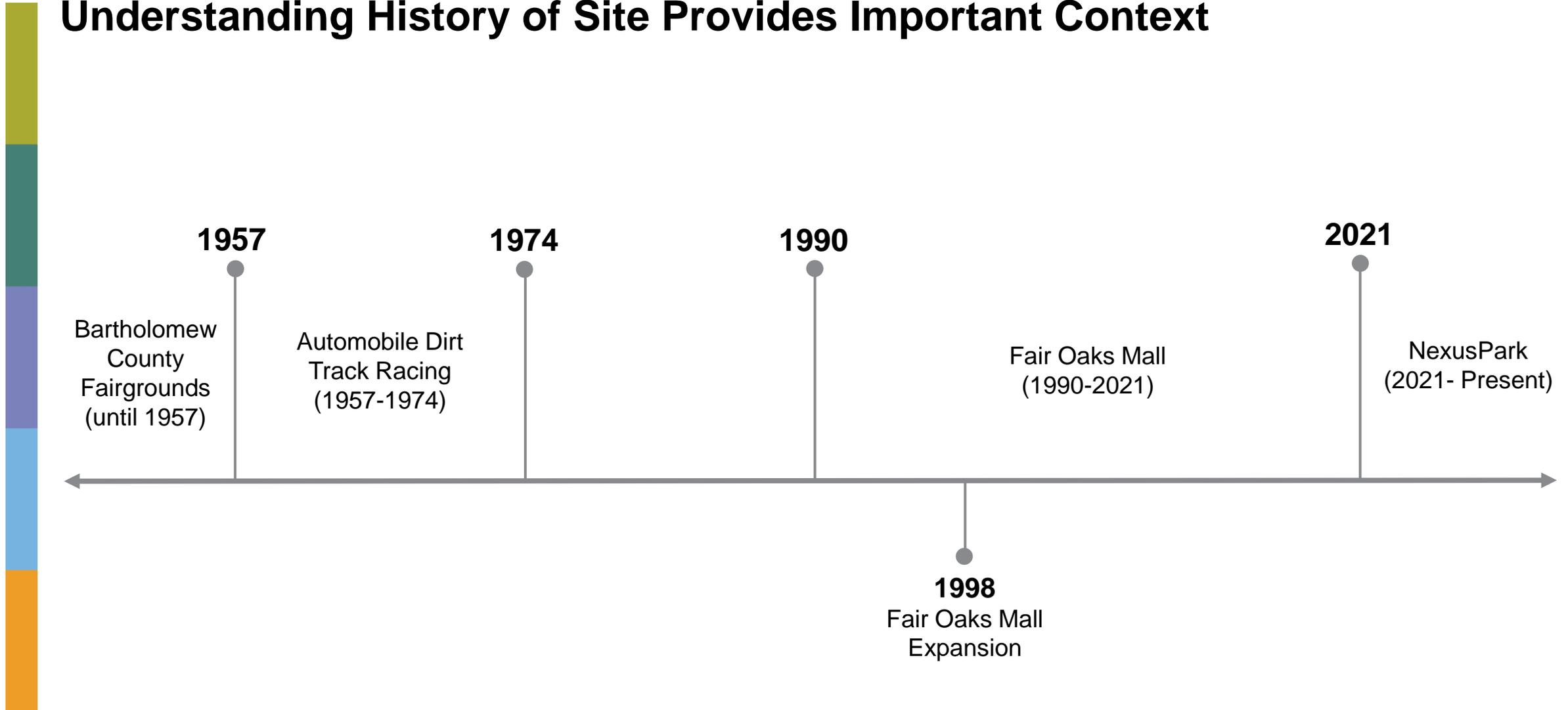
# Project Background

- Strand site design responsibilities
  - Utility relocations and extensions
  - Site grading
  - Pavement rehab and replacement
  - Stormwater management
  - Construction scoping for site improvements
  - Local and state permitting



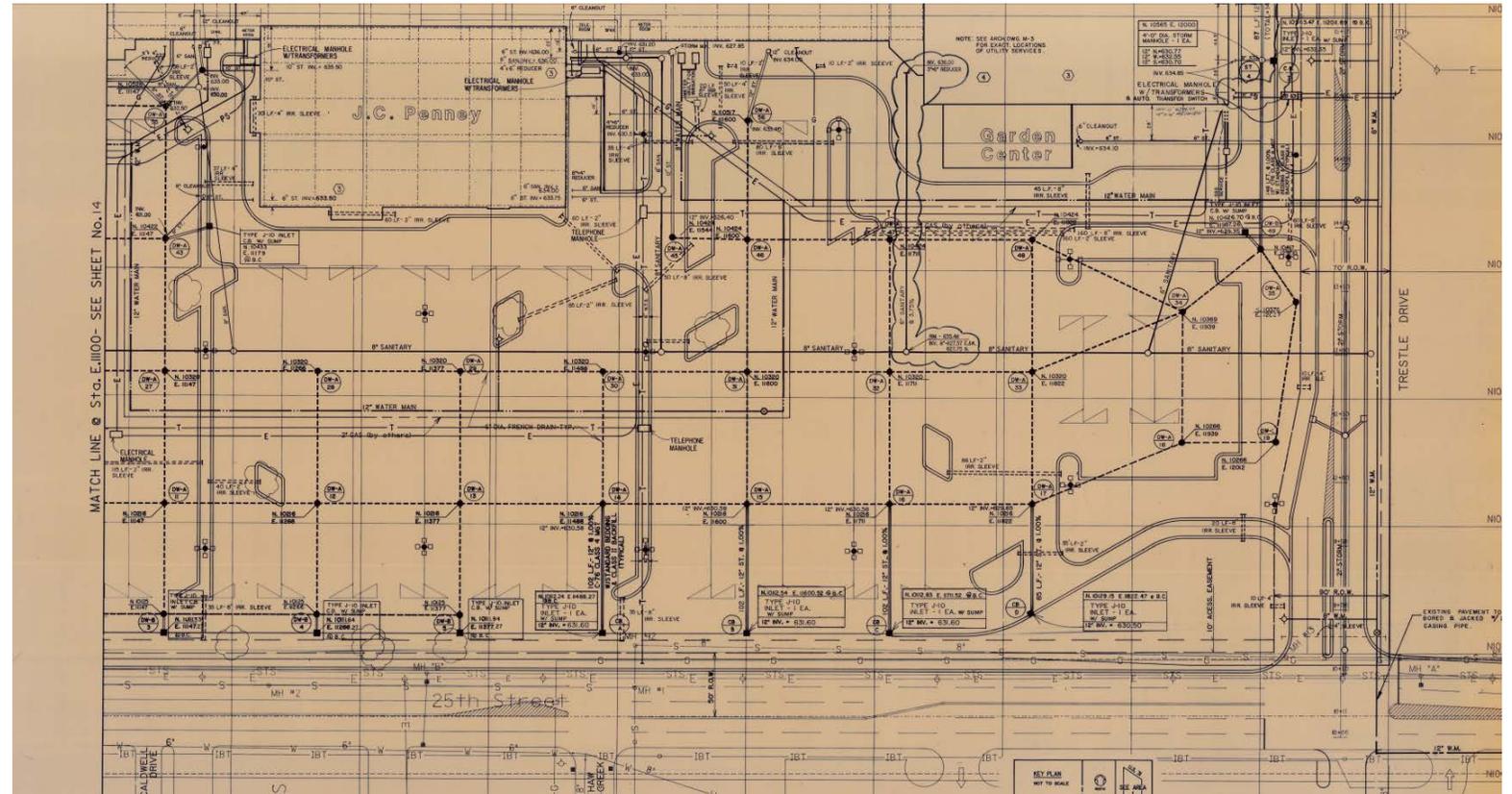
Source: Rendering by MKSK

# Understanding History of Site Provides Important Context



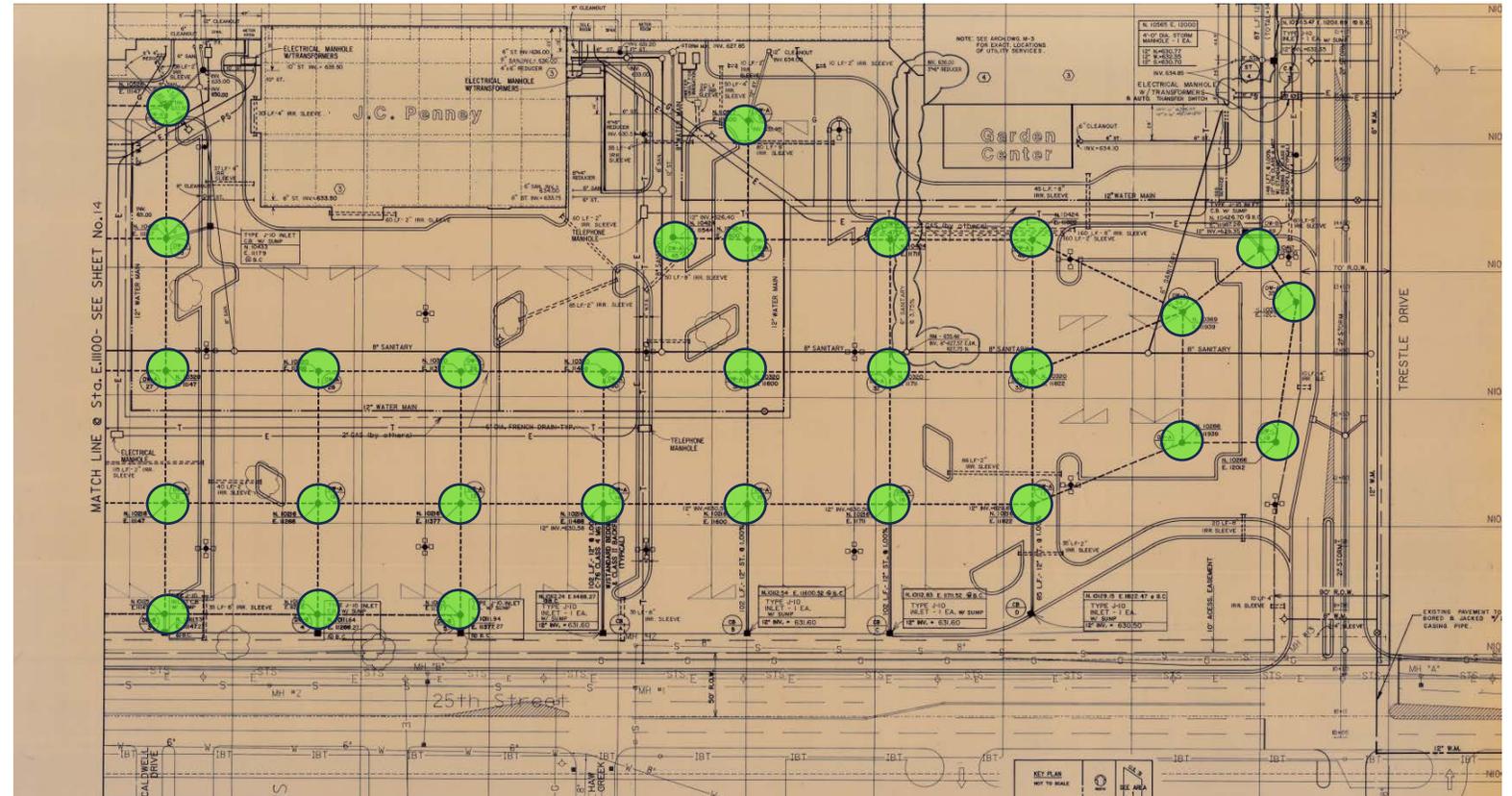
# Fair Oaks Mall – 1990 Site Drawings

- New building
- Utilities
- Parking areas
- New drywell network

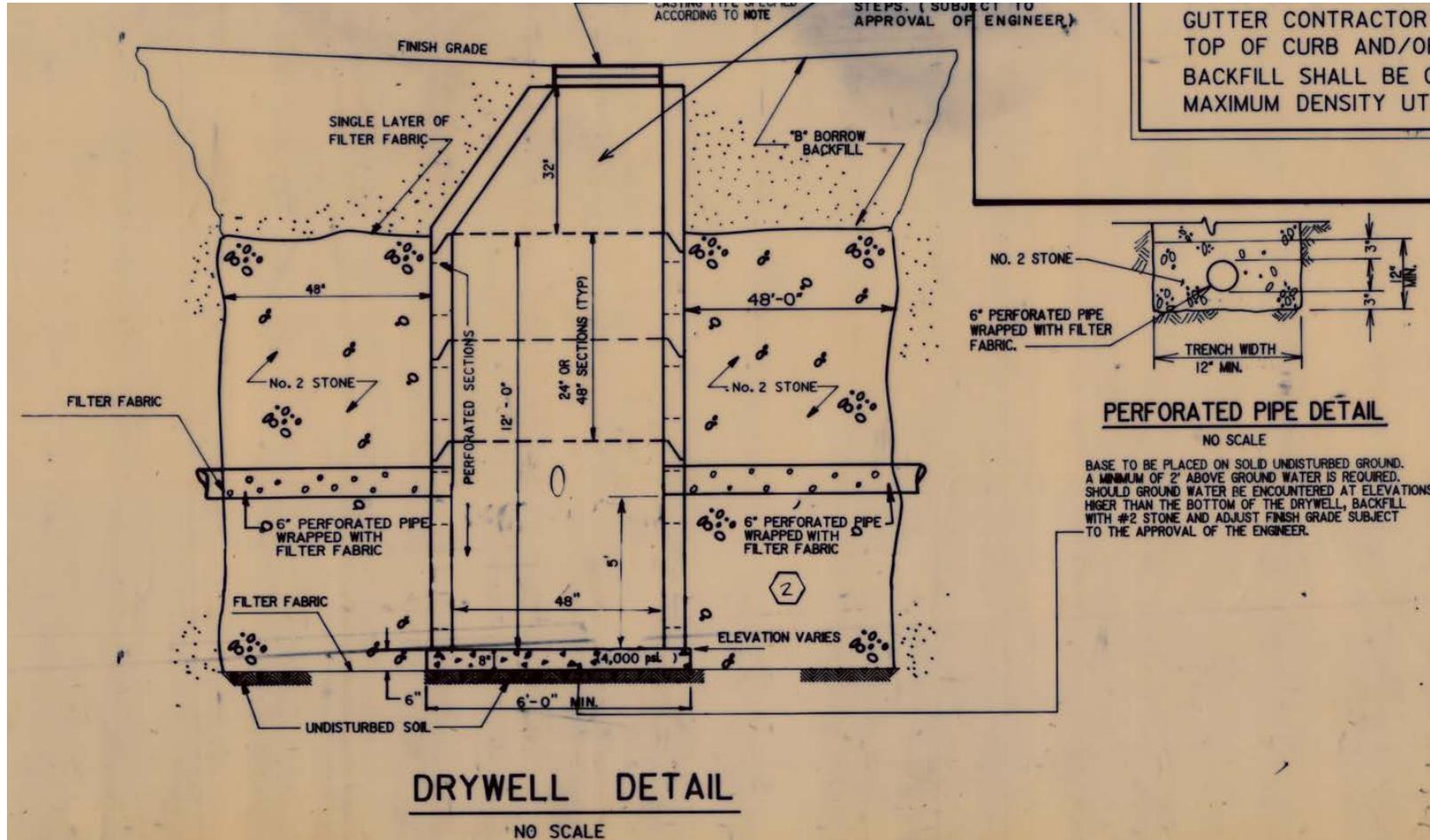


# Fair Oaks Mall – 1990 Site Drawings

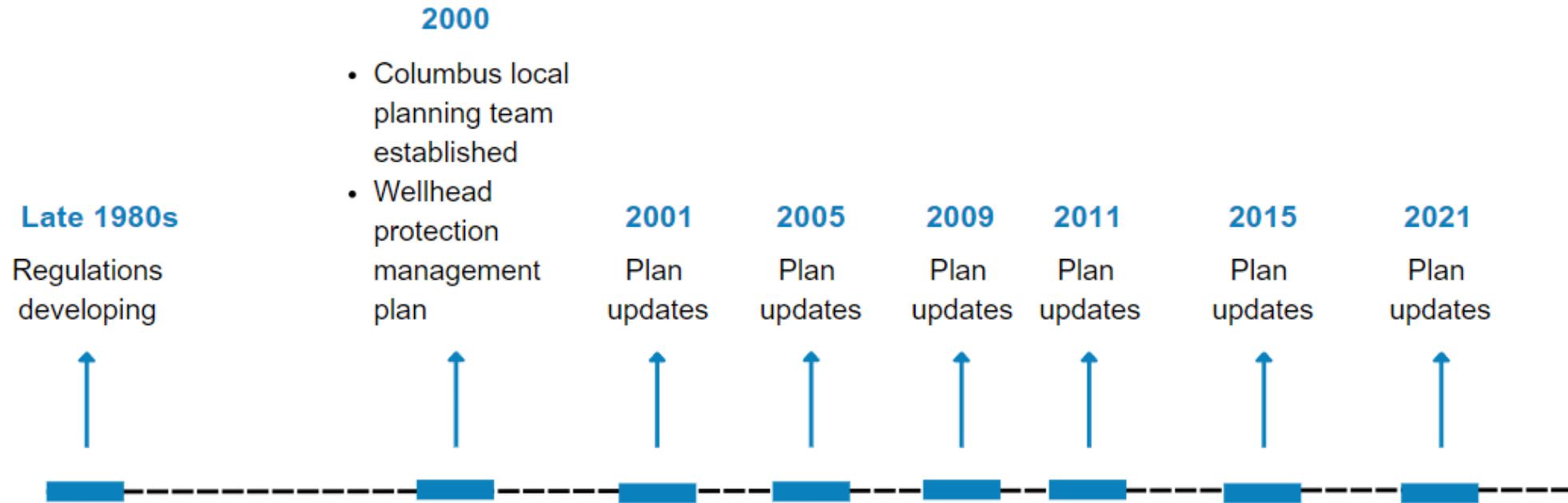
- Sandy soils
- Drywell system
  - 92 drywells
  - Interconnected by French drain
- Drywell = discharge point



# Fair Oaks Mall – 1990 Site Drawings



# Overview of Columbus Wellhead Protection Program



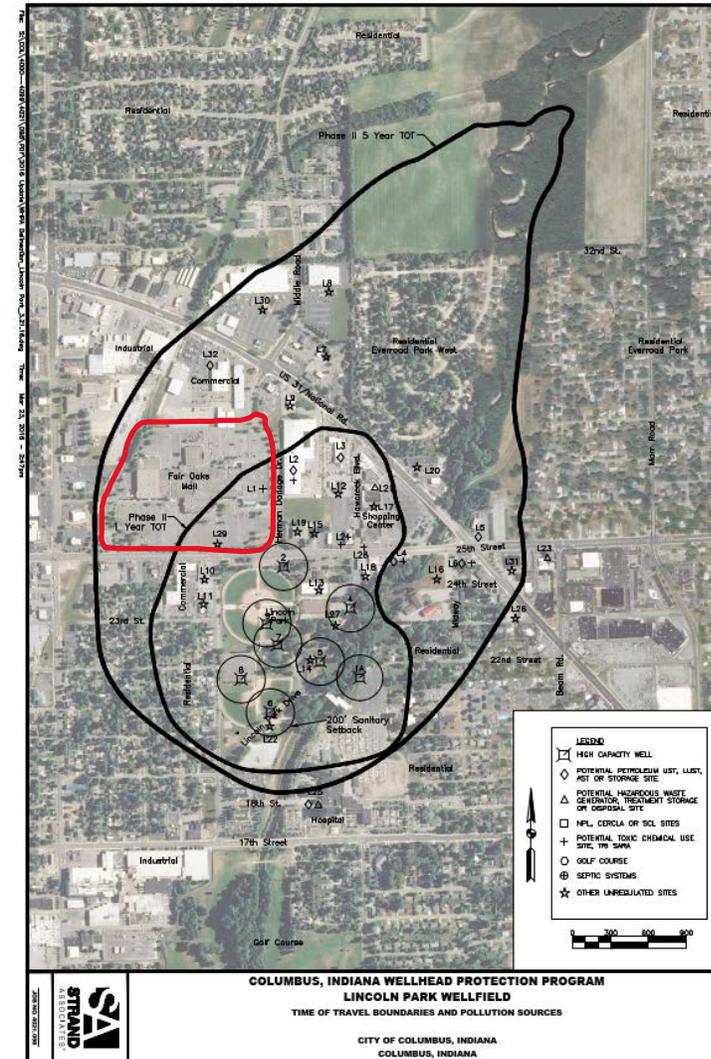
# Columbus Wellhead Protection Program

- 2011 Lincoln Park Wellfield
- 5-year time of travel



# Columbus Wellhead Protection Program

- 2021 Lincoln Park Wellfield
- 5-year time of travel
  - Updated limits include entire project site

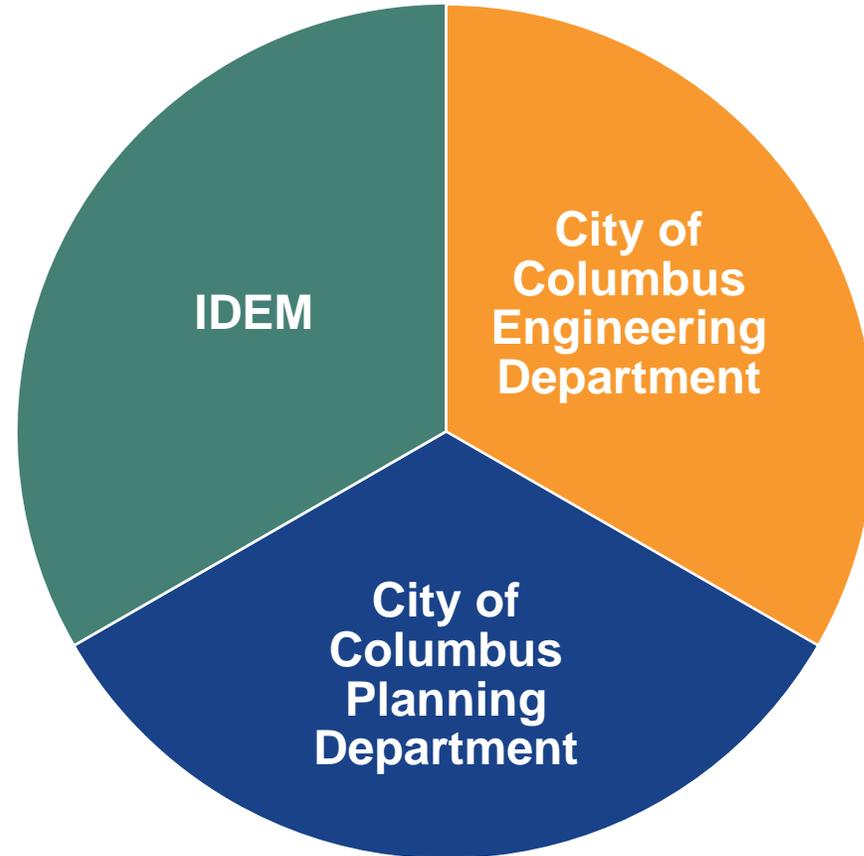


# Summary of Existing Site Conditions

- Existing site drainage infrastructure installed – 1990
- Wellhead protection management plan – 2000
- Entire site drains to groundwater
  - Existing drywells are all located within a 5-year time of travel path
  - No existing stormwater quality BMPs

# Applicable Stormwater Regulations (2021)

- State
  - IDEM
- Local
  - City of Columbus Planning Department
  - City of Columbus Engineering Department
    - Stormwater Department



# Applicable Stormwater Regulations (2021)

- State
  - IDEM
  - IAC 15-13 MS4 rule
  - “Infiltration practices” prohibited in wellhead protection areas

(c) Where appropriate, an MS4 operator shall use any combination of storage, infiltration, filtering, or vegetative practices to reduce the impact of pollutants in storm water run-off on receiving waters. In addition to the combination of practices, the following requirements shall be utilized:

(1) Infiltration practices will not be allowed in wellhead protection areas.

(30) "Infiltration gallery" means a type of infiltration practice used to filter storm water run-off into soils that utilizes one (1) or more vertical pipes leading to a horizontal, perforated pipe laid within a trench, often backfilled with gravel or some other permeable material.

(31) "Infiltration practices" means any structural BMP designed to facilitate the percolation of run-off through the soil to ground water. Examples include infiltration basins or trenches, dry wells, and porous pavement.

(32) "Initial receiving water" means a water that is the direct recipient of a discharge from an MS4 area after the discharge passes through another MS4 conveyance.

# Applicable Stormwater Regulations (2021)

- Local
  - City planning department
  - Zoning ordinance
  - Wellfield protection overlay zoning district
    - Same as 5-year TOT
  - Drywell prohibited in zoning district

## 4

### Overlay Zoning Districts

#### 4.3 Wellfield Protection (WP-OL) (cont.)

**C. Development Standards:** All development within the boundaries of the Wellfield Protection Overlay District shall comply with all applicable state, federal, and local regulations, in addition to the following development standards.

1. Minimum Setback from Well: No structure or septic field shall be located closer to any wellhead than the sanitary setback specified by the Indiana Department of Environmental Management, as periodically updated.
2. Abandoned Wells: All known abandoned wells shall be identified and sealed consistent with any applicable requirements of the applicable water utility and the Indiana Department of Natural Resources per 312 IAC 13-10.
3. Drainage Facilities: The use of dry wells shall be prohibited. A municipal storm sewer system shall be used if available to the subject property. No surface impoundments, ponds, or lagoons shall be established except for the purpose of (a) storm water retention and detention or (b) recreation and landscaping purposes.

# Applicable Stormwater Regulations (2021)

- Local

- City engineering department
- Stormwater Design Manual – BMP section
- Wet pond considerations
- Infiltration trench site considerations

- **Pocket Pond:** A pocket pond drains a smaller area than a traditional wet pond and the permanent pool is maintained by intercepting the groundwater. Excavation to groundwater interception should be avoided where the land uses draining to the pond may contaminate drinking water supplies such as well-field protection zones. Figure 6.5 illustrates a pocket pond.

## 6.8.3 Infiltration Trench

### 6.8.3.1 General Description

Infiltration trenches, if installed properly, can remove suspended solids, particulate pollutants, coli form bacteria, organics, and some soluble forms of metals and nutrients from stormwater runoff. Infiltration trenches are excavated trenches, usually 3 to 12 feet deep, backfilled with a stone aggregate, and lined with filter fabric. A small portion of the runoff, usually the first flush, is diverted to the infiltration trench, which is located either underground or at grade. Pollutants are filtered out of the runoff as it infiltrates the surrounding soils. Infiltration trenches also provide groundwater recharge and preserve base flow in nearby streams.

### 6.8.3.2 Site and Design Considerations

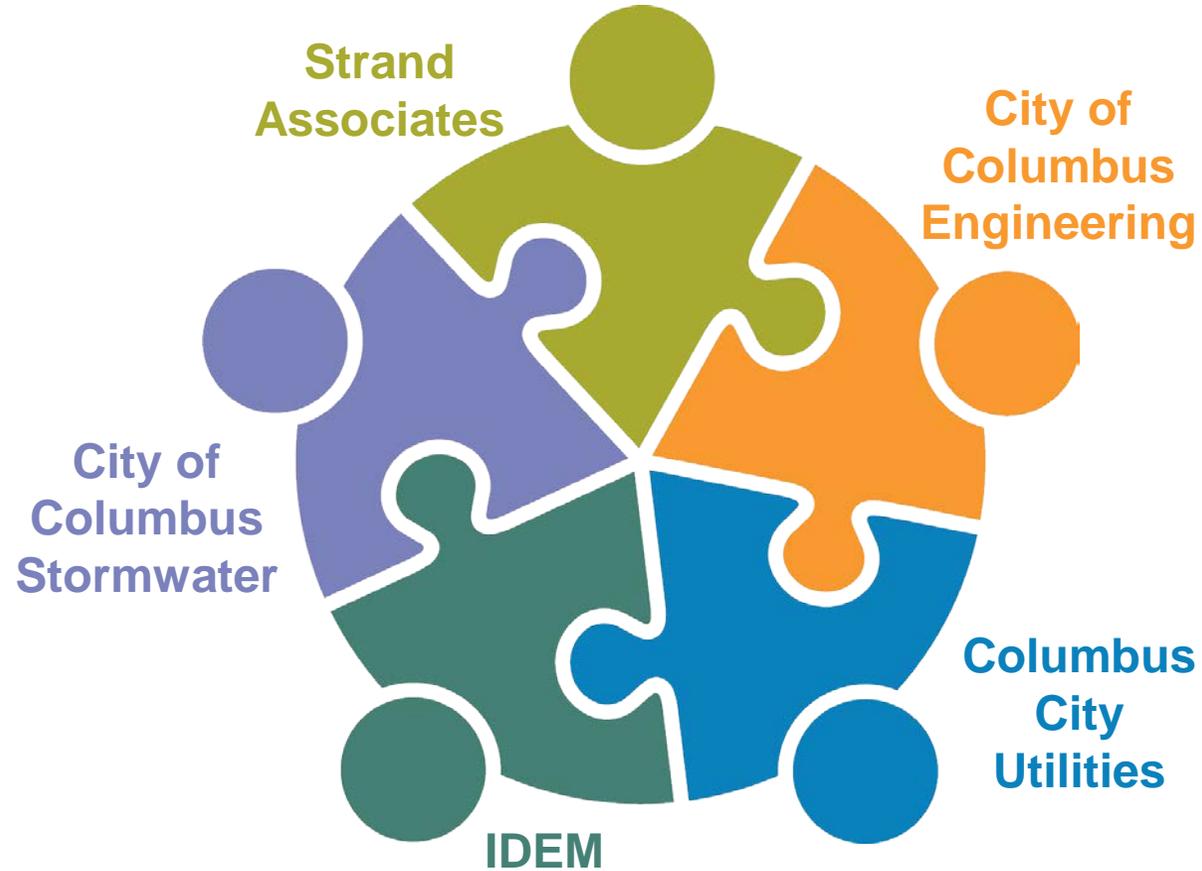
1. Infiltration trenches should not be used in wellfield protection areas.
2. Infiltration trenches are often used in place of other SQUs where limited land is available.

# Summary of Applicable Stormwater Regulations (2021)

- State and local regulations geared toward new development
- Regulations generally prohibit infiltration in the wellhead protection areas for new development
- Local regulations reference state requirements with some discussion for specific infiltration measures

# Meeting with All Jurisdictional Authorities Streamlines Solutions

## Coming Together for Stormwater Quality Solutions



# Meeting with Jurisdictional Authorities

- Discussion on site history
- Walk through proposed site redevelopment master plan
  - Potential uses
  - Pollutant sources
- Proposed stormwater management strategy
  - Discharges to groundwater to remain
  - What WQ measures, if any, should be implemented?

# Water Quality Considerations

- Discussion on pollutant sources
  - Are there new sources added from redevelopment?
- What are the pollutants of potential concern?
  - Sediment
  - Oil and grease
  - Trash and floatables

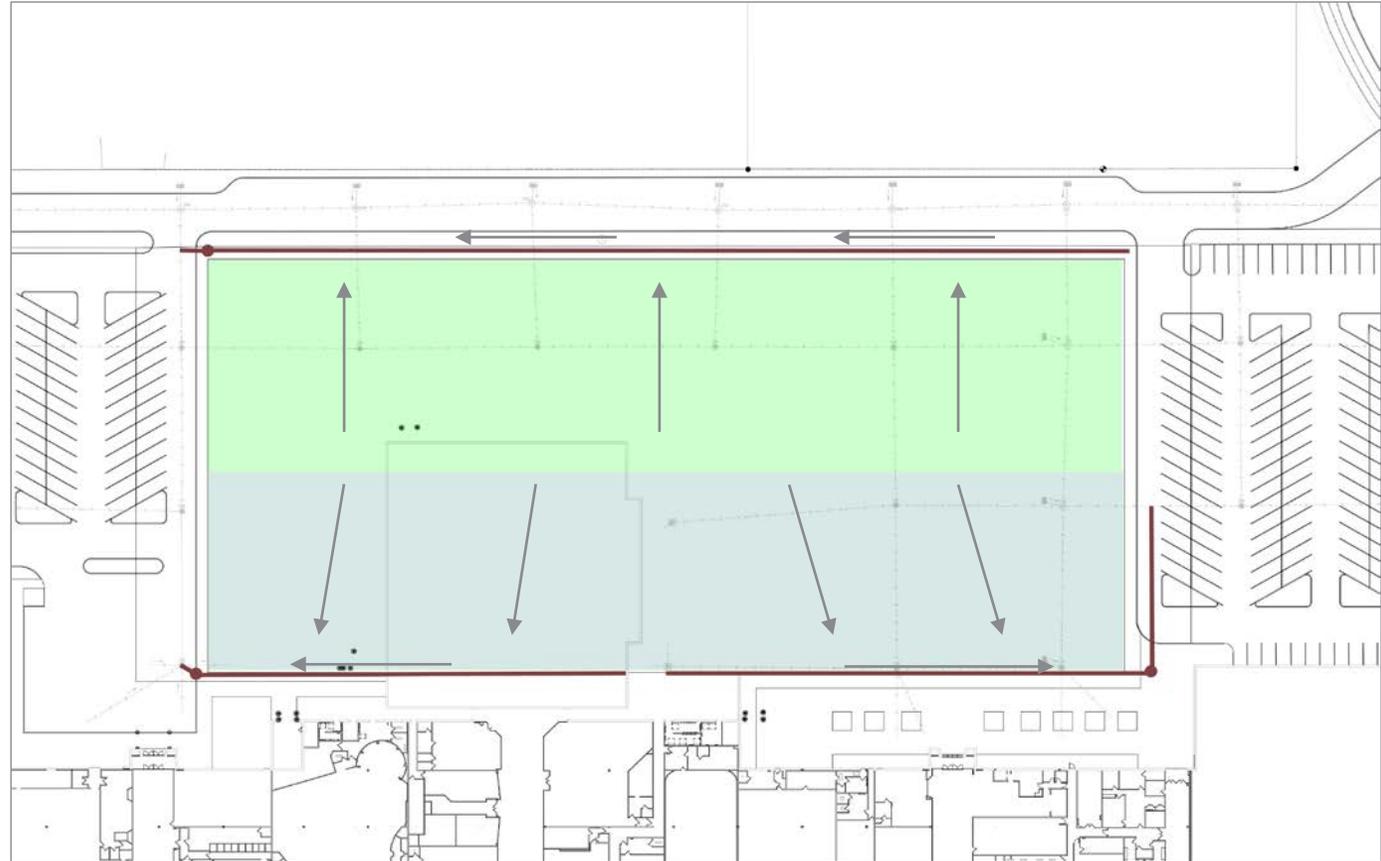


# Stormwater Quality Strategies Agreed Upon by Jurisdictional Authorities

- No new drywells to be constructed
- Stormwater ultimately to be discharged back to existing drywells
- All areas being redeveloped to require stormwater quality measures
  - Upstream of discharge to drywell/groundwater
  - Must provide treatment of pollutants of potential concern
- Definition of redevelopment areas, excluded:
  - Existing roof drains (with some exceptions)
  - Existing pavement rehab areas (resurfacing, seal coating, restriping, etc.)

# Design Implementation – Green vs. Gray Infrastructure

- North side of site
- Gray solution



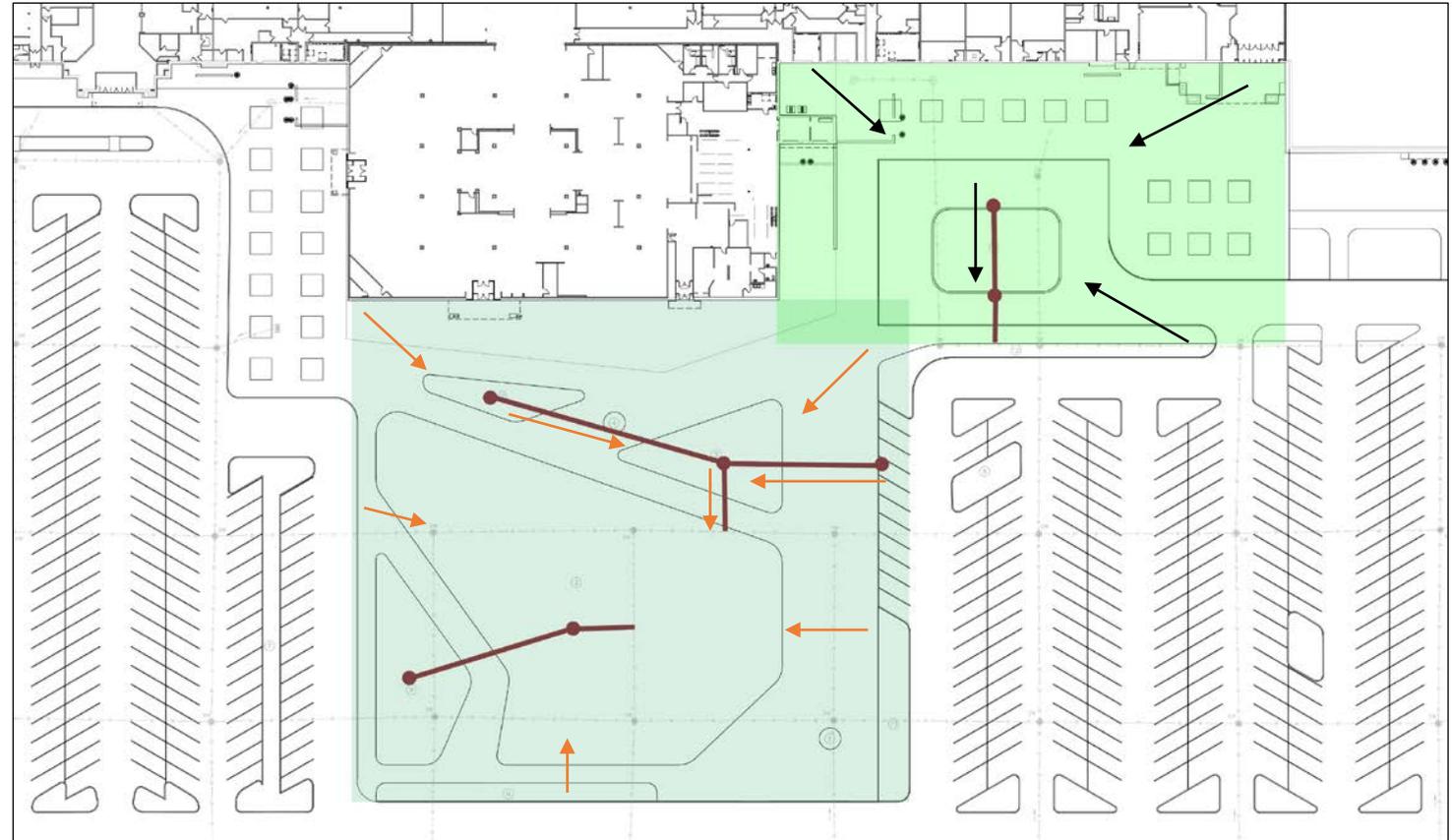
# Design Implementation – Green vs. Gray Infrastructure

- North side of site
- Green solution
- Serves 50% of roof
- Requires building shift



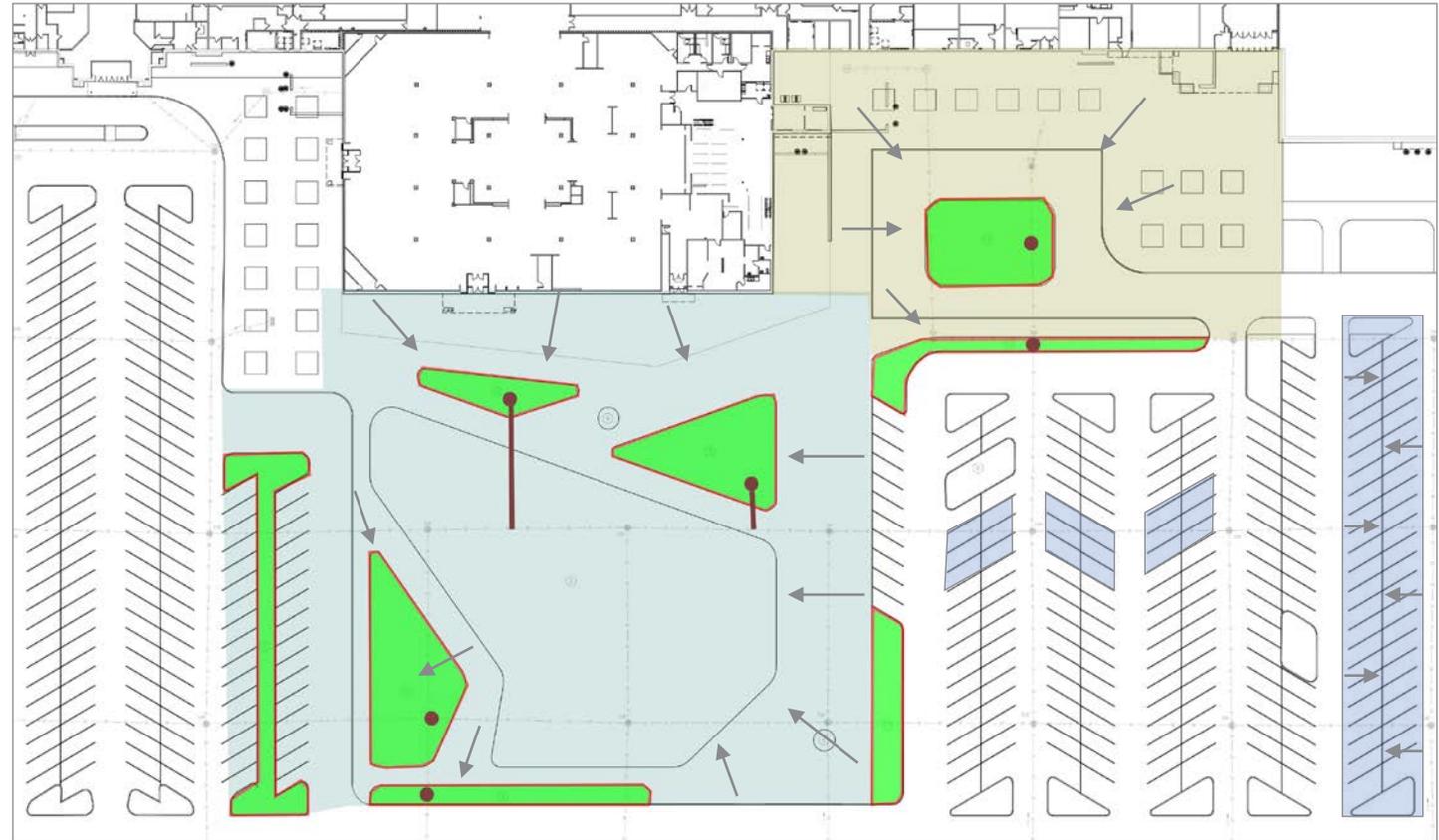
# Design Implementation – Green vs. Gray Infrastructure

- South side of site
- Gray solution
- Hydrodynamic separators to drywell network



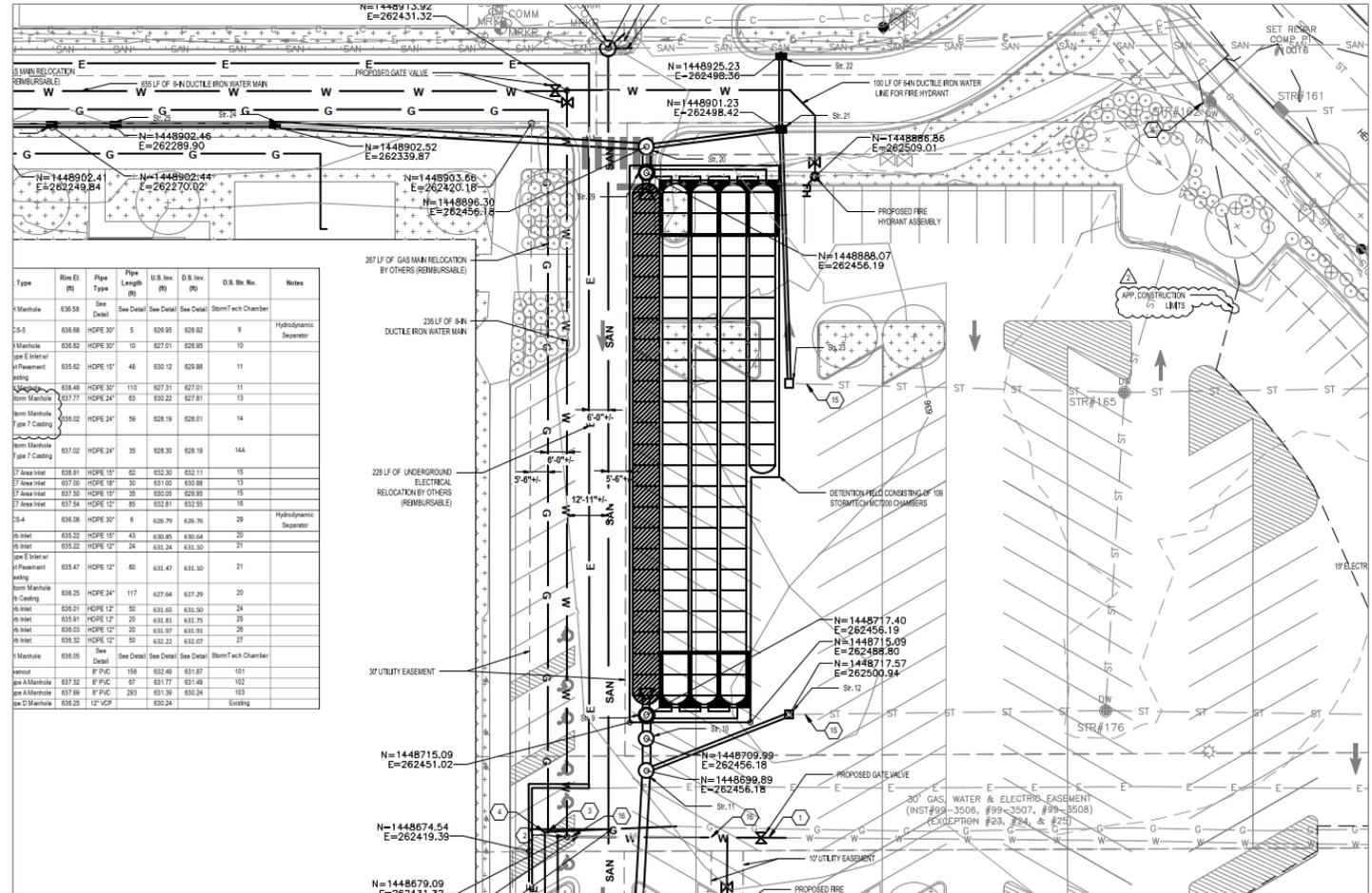
# Design Implementation – Green vs. Gray Infrastructure

- South side of site
- Green solution
- Large area footprint
- Reduced programming
- Reduced parking



# Design Implementation – Fieldhouse Site

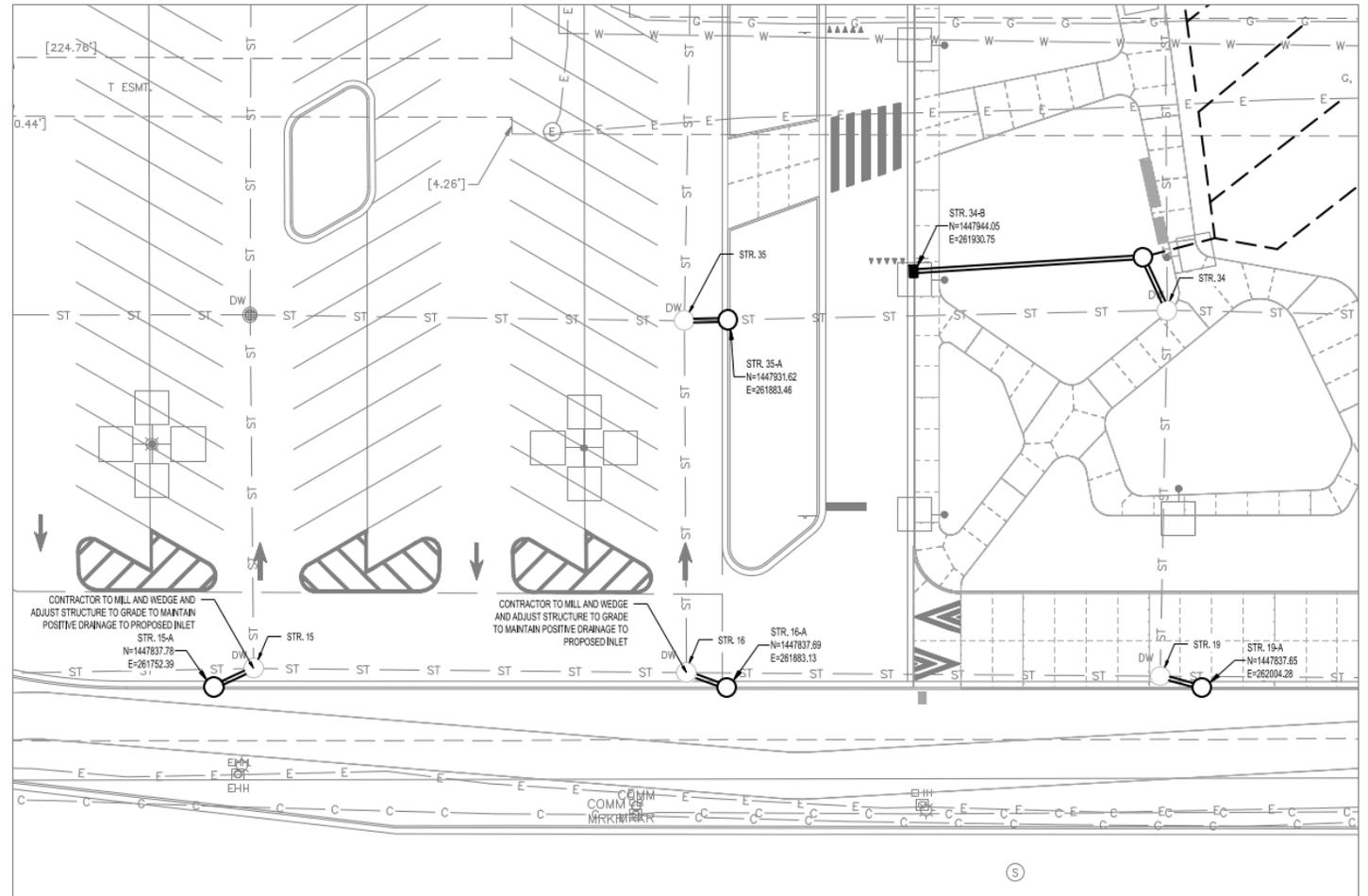
- 24 drywells removed
- Infiltration capacity reduced
- Replaced capacity through underground storage arrays
- 4 stormwater separator units



Courtesy Strand Associates, Inc.

# Design Implementation – Remainder of Site

- Existing drywells remain in place
  - Casting replacements and adjustments
- 45 stormwater new hydrodynamic separator units
  - Many utilize inlet castings to limit piping costs



Courtesy Strand Associates, Inc.

# Design Implementation – Challenges

- Design infiltration rates limited by field methods
  - Could not measure infiltration rate in field
  - Limited to lab calculated rate for soil of 25 in/hr
  - Limited potential consolidation of drainage areas
- Placement of separators near drywells
  - Grading around existing drywells
  - Increase restoration required
- Existing grid pattern
- Relative costs to the project due to scale
  - Communicating to non-technical stakeholders

# Summary of Current Regulations

- IDEM

- Changes contained in the new MS4 general permit
- Gives some allowance for infiltration in wellhead protection areas if water quality is addressed
- Must pre-treat to eliminate or reduce pollutants of concern

- City of Columbus

- Current standards refer to State Regulations
- Specific modifications to come in future

- (D) In combination with proper post-construction measure selection, design and development strategies may be selected and incorporated into the plan to minimize the discharge of pollutants. These strategies may include, but are not limited to:
  - 1) Low Impact Development (LID) and green infrastructure.
  - 2) Infiltration measures, when selected must take into consideration the pollutants associated with run-off and the potential to contaminate ground water resources. When there is a potential for contamination, choose alternative measures or measures that pre-treat run-off to eliminate or reduce the pollutants of concern.

Municipal Separate Storm Sewer System General Permit (INR040000)

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- (4) Register with U.S. EPA all MS4 owned and/or operated stormwater measures that are defined as a Class V injection well. When a MS4 requires the installation of a Class V injection well as a post-construction measure, the MS4 should direct the entity installing the measure to register the well. Refer to the U.S. EPA Underground Injection Well Program for the definitions and complete registration process.
- (5) Select and utilize any combination of practices or controls that promote volume reduction, infiltration, filtering, harvesting, evapotranspiration, vegetative practices or alternative treatment systems. The following standards are required and must be utilized in the decision-making process:
  - (A) Infiltration practices will not be allowed in wellhead protection areas as the primary water quality treatment measure, unless the measure is designed to treat the pollutant(s) of concern that originate in the drainage area of the measure.
  - (B) Discharges from new development and redevelopment sites will not be allowed directly into karst features without pre-treatment.

# Conclusion

- Stormwater quality is directly connected to public health and safety
- Achieving health and safety goals provides significant benefits, but can have significant costs
- Education of stakeholders on stormwater quality remains a challenge
  - Other design professionals
  - Project owners
- Early coordination with all stakeholders is key in design
- The city has a water quality strategy to follow in the wellhead protection area
  - Can be enforced with private developers
  - Definition of redevelopment may require more specifics



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