Stormwater Management

Cayuga County NY

20 July 2016

Presenter : John B. Zepko, CPESC

Agenda

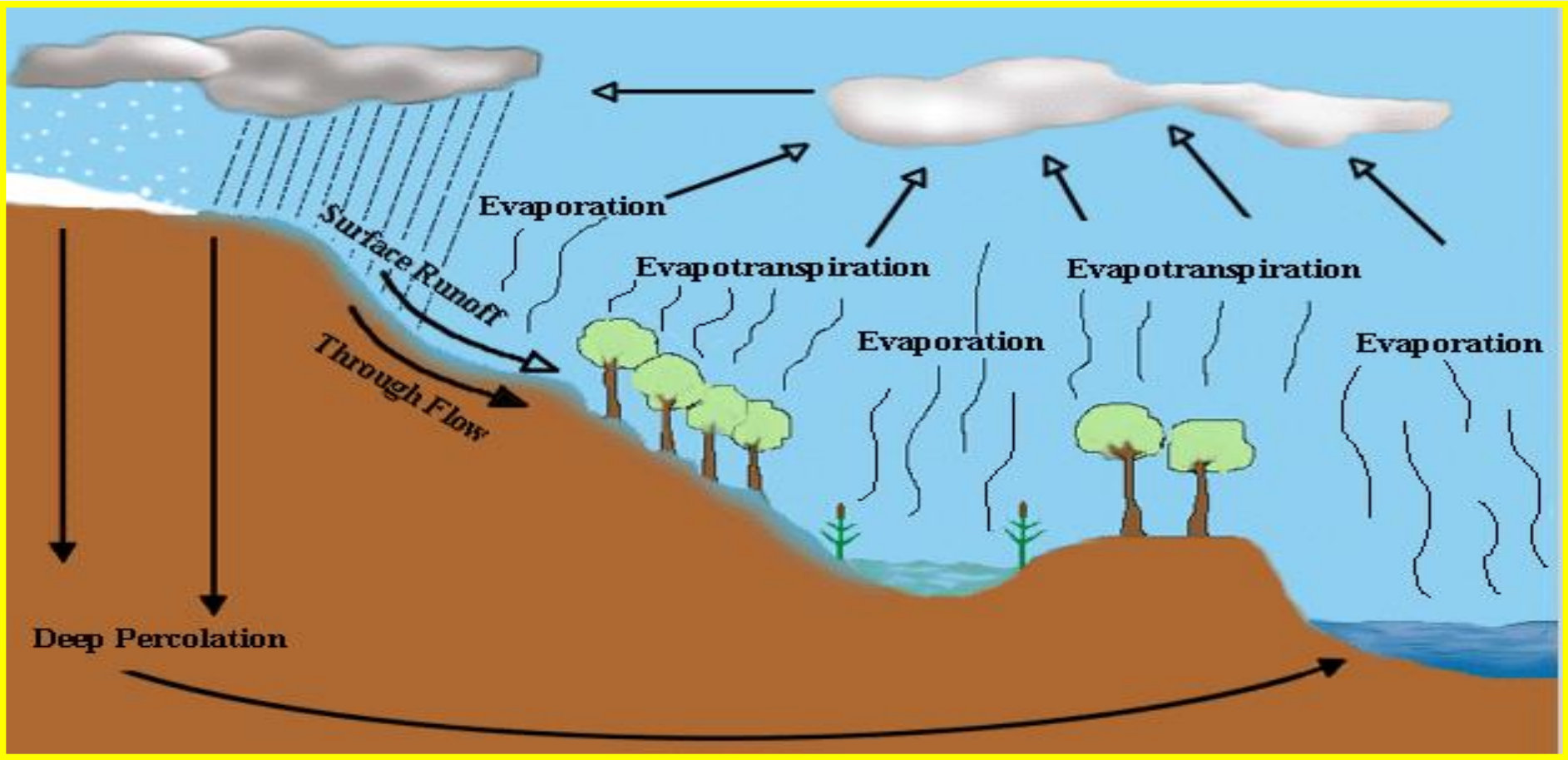
- What is Stormwater?
- Why is Stormwater a Problem?
- NY State Regulations
- Stormwater Pollution Prevention Plans

What is Stormwater ?

- Stormwater is water from rain or melting snow that does NOT soak into the ground. It runs off the surface of the land into storm sewers and ditches.

- "Land"
  - Impervious Surfaces (roads, highways, driveways, rooftops, parking lots)
  - Pervious Surfaces (Grassed areas, residential developments, etc..)

Natural Hydrological Cycle

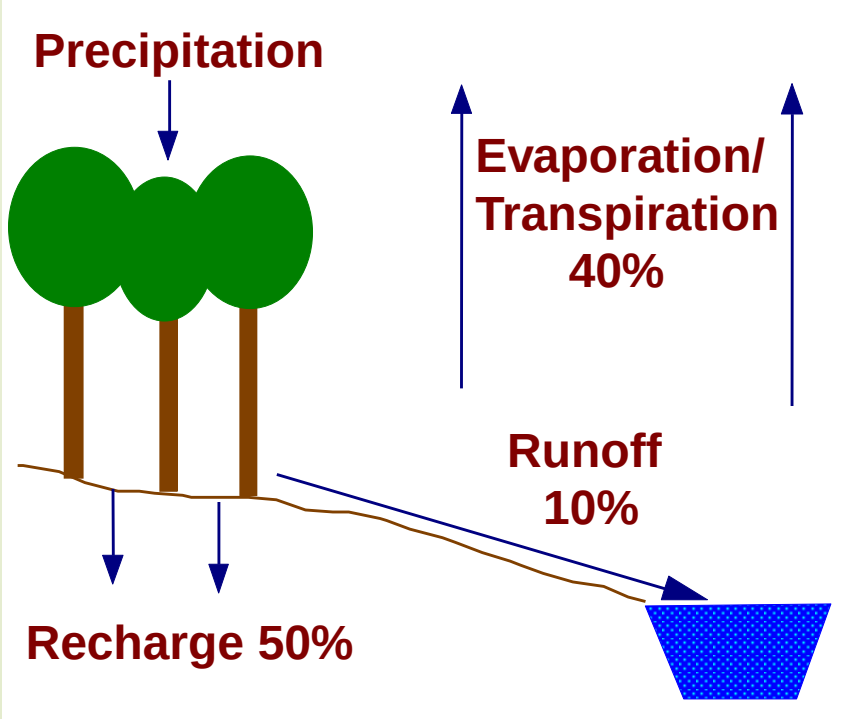


Why is Stormwater a Problem?

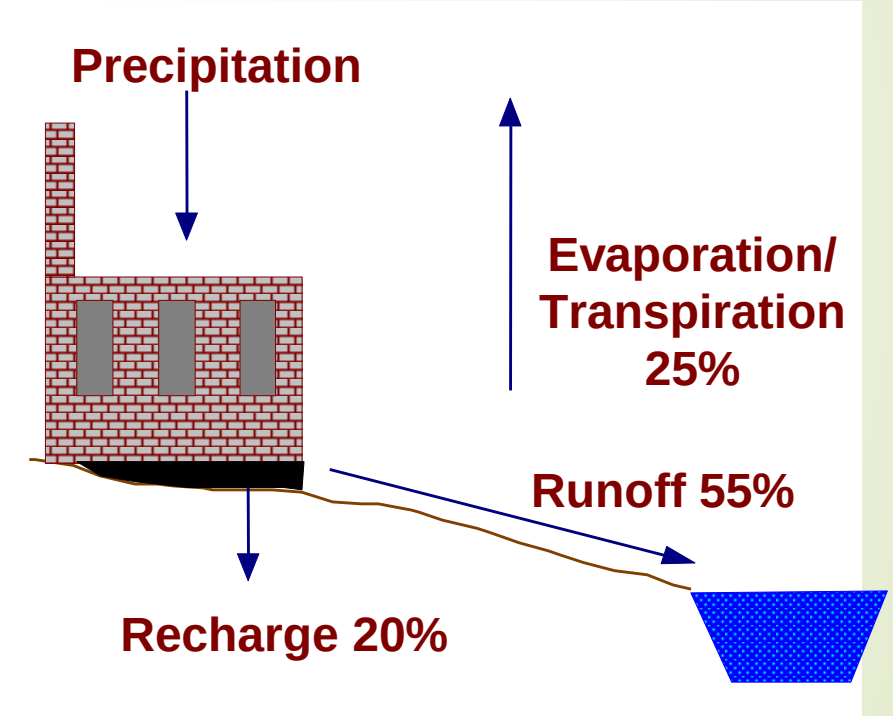
Stormwater runoff is a natural part of the hydrologic cycle, however as land use changes runoff can increase by 45%.

Stormwater is untreated and drains directly into local waterways. Erosion, sedimentation, and the transport of pollutants can result in increased incidences of flooding, property damage, and the loss of aquatic resources.

Undeveloped Conditions



Developed Conditions



Stormwater and Development

- Runoff and stream flow rates increase dramatically under post development conditions
- The higher discharge of runoff can overload the capacity of a stream or river, causing downstream flooding and erosion
- Increased pollutant loads are carried downstream as well, to be deposited in surface waters

Pollutants in Stormwater

- Sediment
- Nutrients (phosphorous, nitrogen)
- Pesticides
- Bacteria
- Hydrocarbons (oil and grease)
- Thermal impacts
- Chlorides (road salt)
- Trash and debris
- Trace Metals (cadmium, copper, lead, zinc)

Accelerated Erosion

Accelerated Erosion = *Natural Erosion X Human Activities*

- Removal of Surface Cover
- Increased Imperviousness (paving, rooftops, compact soils)

Erosion and Sedimentation Process

- Soil Erosion is the removal of soil water, wind, ice, or gravity
- Raindrops can strike the soil surface at velocity of 25-30 feet per second
- Soil particles are dislodged and transported by surface runoff
- Scouring of exposed soil by runoff can cause further erosion
- Runoff can be concentrated into rivulets – *well defined channels several inches deep* – **Rill erosion**
- Rill erosion, left unrepaired, may develop into gullies as more concentrated flows run downslope

Factors influencing Erosion

- Soil Erodibility
- Vegetative Cover
- Topography
- Climate
- Season

The Problems are local….

Eroded Sediment, nutrients, pesticides, bacteria, organic matter, and toxic sediments can all be transported to Local Waterways and neighboring properties

An uncontrolled Construction Site can yield sediment loads of 35-45 tons per acre per year

The Problems are Local…….

In-Stream Damages Can Include:

- Lake degradation (Owasco Lake and Inlet currently on NYS List of Impaired Waters (303d) for pathogens and nutrients
- Destruction of spawning areas, food sources, and habitat
- Toxicity to wildlife
- Loss of navigational channels
- Impacts to fisheries
- Reduction of water storage capability of streams

The Problems are local….

Out of Stream Damages Can Include:

- Property Damage
- Increased Flood Hazards
- Decreased capacity of conveyance structures
- Higher Costs of Maintaining infrastructure

Existing Rules and Regulations

- Federal Clean Water Act – 1972
  - National Pollution Discharge Elimination System – *NPDES*
    - Phase I (1992) – *regulates industrial activities, large municipal separate storm sewer systems (MS4), populations greater than 100,00 and* ***construction sites greater than 5 acres***
    - Phase II (1999) – *regulates small MS4s, and* ***construction sites greater than 1 acre***

- NYS DEC State Pollution Discharge System – *SPDES*
    - Phase I (1993) – *regulates industries and* ***construction sites greater than 5 acres***
    - Phase II (2003) – *regulates industries, commercial establishments, small MS4s, and* ***construction sites greater than 1 acre***

**all small MS4 is defined as being located in an "urbanized area" population of 50,000 and overall density of 1,000 per square mile*

SPDES Requirements For Small Construction Sites

- **Current General Permit – GP-0-15-002** *(29 Jan 2015 – 29 Jan 2020)*
  - Construction activities involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land; excluding routine maintenance activity that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;
  - Construction activities involving soil disturbances of less than one (1) acre where the Department has determined that a SPDES permit is required for stormwater discharges based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to surface waters of the State.
  - Construction activities located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

Stormwater Pollution Prevention Plans (SWPPPs)

- All SWPPPs require the development of **Erosion and Sediment Control Plans**
- Post Construction Controls (ponds, swales, bio-retention, etc.) are required if:
  - Project discharges to a TMDL watershed or 303d list waterbody
  - Greater than 5 acre disturbance
  - Construction other than single family residences
  - Single Family residential subdivisions involving soil disturbances between 1 and 5 acres with *greater than* 25% cover at build out.
  - Single Family residential subdivisions involving soil disturbance of 5 or more acres
  - Single Family residential subdivisions disturbing less than 5 acres of land that are part of large common plan of development or sale that will ultimately disturb 5 acres or more of land

The Process

- Construction Site Operators develop a SWPPP in accordance with the General Permit conditions, the New York Stormwater Management Design Manual, and the NY Standards and Specifications for Erosion and Sediment Control (referred to as "the blue book").
- A Notice of Intent (NOI) is completed and submitted to DEC
- Project is authorized 5 business days from the date the DEC receives and electronic NOI, or 10 days if a paper version of the NOI .
- Project is authorized in 60 days if the SWPPP has NOT been prepared in conformance with the design criteria

Erosion and Sediment Control Plans

- The purpose of an erosion and sediment control plan is to define and schedule the control measures that will be used to minimize erosion, detain excess stormwater runoff and prevent off-site sedimentation. Typically, a detailed map is prepared to display the location of each practice in relation to the onsite and offsite resources to be protected.

Erosion & Sediment Control Plan Elements

- Existing and Proposed contours at 2' intervals or less
- Map drawn to scale of 1" = 20 ft, 1" = 30 ft, 1" = 40 or 1" = 50 ft
- Details of temporary and permanent structural and vegetative measures used to control erosion for ***each stage*** of project (from land clearing to finish).
- The location of structural ESC measures with standard symbols to facilitate the understanding and review of plans.
- The dimensions, material specifications, installation details, and operation and maintenance requirements, for all erosion and sediment control practices, including the locations and size of any temporary sediment traps, basins, or structural practice.
- Notes regarding temporary ESC facilities which will be converted to permanent stormwater management facilities.
- A schedule to establish the construction sequence of temporary and permanent practices and their timing relative to other construction activities.
- An inspection and maintenance schedule for soil ESC facilities which describes maintenance activities to be performed.
- Dewatering practices for subsurface construction activities.

Construction Drawings

- Vicinity Map with scale and north arrow
- Legend, scales, N arrow on plan view
- Existing and proposed topography shown with contours labeled with spots elevations in critical areas
- Scope of the plan noted in the Title Block
- Limits of clearing and grading shown
- Existing vegetation delineated
- Soil boundaries shown on the existing and proposed plan views
- Existing drainage patterns, 100 year floodplain and sub-areas shown
- Existing and proposed development facilities/ improvements shown
- Location of Erosion and Sediment control practices as phased with construction, with dimensions and material specifications
- Phasing plan with 5 acre threshold limits shown
- Stockpile locations, staging areas and access points clearly defined
- Street profiles, utility locations, property boundaries and, easement delineations shown
- Soil Restoration Plan detailed on the site plan

Construction Schedule (sample)

- 1. Obtain plan approval and other applicable permits.
- 2. Flag the work limits and mark the oak tree and buffer area for protection.
- 3. Hold pre-construction conference at least one week prior to starting construction.
- 4. Install erosion and sediment controls as the first construction activity.
- 5. Install storm drain with block and gravel inlet protection at construction entrance/exit.
- 6. Install temporary gravel construction entrance/exit and material laydown areas
- 7. Construct temporary diversions above proposed building sites. Install level spreader and sediment trap and vegetate disturbed areas.
- 8. Complete site clearing
- 9. Clear waste disposal area only as needed.

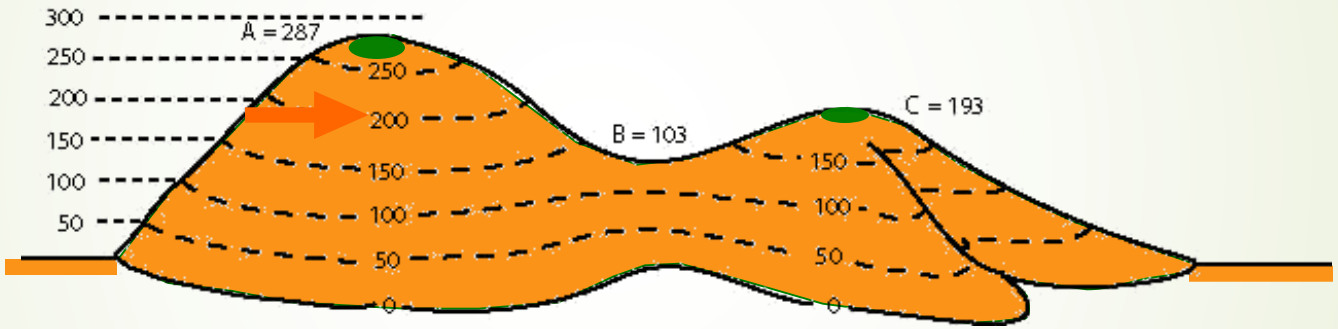
Construction Schedule Continued…..

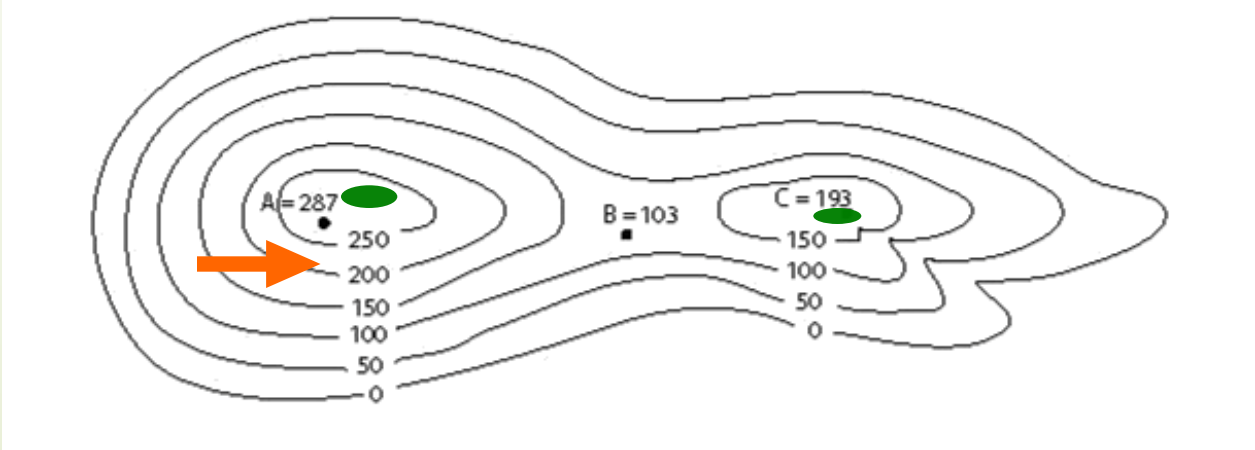
- 10. Rough grade site, stockpile topsoil, construct channels, install culverts and outlet protection, and install sediment fence as needed. Maintain daily. NOTE: bare areas mulched should grading be discontinued for more than 14 days.
- 11. Finish the slopes around buildings as soon as rough grading is complete. Leave the surface slightly roughened and vegetate and mulch immediately.
- 12. Complete final grading for roads and parking and stabilize with gravel.
- 13. Complete final grading for buildings.
- 14. Complete final grading of grounds, topsoil critical areas, and permanently vegetate, landscape, and mulch.
- 15. Install permanent stormwater management practices.
- 16. All erosion and sediment control practices will be inspected weekly and after rainfall events. Needed repairs will be made immediately.
- 17. After the site is stabilized, remove all temporary measures and install permanent vegetation on the disturbed areas.
- 18. Estimated time before final stabilization—??.

A Primer on Reading Topographic Maps

Topography

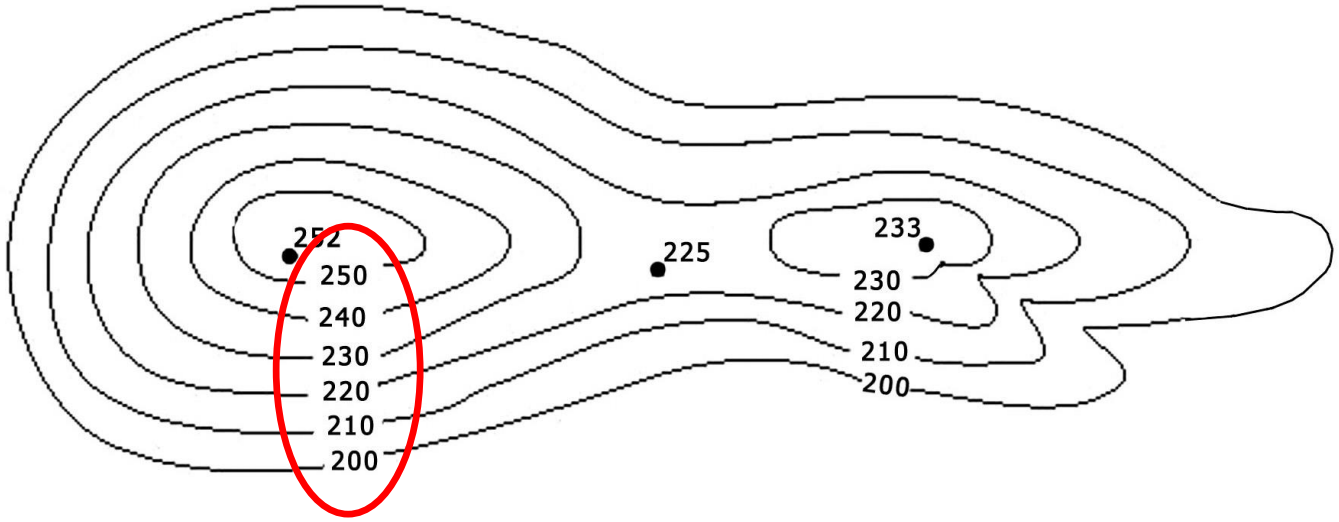
Contours: an imaginary line that connects points of equal elevation





Topography

Cross-sections are sometimes used to represent 3-D objects in 2 dimensions.



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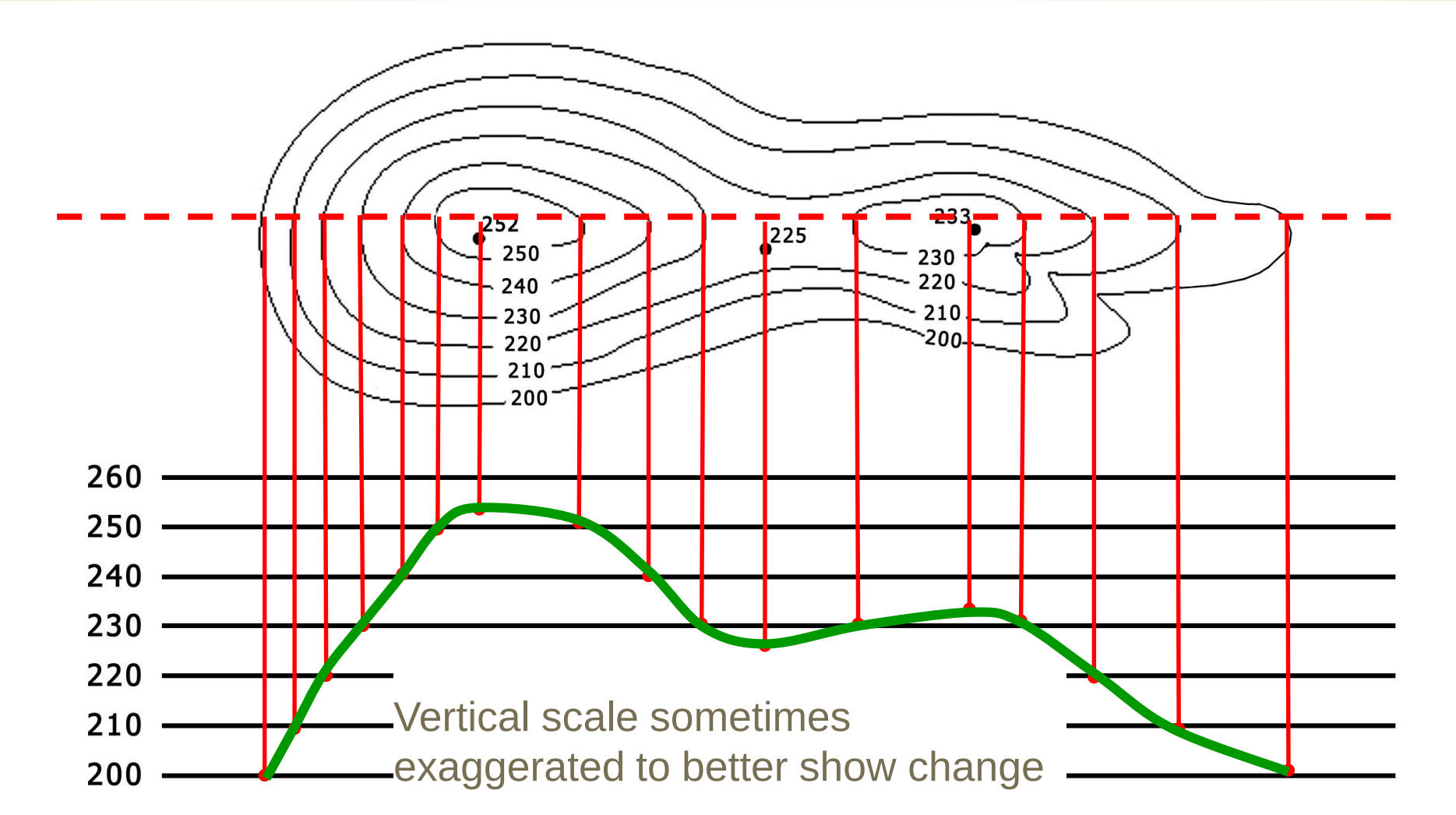
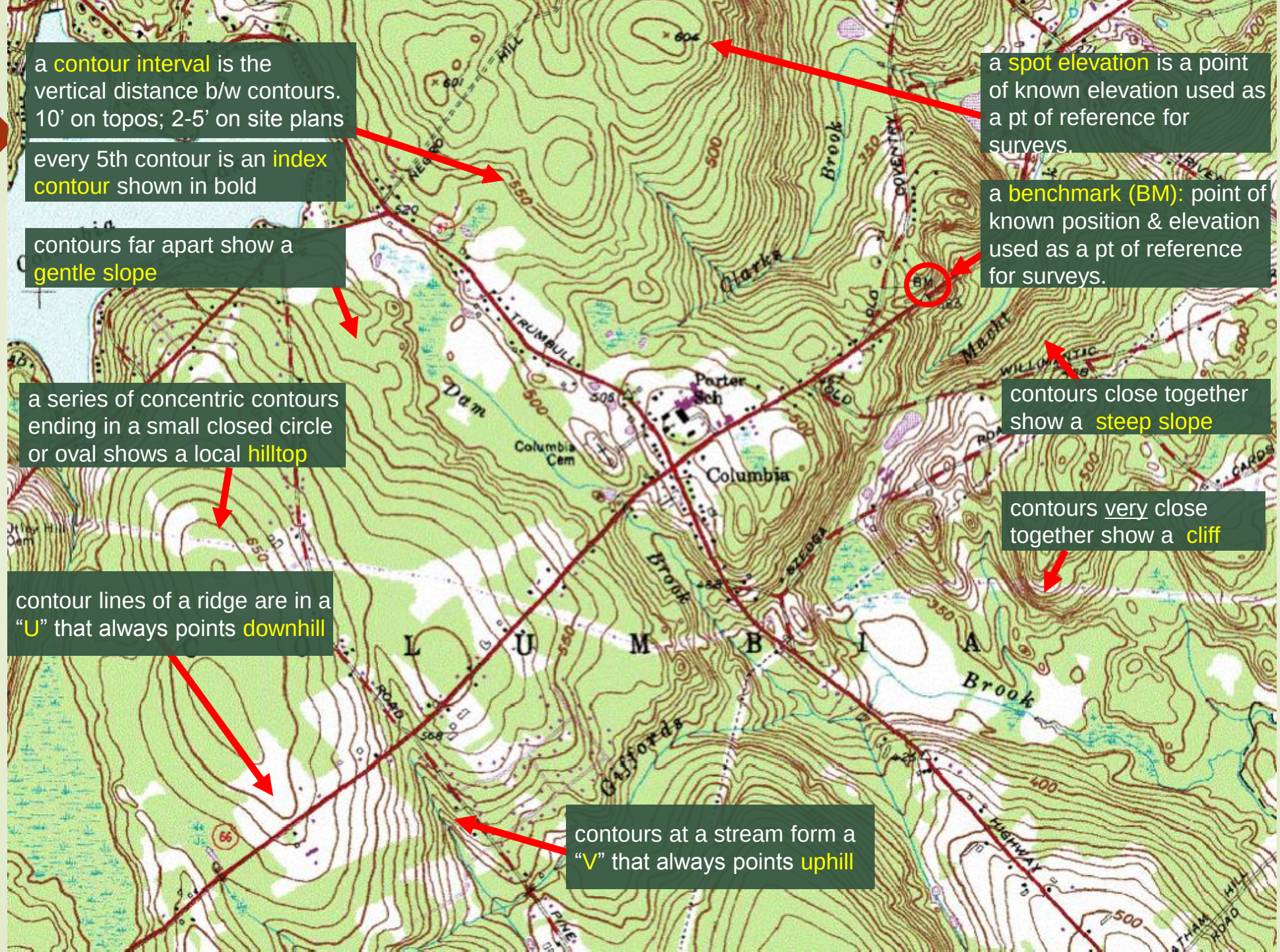
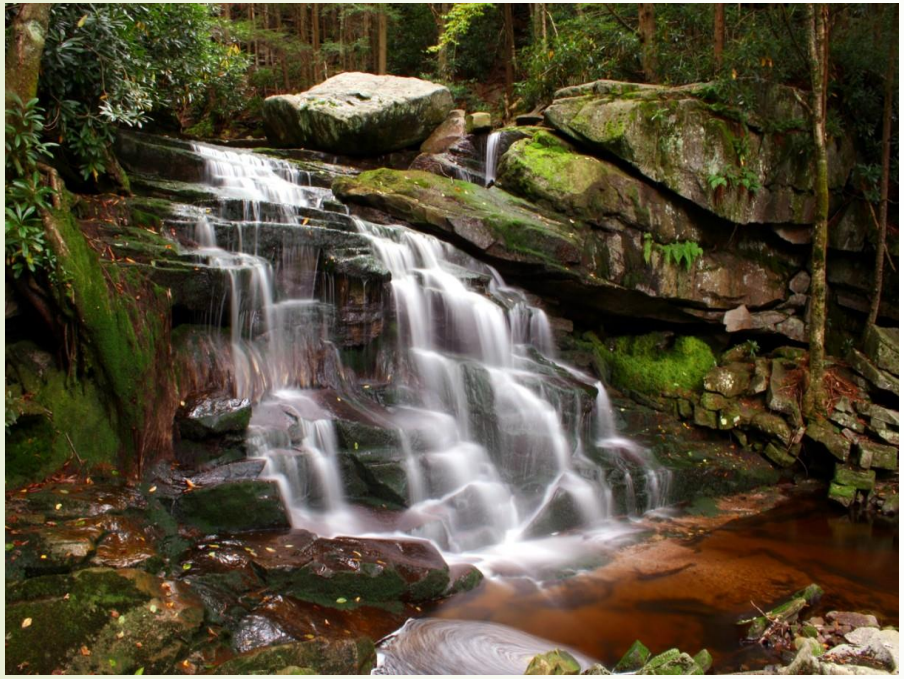
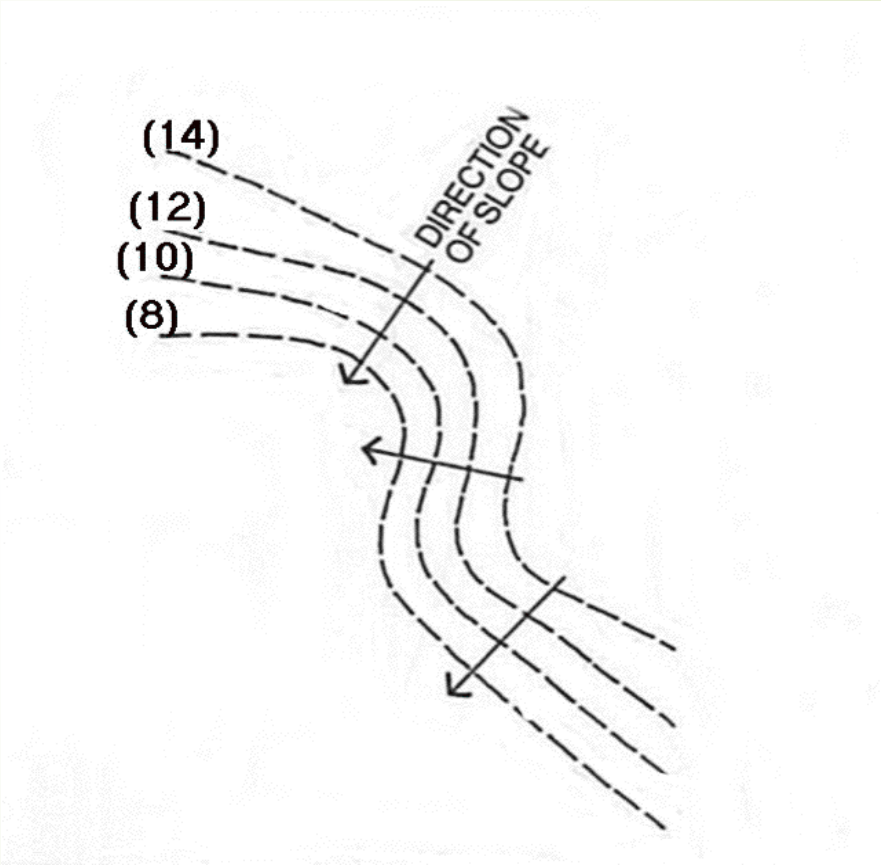



a contour interval is the vertical distance b/w contours. 10’ on topos; 2-5’ on site plans
every 5th contour is an index contour shown in bold
contours far apart show a gentle slope
a series of concentric contours ending in a small closed circle or oval shows a local hilltop
contour lines of a ridge are in a “U” that always points downhill
contours at a stream form a “V” that always points uphill
a spot elevation is a point of known elevation used as a pt of reference for surveys.
a benchmark (BM): point of known position & elevation used as a pt of reference for surveys.
contours close together show a steep slope
contours very close together show a cliff
Columbia
Porter Sch
Columbia Cem
Dam
Brook
Clarks
Macht
Giffords
L U M B I A

Topography

Slope direction is calculated perpendicular to the contour lines.



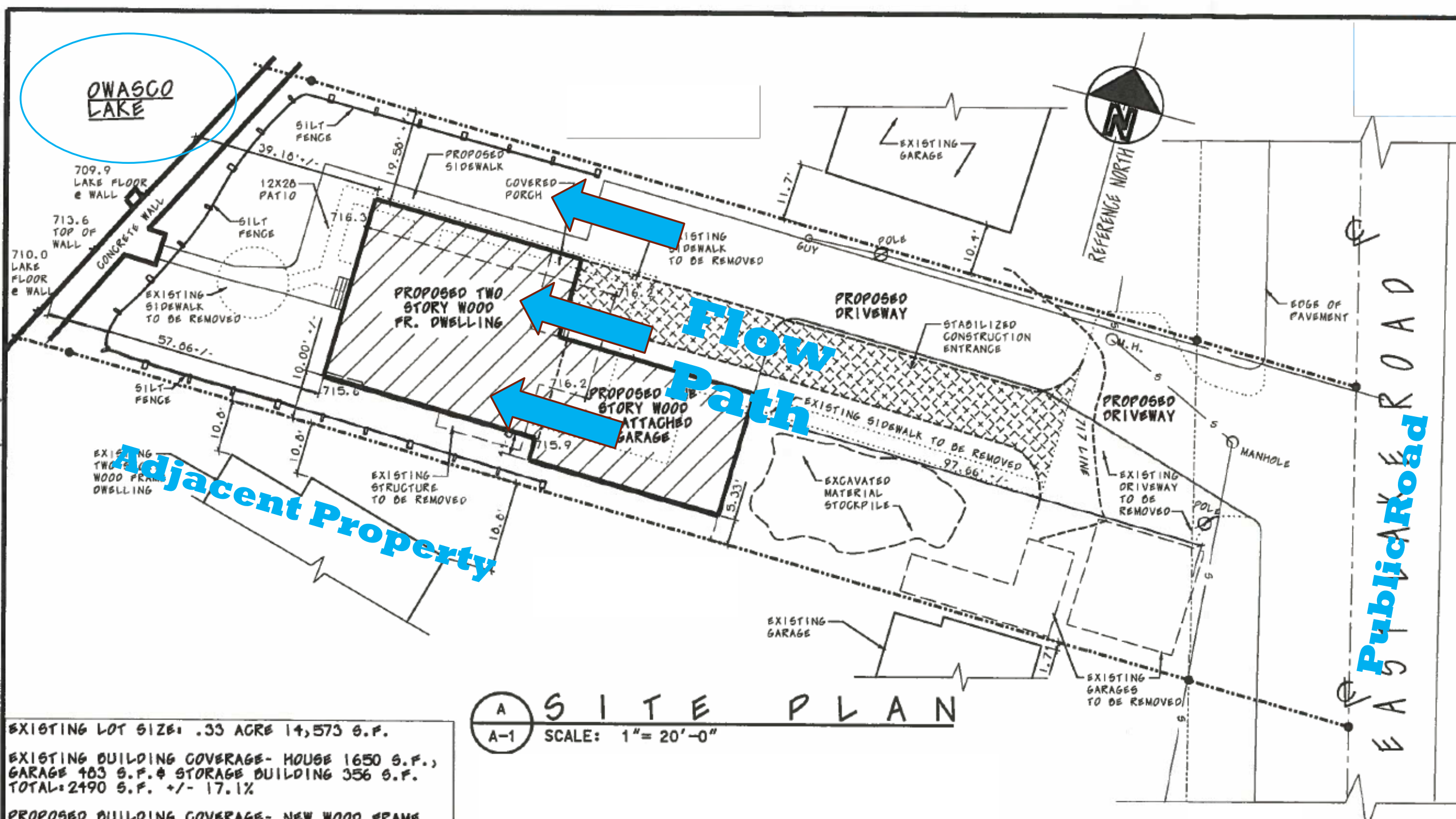


Water flows downhill...

...so the direction of flow is always perpendicular to the contour lines, since this is the steepest slope

When Reviewing, K.I.S.S. Keep It Simple……

- E&S Plans are essentially resource protection plans and should have resource protection AT ITS CORE
- Good plans emphasize Erosion Control FIRST (controlling runoff and stabilizing soil) and Sediment Control second, as a management practice.
- Identify flow of surface water
- Identify what needs protection
  - Lakes, streams, wetlands, adjacent properties, infrastructure



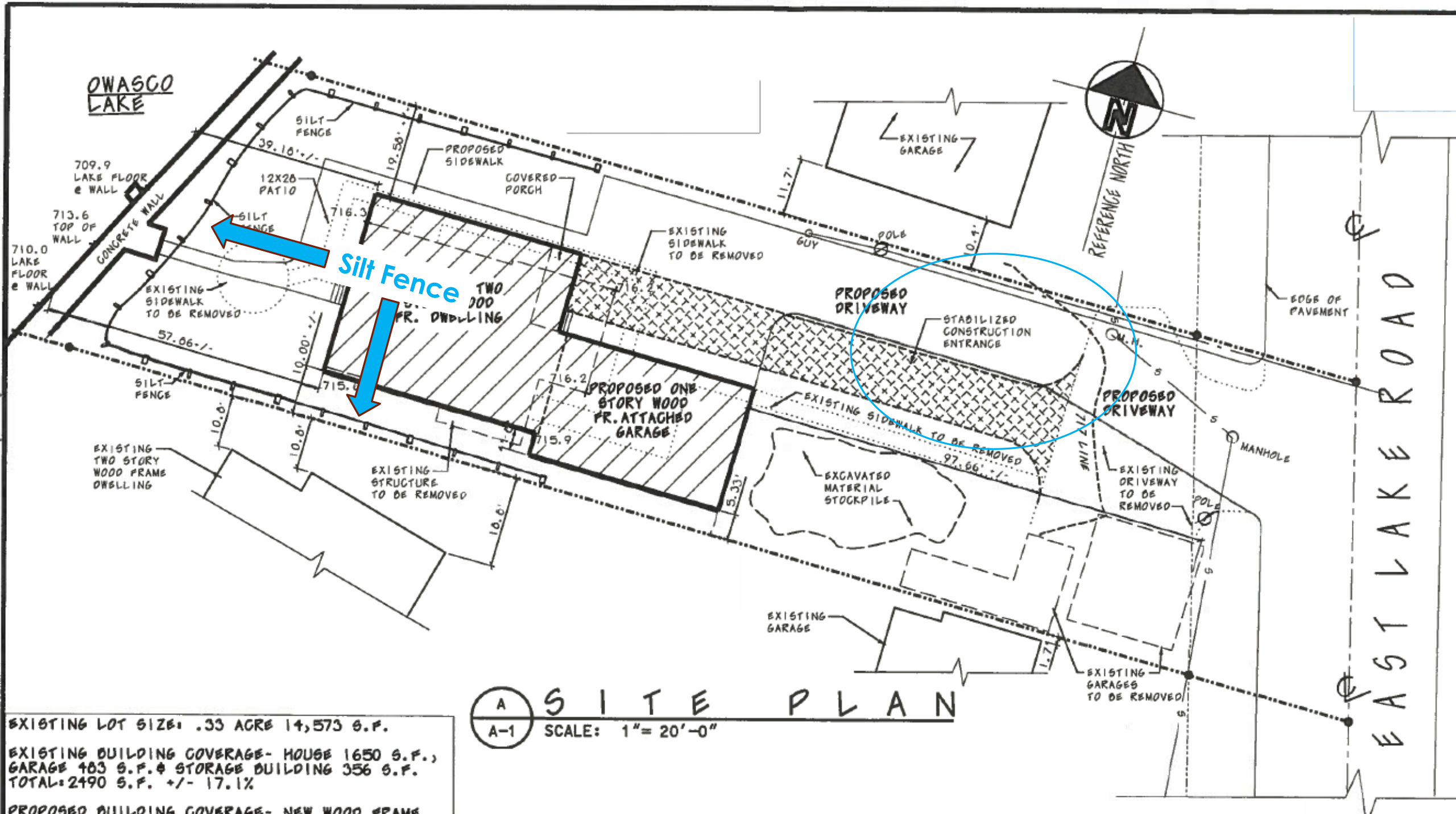
A / A-1 SITE PLAN

SCALE: 1"= 20'-0"

EXISTING LOT SIZE: .33 ACRE 14,573 S.F.

EXISTING BUILDING COVERAGE- HOUSE 1650 S.F., GARAGE 483 S.F. & STORAGE BUILDING 356 S.F. TOTAL: 2490 S.F. +/- 17.1%

PROPOSED BUILDING COVERAGE- NEW WOOD FRAME



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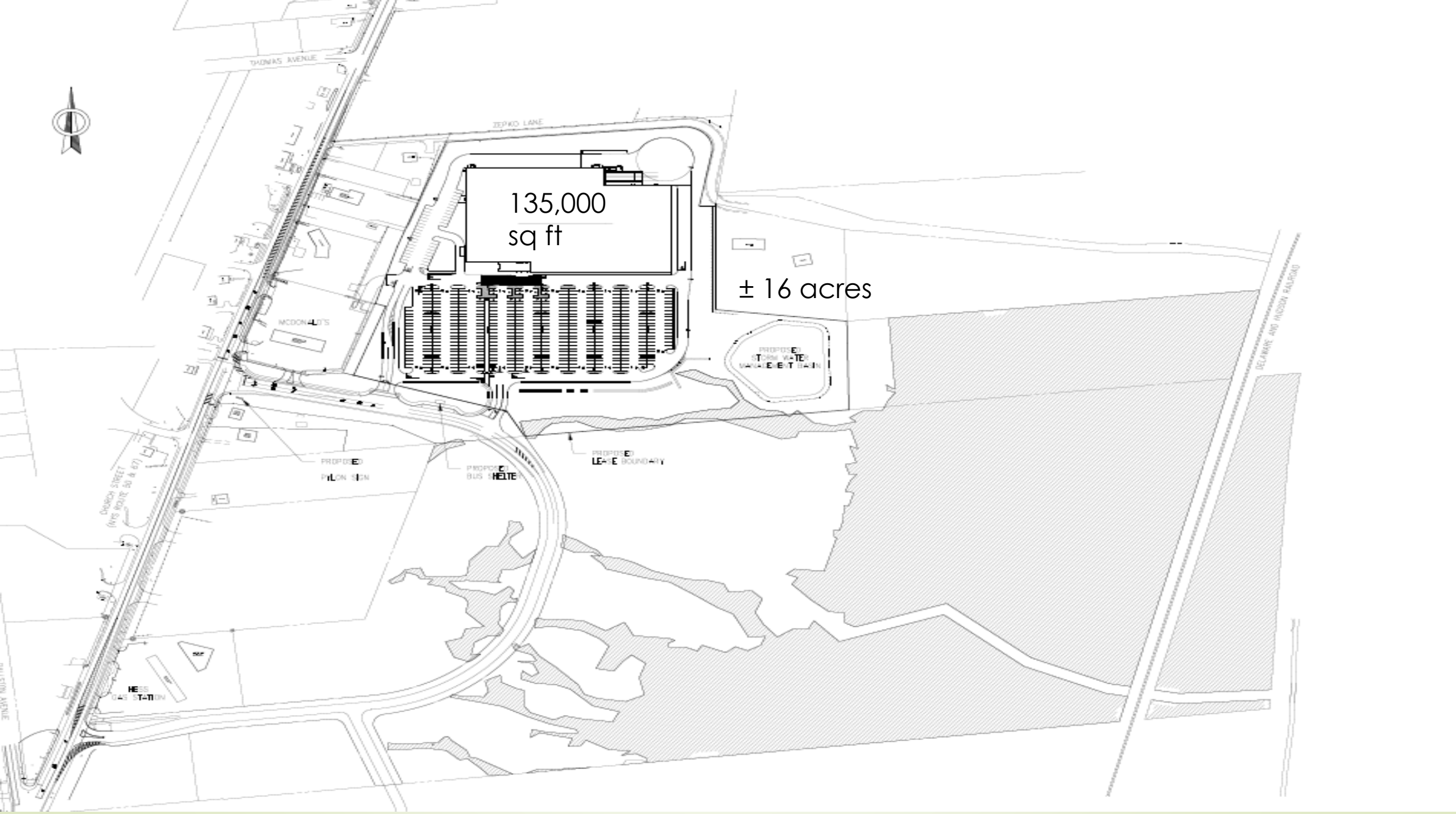
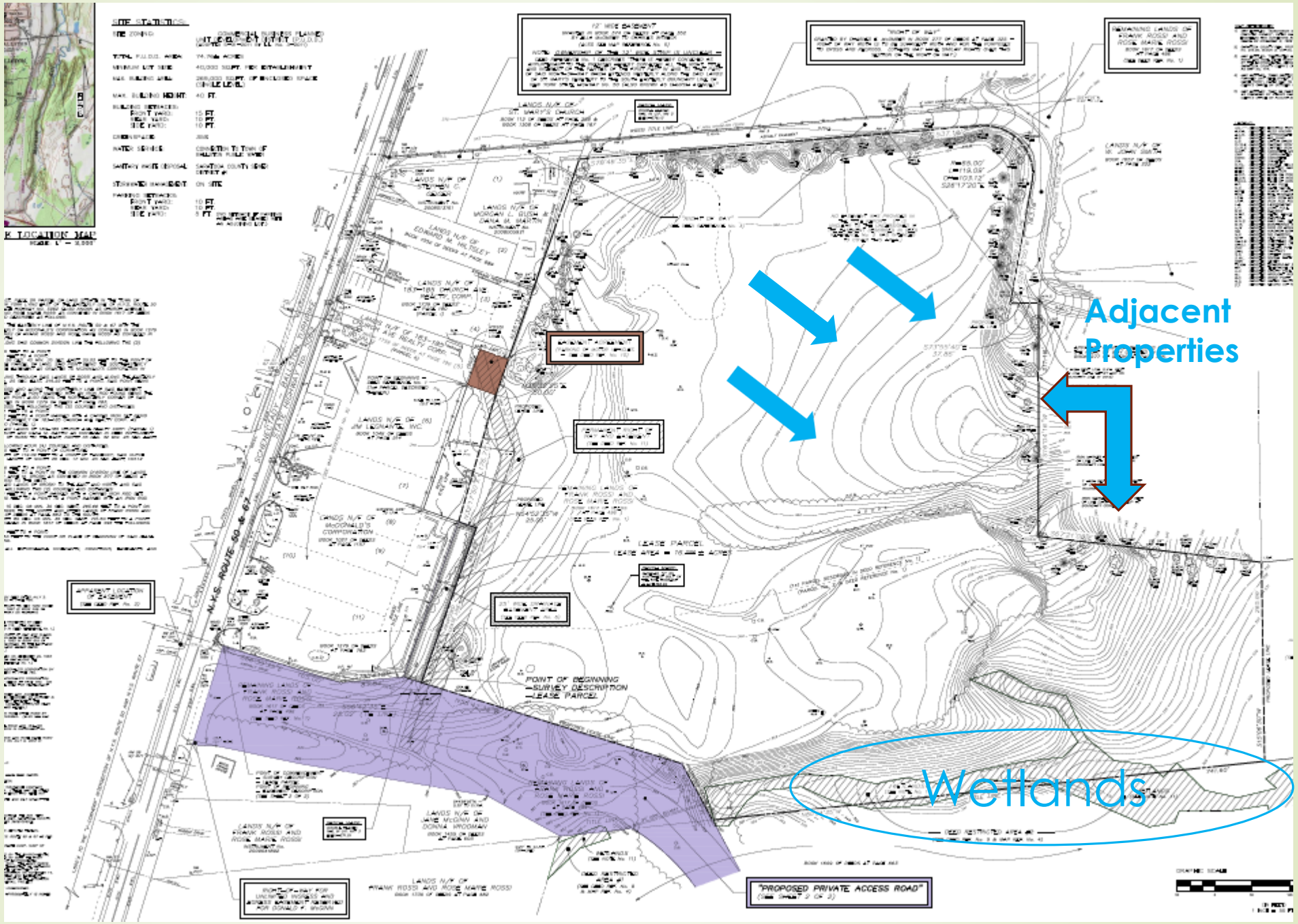
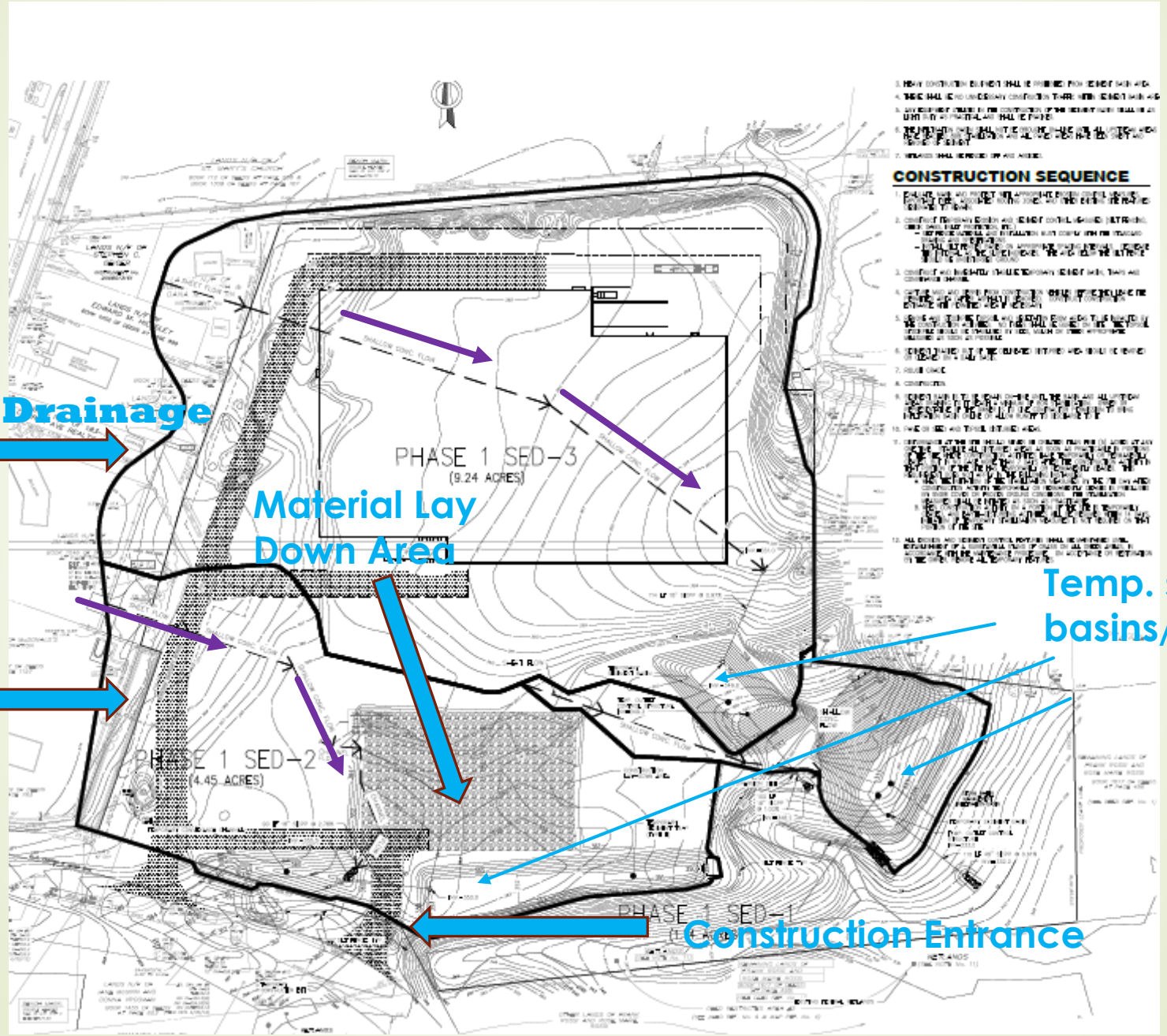
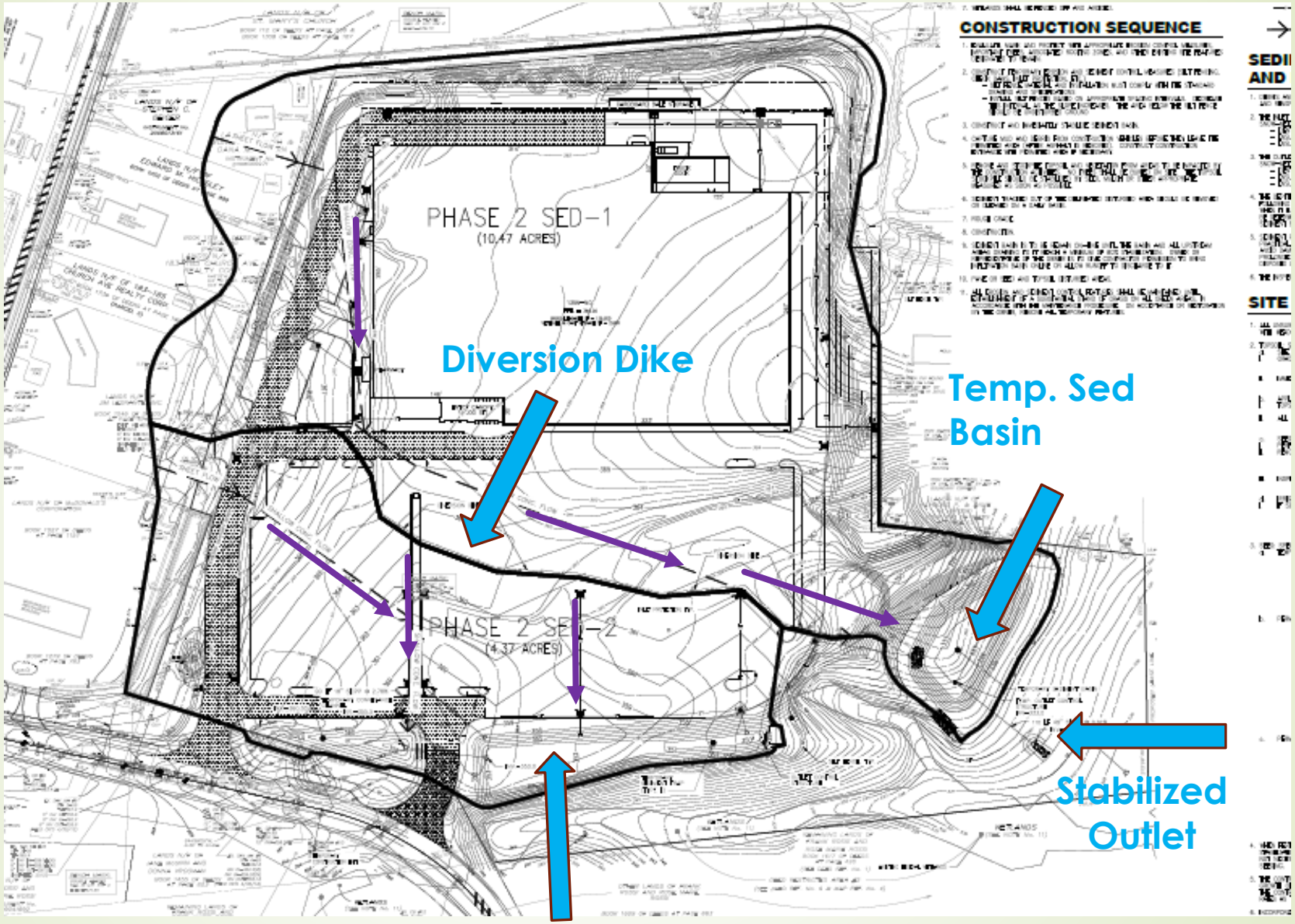
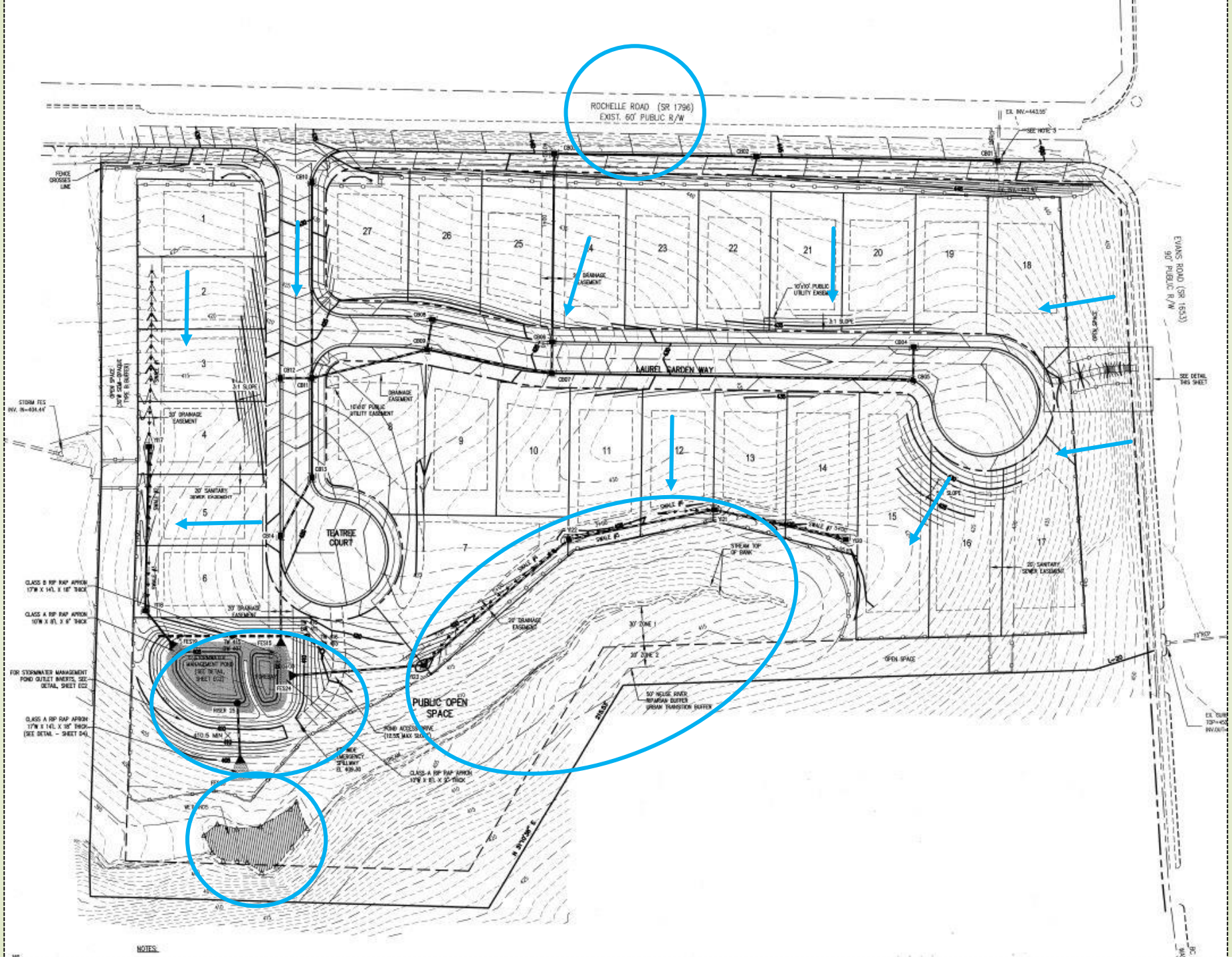

THOMAS AVENUE
ZEPKO LANE
135,000
sq ft
± 16 acres
MCDONALD'S
PROPOSED
STORM WATER
MANAGEMENT BASIN
PROPOSED
LEASE BOUNDARY
PROPOSED
PYLON SIGN
PROPOSED
BUS SHELTER
CHURCH STREET
(NYS ROUTE 50 & 67)
HESS
GAS STATION
DELAWARE AND HUDSON RAILROAD

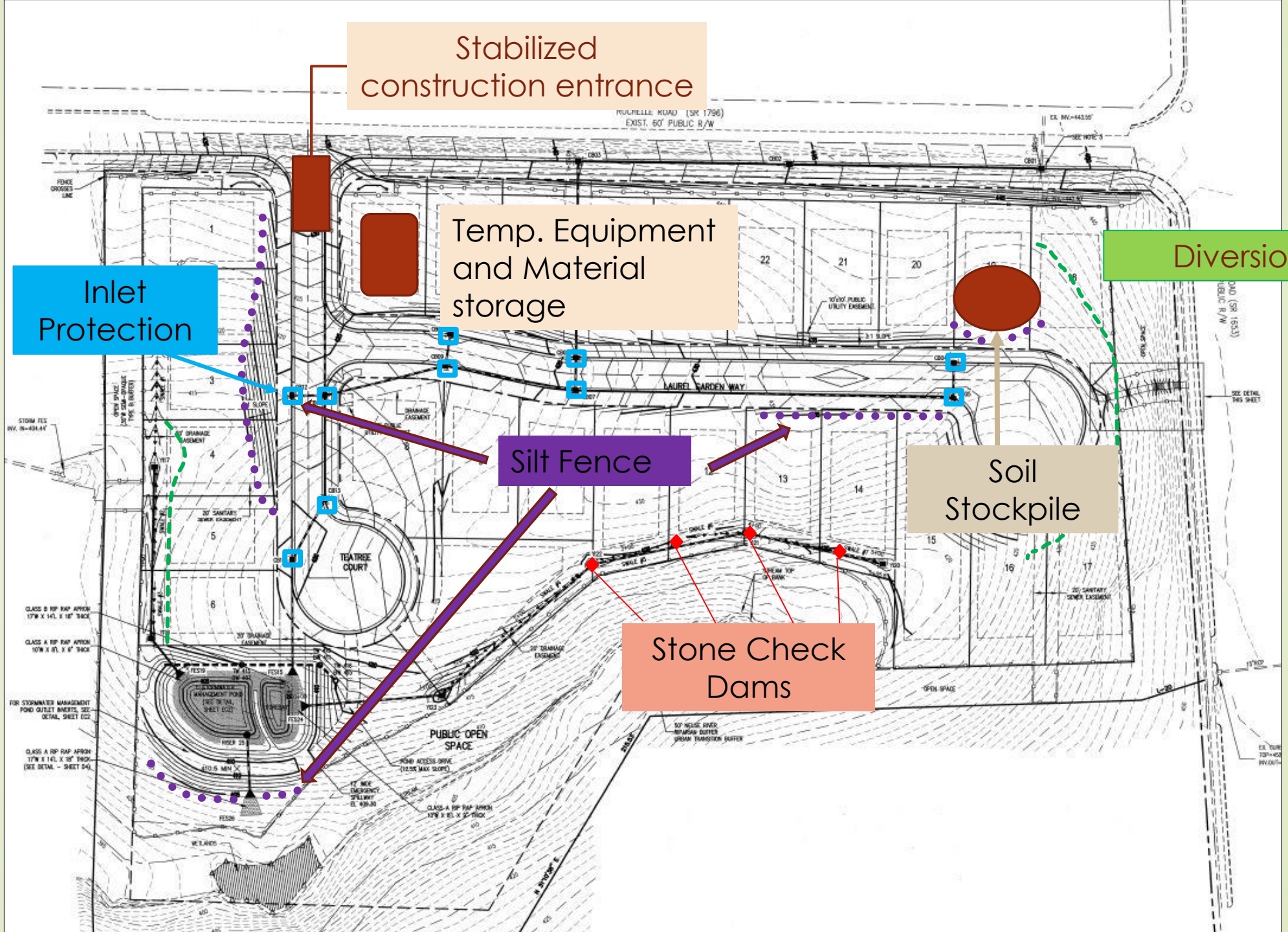

Adjacent Properties
Wetlands
N.Y.S. ROUTE 50 & 67
POINT OF BEGINNING
"PROPOSED PRIVATE ACCESS ROAD"


CONSTRUCTION SEQUENCE
PHASE 1 SED-3
(9.24 ACRES)
PHASE 1 SED-2
(4.45 ACRES)
PHASE 1 SED-1
Sub - Drainage
Material Lay Down Area
Temp. sediment basins/trap
Construction Entrance


CONSTRUCTION SEQUENCE
PHASE 2 SED-1
(10.47 ACRES)
PHASE 2 SED-2
(4.37 ACRES)
Diversion Dike
Temp. Sed Basin
Stabilized Outlet
Temp. Sediment Trap

ESC Exercise


ROCHELLE ROAD (SR 1796)
EXIST. 60' PUBLIC R/W
LAUREL GARDEN WAY
TEATREE COURT
PUBLIC OPEN SPACE
EVANS ROAD (SR 1653)
90' PUBLIC R/W
OPEN SPACE
NOTES:


Stabilized construction entrance
Temp. Equipment and Material storage
Diversion Ditch
Inlet Protection
Silt Fence
Soil Stockpile
Stone Check Dams
LAUREL GARDEN WAY
TEA TREE COURT
PUBLIC OPEN SPACE

What Else Can We DO?

- Increase awareness and training
  - Planning Boards, Zoning Boards
  - Code Enforcement Officers
  - Highway Departments
  - Residents
- Implement Best Management Practices
  - Small home-site construction BMPs
  - Municipal operations (salt/sand storage, fuel storage, ditch maintenance, etc.)
- Protect Steep Slopes
- Locally Adopted Stormwater Regulations

Locally Adopted Erosion and Sediment Control Laws

The municipality can protect its residents' water and property by establishing:

- Minimum thresholds for disturbance
- Design criteria
- Local review (Planning Board, Zoning Board, Building Permit)
- Inspection and enforcement procedures

Questions?