Memorial Field Stormwater

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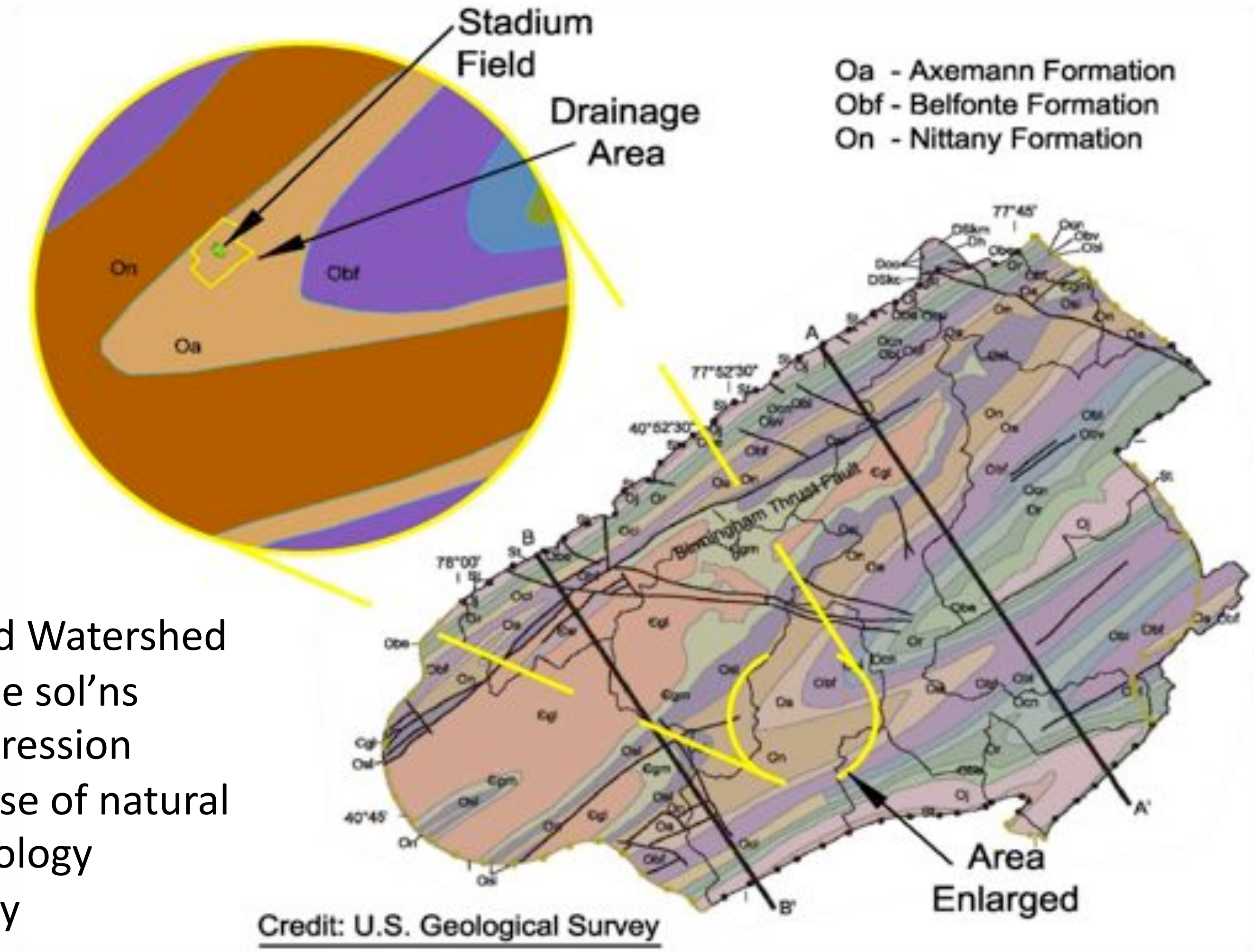
STORMWATER

DESIGN ISSUES:

- Reduce field flooding potential from reoccurring season floods (high intensity short storms)
- Complex Geologic and Hydrologic Setting;
- Potential for more Karst Sinkholes and Structural Problems if water is not properly controlled
- Minimize excavation and maximize storage
- Allow sufficient water storage and detention to allow sinkhole time to "catch-up"



•Well Studied Watershed
- offer little sol'ns
• Closed Depression
• Historical use of natural geology
• High Quality

Geologic Setting

Axemann Formation is important because not all limestones are equal in their ability to carry groundwater flows – large scale infiltration occurs in specific areas and not equally across all lands cover or uses

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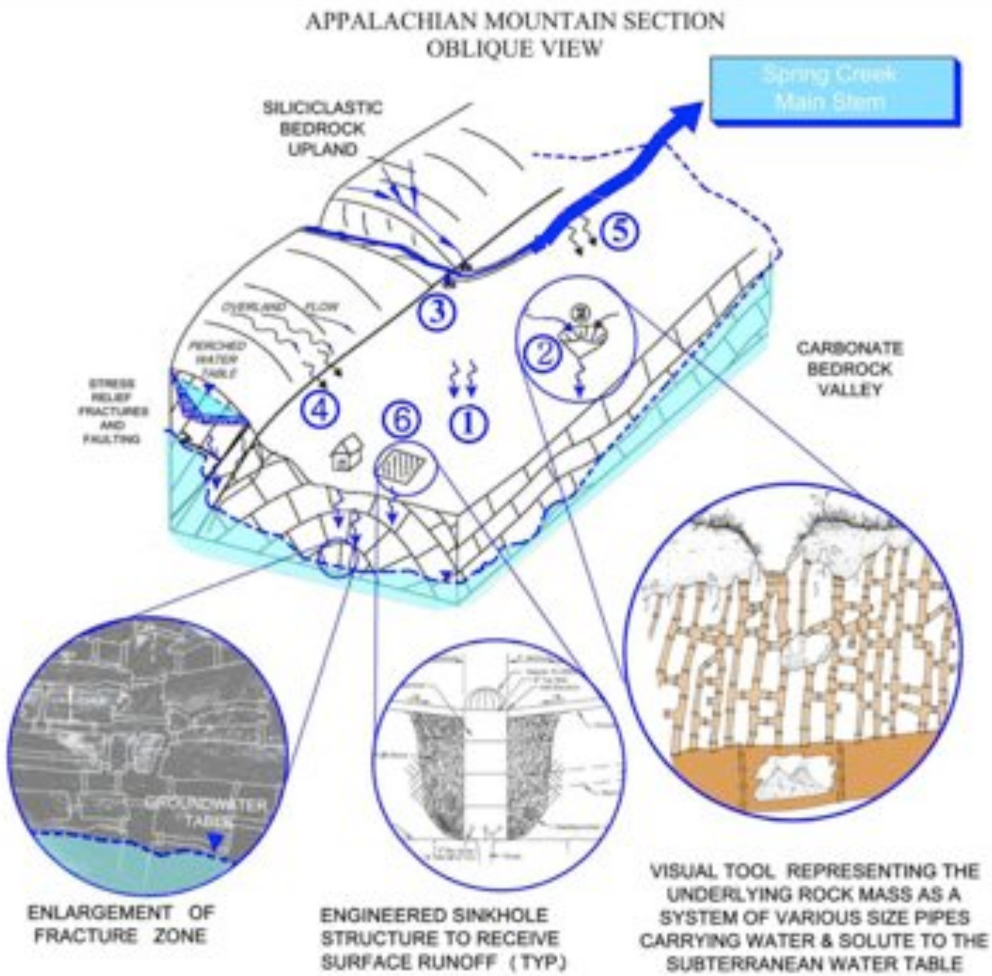

CONCEPTUALIZED MODEL OF GROUNDWATER RECHARGE IN STEEPLY DIPPING AND ANTICLINAL STRAT

STATE COLLEGE SPRING CREEK BASIN

1. WATER INFILTRATES IN AREAS NOT COVERED BY IMPERVIOUS SURFACES
2. SINKHOLES FORM NATURALLY IN LOW DEPRESSION AREAS
3. SINKHOLES FORM NATURALLY IN AREAS OF STREAM FLOW
4. SURFACE WATERS FLOW FROM HARDER SANDSTONE ROCK MOUNTAIN
5. SURFACE WATER INFILTRATES AND GROUNDWATER DISCHARGES AS SPRINGS ALONG CREEK
6. ENGINEERED DEVELOPMENT UTILIZES SINKHOLES IN URBAN AREAS

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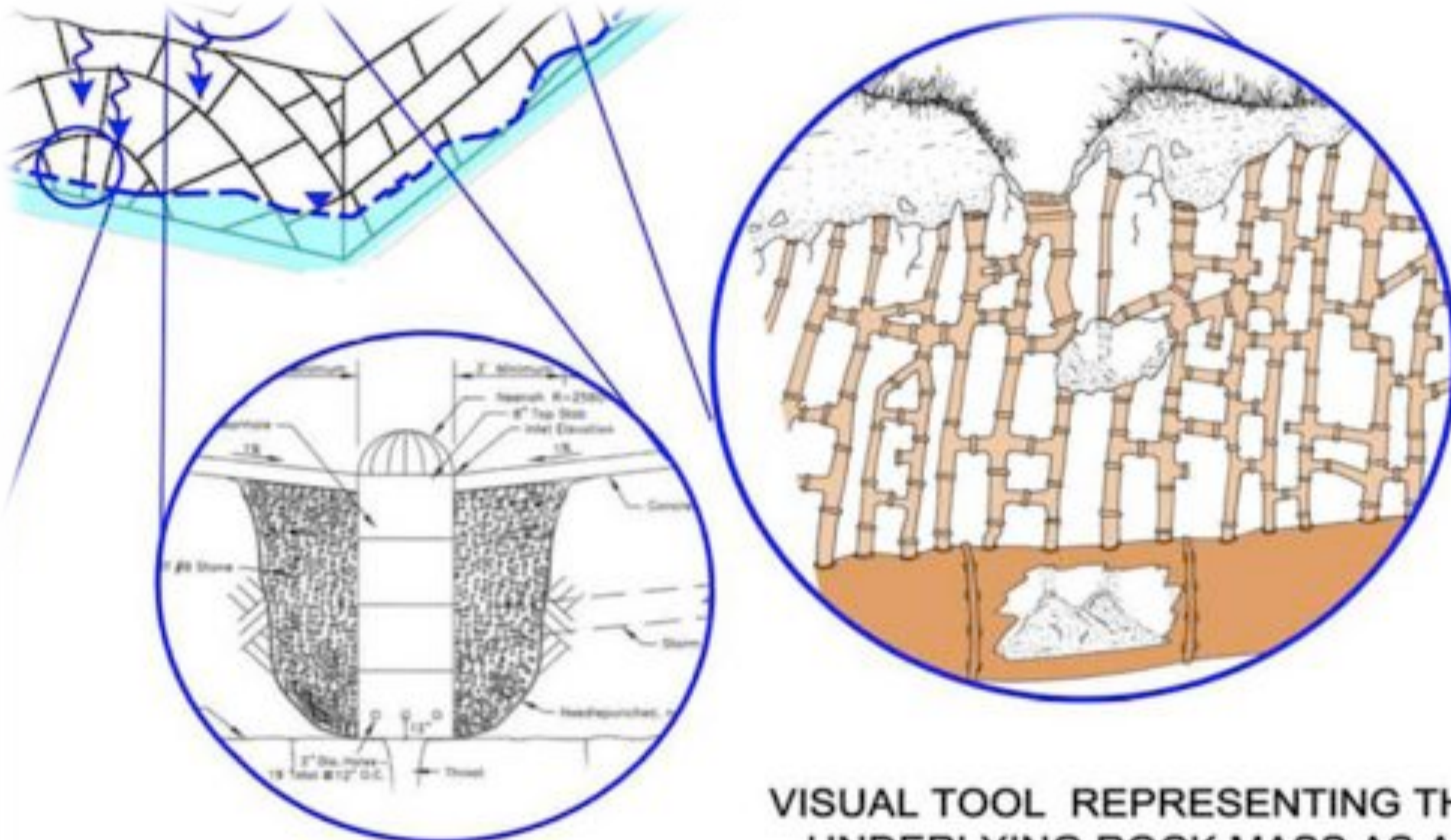

ENGINEERED SINKHOLE STRUCTURE TO RECEIVE SURFACE RUNOFF (TYP.)

VISUAL TOOL REPRESENTING THE UNDERLYING ROCK MASS AS A SYSTEM OF VARIOUS SIZE PIPES CARRYING WATER & SOLUTE TO THE SUBTERRANEAN WATER TABLE

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A Geologic Fact of Life

•Geologic uncertainty will always exist in a carbonate deposit and regardless of the best geotechnical program, construction will reveal challenges beneath the surface.

•Sinkholes are an inevitable consequence and less construction is often met with more favorable outcomes.

•The closed depression and improved sinkhole setting of the Stadium is a critical land form that can have major impacts to the surrounding area by disrupting the balance of the water entering the system.

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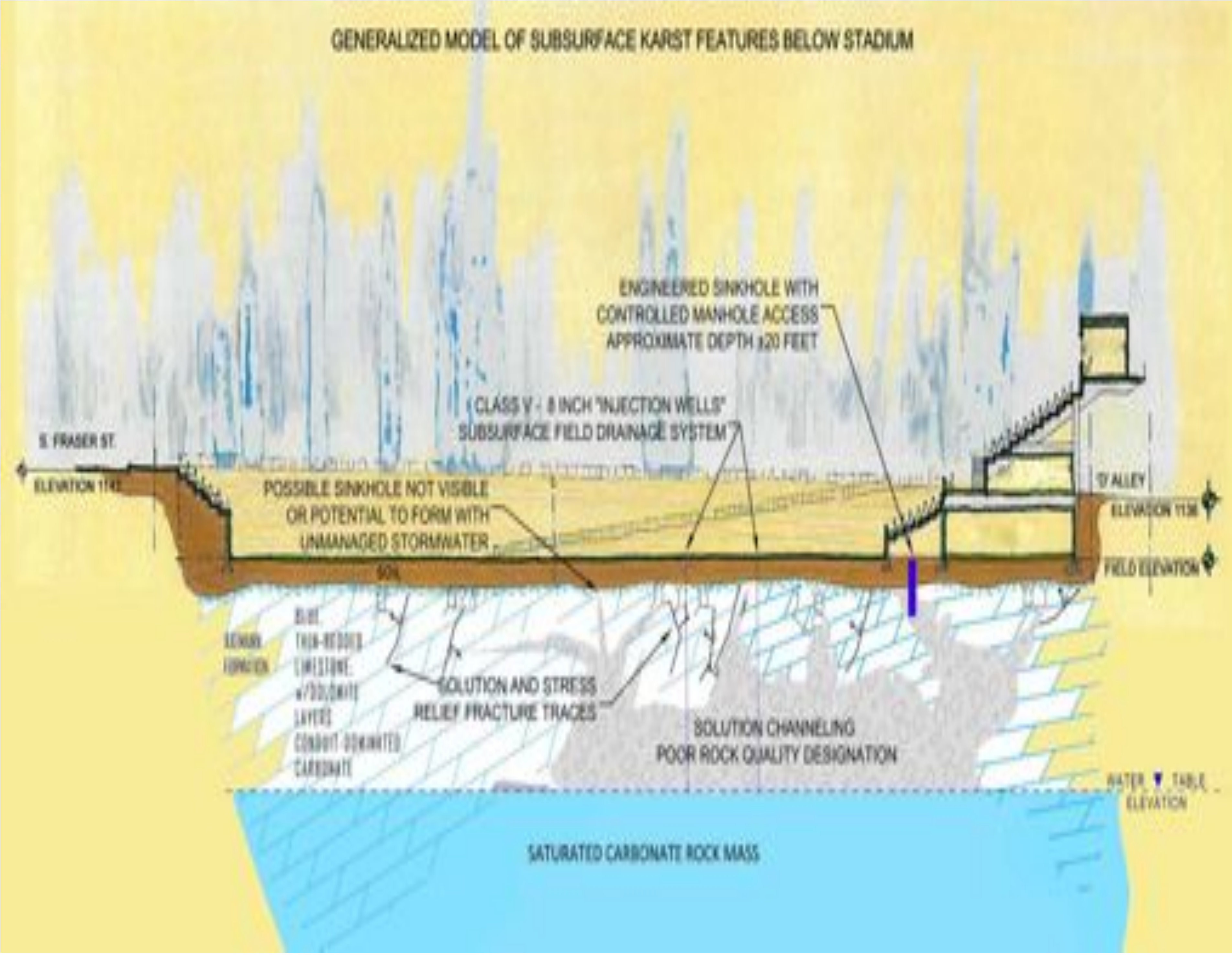
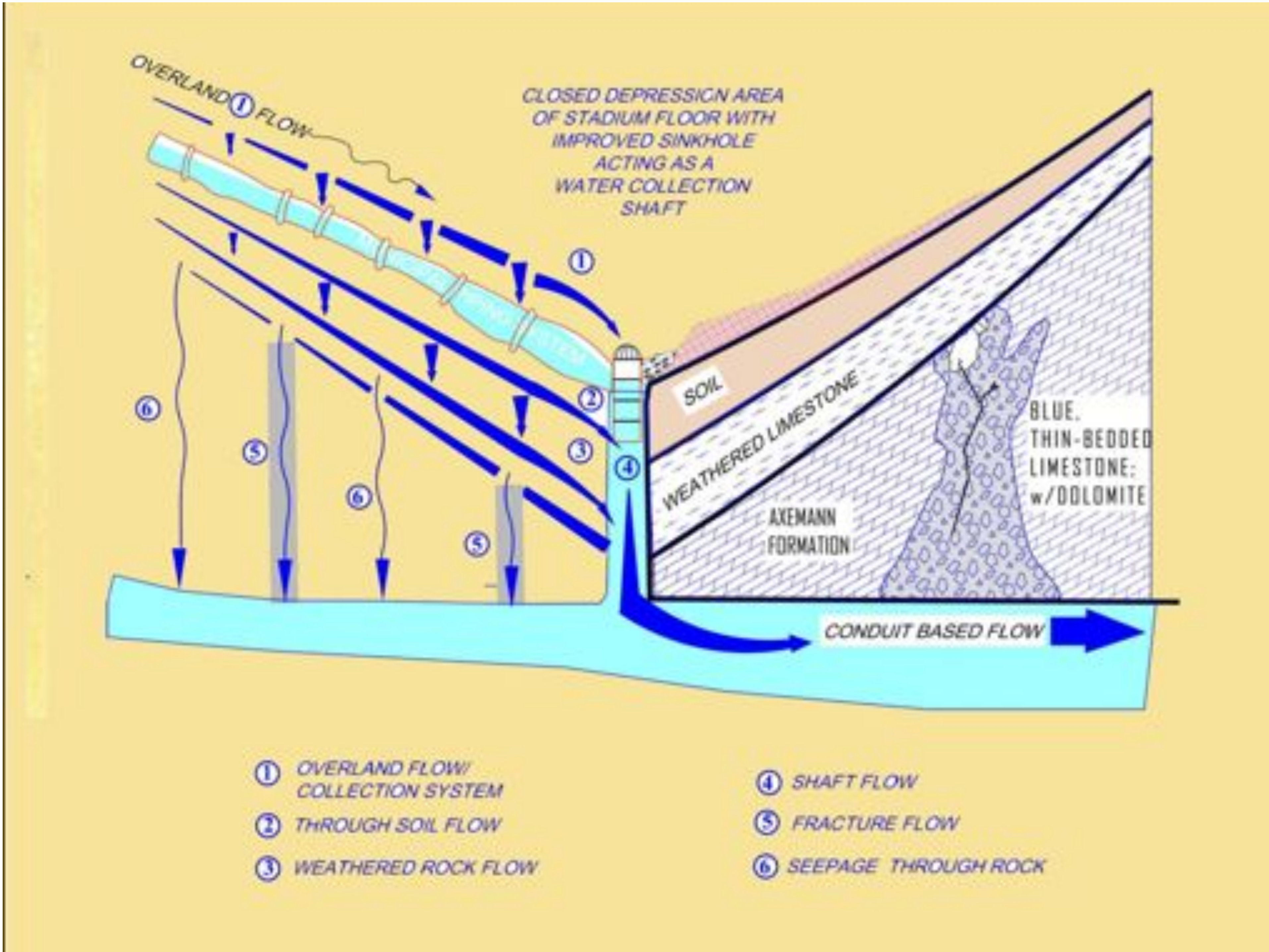

GENERALIZED MODEL OF SUBSURFACE KARST FEATURES BELOW STADIUM
ENGINEERED SINKHOLE WITH
CONTROLLED MANHOLE ACCESS
APPROXIMATE DEPTH ±20 FEET
CLASS V - 8 INCH "INJECTION WELLS"
SUBSURFACE FIELD DRAINAGE SYSTEM
S. FRASER ST.
POSSIBLE SINKHOLE NOT VISIBLE
OR POTENTIAL TO FORM WITH
UNMANAGED STORMWATER
'D' ALLEY
FIELD ELEVATION
SOLUTION AND STRESS
RELIEF FRACTURE TRACES
SOLUTION CHANNELING
POOR ROCK QUALITY DESIGNATION
WATER TABLE
ELEVATION
SATURATED CARBONATE ROCK MASS



OVERLAND ① FLOW
CLOSED DEPRESSION AREA
OF STADIUM FLOOR WITH
IMPROVED SINKHOLE
ACTING AS A
WATER COLLECTION
SHAFT
①
②
③
④
⑤
⑥
SOIL
WEATHERED LIMESTONE
BLUE,
THIN-BEDDED
LIMESTONE;
w/DOLOMITE
AXEMANN
FORMATION
CONDUIT BASED FLOW
① OVERLAND FLOW/
COLLECTION SYSTEM
② THROUGH SOIL FLOW
③ WEATHERED ROCK FLOW
④ SHAFT FLOW
⑤ FRACTURE FLOW
⑥ SEEPAGE THROUGH ROCK

Questions Posed to the Community

- How much water is an inconvenience?
- How much expense should be incurred to mitigate?
- What level of construction risk should be taken?

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STORMWATER

Options:

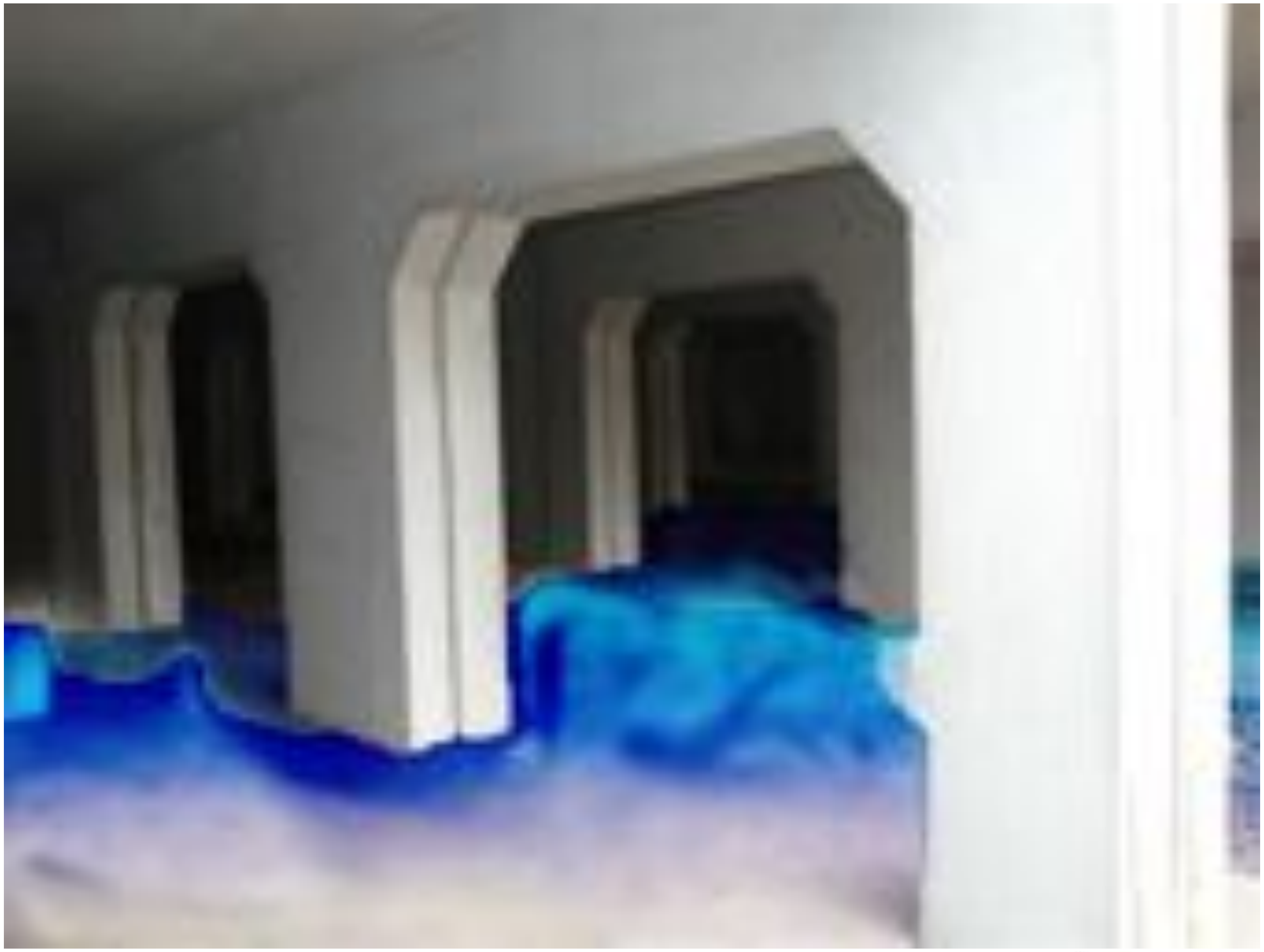
1. Watertight Subterranean vault in field area

2. Watertight Subterranean vault under Parklet Area

3. West Stand Storage Vault parallel S. Fraser Street

- Systems protect public safety and allow for easy maintenance and inspection.
- Systems reduce the potential for debris to block sinkhole
- Improves water quality discharging to groundwater table
- Reduced water infiltration and potential new sinkhole formation (structural concern)
- Option 3 has least utility congestion, structural design considerations and smallest storage volume
- Option 2 provides greatest storage per dollar installation cost
- Option 1 eliminates disturbance to Park Area but increase flooding probability.

Double Trap Prefabricated Concrete Stormtrap



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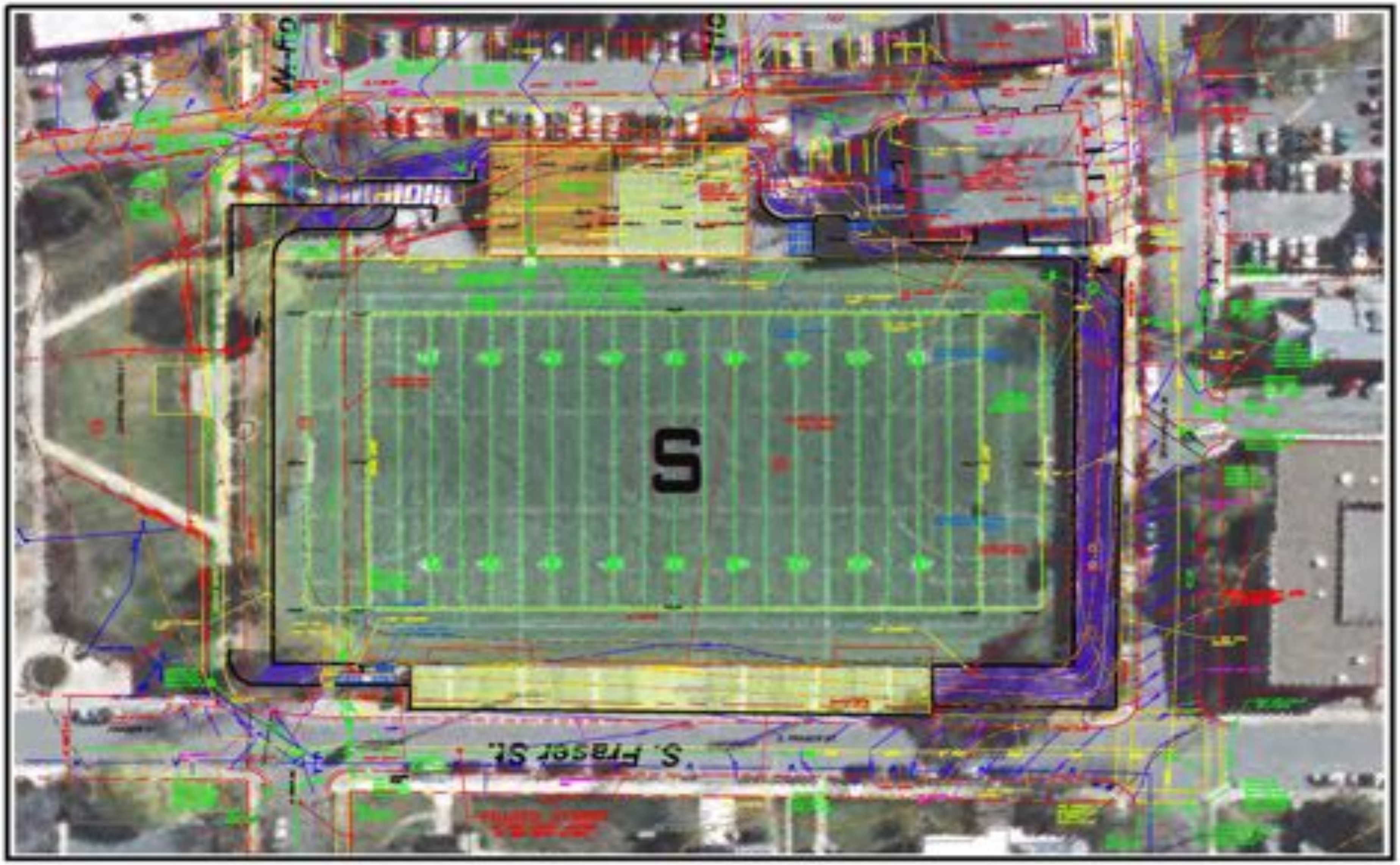
EXISTING CONDITIONS



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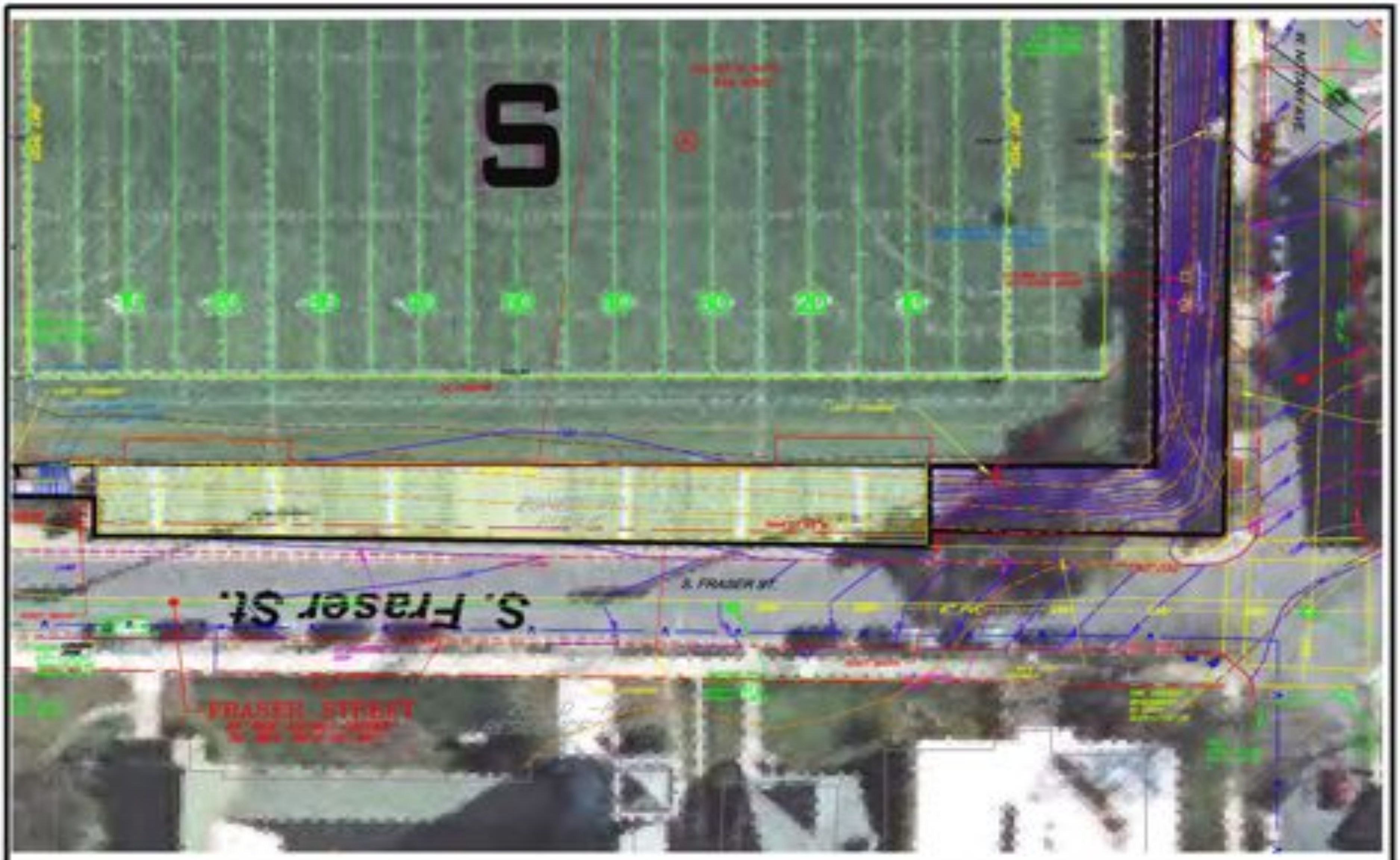
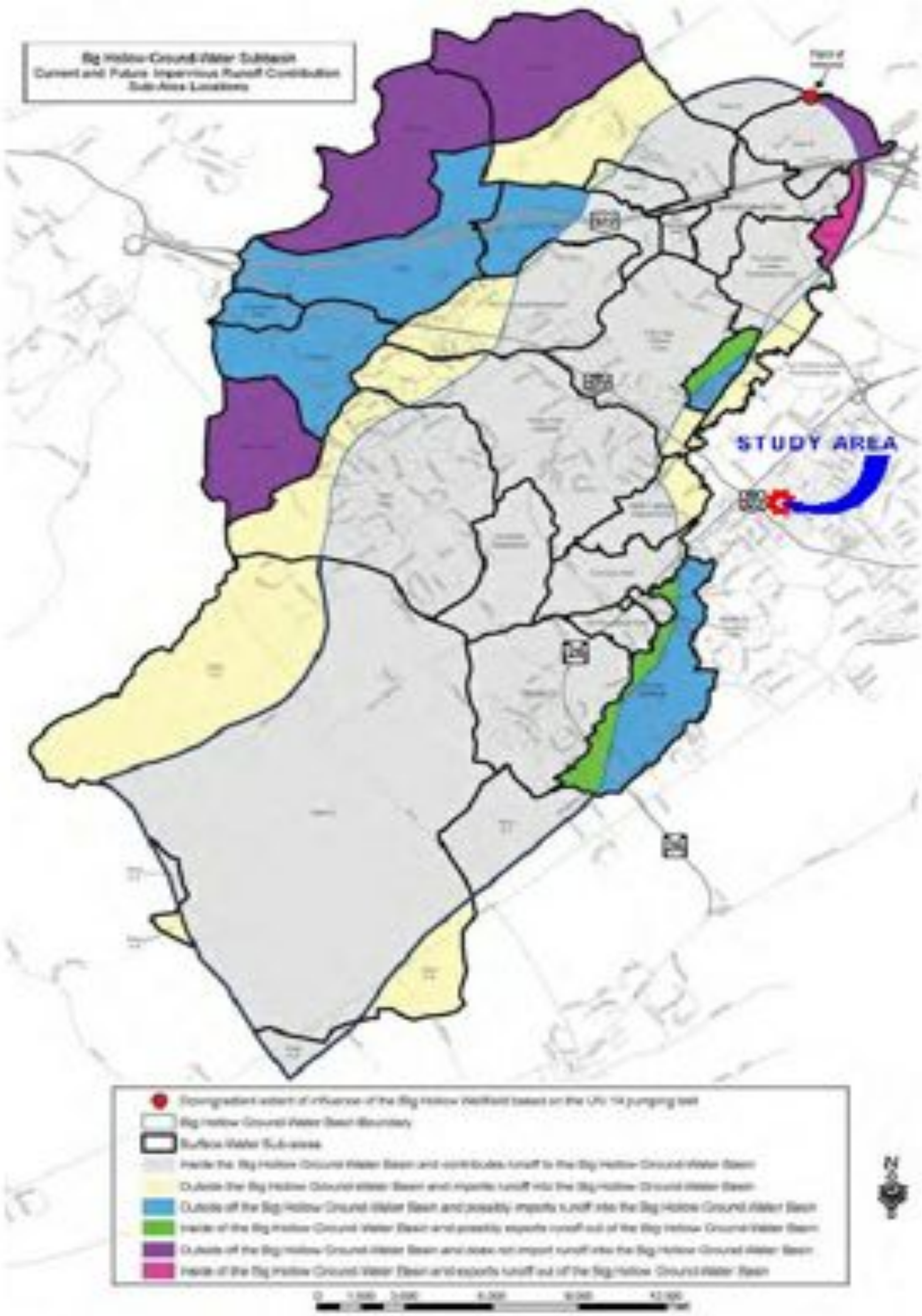
CRAWFORD

EXISTING CONDITIONS




Big Hollow Ground-Water Subbasin
Current and Future Impervious Runoff Contribution
Sub-Area Locations
STUDY AREA
Big Hollow Ground Water Basin Boundary
Surface Water Sub-areas