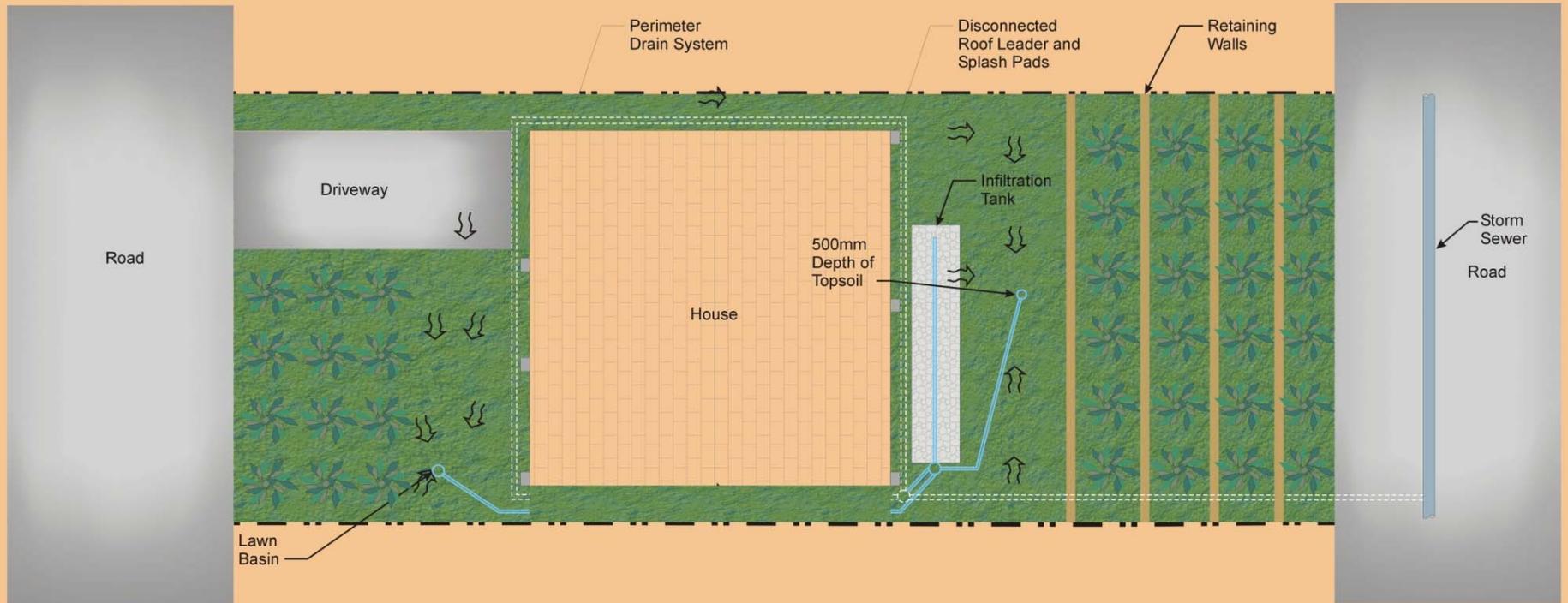


INNOVATIVE STORMWATER MANAGEMENT TECHNIQUES FOR STEEP SLOPES











**STEEP GRADES
IMPERMEABLE AREAS**

FLOWS

VOLUMES

FREQUENCY

FLOODING

HYDROGRAPH

SOIL STABILITY

EROSION

WATER QUALITY

CONSEQUENCE OF FAILURE



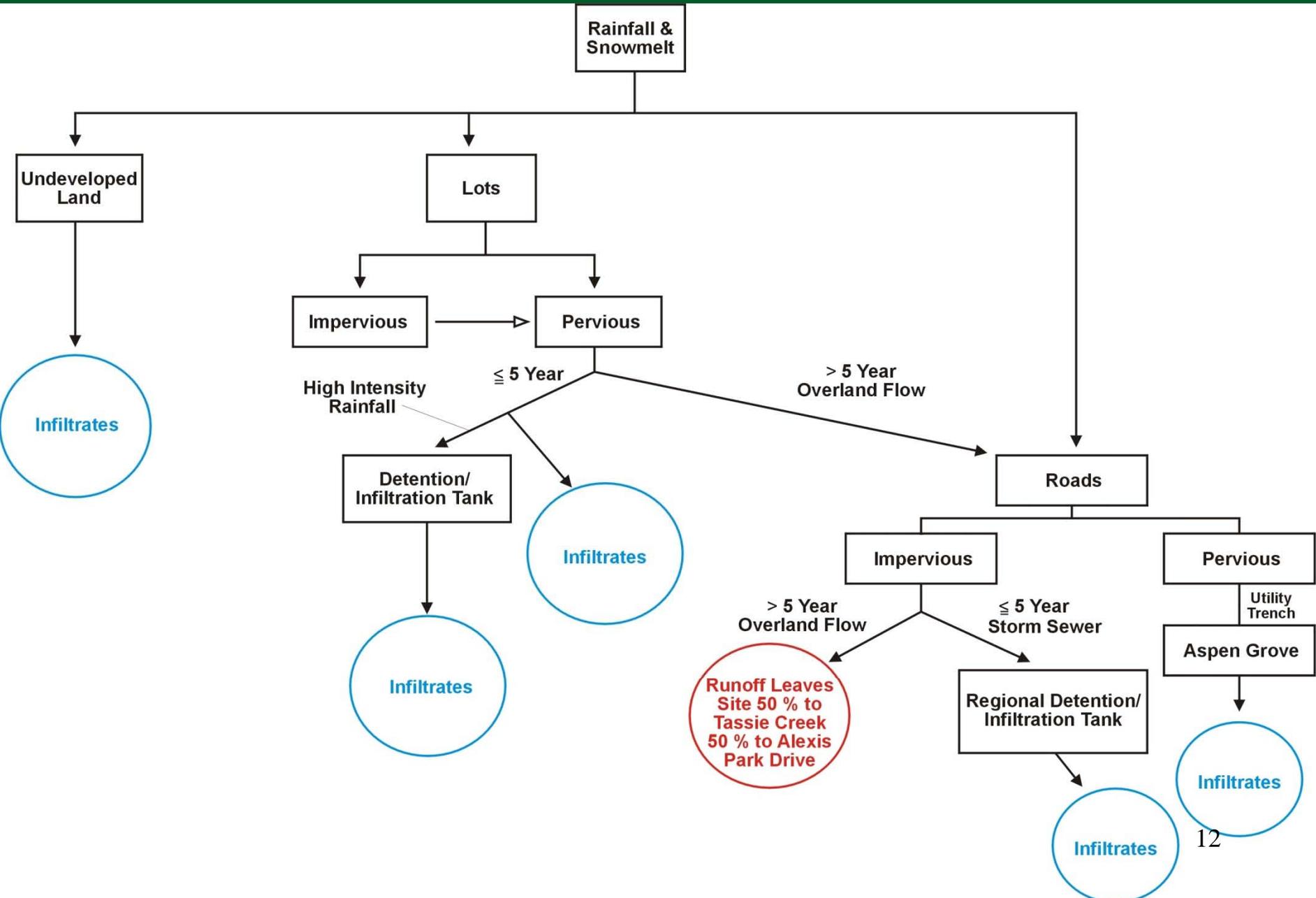








STORMWATER MANAGEMENT STRATEGY

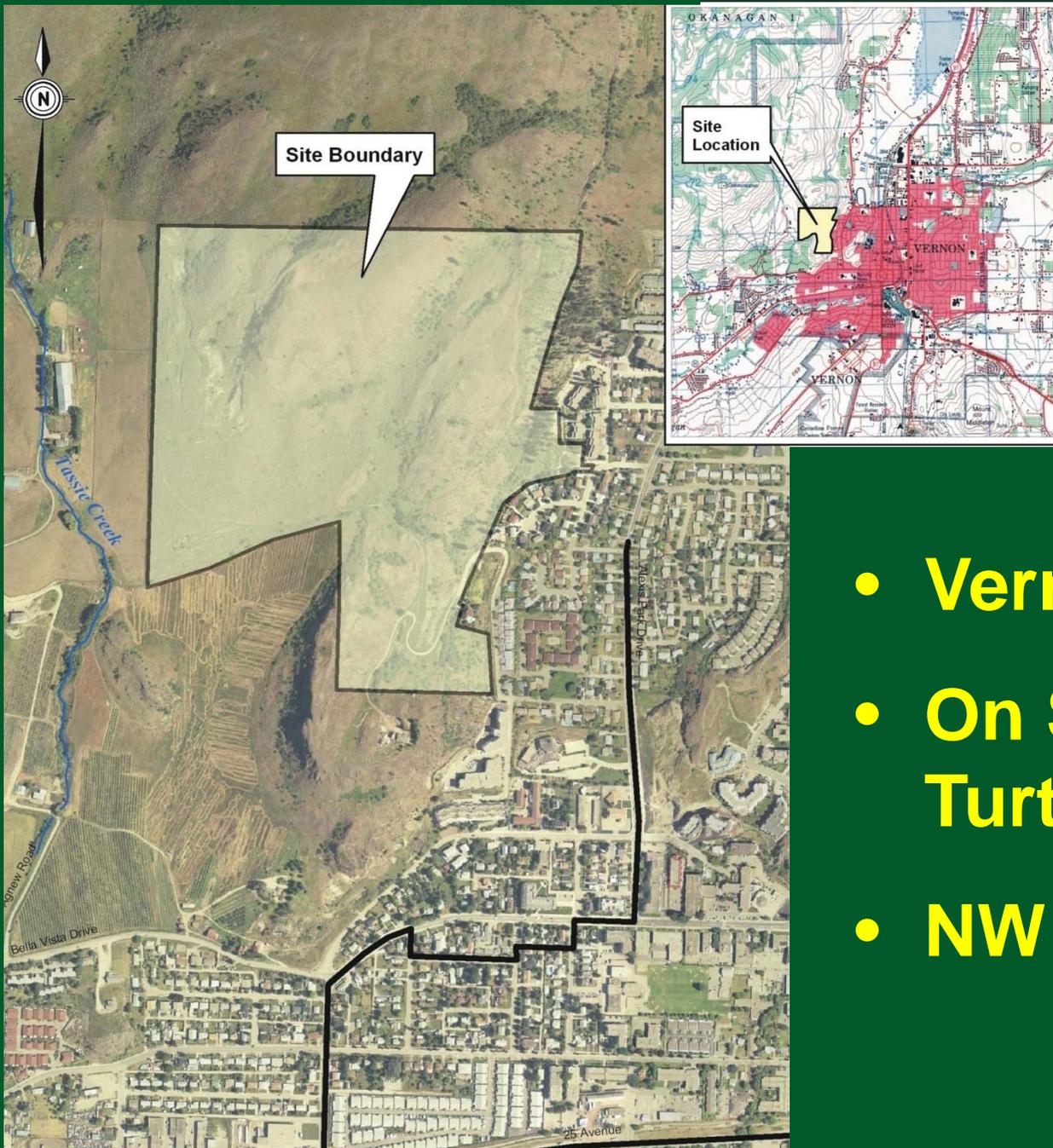


TEAM



- **Developer: Wesbild Holdings**
- **Civil and Stormwater:
Kerr Wood Leidal Associates**
- **Landscaping: Durante Kreuk**
- **Geotechnical: Fletcher Paine
Associates**

SITE LOCATION



- **Vernon, B.C.**
- **On Slopes of Turtle Mountain**
- **NW of Downtown**

SITE DESCRIPTION



- **North Okanagan Grasslands**
- **Sage Brush**
- **Small Copses of Deciduous Trees in Damp Areas**
- **Some Bedrock Outcroppings**

DESIGN CRITERIA - HYDROTECHNICAL



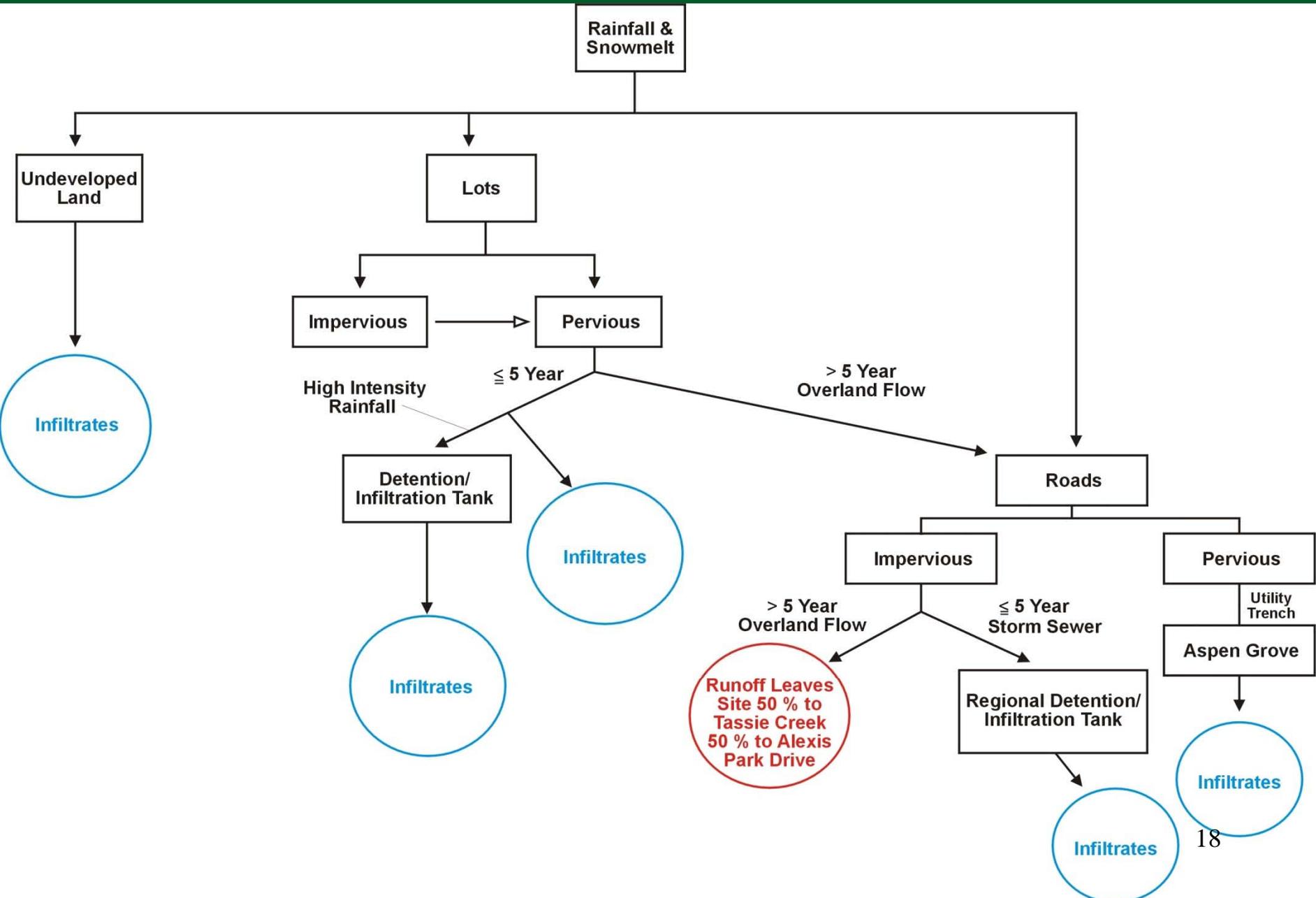
- **City of Vernon Criteria Applies**
- **Minor Drainage System: 5-year Return Period Design Event**
- **Major System: 100-year Return Period Design Event**
- **Provide On-Site or Off-Site Detention Facilities to Restrict the Post-Development Peak Runoff to the Pre-Development Grassland Condition for 5-year Return Period Flows**

UNIQUE CHALLENGES

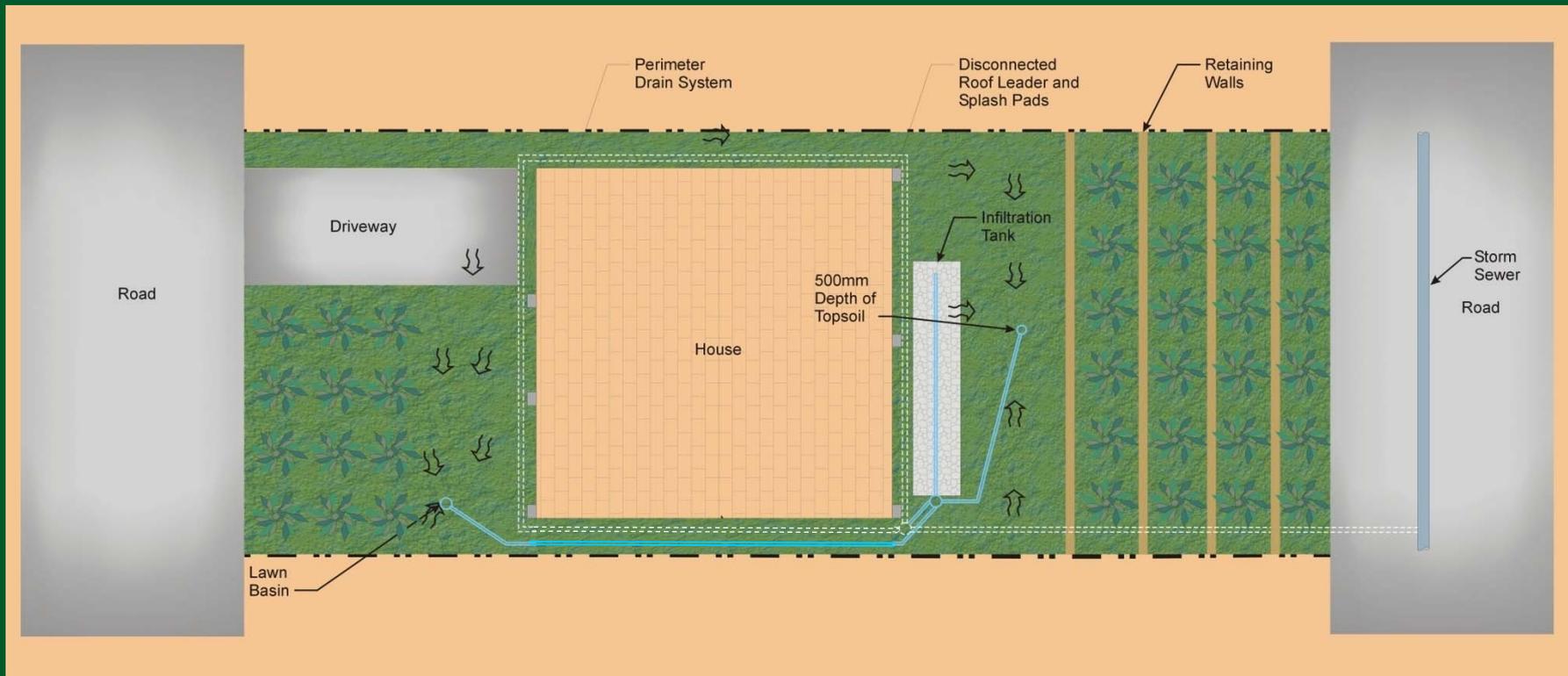


- **Limit Post-Development Runoff to Pre-Development for 5-year Storm**
- **No Pre-Development Runoff = No Post-Development Runoff = Infiltration Required**
- **Steep Slopes and High Density = Difficult to Locate Detention and Infiltration Ponds**

STORMWATER MANAGEMENT STRATEGY



LOT INFRASTRUCTURE

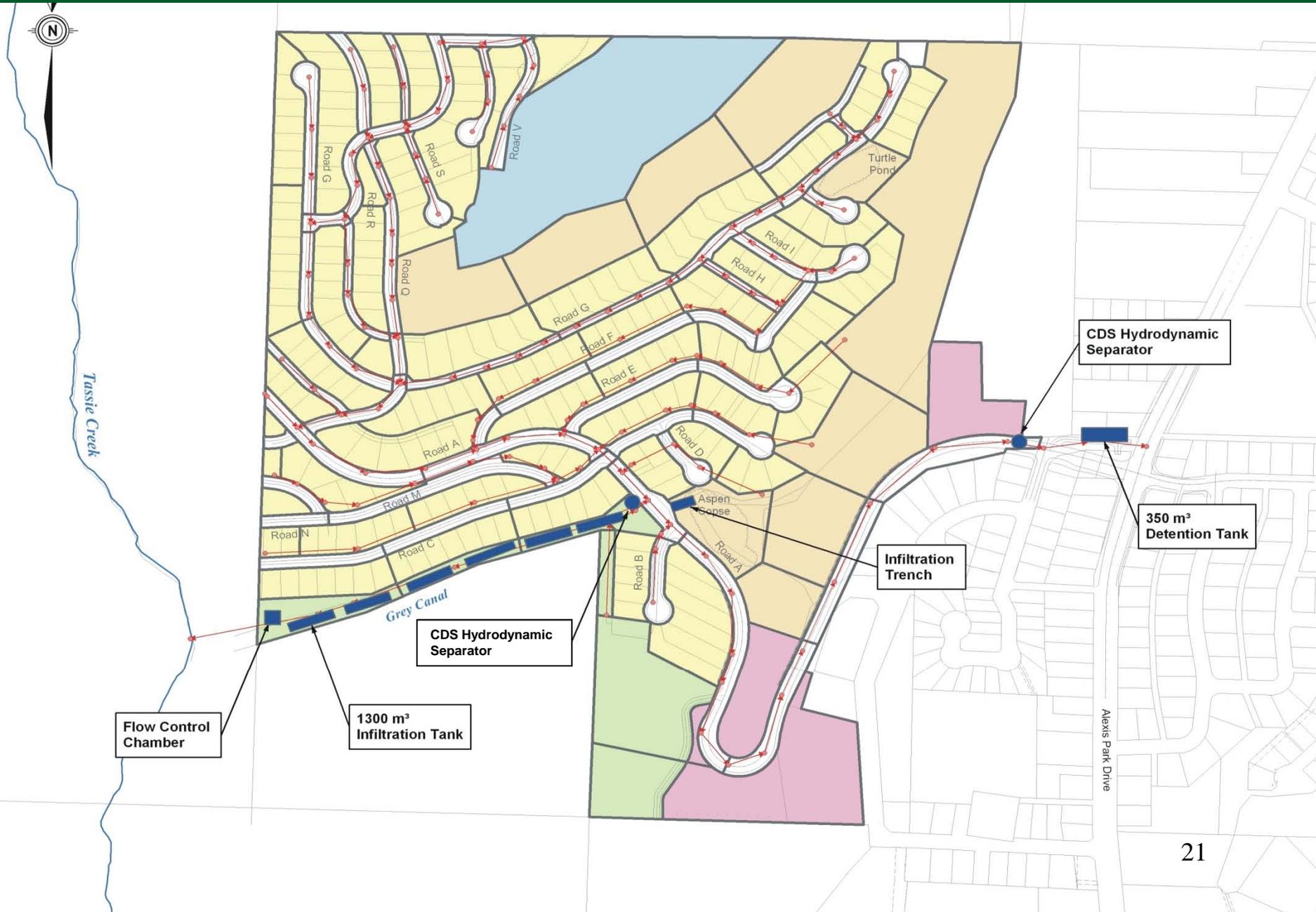


- **Goal = Capture 5-Year Event**
- **Combination of Soil and Infiltration Tank Capture**
- **500 mm Depth of Amended Topsoil with Xeriscaping to Increase Infiltration Rate**
- **Disconnected Roof Leaders**
- **Front and Backyard Lawn Basins Connected to Infiltration Tank**
- **Retaining Walls in Backyards Restrict Space Available**

ROADS

- **Goals = Infiltrate 5-Year Event & Convey 100-year Event**
- **Slope Sidewalks to Pervious Areas- Convey to Aspen Copse by Utility Trench**
- **Curbs to Convey 100-Year Event**
- **End of Pipe Infiltration/ Detention Systems**

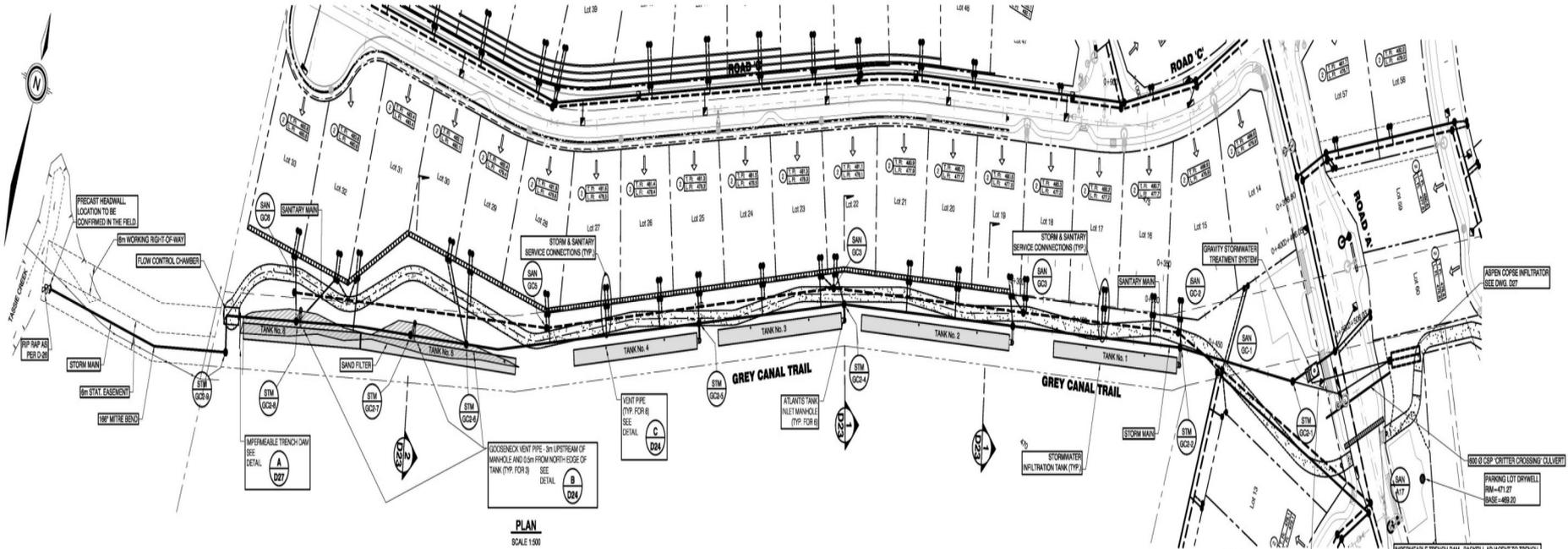
END OF PIPE INFILTRATION/DETENTION



GREY CANAL INFILTRATION SYSTEM



- **15 m wide = Not Enough Room for Pond and Trail = Infiltrate Underground**
- **Area Constraints Prevent Use of Drain Rock Filled Tanks (Void Ratio)**
- **Solution = Atlantis Tanks**
- **Pre-treatment Provided Prior to Infiltration to Maintain Infiltration**

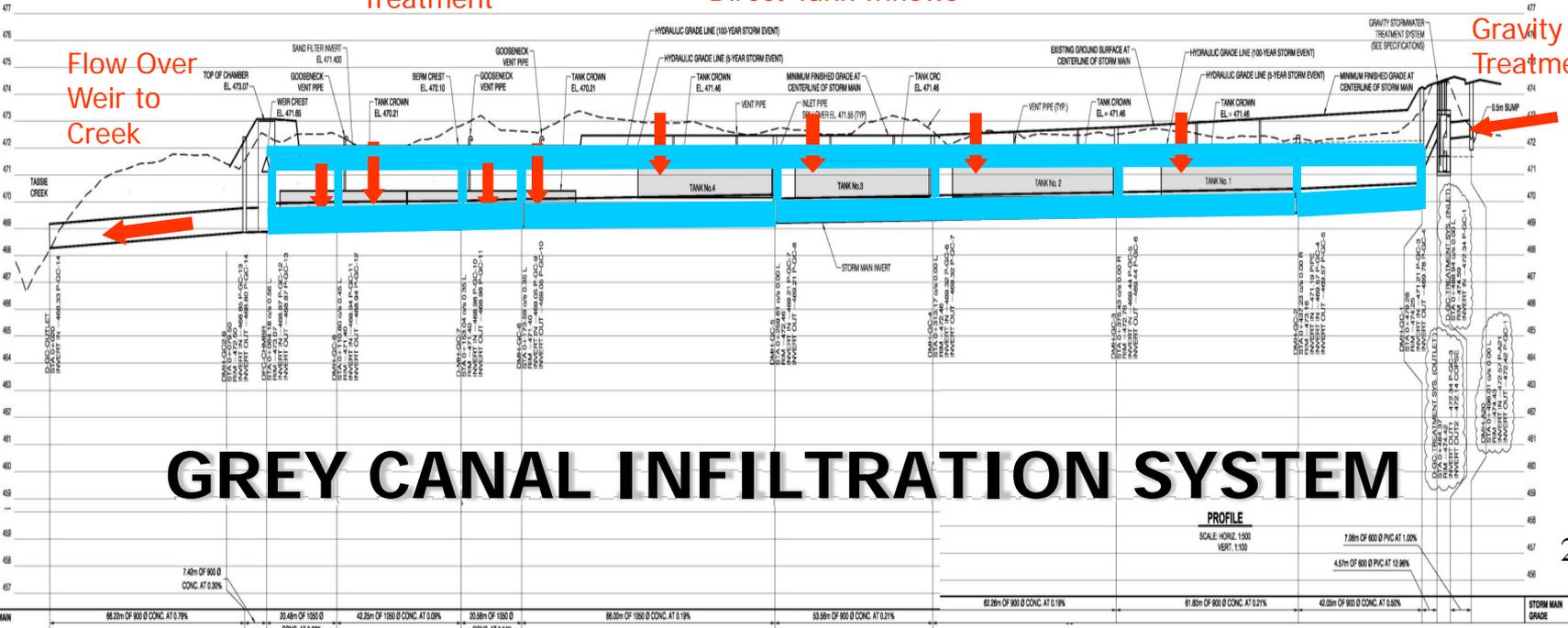


Sand Filter Treatment

Direct Tank Inflows

Gravity Treatment

Flow Over Weir to Creek



GREY CANAL INFILTRATION SYSTEM



Grey Canal Trail



10/09/2006



07/09/2006

ATLANTIS TANK INSTALLATION

- **Geotextile
Wrapped**
- **Washed Sand
Envelope**
- **Geogrid in
Traffic Areas**

ATLANTIS TANK INSTALLATION



- About 4 weeks for Excavation, Installation and Backfilling of 1,300 m³



Storm Sewer

CDS Hydrodynamic Separator

STORM SEWER INSTALLATION



Infiltration Tanks



Storm Sewer

Sand Filter

Flow Control Chamber



27/03/2007

COSTS



- **On-lot Works = Projected at About \$5,000 Per Lot**
- **Little Cost Savings on Storm Sewers**
- **Grey Canal Works = \$580/m³ (\$950 k)**
- **Traditional Pond = \$100/m³ Including Inlet and Outlet Works**
- **Higher Costs Due to Low Pre-Development Runoff, Need for Infiltration and Site Constraints at Grey Canal**

















QUESTIONS?

A photograph of a sidewalk with a handwritten message in white chalk. The message reads "SAVE WATER. SHOWER TOGETHER." in all caps, with the words arranged in four lines: "SAVE", "WATER.", "SHOWER", and "TOGETHER". The sidewalk is a light brown color with some dark spots. The text is written in a simple, hand-drawn style.

SAVE
WATER.
SHOWER
TOGETHER