Oak Creek Village/ Butler Farms Stormwater Study Group

July 27, 2006

Objectives tonight:

1. Understand “hybrid” or “whole picture” engineering approach
2. Review cost, finance, pros/cons sheets
3. Choose date for field day to look at options on the ground
4. Identify points to be included in mailer to entire neighborhood to explain options and field day
5. Choose date for next meeting on recommending an engineering option, timeframe, financial approach, and any other aspects to Council

Recap:

- Two engineering options developed, with cost estimates:
  1. "The Super Pond" – Treat all development runoff in a large pond at north end of Oak Creek Village
  2. More minimal, State Rules-Based Upgrades and New Treatment in four dispersed sites
- Third "hybrid" engineering option outlined by UVM and rough cost estimate completed by Stantech & City – presentation & comparison tonight

City Council Discussion:

- Total City-wide cost likely to be $18 million to comply with TMDLs/Watershed General Permits
- About $9.5 million does NOT have identified funding, including BF/OCV (except engineering)
- Roughly 3,000 residential units face expiration of "deferral of permit" provisions in Sept. 2007
- *Maybe* 12 neighborhoods can complete takeover before that date – possibly including OCV/BF
- City needs to work out plan with State, EPA, legislature to move forward and prevent title problems
- Significant decision to be made about how and when to socialize stormwater costs among taxpayers.

Where BF/OCV Fits:

Residential Systems with Expired Permits and No Association:

Watershed	Owner	Permit Status	Existing Treatment ?	Impervious Acres	CITY ROAD?	Cost based on per-acre assumptions	Units
Potash	Ledgeknoll	Expired	No	7.6	Yes	$228,000	49
Potash	**Butler Farms/Oak Creek**	**Expired**	**No**	**43.7**	**Yes**	**$1,311,000**	**253**
Potash	Brookwood Drive	Expired	No	5	Yes	$150,000	
Potash	Funky houses on Dorset	Expired	Yes	5.6	Yes	$42,000	6
Potash	Davis Parkway	expired	Yes	5.1	Yes	$38,250	30
Centennial	Queensbury Road	Expired	No	2.35	Yes	$70,500	5
Bartlett	Pheasant Way	Expired	No	15.7	Yes	$471,000	
Bartlett	Irish Farm	Expired	Yes	8.4	Yes	$63,000	30
Bartlett	Overlook at Spear	Expired	Yes	15.9	Yes	$119,250	70

Financial Status:

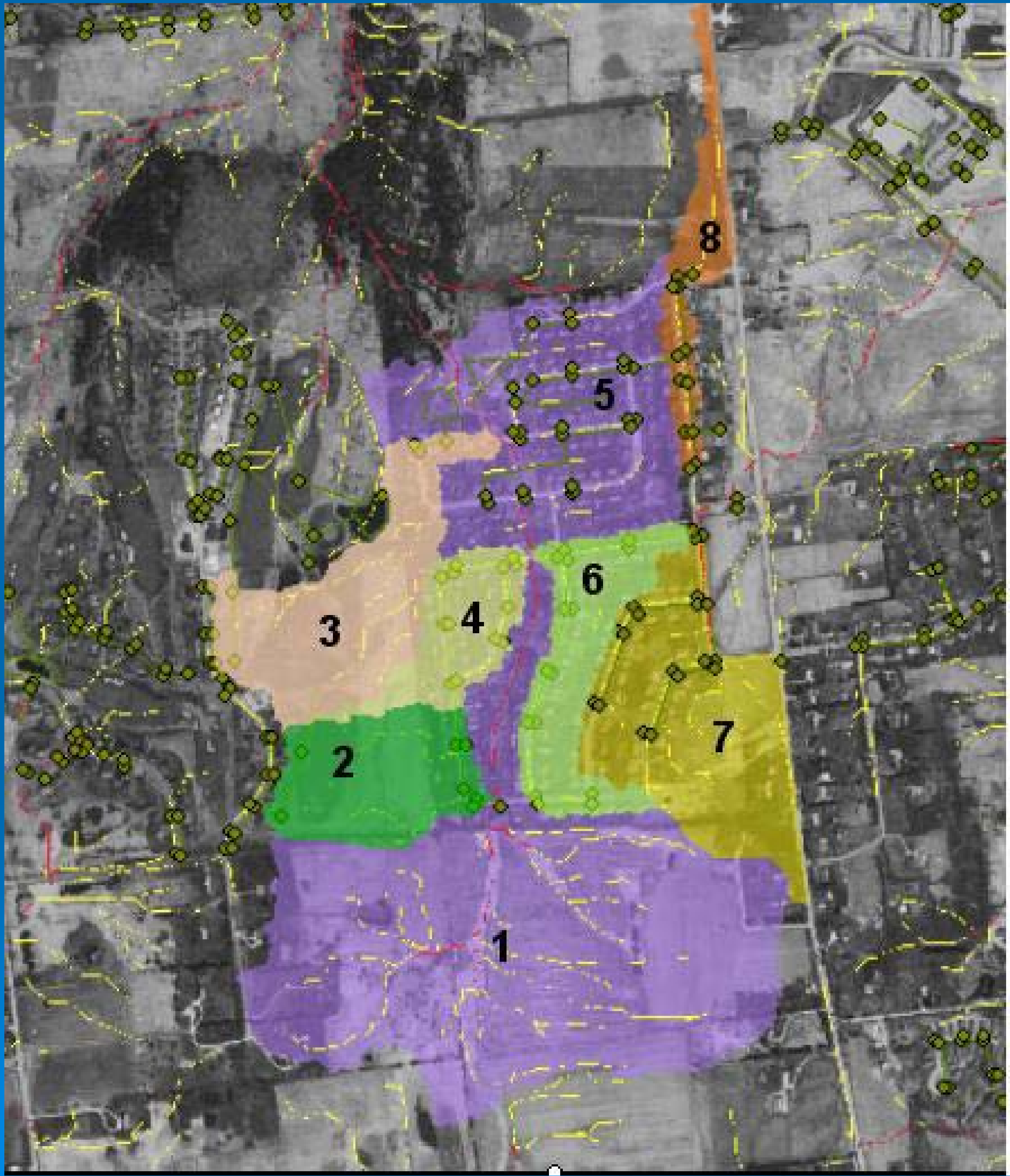
- Current annual utility appropriation for capital could support a $4 million, 20-year bond
- Some suggestions for funding upgrades of permitted surfaces have included:
  - Utility surcharge by permitted area/neighborhood
  - Capped per-unit contribution from each unit to Utility capital fund
  - Combination of utility and general obligation bonding to cover total cost

Job for the Study Group:

- In a perfect world, which ENGINEERING OPTION is preferred?
- In a perfect world, which FUNDING OPTION is preferred?
- In an imperfect real world, what approach should be recommended to the owners, state, and City Council?

Back to Engineering:

- Hybrid Approach has been developed in conceptual engineering and cost terms
- Treats all sources and areas in a "distributed" approach
- Deals with flooding, safety, quality of life AND permit standards
- Has *very different implications* for use of private and public *land*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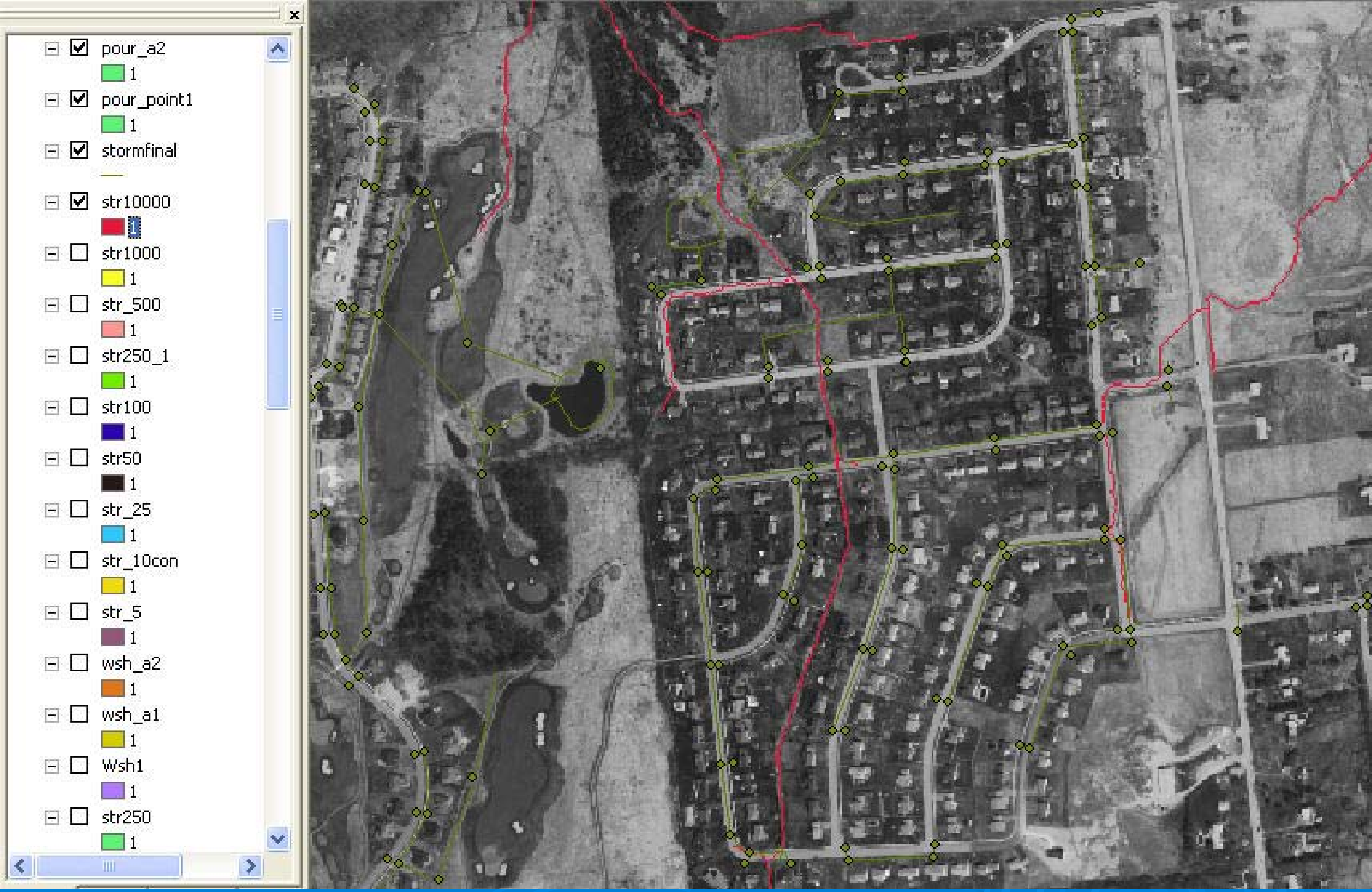
USE OF HIGH RESOLUTION REMOTE SENSING DATA TO OPTIMIZE THE PLACEMENT OF ALTERNATIVE STORMWATER BMPS

- Data: 3m Lidar and 16cm (5-inch) MOP Orthophotos –Nat Colors, NIR.
- VCGI data on hydrologic stream network, roads, houses, Land Use, Engineered catchments pipeline network and inlets points.
- With high resolution data at the first stage of analysis. We used Lidar elevation data , with hydrologic modeling capabilities of

Arc GIS, we've created DEMs, defined stream network, delineated the watershed and multiple subwatersheds

Step 1 Identify:

- Areas where engineering solutions bring most relief before anything else can be applied.
- Areas that have been artificially connected to our neighborhood, adding significantly to the existing problem. Redirecting water from these areas would not be interbasin transfer but rather restoration of natural water pathways
- Areas suitable for mid-scale BMPs and small-scale dispersed BMPs
- Time line for BMPs depending on large-scale engineering solutions and redirecting the artificial adds-on from the watershed



Stream network derived from LIDAR elevation data. How it is supposed to look.

Stream network derived from LIDAR elevation data. Some storm micro-drainage

Stream network derived from LIDAR elevation data. Detailed storm micro-drainage .

Closer look. Only the main stream

Closer look. Some storm micro-drainage

Closer look. Detailed storm micro-drainage

Subwatersheds delineated
Based on Lidar elevation data

Areas 1,2,3 - large scale engineering solutions. Most part of those areas extend way beyond the neighborhood (golf course)

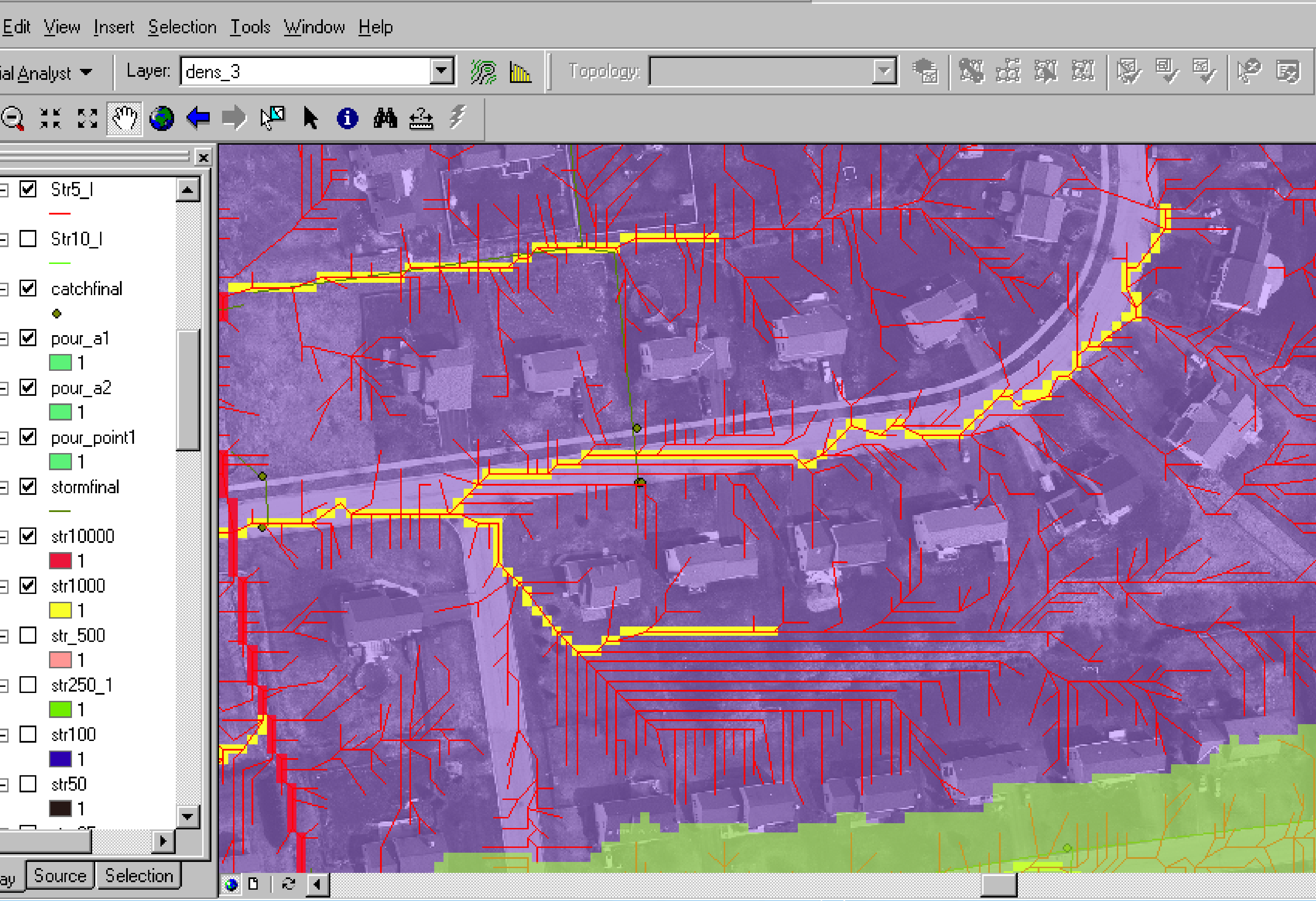
Areas 4, 5, 6 – mid scale and small scale BMPs

Areas 7 and 8 – Delineation of watershed based on Lidar data shows that according to elevation those areas are supposed to drain to the right of Hinesburg road

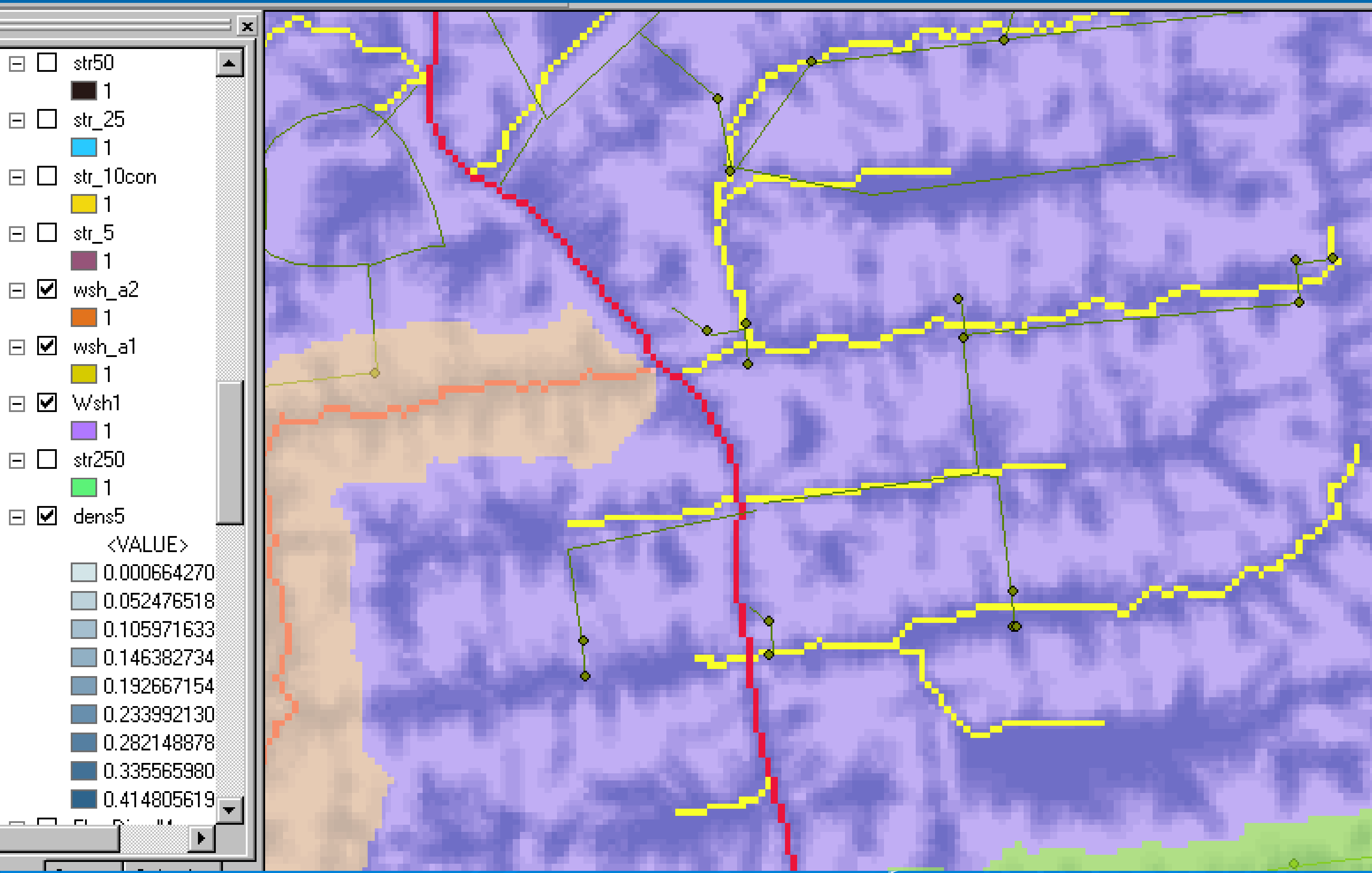
Step 2 - Identify the patterns of micro storm water drainage network and the density of this network (MSDD – index).

Using MSDD index we are able to identify where the medium-sized alternative BMPs will do the job and where the small-scale private rain gardens will be effective.

The threshold for calculating this index has been derived from the information about DEM resolution, the average parcel size, average imperviousness for the area, and EPA recommendation for the private rain garden size based on all above.



Micro Storm Water Drainage Pathways



Spatial representation of MSDD index - the density of micro storm water drainage network

Step 3 . Calculate the water volumes and quantities for the chosen mid-range BMP areas

To do so we have to finesse the analysis by:

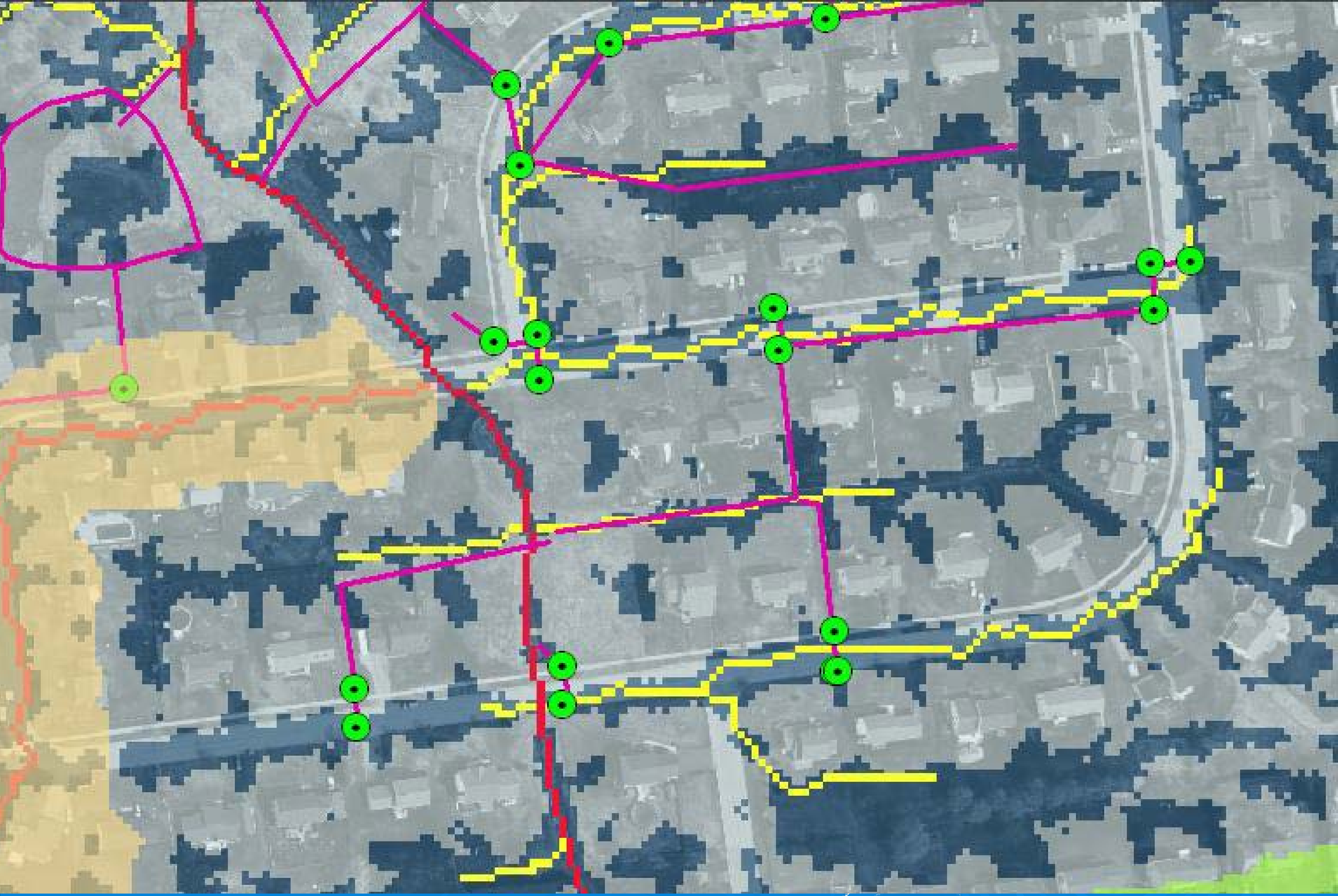
1 – deriving and utilizing remote sensing indices in order to assess the impervious areas for selected subwatersheds.

2 - developing the GIS model/tool to estimate amount of water/sediments accumulated/ intercepted by BMPs

We use high resolution Quick Bird or 0.15m MPO NIR image to calculate NDVI and consequently calculate impervious surfaces

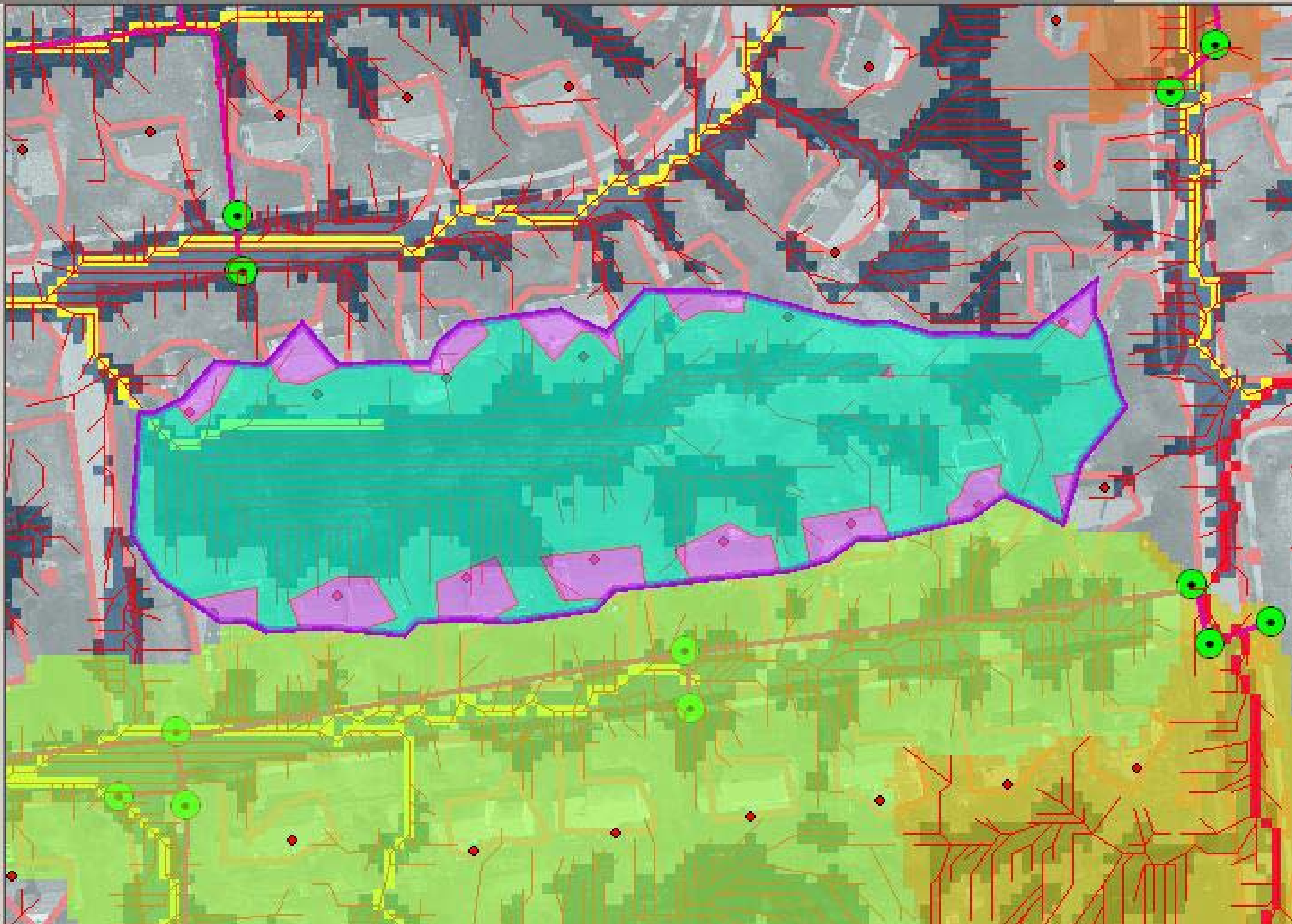
NDVI based on 15cm MPO NIR image

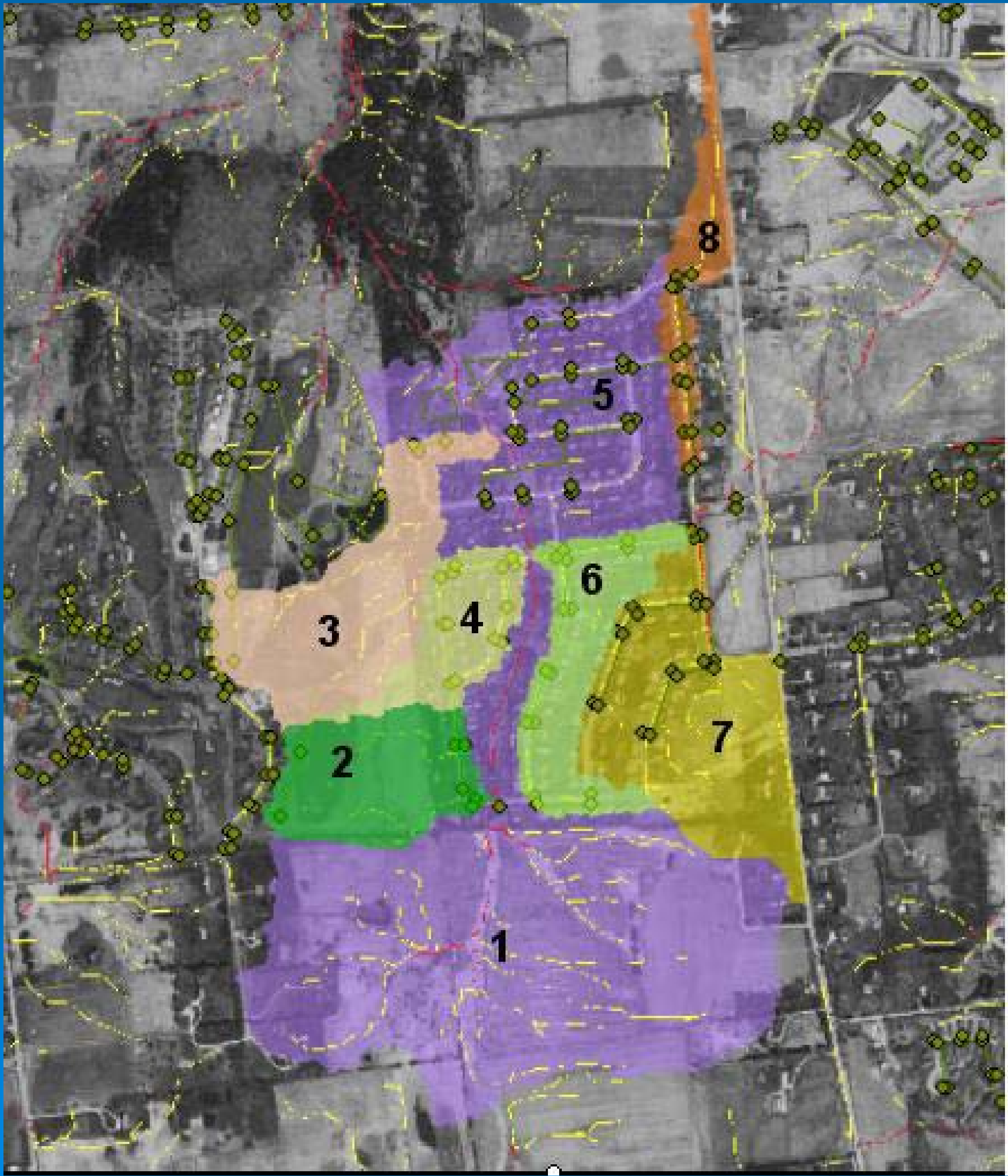
Very good match - Impervious surfaces calculated on the basis of Quick Bird (red line) versus NDVI on the basis of 15cm MPO NIR image



Reclassified MSDD index for clear delineation of mid-scale/small scale BMPs areas

Mid-scale BMP Watershed delineation based on Lidar data

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“EFA” Approach

Area 1	Marceau Meadows	Do not treat or size pond for flow; allow to flow through Trib 7/swale as is; not needed for EFA specs
Areas 2 & 3	Golf Course	Size pond for inflow from a new swale, but swale not needed to meet EFA specs
Areas 4 & 6 (BF) and 5 (OCV)	Central sections	Route area 6 into east pond; Resize pond & build infiltration for area 5; no treatment for area 4
Areas 7 & 8	Eastern sections	Build east pond for areas 6 & 7; build infiltration for area 8

“Super Pond” Approach

Area 1	Marceau Meadows	Do not treat or size pond for flow; allow to flow through Trib 7/swale as is; not needed for specs
Areas 2 & 3	Golf Course	Size pond for inflow from a new swale, but swale not needed to meet EFA specs
Areas 4 & 6 (BF) and 5 (OCV)	Central sections	Connect into treatment system draining to pond
Areas 7 & 8	Eastern sections	Connect 7 into treatment system; no treatment for area 8

Whole Picture Approach

Area 1	Marceau Meadows	Build detention pond to reduce flow, velocity, and sediment load in Trib 7
Areas 2 & 3	Golf Course	Build swale to re-route flow into properly sized pond
Areas 4 & 6 (BF) and 5 (OCV)	Central sections	Treat with multiple small and mid-sized retention areas and BMPs; retro-fit Oak Creek pond
Areas 7 & 8	Eastern sections	Build eastern pond for area 7 (smaller than EFA version) and infiltration for area 8