WEBER THOMPSON GRAPHIC PRESENTATION

SITE ANALYSIS: USING IT TO INFORM SITE DESIGN

WSU LID TECHNICAL WORKSHOP

May 21, 2013

WEBER THOMPSON

Do it:

Gather all the information in conjunction with consultant team.

Synthesize, Analyze, Optimize:

Consider how sensitive, important, is this item to development.

Avoid Analysis Paralysis:

Don’t get overwhelmed with details; think big picture.

Use it:

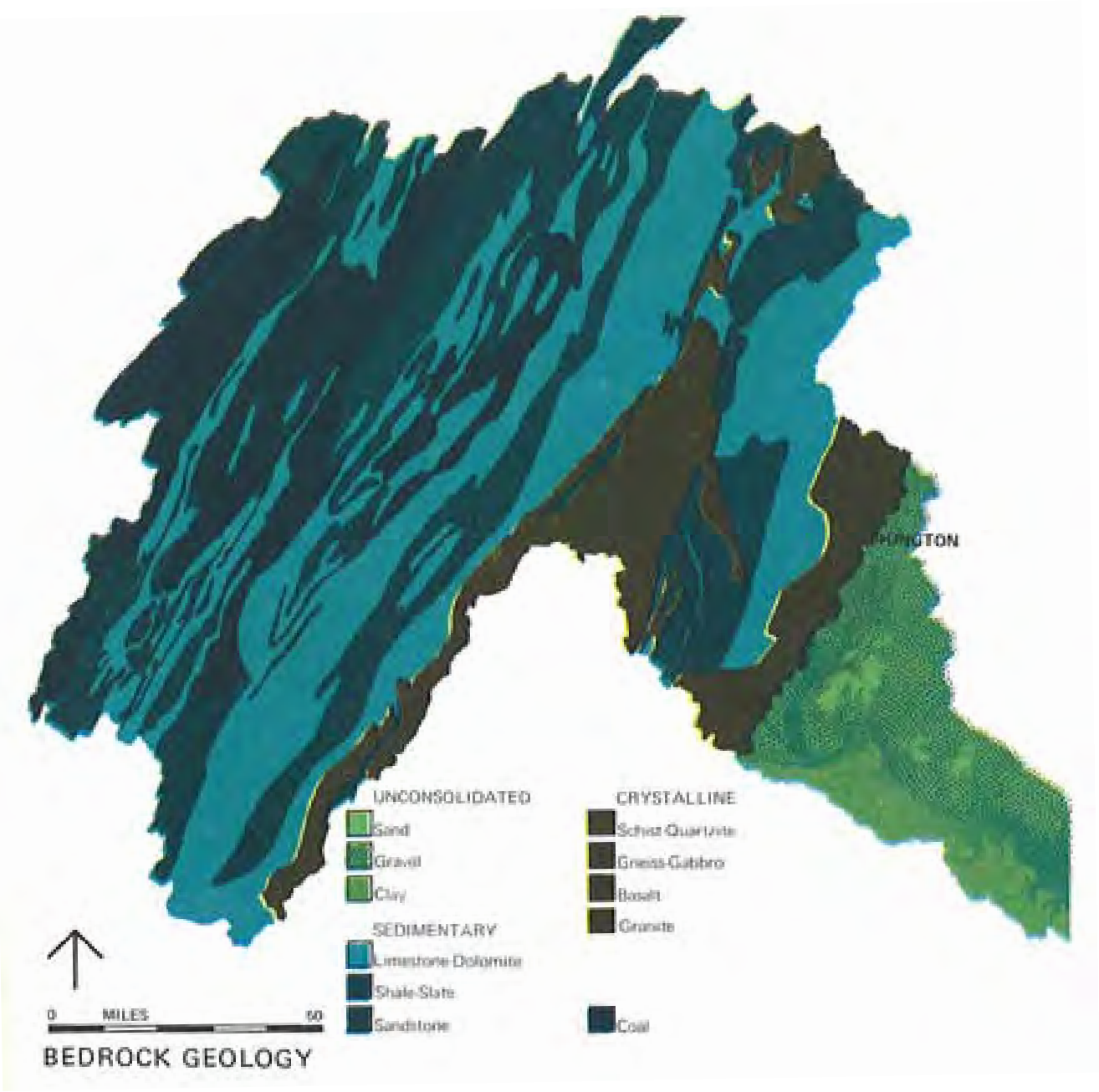
The most salient items will guide your planning.

SITE ANALYSIS: DO IT. USE IT.

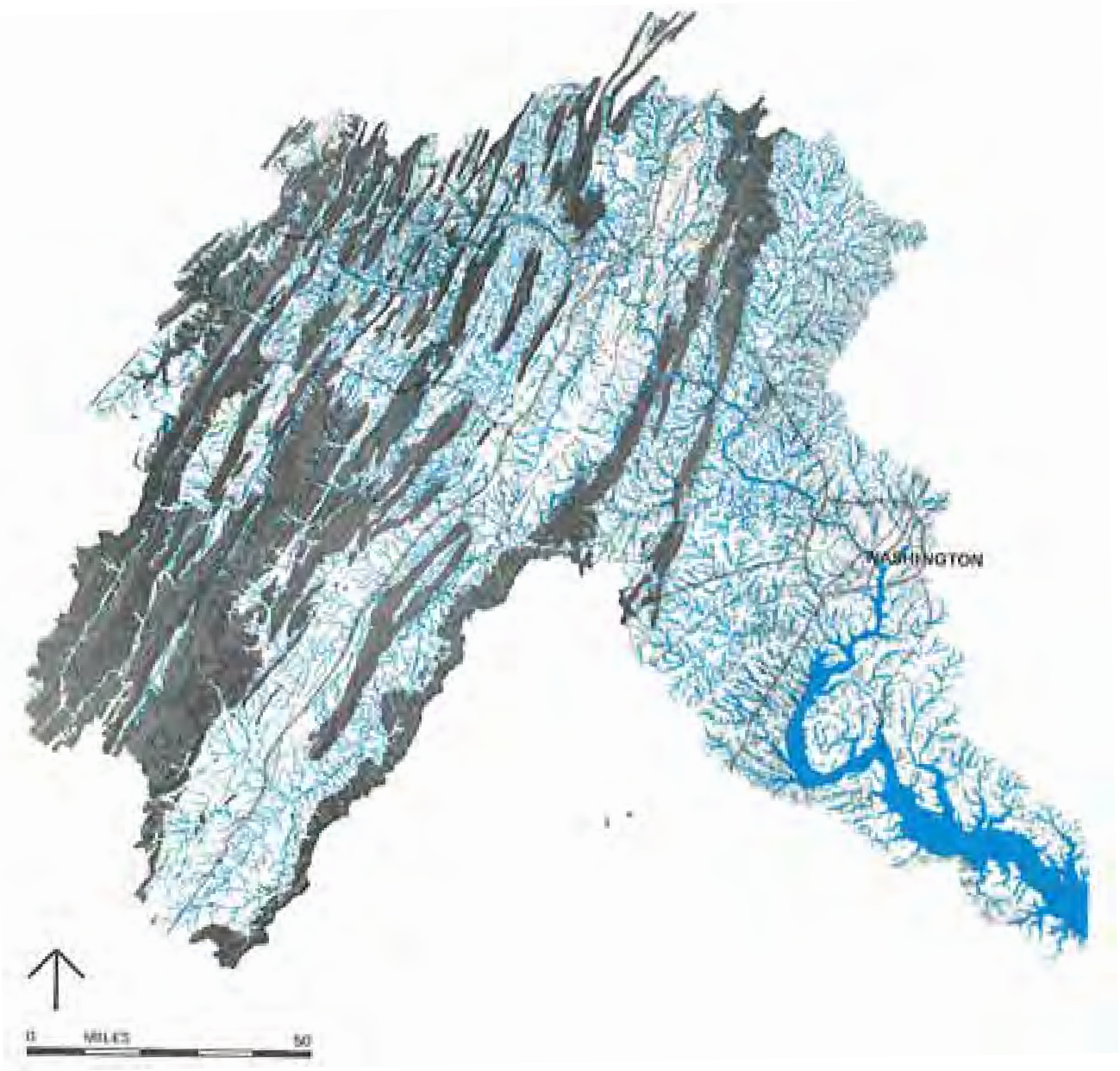
- Topography
- Soils — Geotech
- Hydrology
- Habitat — Flora
- Fauna
- Climate
- Views
- Recreation Potential
- Urban Form
- Visual and Aesthetic Values
- Historical Uses
- Transportation
- Zoning and Land Uses
- Other items as determined by your site

Best Reference—First Published in 1969

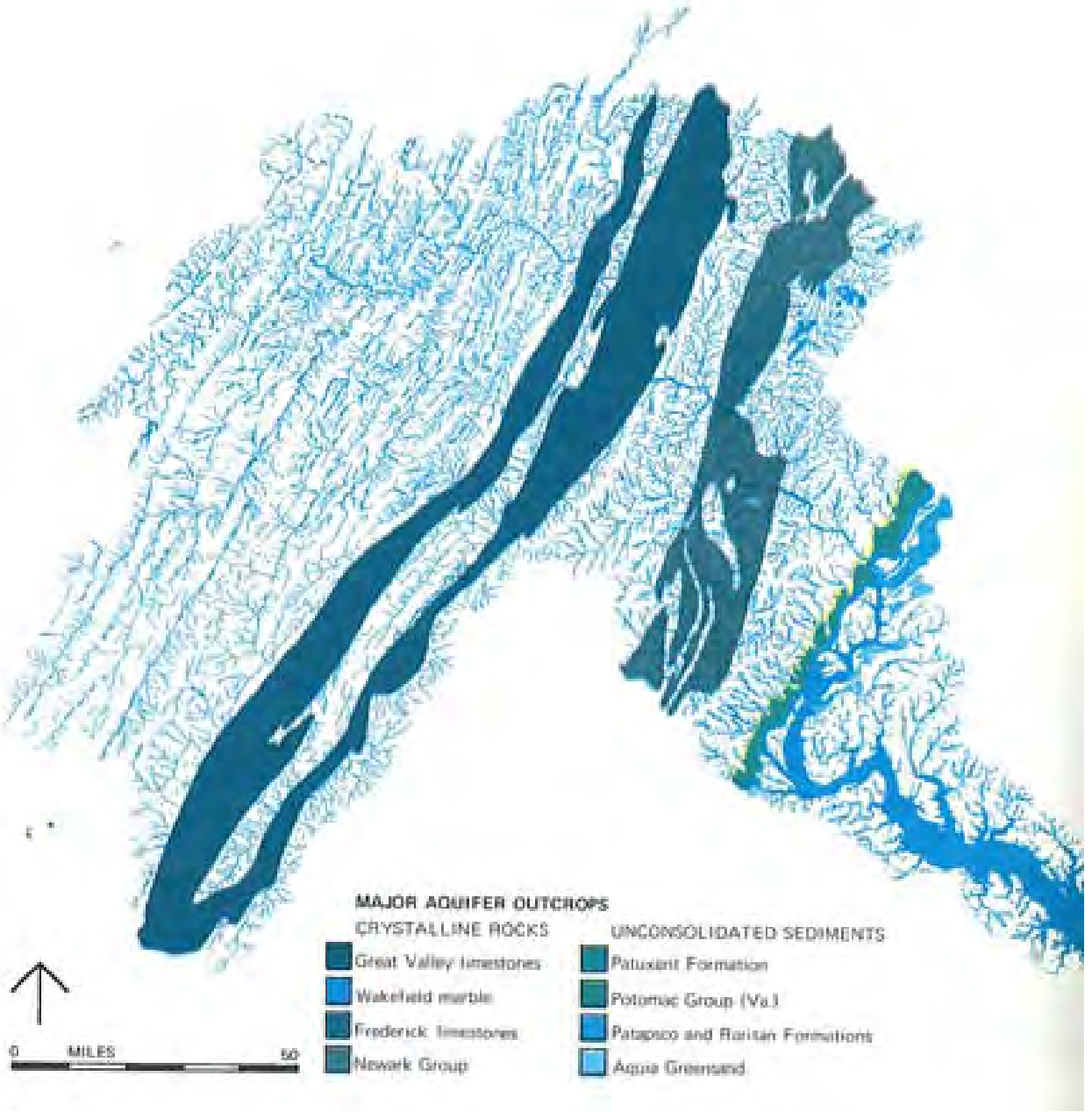
GEOLOGY



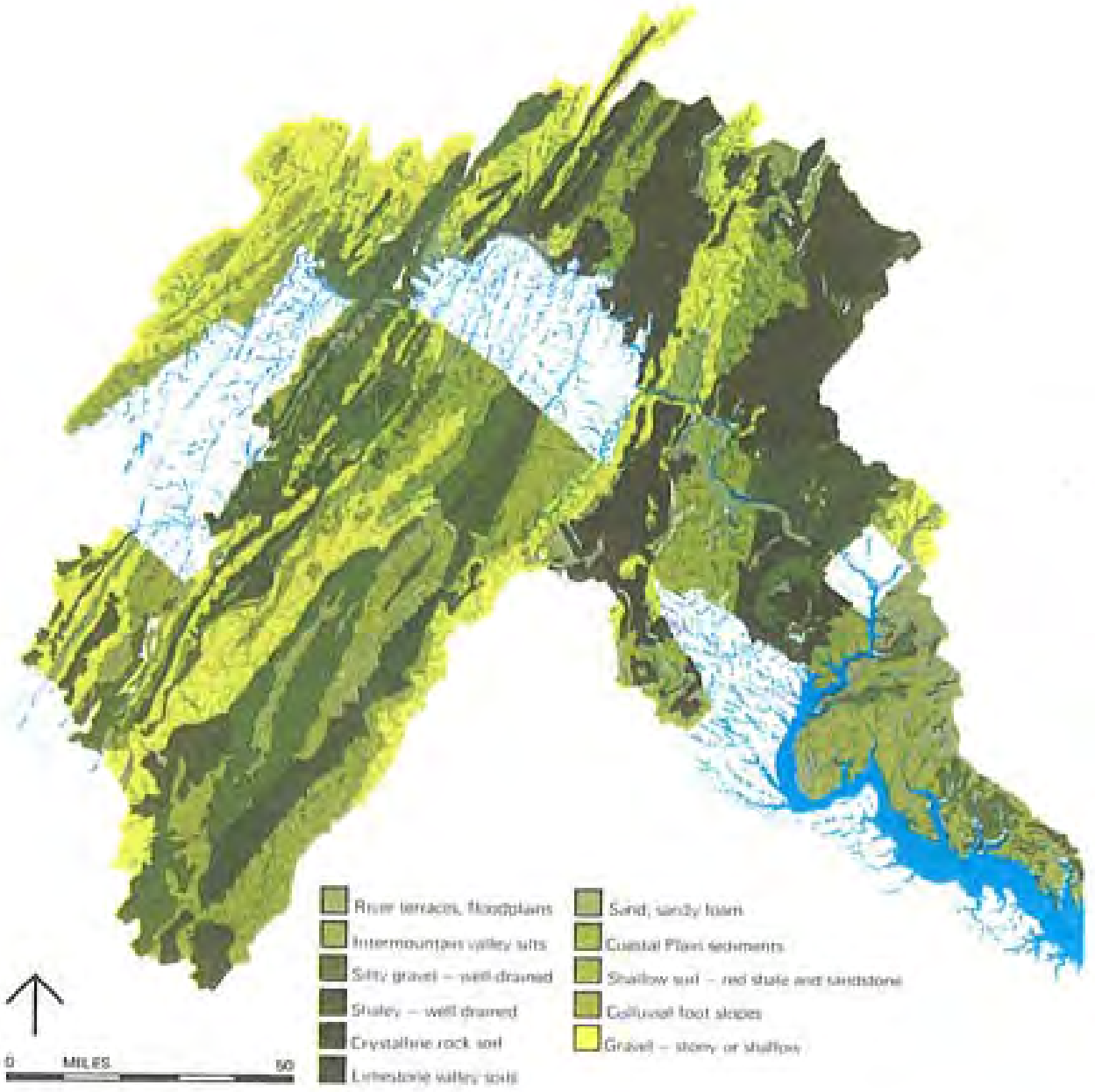
PHYSIOLOGY



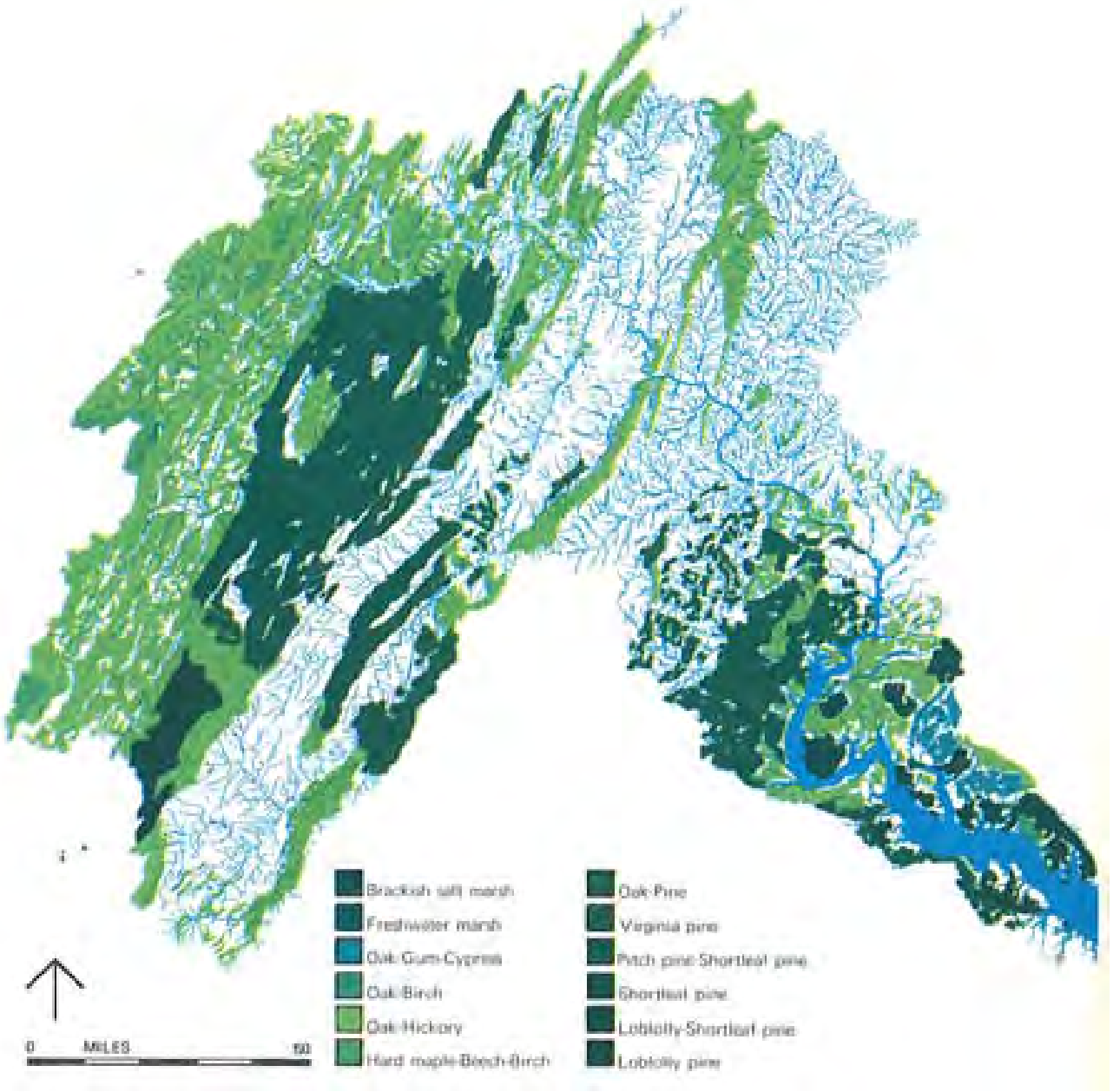
HYDROLOGY



SOILS

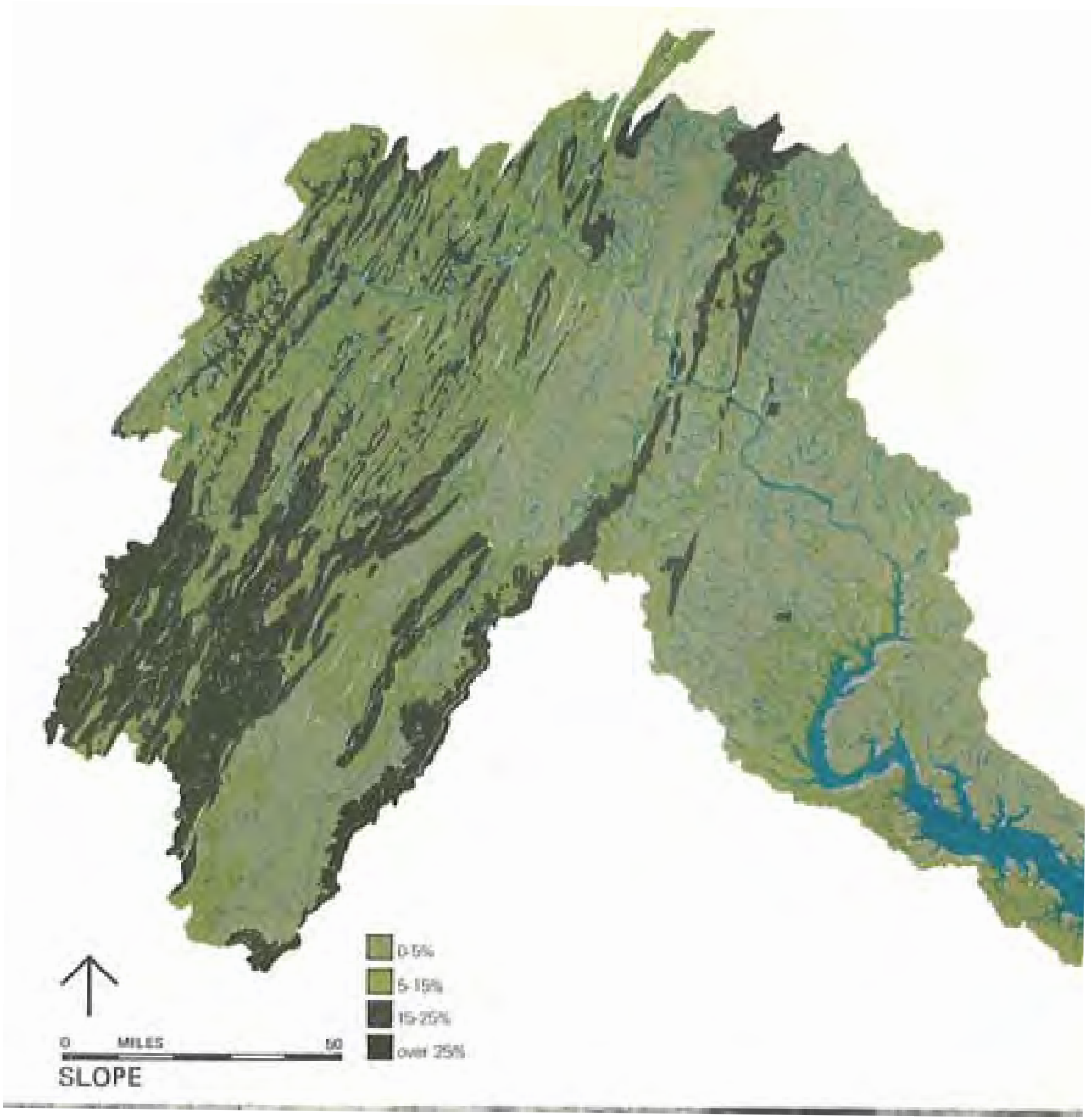


PLANT ASSOCIATIONS

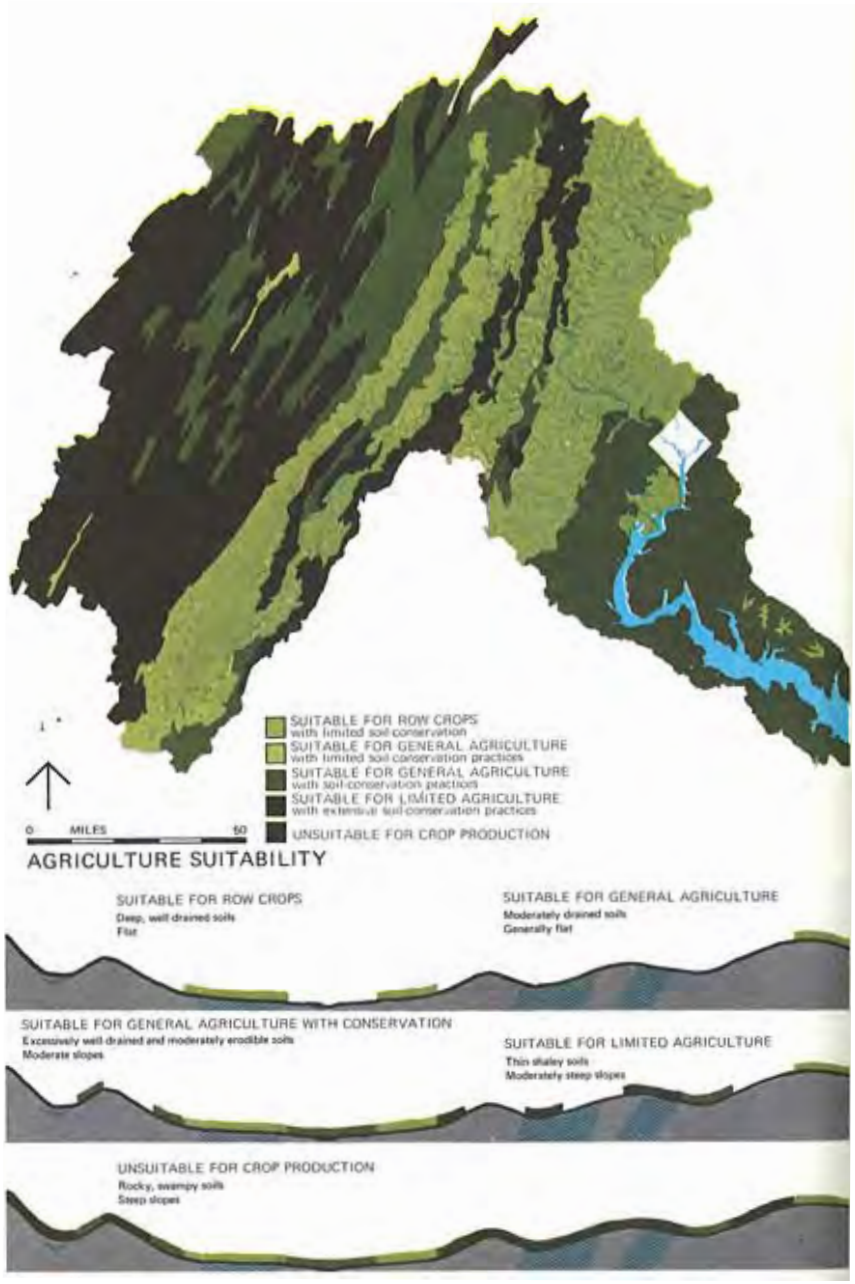


WILDLIFE

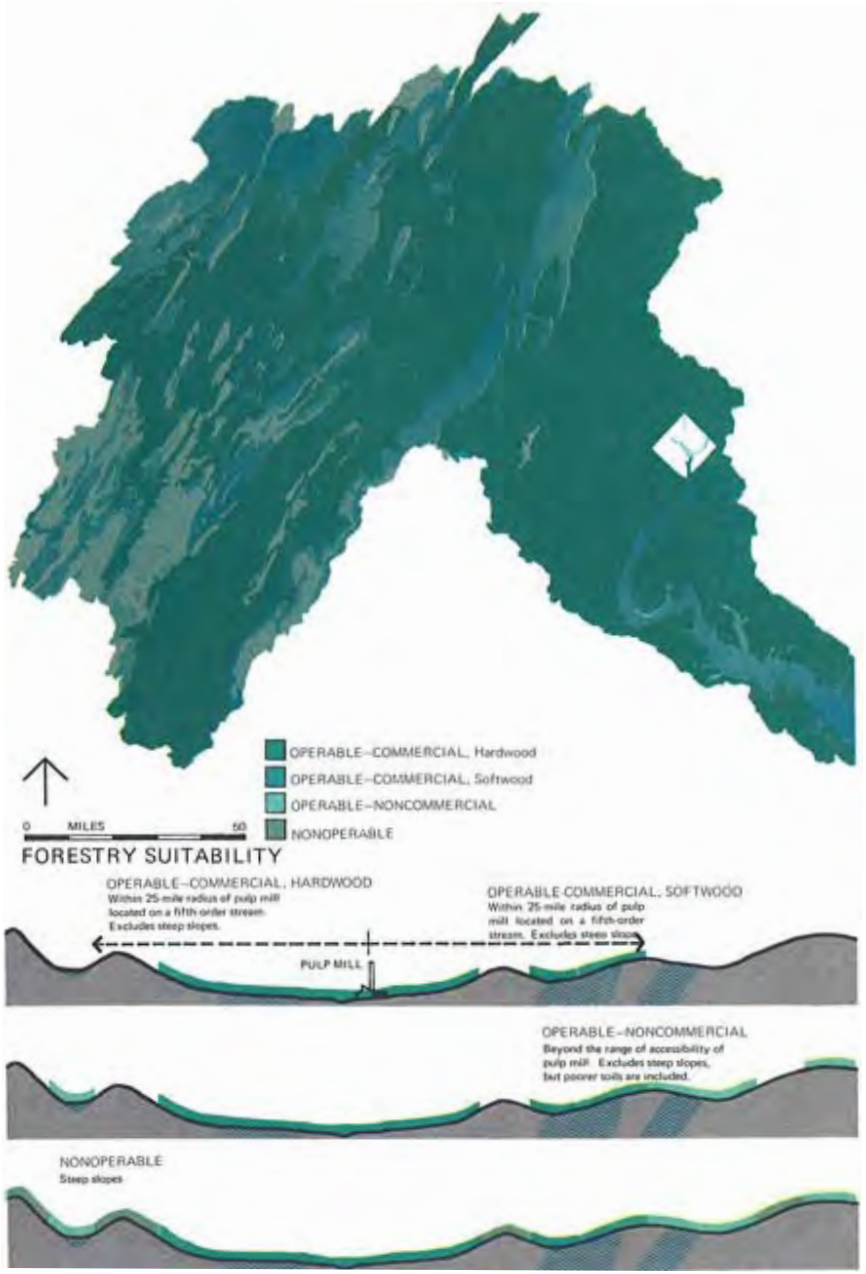
SLOPE



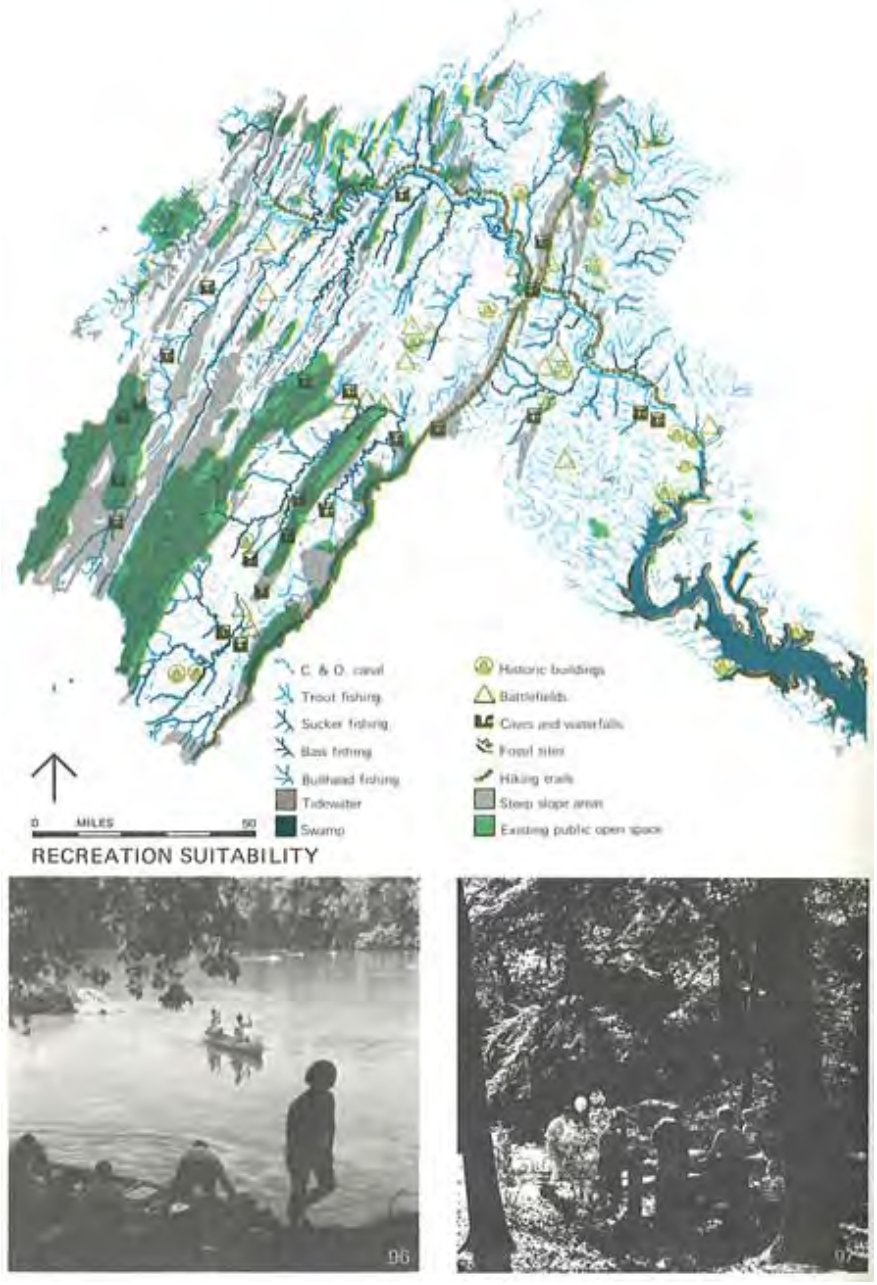
AGRICULTURE



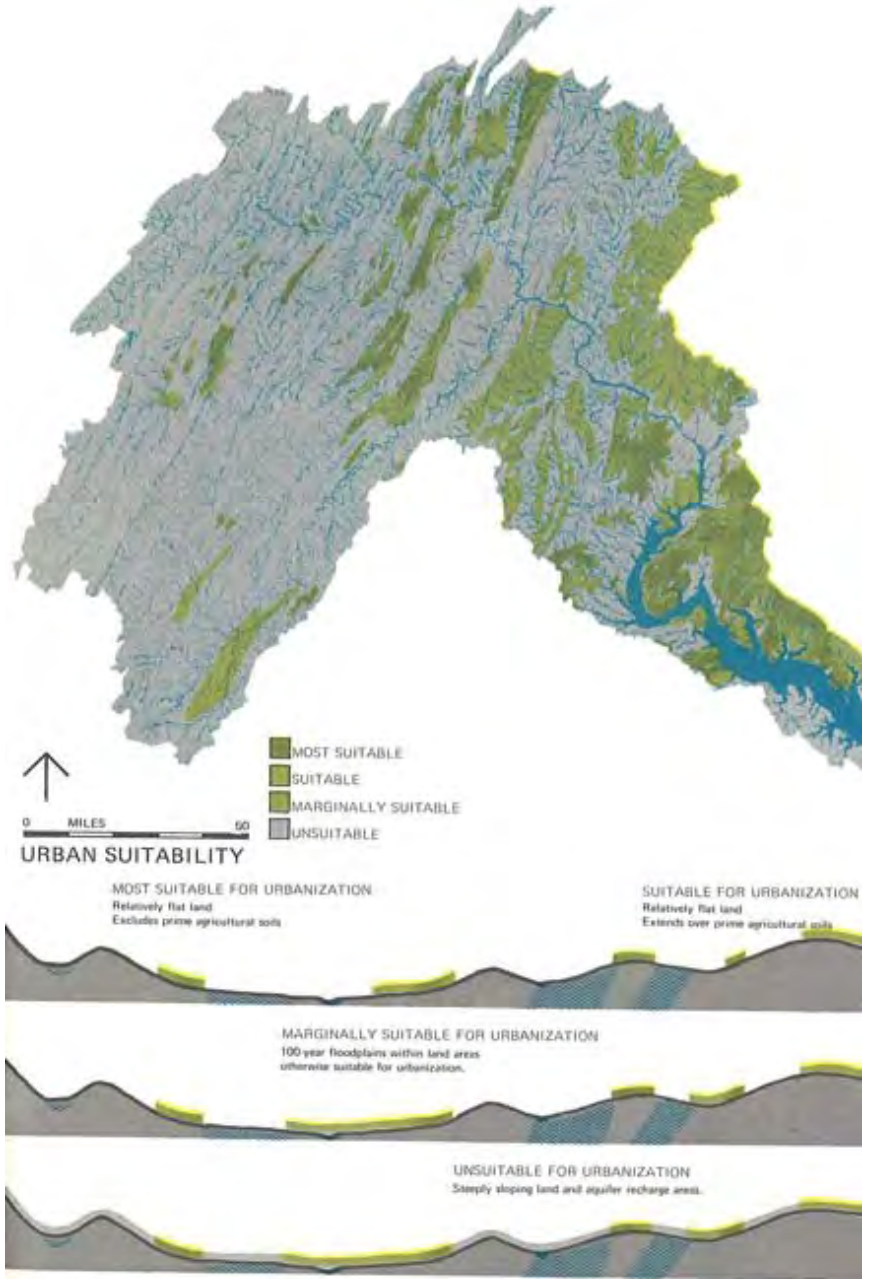
FORESTRY



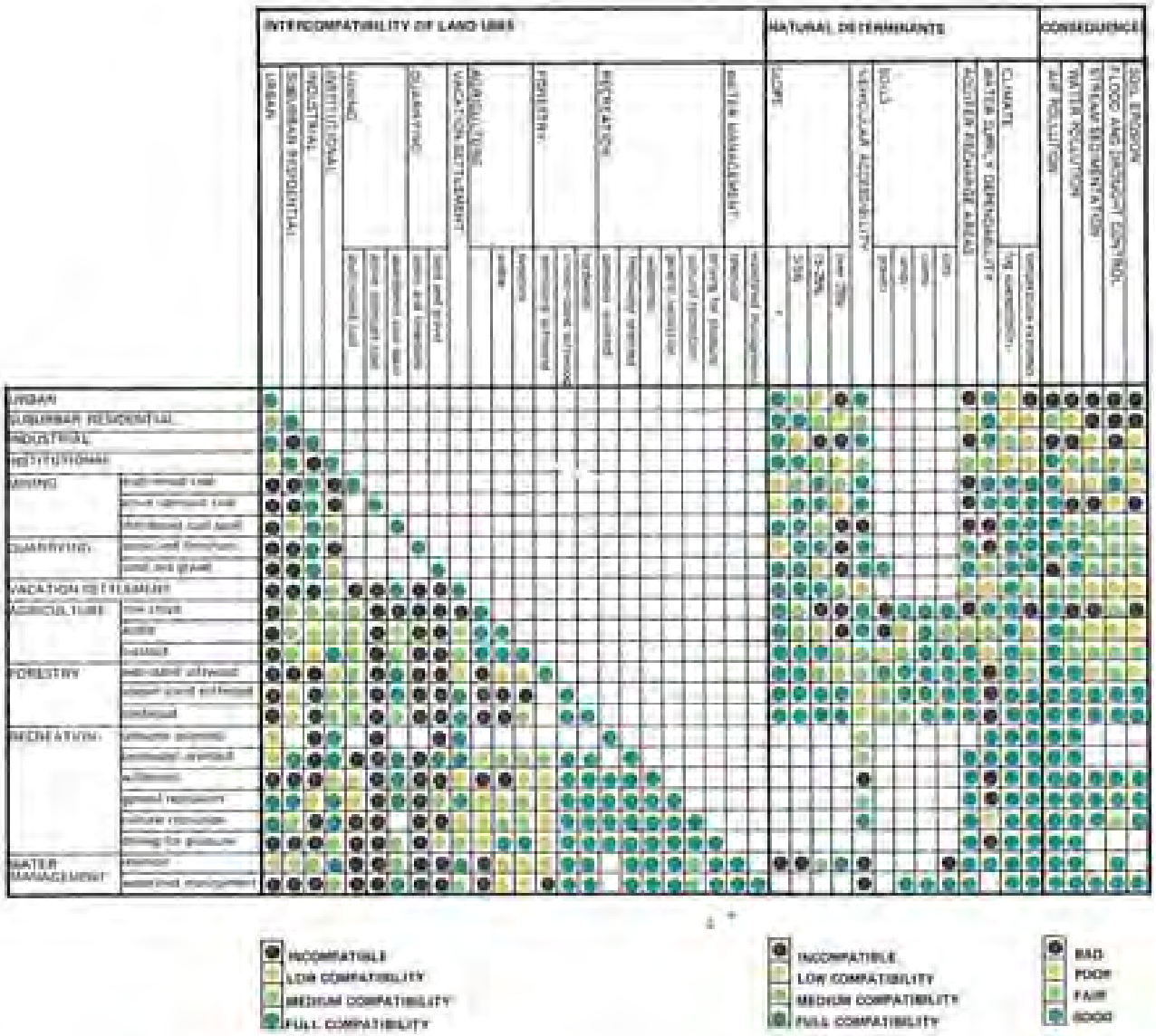
RECREATION



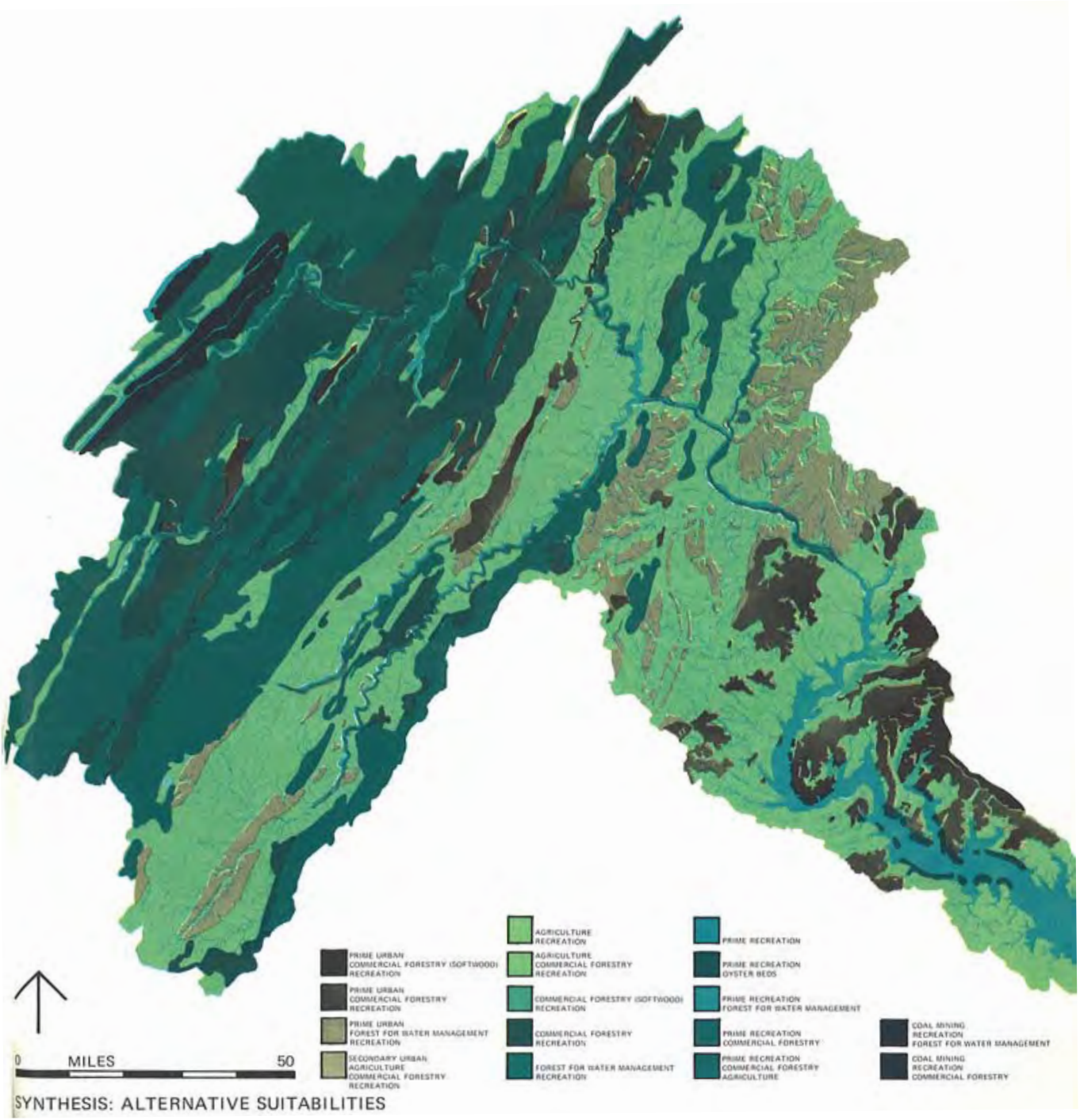
URBAN SUITABILITY



COMPATIBILITY



SYNTHESIS



SYNTHESIS: ALTERNATIVE SUITABILITIES

WEBER THOMPSON

Ronald T. Jepson & Associates

THE WATERSHED COMPANY

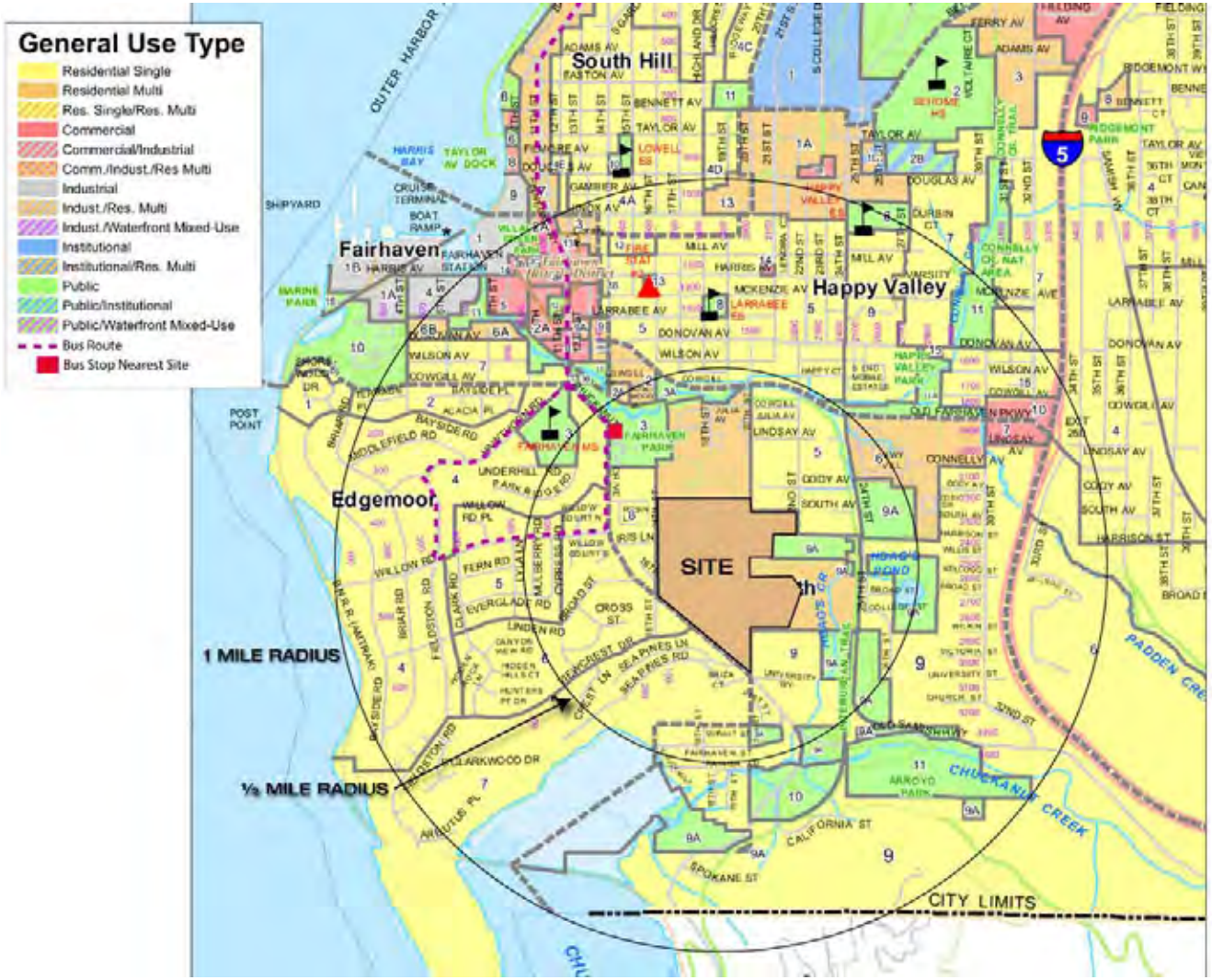
An Evolving Plan

FAIRHAVEN HIGHLANDS
BELLINGHAM, WA

EIS Scoping Meeting

January 16, 2008

EXAMPLES OF USING THE SITE TO DESIGN



SITE LOCATION

EXISTING CONDITIONS

VIEW SOUTH ON CHUCKANUT DRIVE

VIEW NORTH ON CHUCKANUT DRIVE

VIEW ACROSS STREET

VIEW SOUTH OF DEVELOPMENT

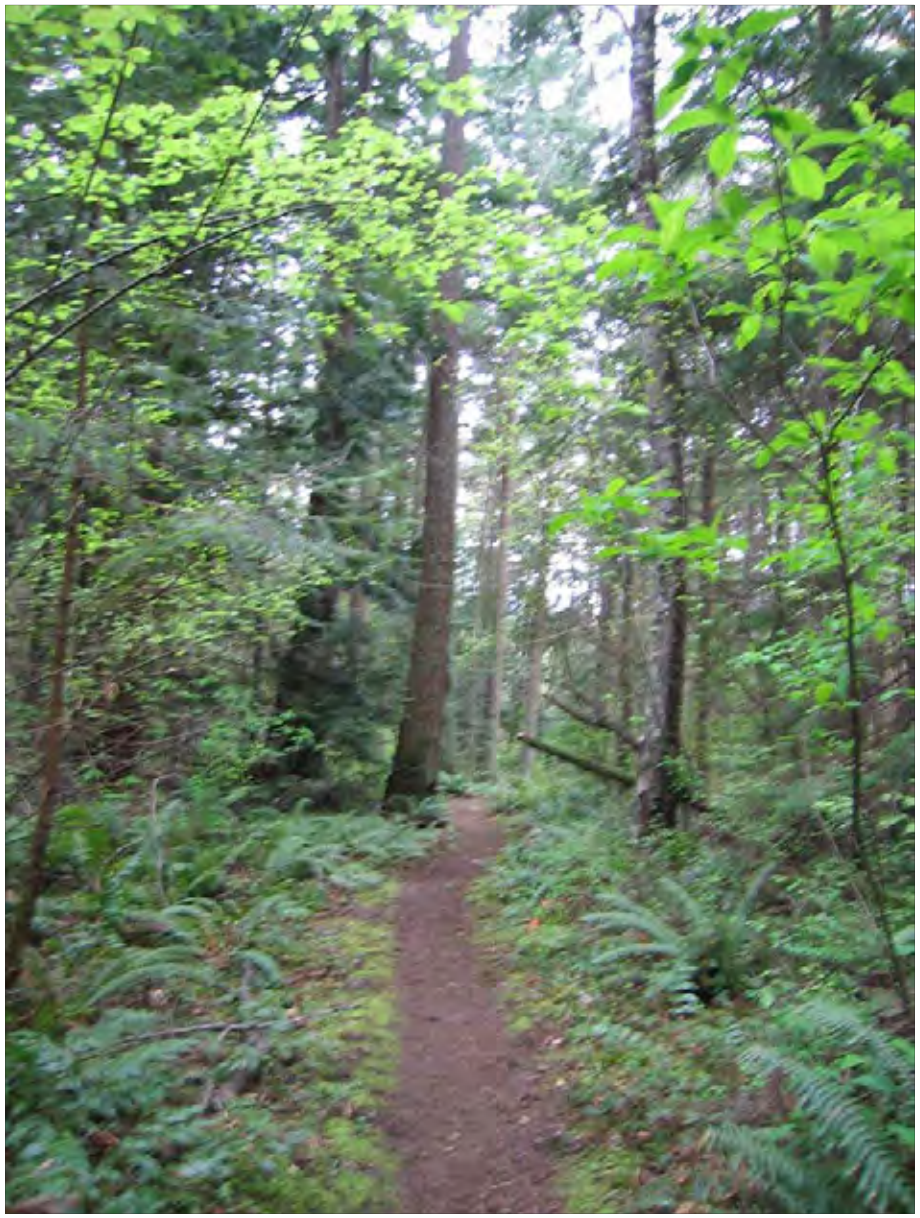
NEW COMMUNITIES WEST OF SITE

SINGLE FAMILY WEST OF SITE

VIEW WEST

NORTH OF SITE

SITE—TRAILS



SITE – FORMER GRAVEL PIT

SITE

SITE — TRAILS THROUGH WETLAND

SITE

SITE

SITE

WETLAND

WETLAND

TRAILS

AERIAL PHOTO

AN INTEGRATED DESIGN APPROACH

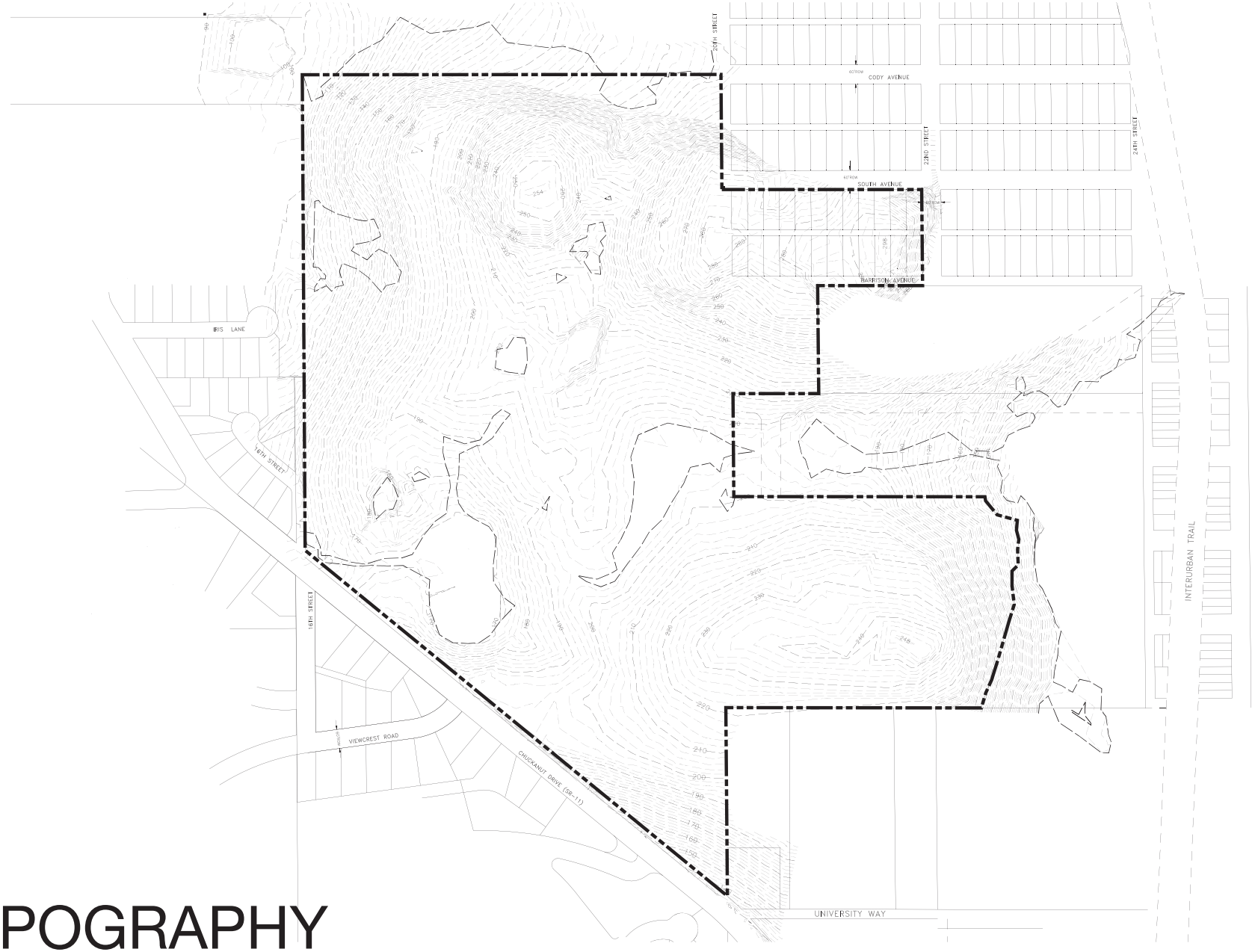
Geotechnical Engineering
- Sub-surface Flows
- Steep Slopes
- Infiltration Testing
- Grading Considerations

Wetland Studies
- Biological Assessment
- Wetland Delineation
- Water Level Monitoring
- Flora and Fauna

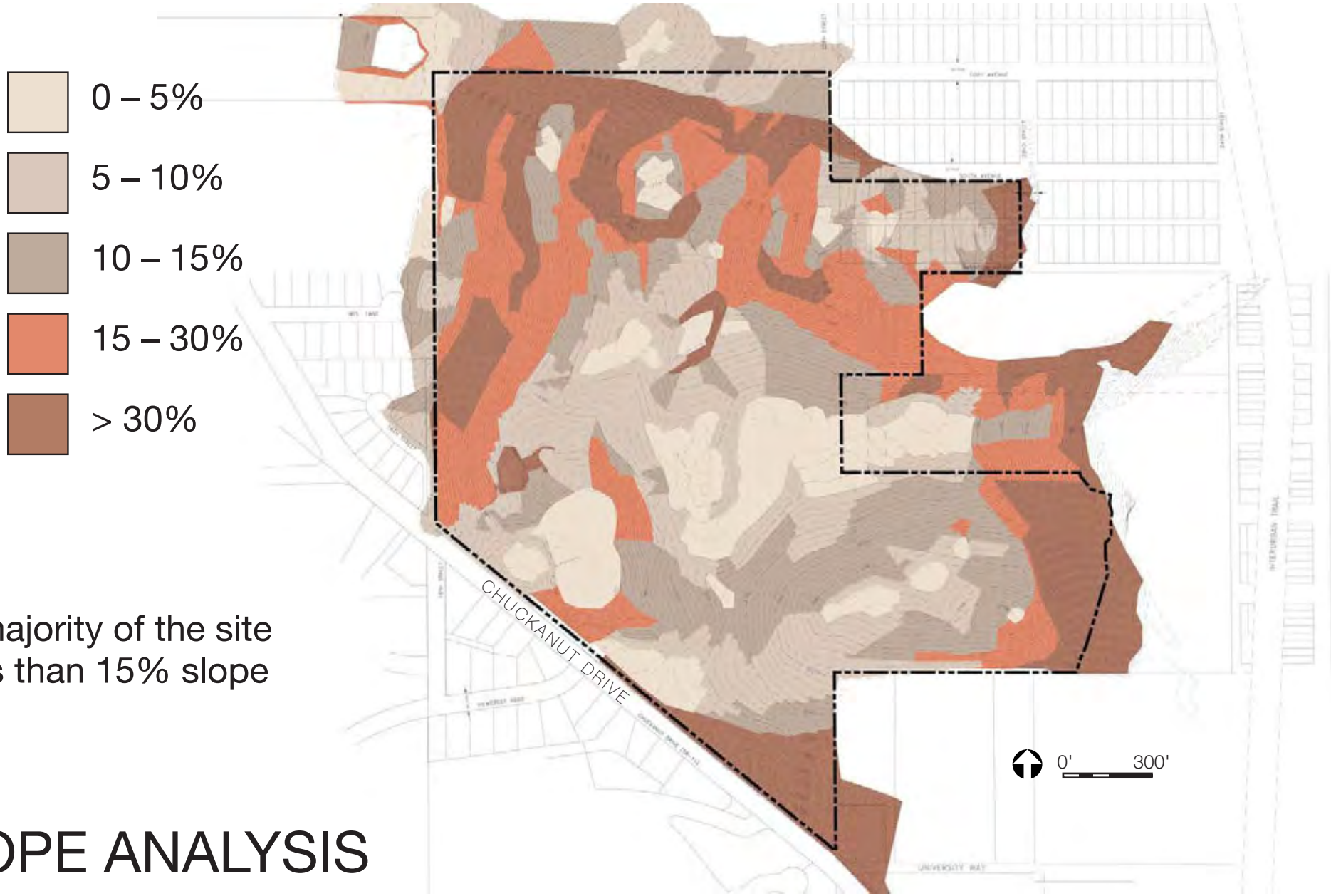
Civil Engineering
- Stormwater Management
- Road Grading and Design
- Utility Design

Architecture/ Planning
- Site Planning
- Site Design
- Building and Unit Design
- Open Space and Community Planning

Landscape Architecture
- Low Impact Landscape Design
- Planting for Wetland Enhancement, Mitigation
- Parks, Greens, Streetscape Landscape

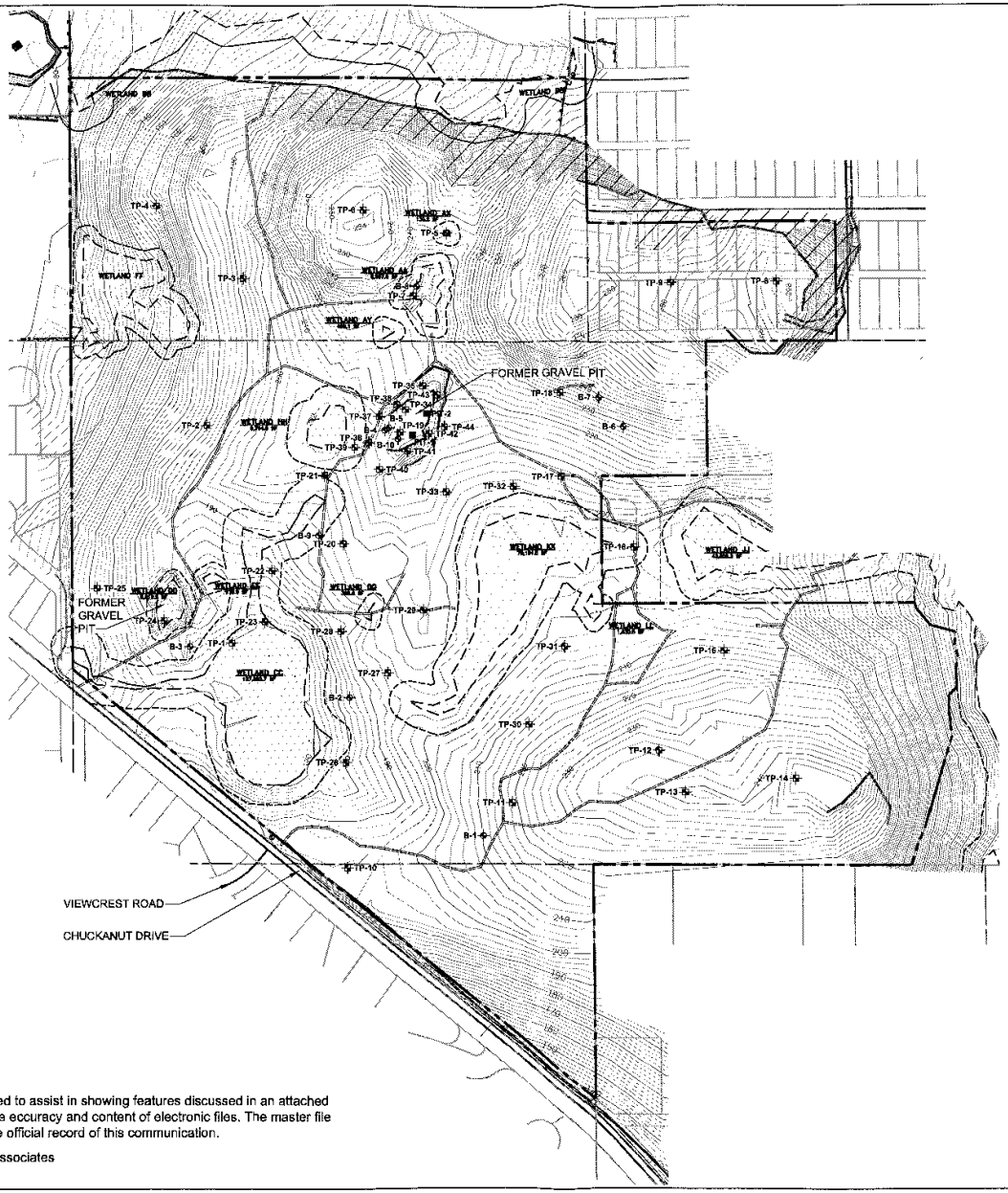


TOPOGRAPHY



The majority of the site is less than 15% slope

SLOPE ANALYSIS



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Drawing providad by Ronald T. Jepson & Associates

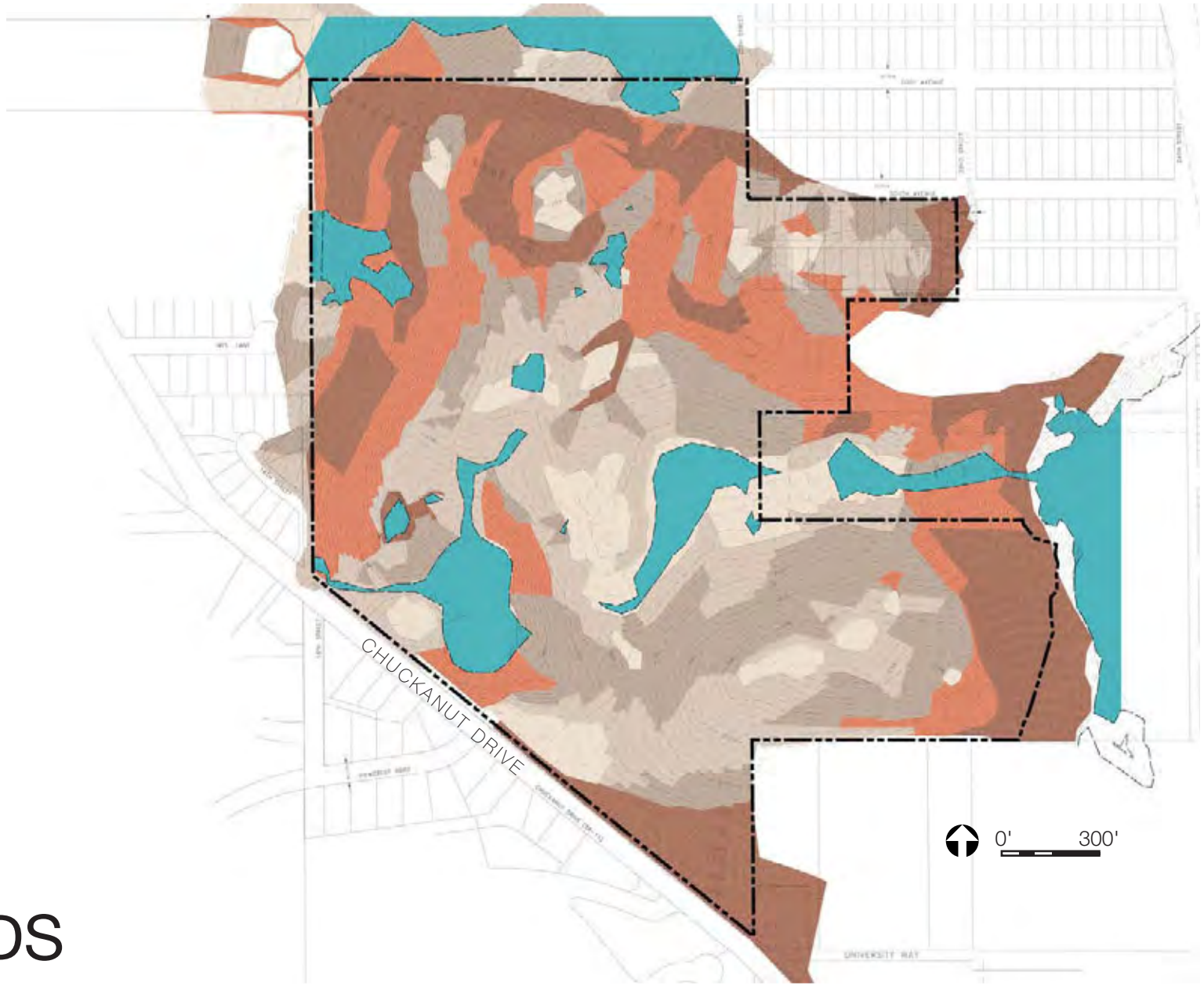
Site Plan and Subsurface Explorations

Fairhaven Highlands
Bellingham, Washington

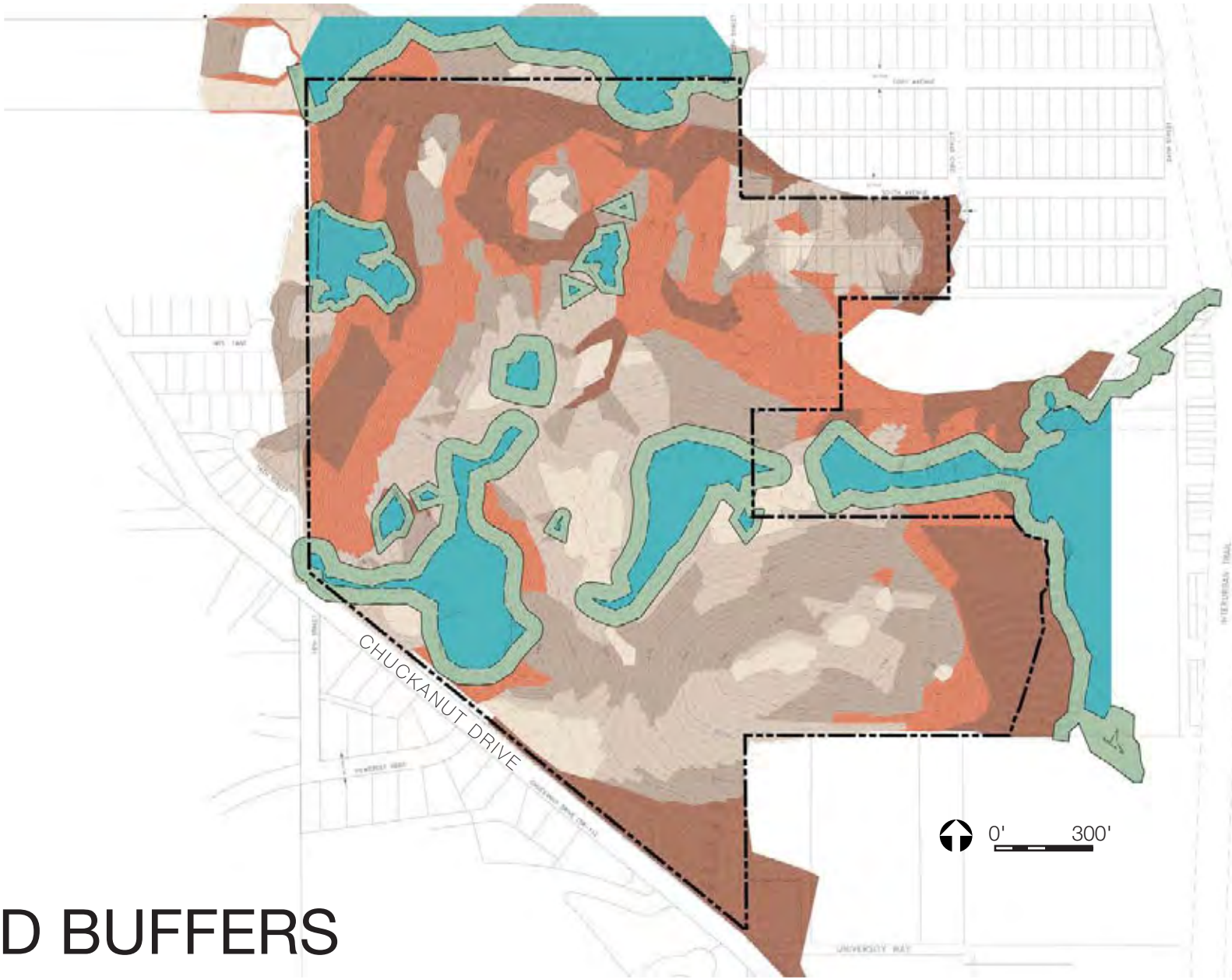
GeoEngineers | Figure 2

BELL\P:\119110O1\01\CAD\119110O101F2-F3.dwg RMB:BMK 07/09/07

GEOTECHNICAL REPORT

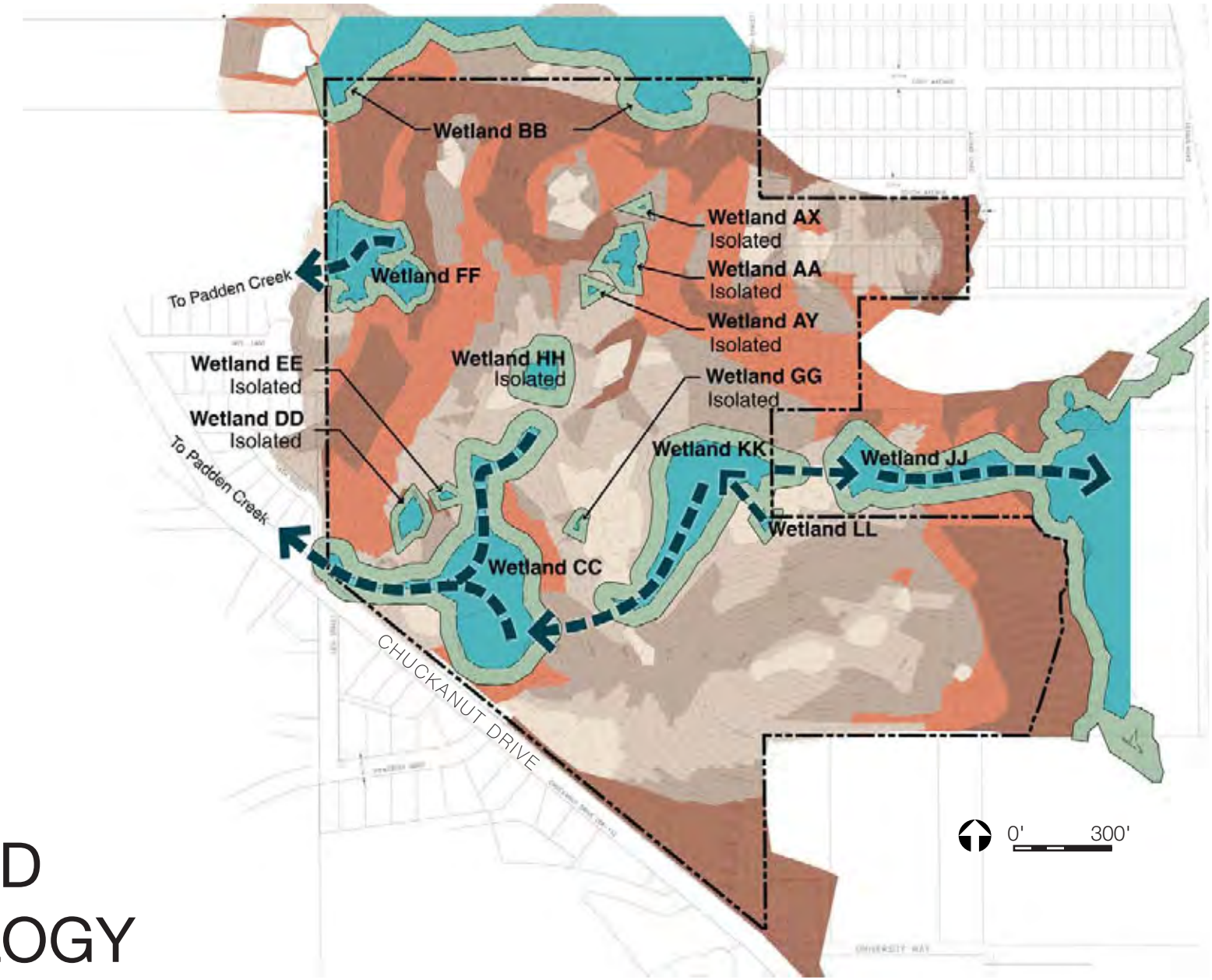


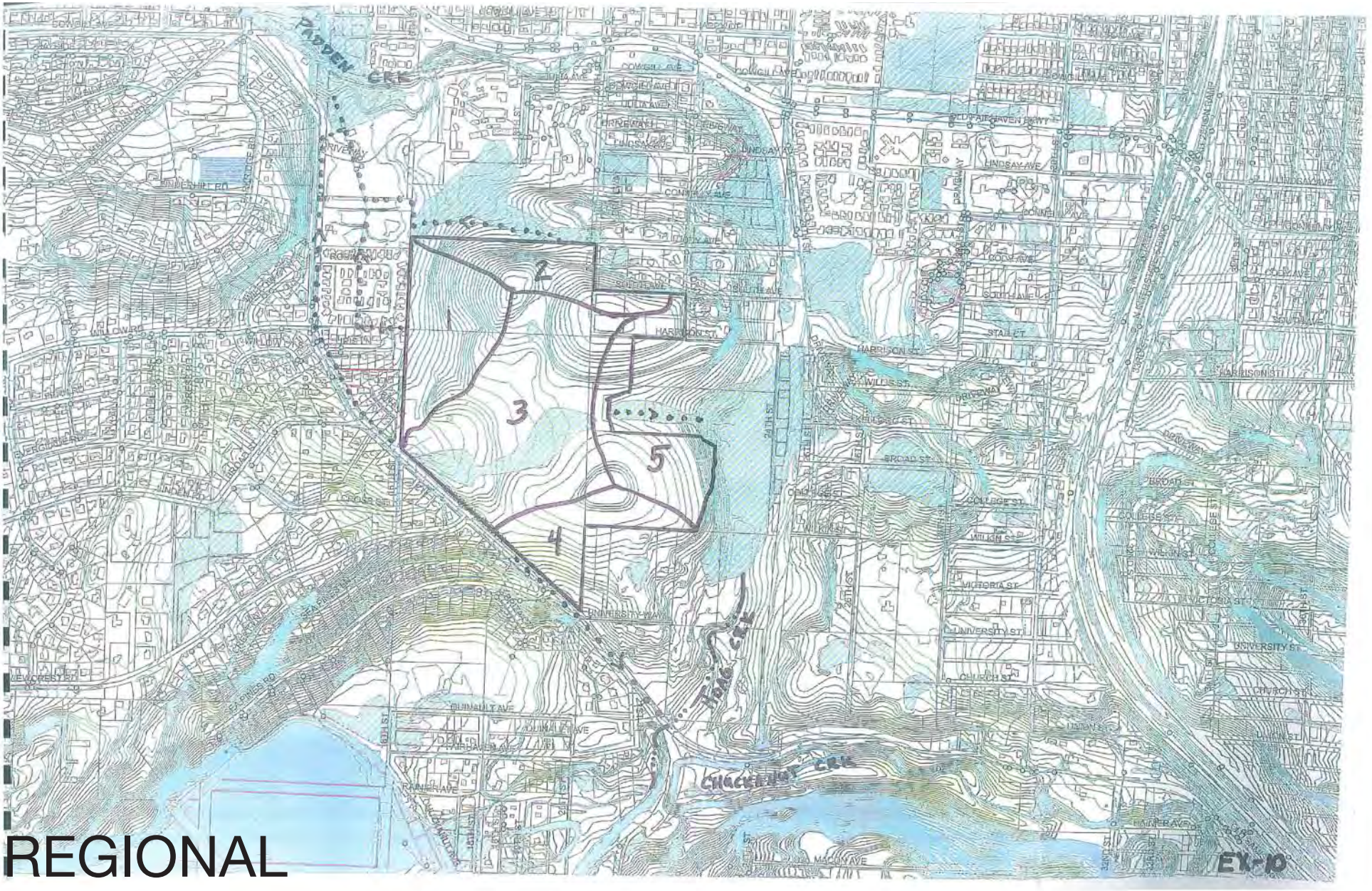
WETLANDS



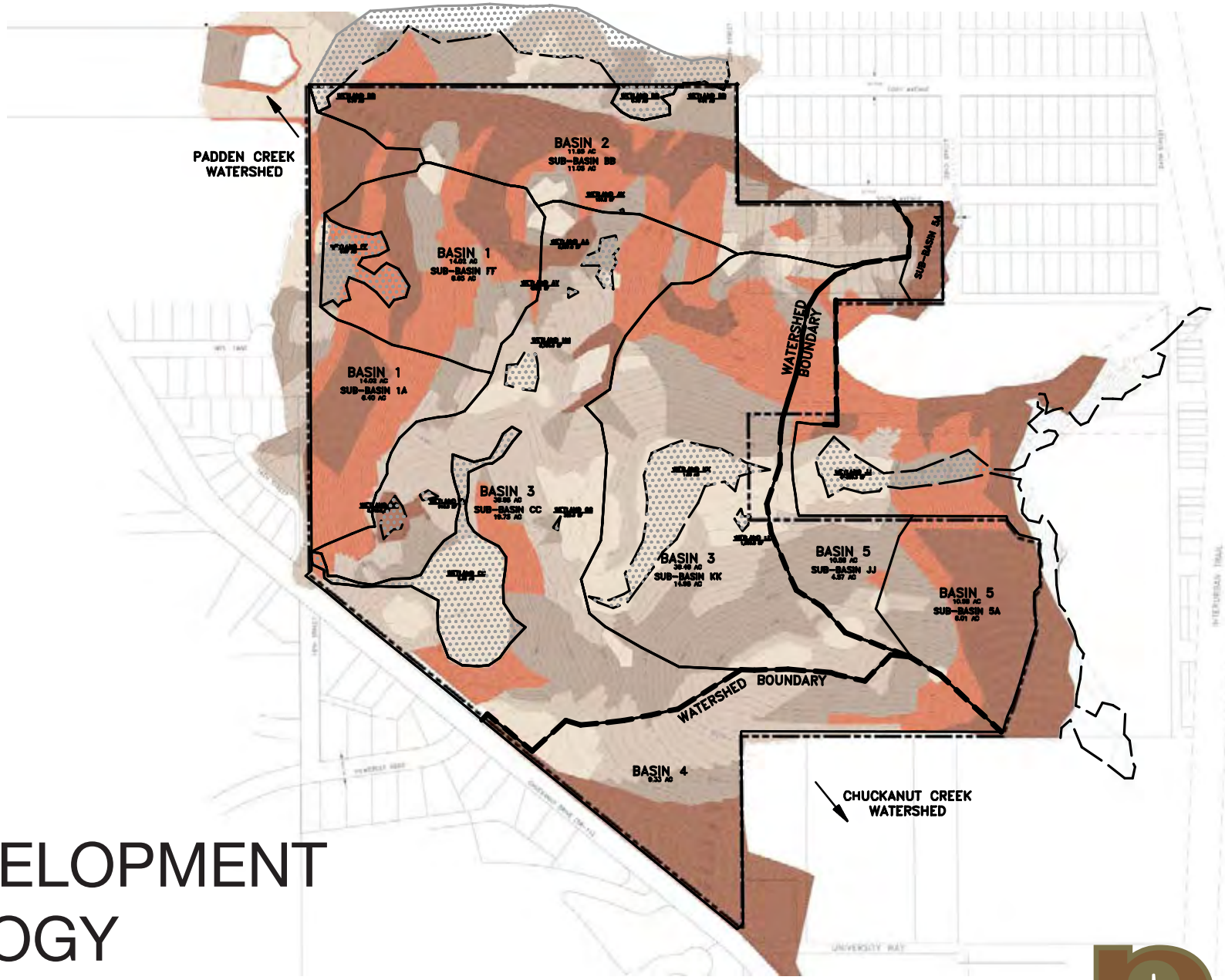
REQUIRED BUFFERS

WETLAND HYDROLOGY

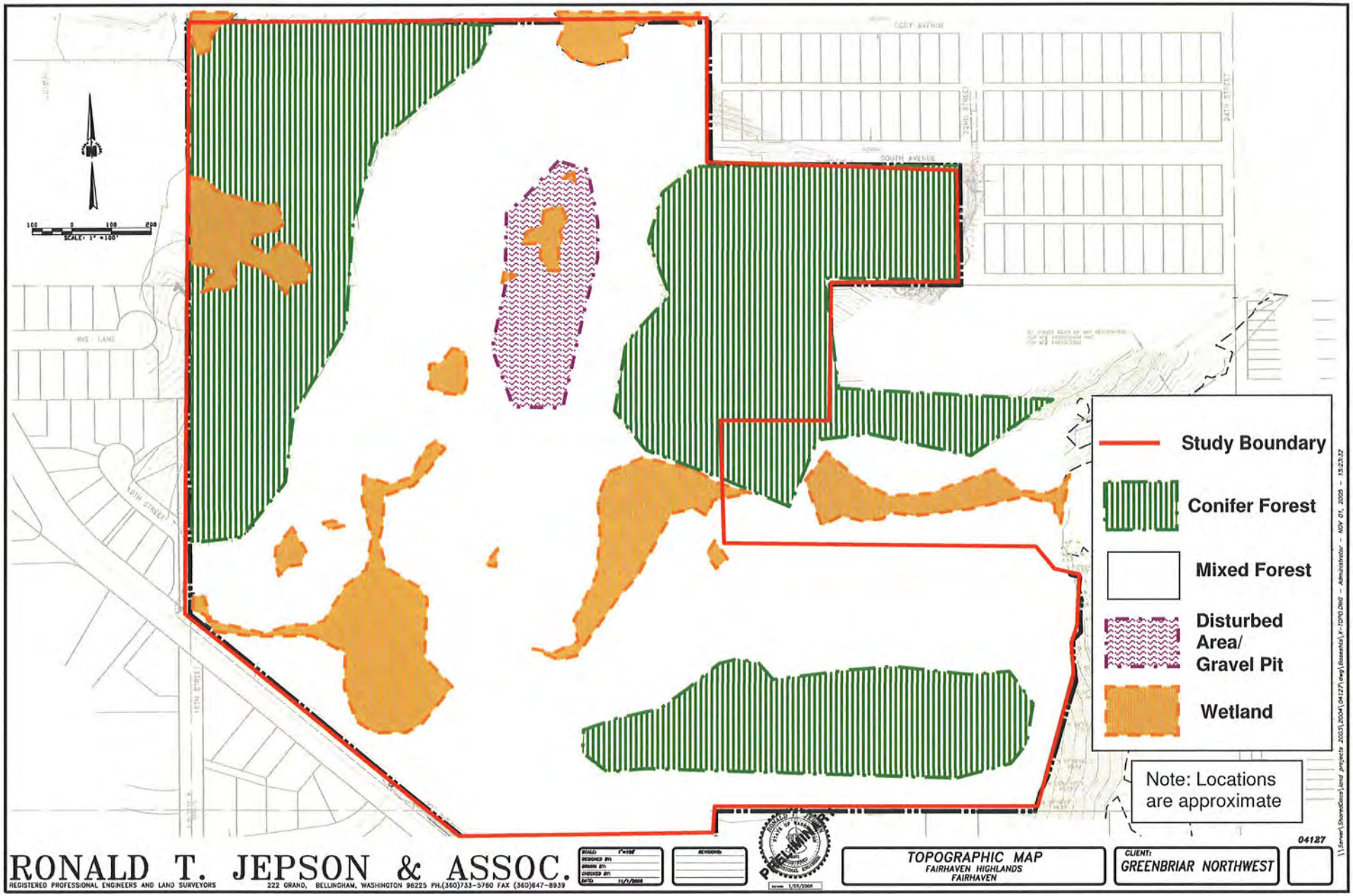




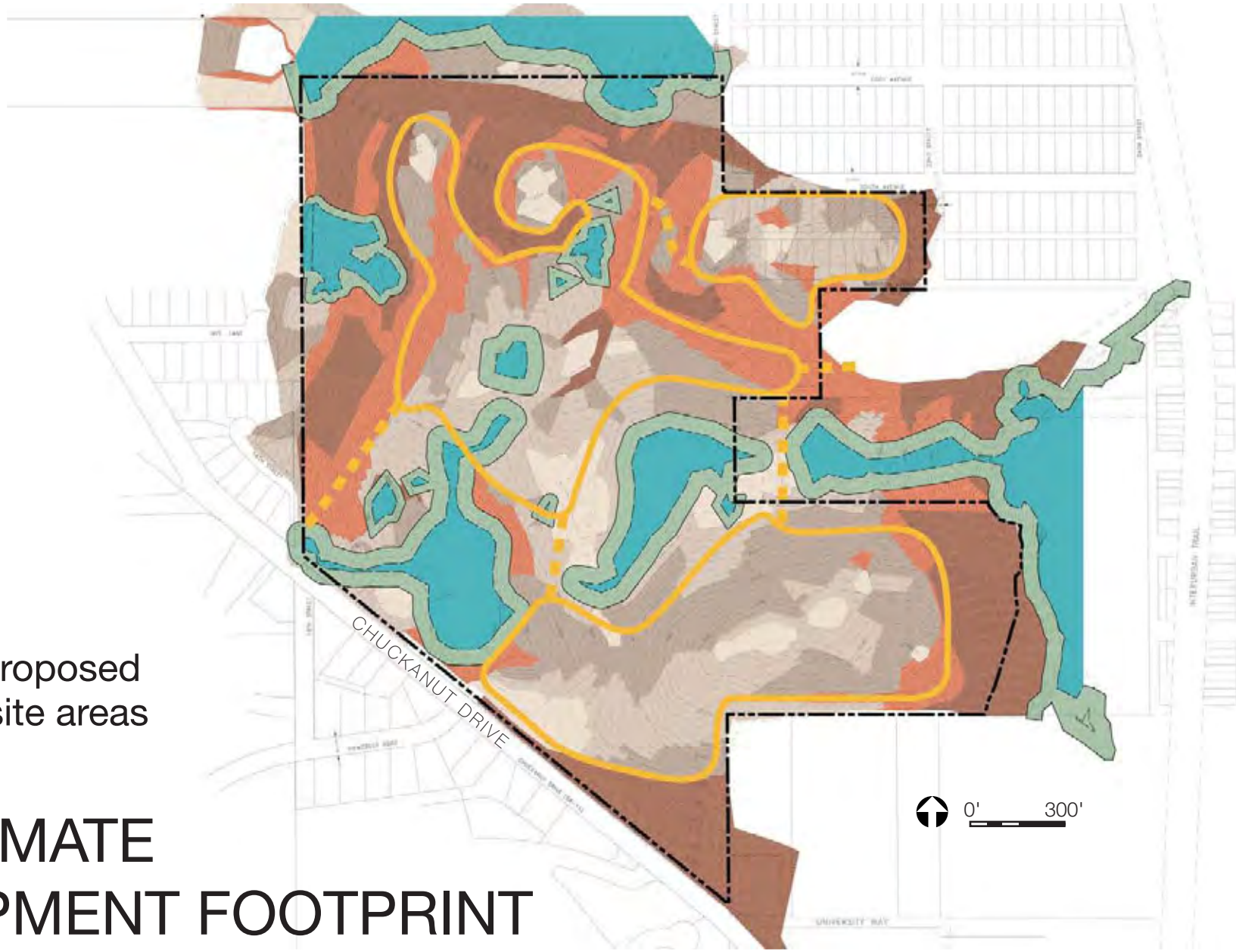
REGIONAL HYDROLOGY



PRE-DEVELOPMENT HYDROLOGY

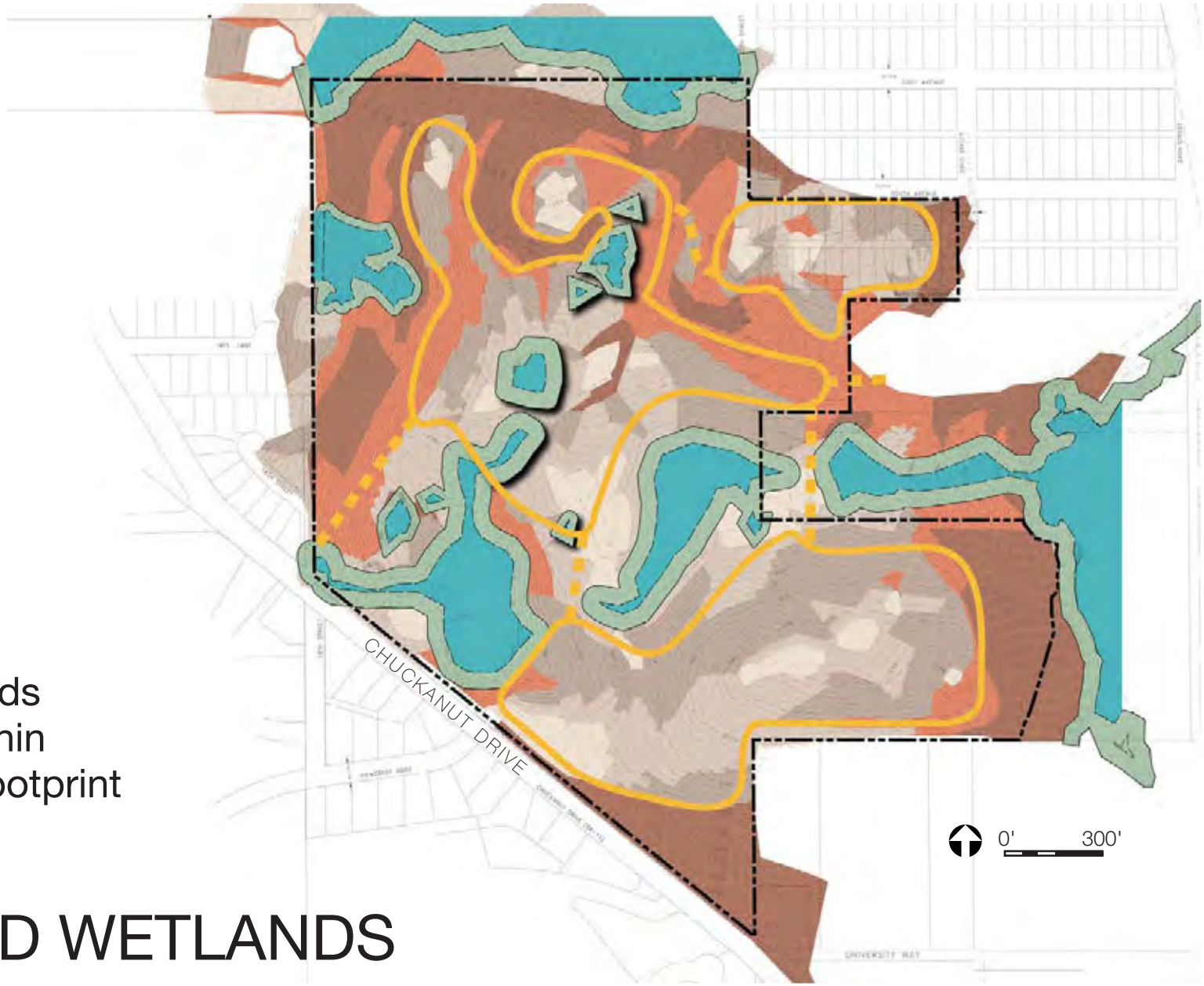


LOCATION OF HABITAT TYPES



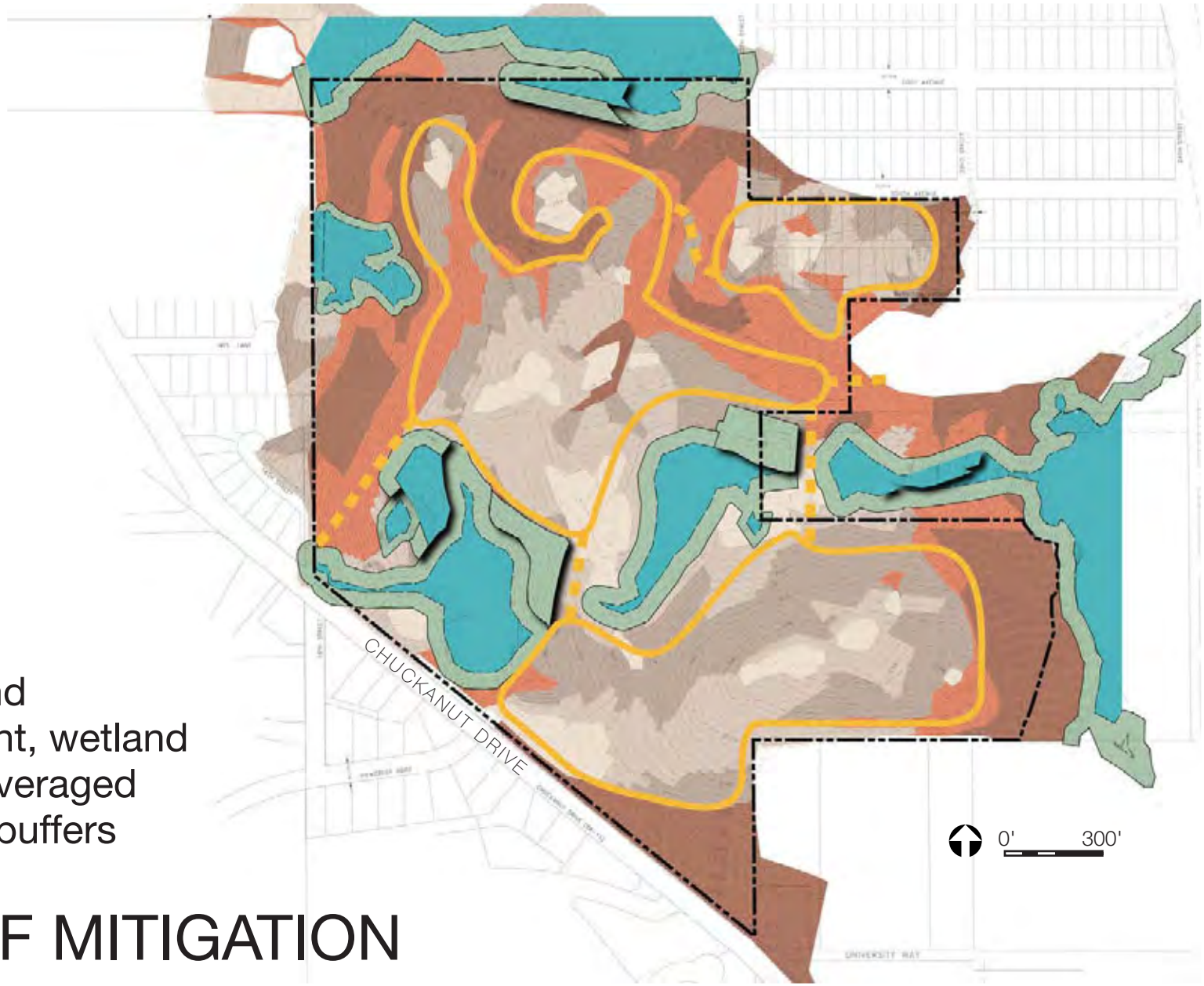
Development proposed
on the flattest site areas

APPROXIMATE DEVELOPMENT FOOTPRINT



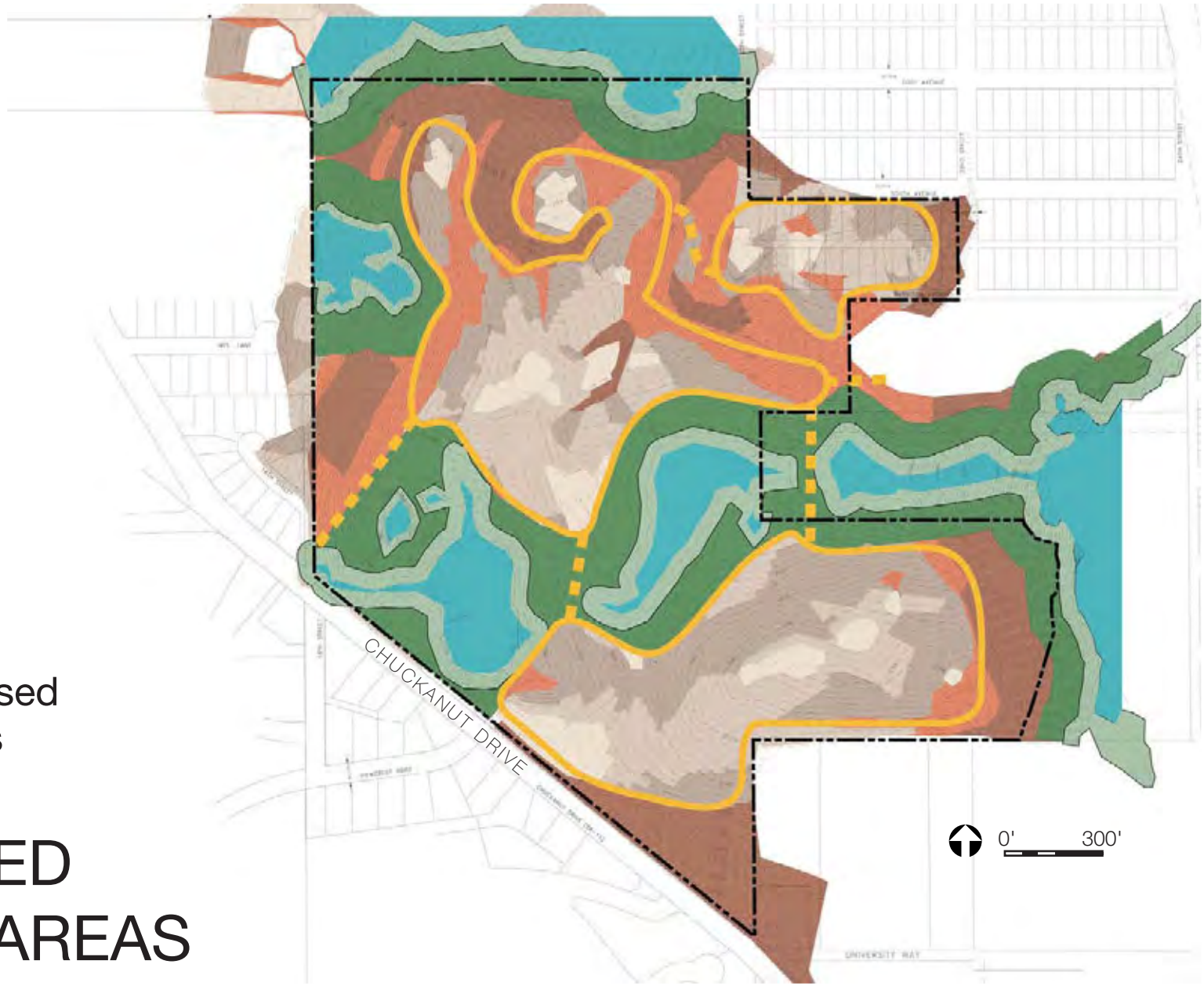
Isolated wetlands
and buffers within
development footprint

IMPACTED WETLANDS



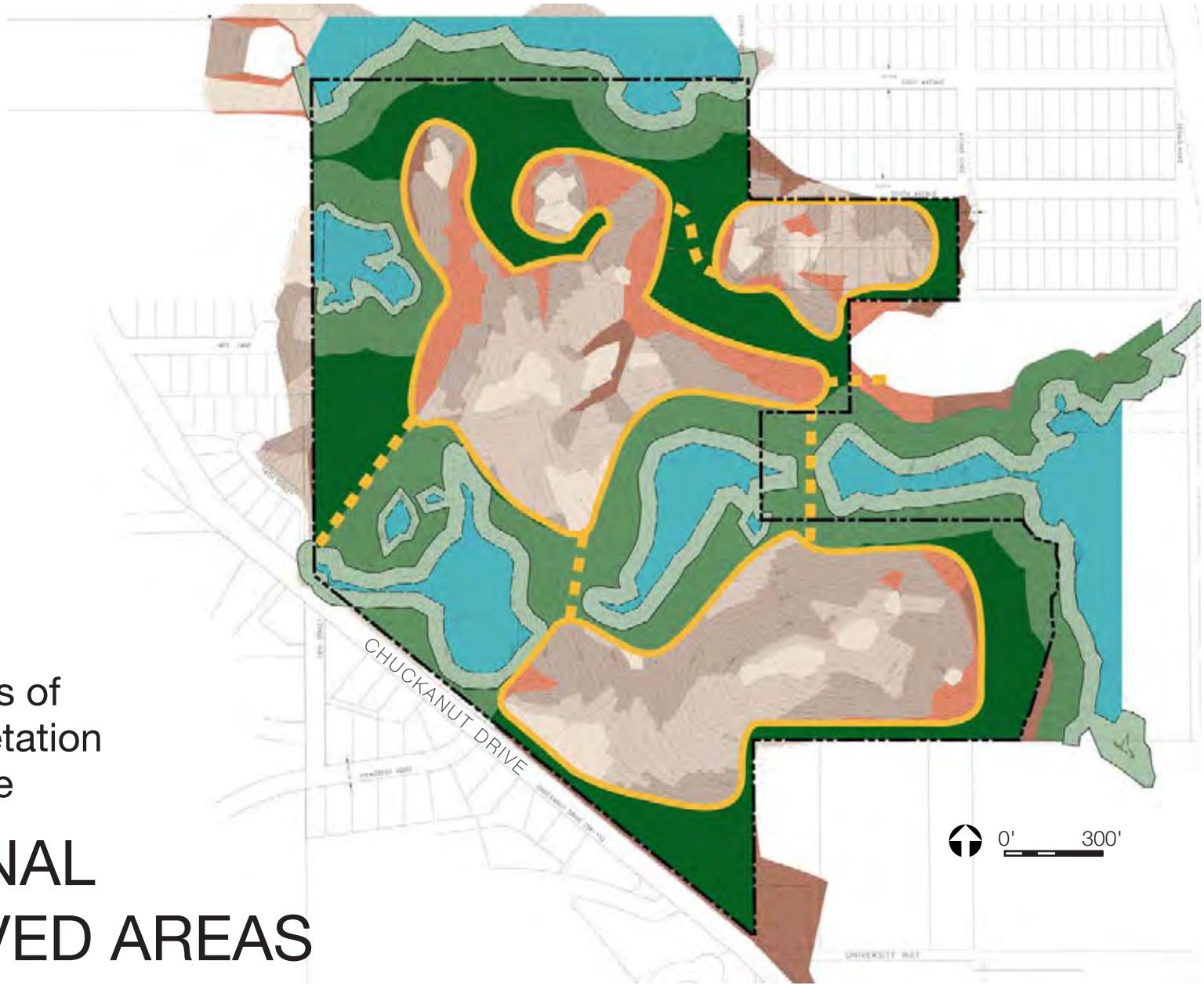
Areas of wetland re-establishment, wetland creation, and averaged and enhanced buffers

AREAS OF MITIGATION



Areas of increased wetland buffers

ENHANCED BUFFER AREAS

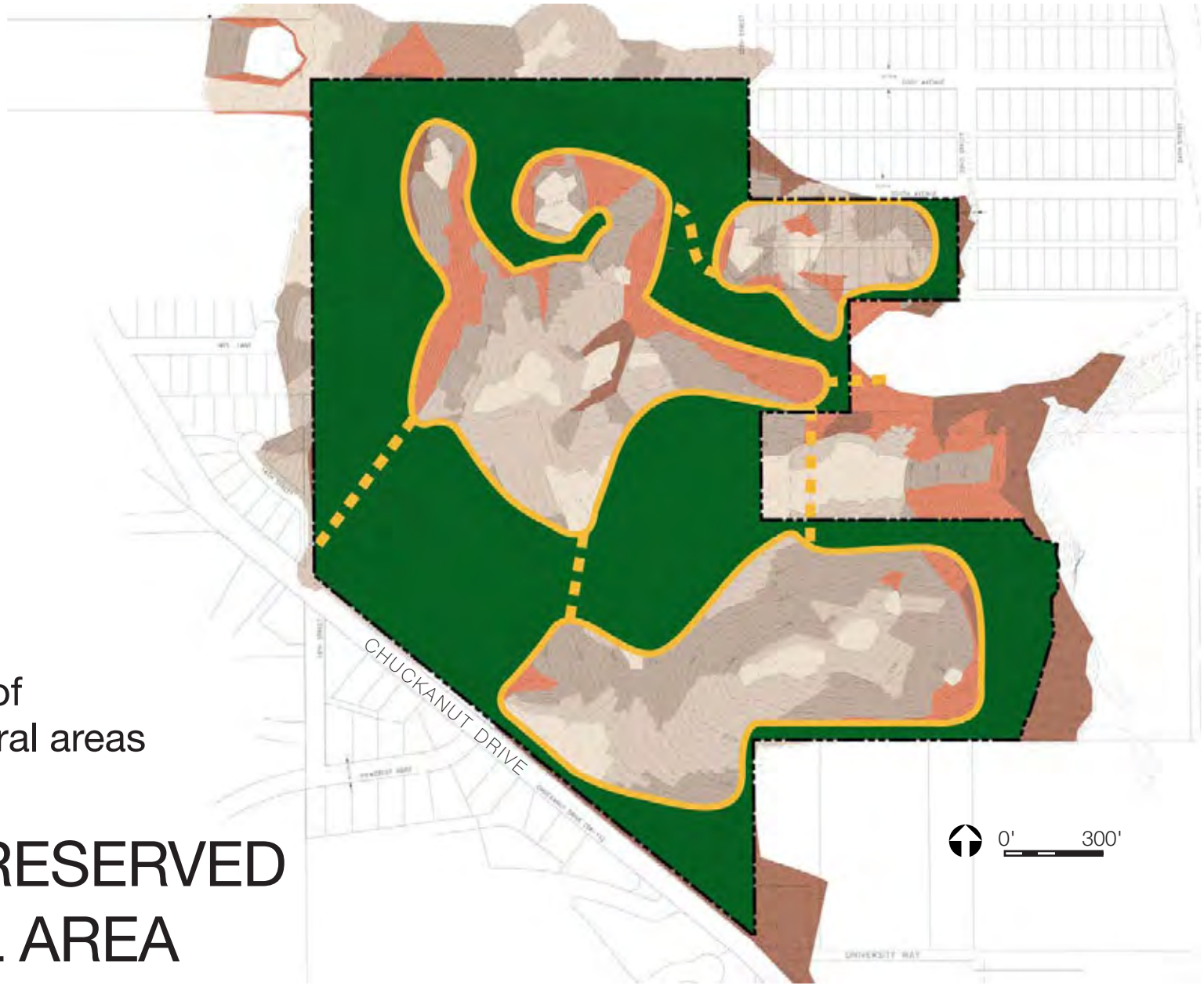


Additional areas of preserved vegetation and steep slope

ADDITIONAL PRESERVED AREAS

Over 40 acres of
preserved natural areas

TOTAL PRESERVED NATURAL AREA



COMMUNITY BUILDING

SINGLE FAMILY DETACHED
17 UNITS

SINGLE FAMILY ATTACHED
112 UNITS

LOW RISE MULTI FAMILY
TOWN HOMES OVER FLATS
166 UNITS

LOW RISE MULTI FAMILY
BACK TO BACK TOWN HOMES
74 UNITS

LOW RISE MULTI FAMILY
3 FLOORS STACKED FLATS
60 UNITS

4 FLOOR MULTI FAMILY
STACKED FLATS
210 UNITS

5 FLOOR MULTI FAMILY
STACKED FLATS
100 UNITS

739 UNITS

January 16, 2008

SITE PLAN

AN INTEGRATED DESIGN APPROACH

Geotechnical Engineering
- Sub-surface Flows
- Steep Slopes
- Infiltration Testing
- Grading Considerations

Wetland Studies
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- Parks, Greens, Streetscape Landscape

STORMWATER MANAGEMENT

Maintaining Wetland Hydrology

- Water Level Monitoring
- Fluctuation Analysis
- Matching 2 to 10 year storm frequencies and durations

Matching Pre and Post Developed Flow Frequencies and Durations

- Matching Flow Frequencies and Durations to Appropriate Watersheds

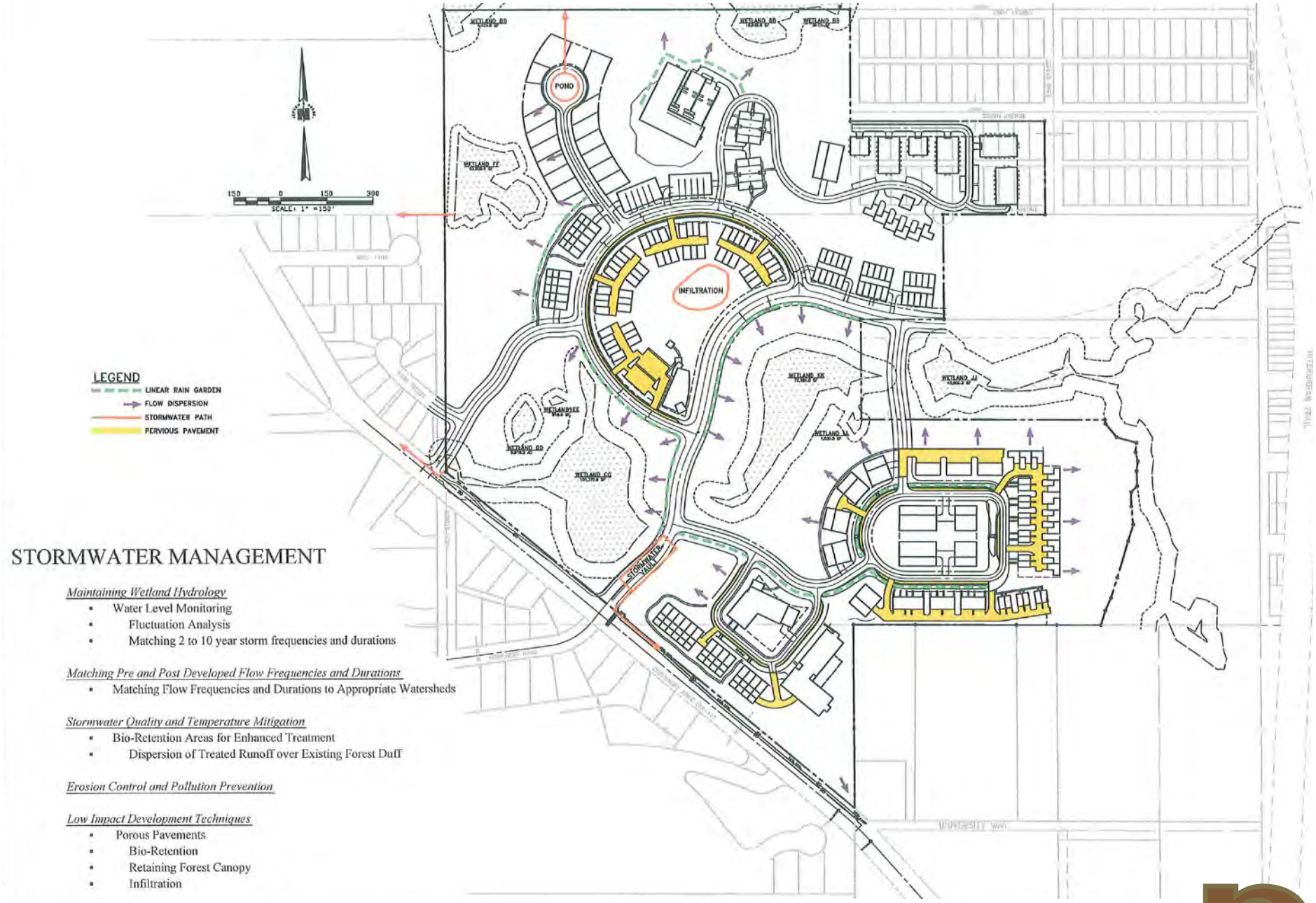
Stormwater Quality and Temperature Mitigation

- Bio-Retention Areas for Enhanced Treatment
- Dispersion of Treated Runoff over Existing Forest Duff

Erosion Control and Pollution Prevention

Low Impact Development Techniques

- Porous Pavements
- Bio-Retention
- Retaining Forest Canopy
- Infiltration



STORMWATER MANAGEMENT

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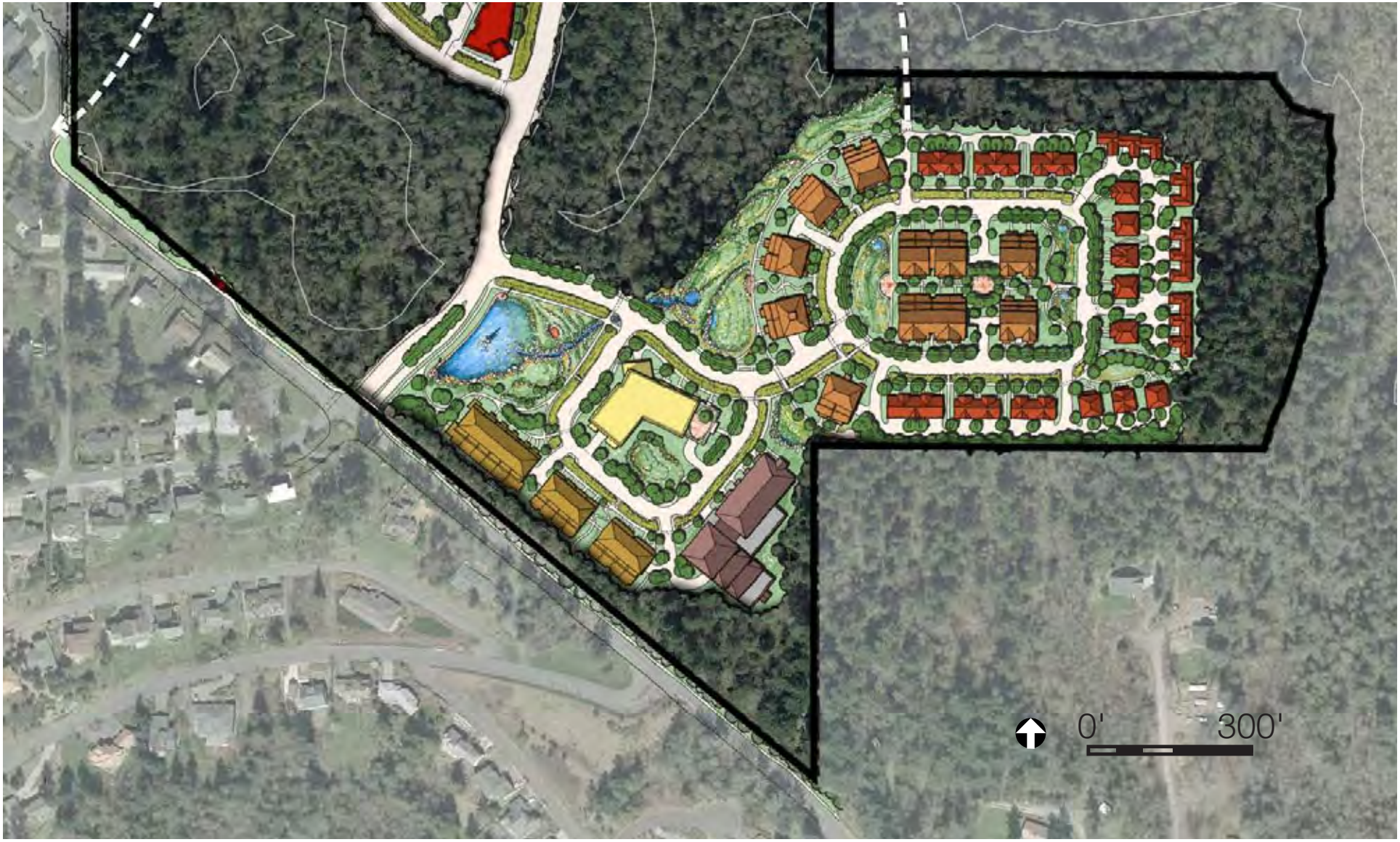
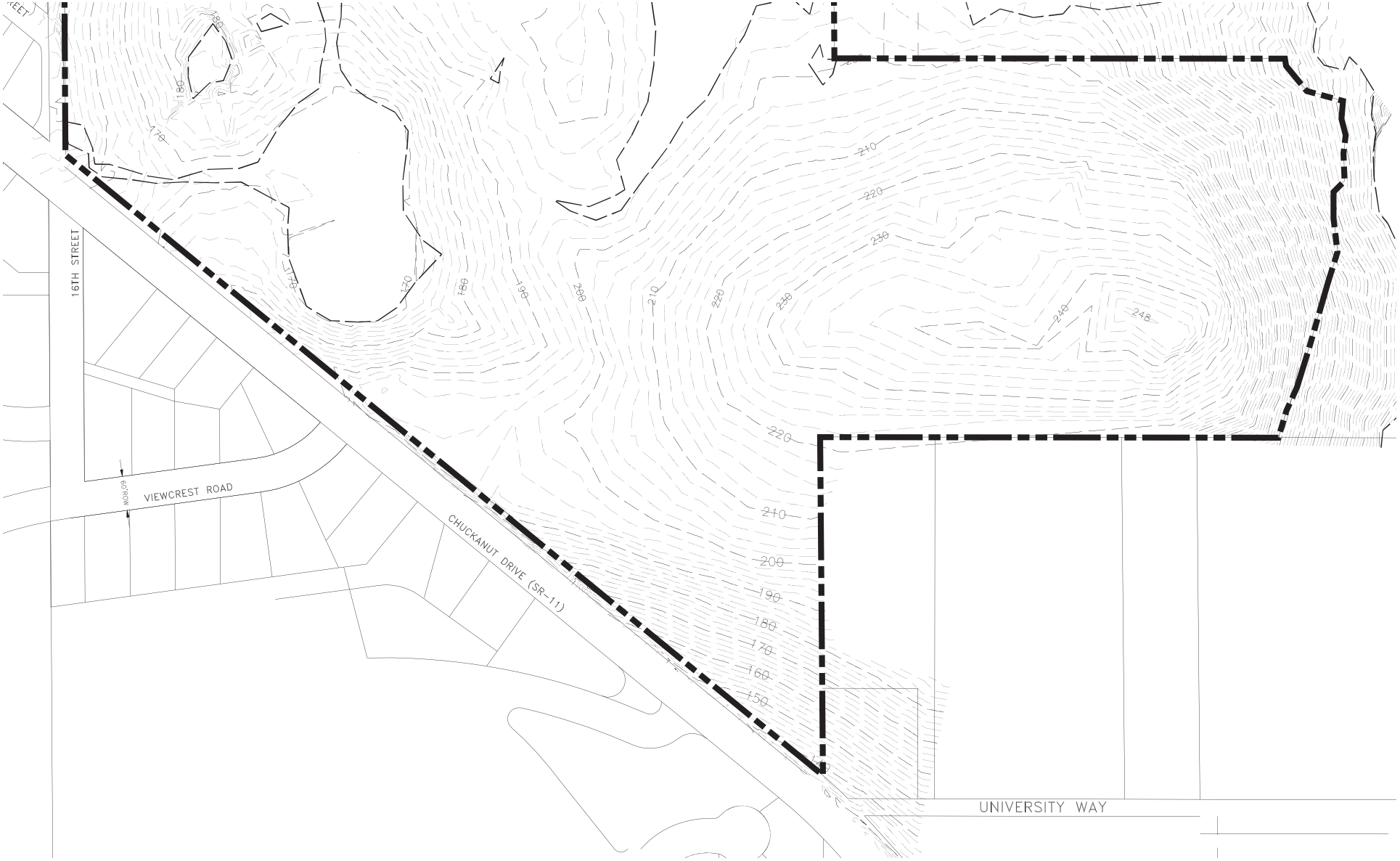
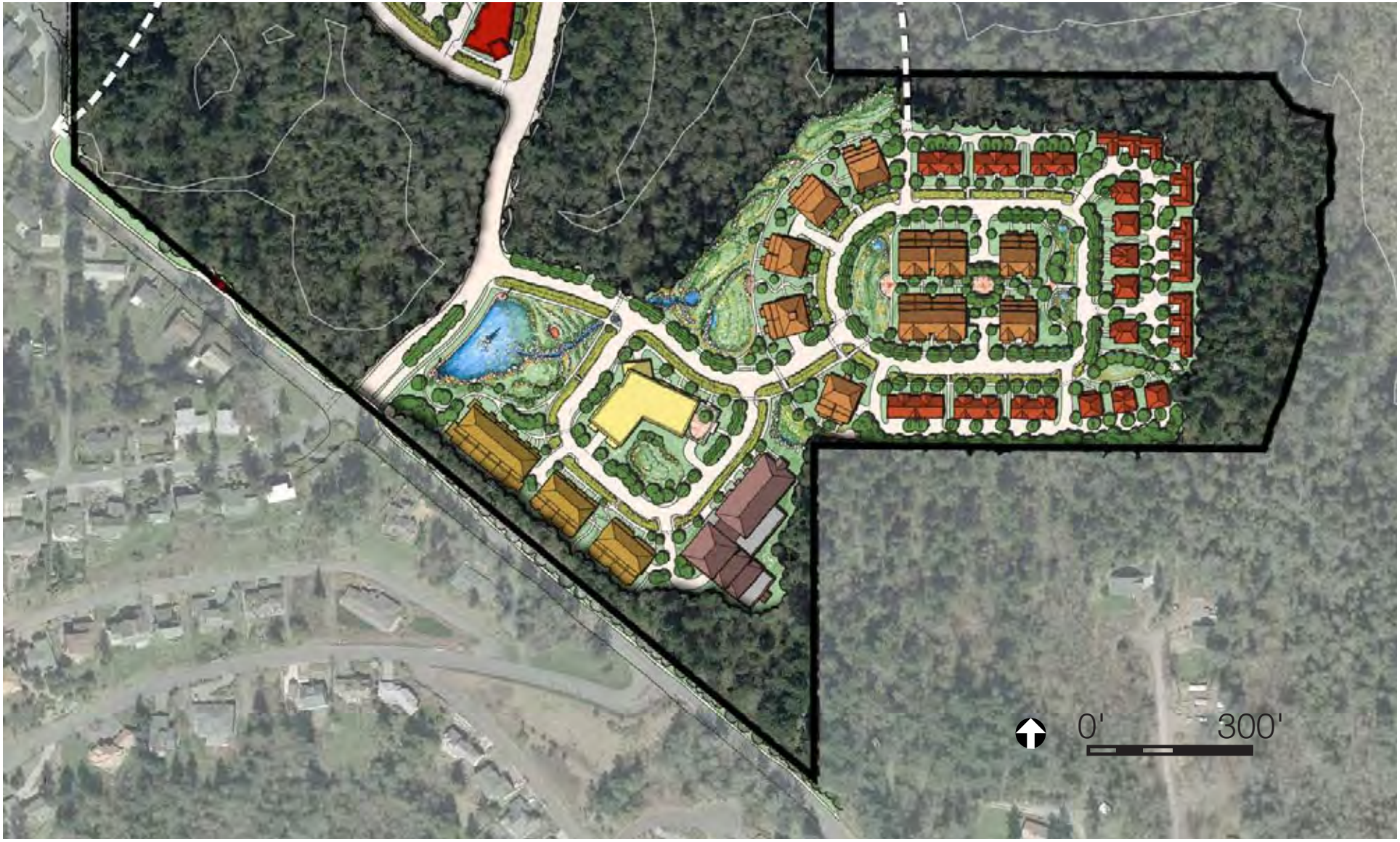


SITE PLAN—SOUTH SIDE



DETAIL OF TOPOGRAPHY



SITE PLAN—SOUTH SIDE

Low-impact storm water methods protect wetland hydrology

Photo Source: Urban Land Institute

Examples of GREEN INFRASTRUCTURE

Photo Source: Rain Garden Handbook / Washington State University except where noted.

MAIN ROAD SECTION

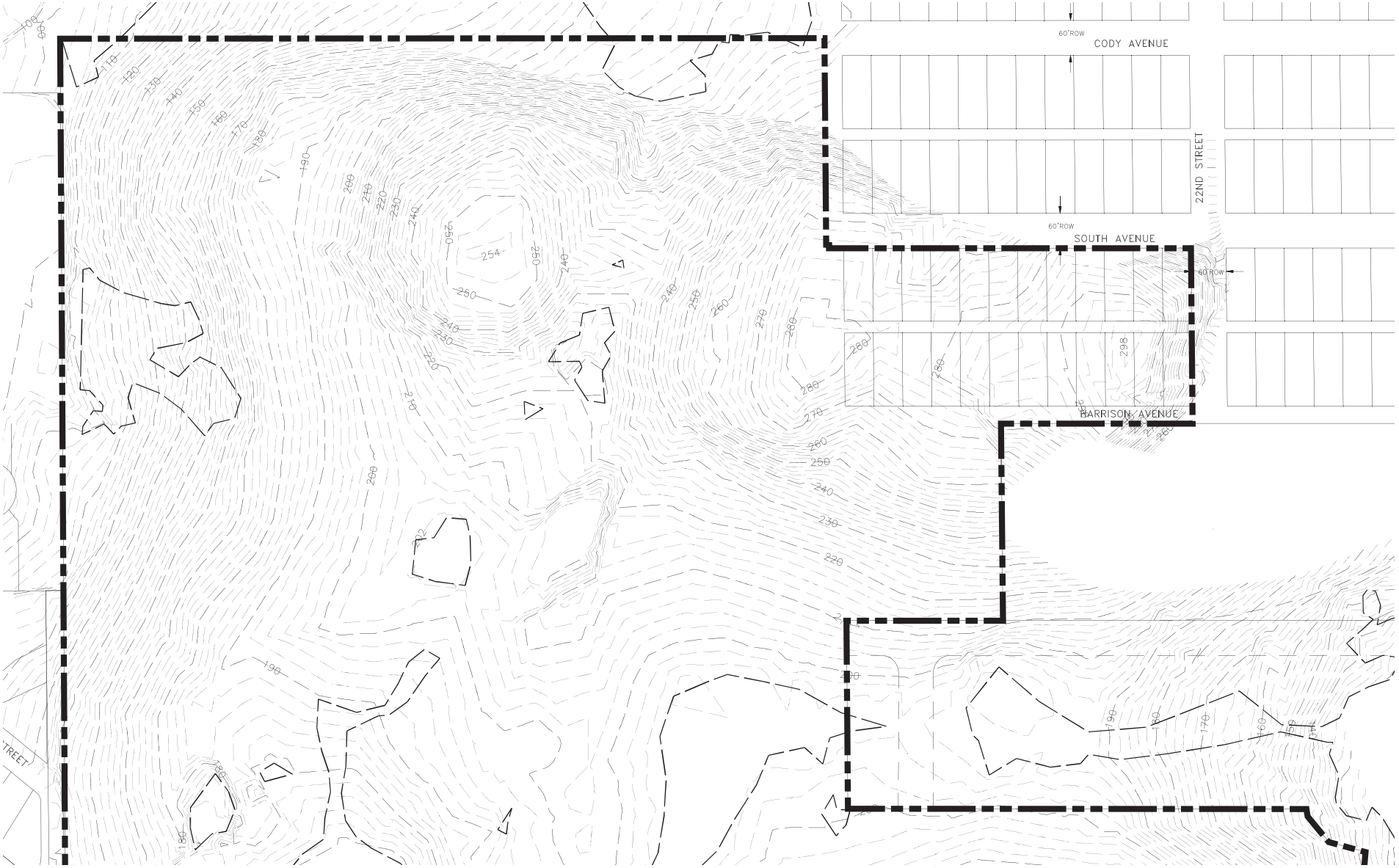
Proposed linear rain gardens along road clean and slow storm water runoff

ROAD 'A' SECTION

GREEN INFRASTRUCTURE

THE WATERSHED COMPANY

SITE PLAN—NORTH SIDE



DETAIL OF TOPOGRAPHY

SITE PLAN—NORTH SIDE

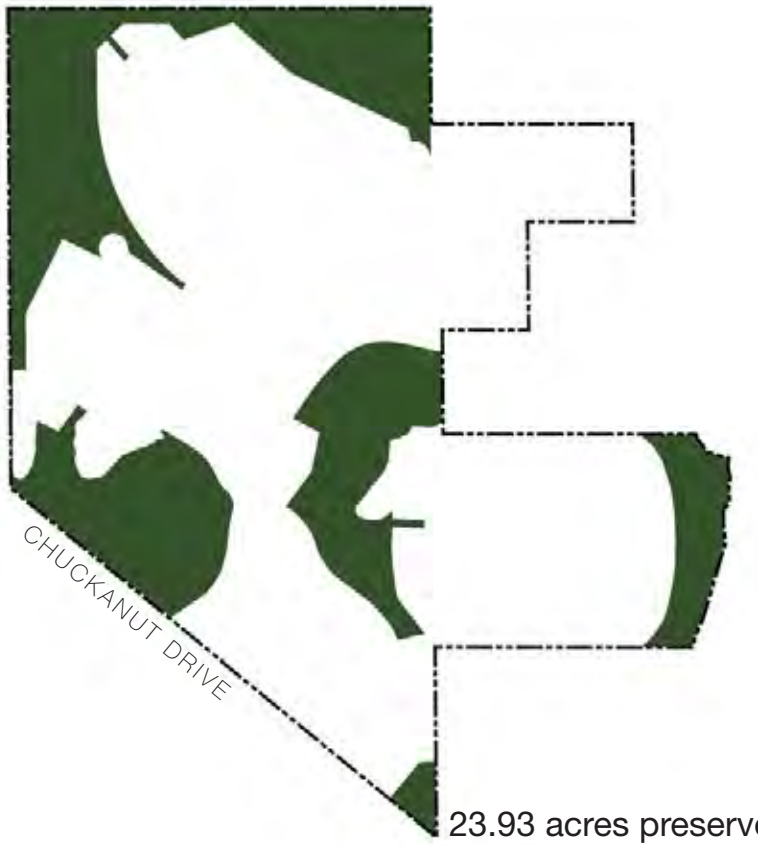
SITE PLAN APRIL 2005

April 2005 Plan

2008 Enhanced Buffer Plan

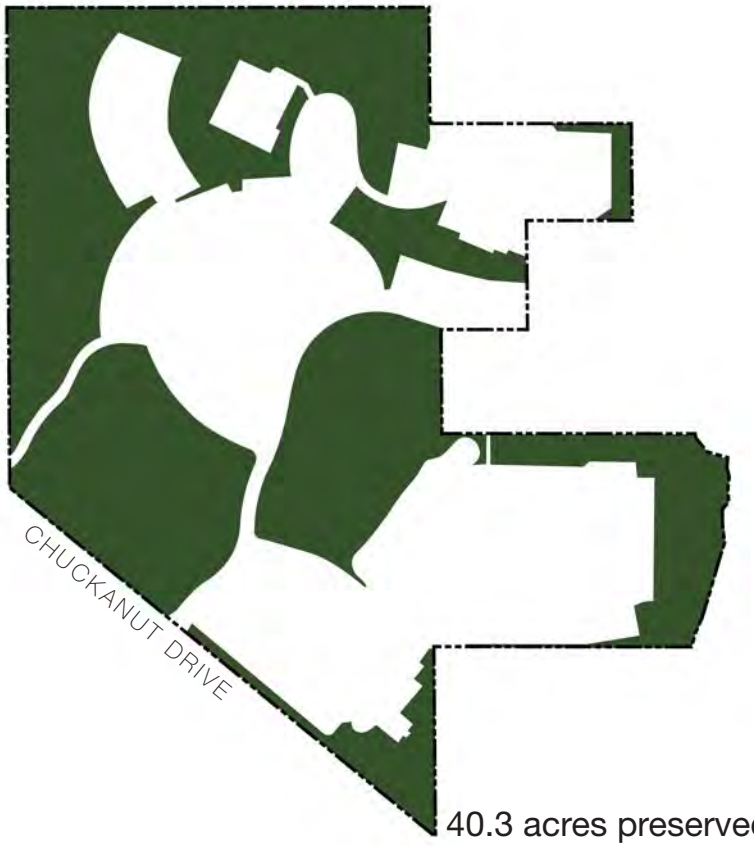
Comparison of the TWO PLANS

April 2005 Plan



23.93 acres preserved

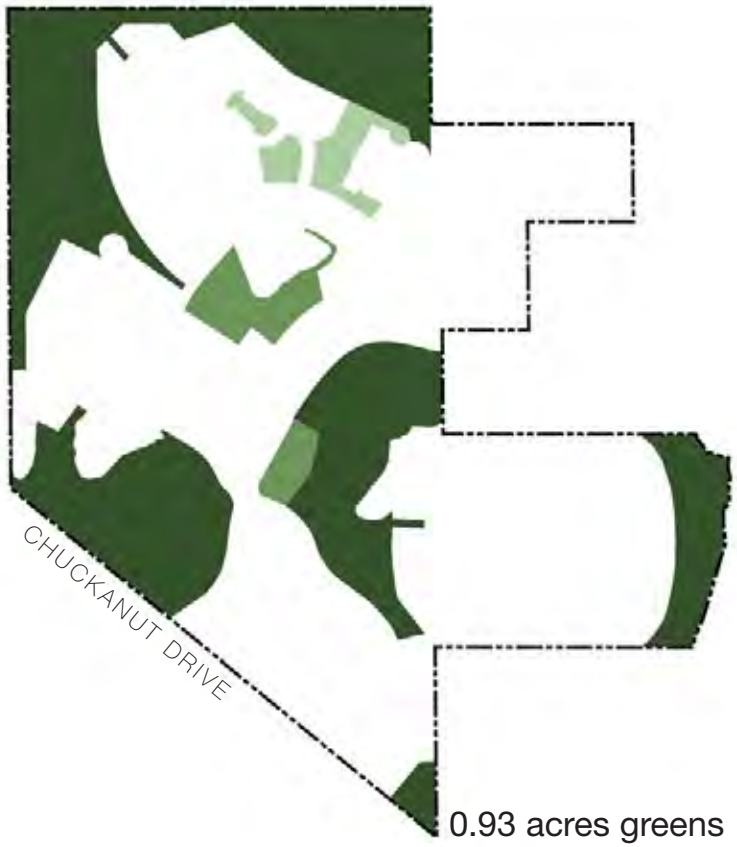
2008 Enhanced Buffer Plan



40.3 acres preserved

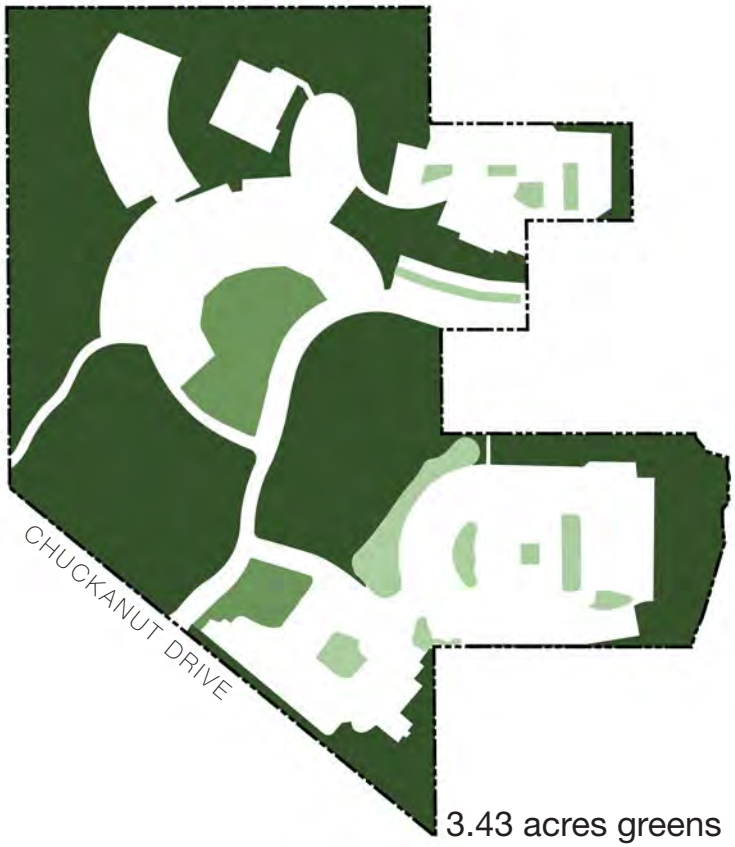
Comparison of PRESERVED AREAS

April 2005 Plan



0.93 acres greens

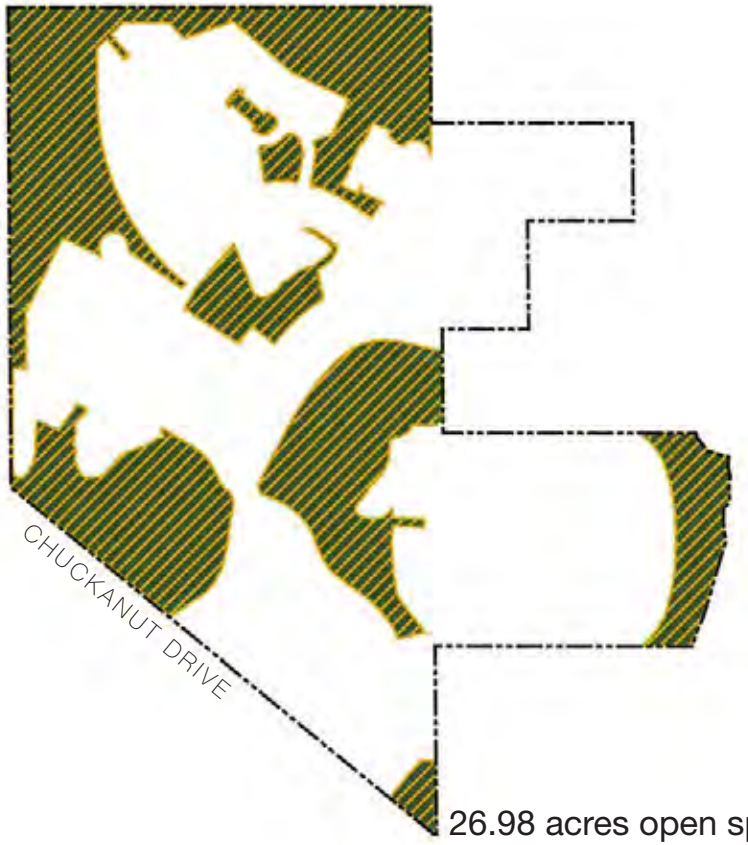
2008 Enhanced Buffer Plan



3.43 acres greens

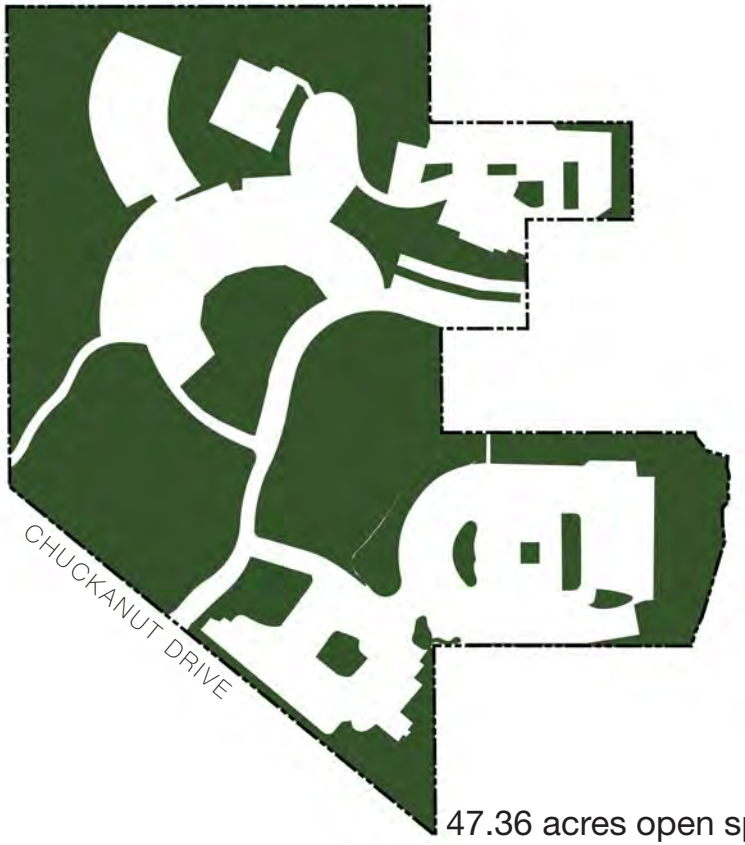
Comparison of GREENS + COURTYARDS

April 2005 Plan



26.98 acres open space

2008 Enhanced Buffer Plan



47.36 acres open space

Comparison of TOTAL OPEN SPACE

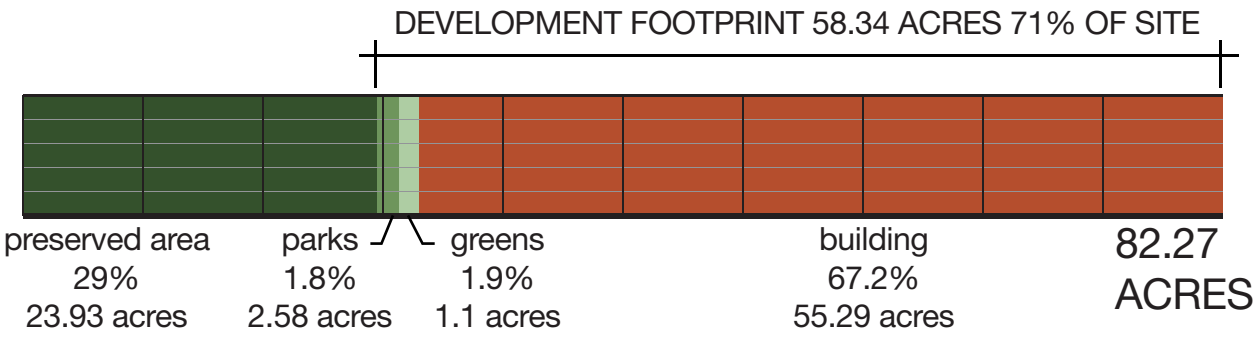
April 2005 Plan

2008 Enhanced Buffer Plan

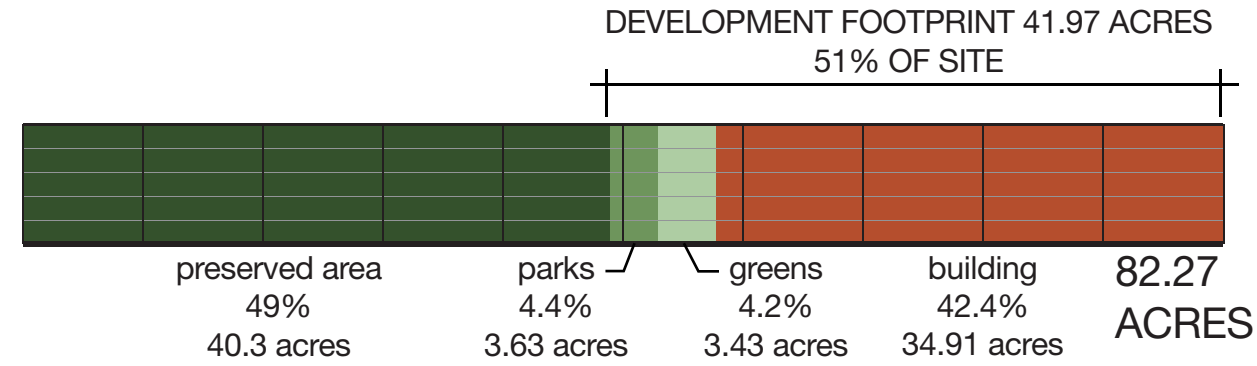
An additional 20.38 acres open space — almost 25%

Comparison of TOTAL OPEN SPACE

April 2005 Plan



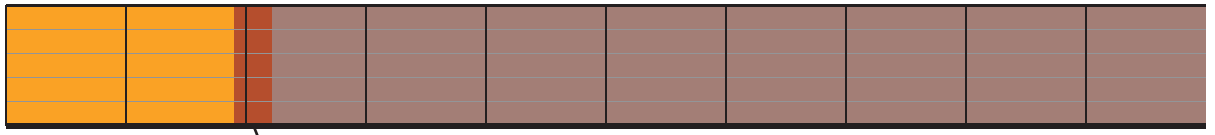
2008 Enhanced Buffer Plan



Comparison of
OPEN SPACE VS. BUILDING AREA

April 2005 Plan

BUILDING AREA 55.29 ACRES



single family detached
142 units
19.2%

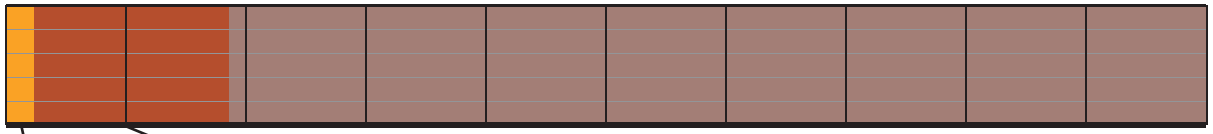
single family attached
24 units
3.3%

multi family
573 units
77.5%

739
UNITS

2008 Enhanced Buffer Plan

BUILDING AREA 34.91 ACRES



single family detached
17 units
2.3%

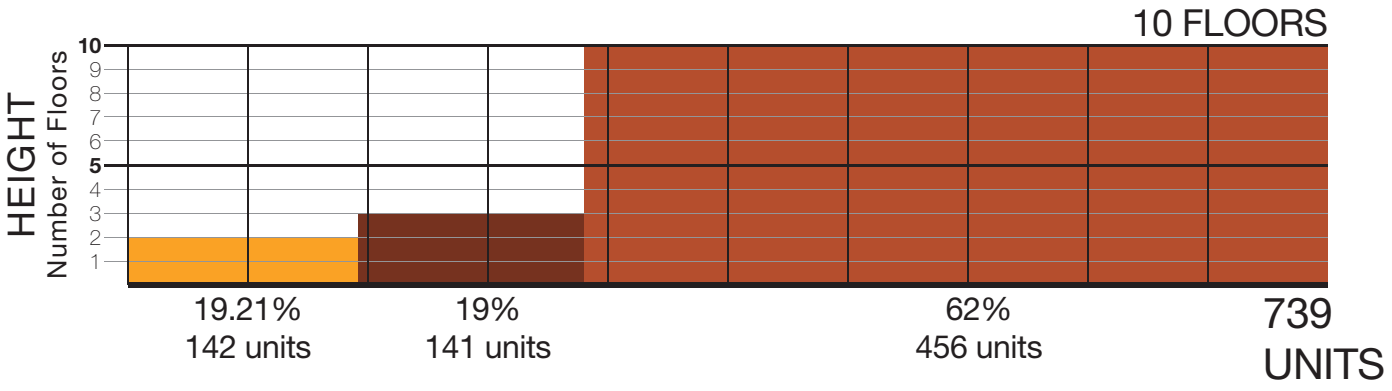
single family attached
112 units
15.2%

multi family
610 units
82.5%

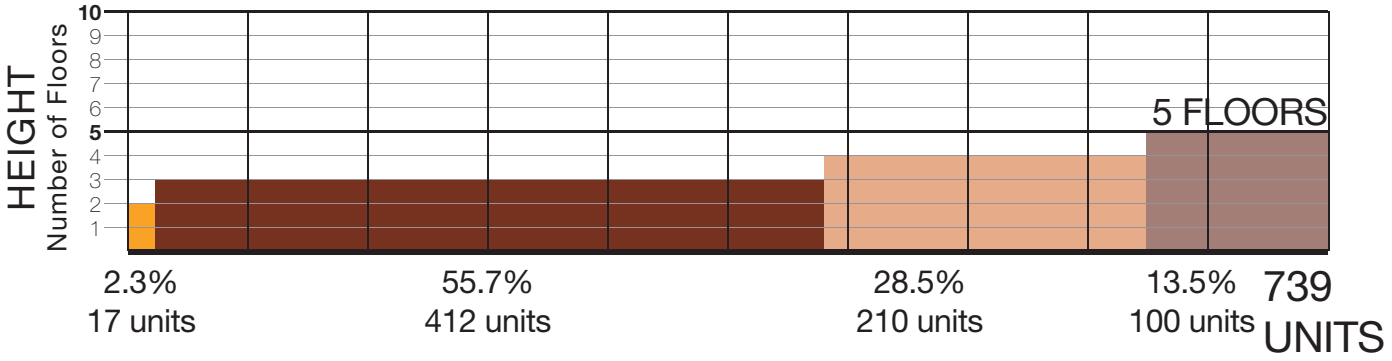
739
UNITS

Comparison of HOUSING MIX

April 2005 Plan



2008 Enhanced Buffer Plan



Comparison of BUILDING HEIGHT

Examples of
SINGLE FAMILY ATTACHED / DETACHED

Examples of
LOW RISE MULTI FAMILY

Examples of
MID RISE MULTI FAMILY

THE 2008 ENHANCED BUFFER PLAN PROVIDES:

1. Over 40 acres of preserved natural areas

2. Much greater wetland buffers and enhancements

3. Low-impact storm water management and protected wetland hydrology

4. Approximately seven acres of park areas and green space

5. Lower height of buildings

SUMMARY

COMMUNITY BUILDING

SINGLE FAMILY DETACHED
17 UNITS

SINGLE FAMILY ATTACHED
112 UNITS

LOW RISE MULTI FAMILY
TOWN HOMES OVER FLATS
166 UNITS

LOW RISE MULTI FAMILY
BACK TO BACK TOWN HOMES
74 UNITS

LOW RISE MULTI FAMILY
3 FLOORS STACKED FLATS
60 UNITS

4 FLOOR MULTI FAMILY
STACKED FLATS
210 UNITS

5 FLOOR MULTI FAMILY
STACKED FLATS
100 UNITS

739 UNITS

QUESTIONS?

THE SUSTAINABLE SITES INITIATIVE™

GUIDELINES AND PERFORMANCE BENCHMARKS

DRAFT 2008

American Society of Landscape Architects

Lady Bird Johnson Wildflower Center, University of Texas at Austin

United States Botanic Garden

Ecosystem Services

Ecosystem services are goods and services of direct or indirect benefit to humans that are produced by ecosystem processes involving the interaction of living elements, such as vegetation and soil organisms, and non-living elements, such as bedrock, water, and air.

Various researchers have come up with a number of lists of these benefits, each with slightly different wording, some lists slightly longer than others. For the purpose of developing performance criteria for practices that will protect or regenerate these benefits, the members of the Sustainable Sites Technical Subcommittees and staff have reviewed and consolidated the research into the list below of services provided by natural ecosystems. The goal of a sustainable site is to protect, restore, and enhance such ecosystem services wherever possible through sustainable land development and management practices.

1. **Global climate regulation**
   Maintaining balance of atmospheric gases at historic levels, creating breathable air, and sequestering greenhouse gases
2. **Local climate regulation**
   Regulating local temperature, precipitation, and humidity through shading, evapotranspiration, and windbreaks
3. **Air and water cleansing**
   Removing and reducing pollutants in air and water
4. **Water supply and regulation**
   Storing and providing water within watersheds and aquifers
5. **Erosion and sediment control**
   Retaining soil within an ecosystem, preventing damage from erosion and siltation
6. **Hazard mitigation**
   Reducing vulnerability to damage from flooding, storm surge, wildfire, and drought
7. **Pollination**
   Providing pollinator species for reproduction of crops or other plants
8. **Habitat functions**
   Providing refuge and reproduction habitat to plants and animals, thereby contributing to conservation of biological and genetic diversity and evolutionary processes
9. **Waste decomposition and treatment**
   Breaking down waste and cycling nutrients
10. **Human health and well-being benefits**
    Enhancing physical, mental, and social well-being as a result of interaction with nature
11. **Food and renewable non-food products**
    Producing food, fuel, energy, medicine, or other products for human use
12. **Cultural benefits**
    Enhancing cultural, educational, aesthetic, and spiritual experiences as a result of interaction with nature

respective flowers and promote the growth of myriad plants and crops. Healthy wetlands protect against floods. Soils and vegetation purify stormwater seeping through to groundwater and underground aquifers.

All of these services take place in functioning ecosystems whether anyone is paying attention or not. And because these services occur largely in the background, governments and businesses don't include them in their conventional cost