SITE ANALYSIS: USING IT TO INFORM SITE DESIGN
WSU LID TECHNICAL WORKSHOP

May 21, 2013
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
PLANT ASSOCIATIONS
SLOPE
RECREATION
URBAN SUITABILITY
### Mchargian Site Analysis — Compatibility

<table>
<thead>
<tr>
<th>Urban</th>
<th>Suburban Residential</th>
<th>Industrial</th>
<th>Institutional</th>
<th>Mixing</th>
<th>Quarrying</th>
<th>Recreation Settlement</th>
<th>Agriculture</th>
<th>Forestry</th>
<th>Recreation</th>
<th>Water Management</th>
<th>Natural Determinants</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
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- **Compatibility Levels:**
  - Incompatible
  - Low Compatibility
  - Medium Compatibility
  - Full Compatibility

**Legend:**
- **Rain:** Poor
- **Soil:** Fair
- **Vegetation:** Full Compatibility
An Evolving Plan

FAIRHAVEN HIGHLANDS
BELLINGHAM, WA

EIS Scoping Meeting
January 16, 2008

EXAMPLES OF USING THE SITE TO DESIGN
EXISTING CONDITIONS
VIEW SOUTH ON CHUCKANUT DRIVE
VIEW NORTH ON CHUCKANUT DRIVE
VIEW ACROSS STREET
VIEW SOUTH OF DEVELOPMENT
NEW COMMUNITIES WEST OF SITE
VIEW WEST
NORTH OF SITE
SITE—TRAILS
SITE — FORMER GRAVEL PIT
SITE — TRAILS THROUGH 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
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
January 16, 2008
SITE PLAN

739 UNITS

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

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AN INTEGRATED DESIGN APPROACH

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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

Low Impact Development Techniques
- Porous Pavements
- Bio-Retention
- Retaining Forest Canopy
- Infiltration

Stormwater Quality and Temperature Mitigation
- Bio-Retention Areas for Enhanced Treatment
- Dispersion of Treated Runoff over Existing Forest Duff

Erosion Control and Pollution Prevention
STORMWATER MANAGEMENT

Mitigation/Prevented Flooding:
- Water Level Monitoring
- Flooding 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:
- Forest Paving
- Bio-Retention
- Retaining Forest Canopy
- Infiltration
DETAIL OF TOPOGRAPHY
Examples of GREEN INFRASTRUCTURE

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

Low-impact storm water methods protect wetland hydrology
Proposed linear rain gardens along road clean and slow storm water runoff

GREEN INFRASTRUCTURE
SITE PLAN—NORTH SIDE
DETAIL OF TOPOGRAPHY
Comparison of the TWO PLANS

April 2005 Plan

2008 Enhanced Buffer Plan
Comparison of PRESERVED AREAS

April 2005 Plan

23.93 acres preserved

2008 Enhanced Buffer Plan

40.3 acres preserved
Comparison of 
GREENS + COURTYARDS
Comparison of TOTAL OPEN SPACE

April 2005 Plan

26.98 acres open space

2008 Enhanced Buffer Plan

47.36 acres open space
An additional 20.38 acres open space — almost 25%

Comparison of TOTAL OPEN SPACE
April 2005 Plan

DEVELOPMENT FOOTPRINT 58.34 ACRES 71% OF SITE

- preserved area: 29% (23.93 acres)
- parks: 1.8% (2.58 acres)
- greens: 1.9% (1.1 acres)
- building: 67.2% (55.29 acres)

2008 Enhanced Buffer Plan

DEVELOPMENT FOOTPRINT 41.97 ACRES 51% OF SITE

- preserved area: 49% (40.3 acres)
- parks: 4.4% (3.63 acres)
- greens: 4.2% (3.43 acres)
- building: 42.4% (34.91 acres)

Comparison of OPEN SPACE VS. BUILDING AREA
April 2005 Plan

- Single family detached: 142 units (19.2%)
- Single family attached: 24 units (3.3%)
- Multi family: 573 units (77.5%)

Total units: 739
Building area: 55.29 acres

2008 Enhanced Buffer Plan

- Single family detached: 17 units (2.3%)
- Single family attached: 112 units (15.2%)
- Multi family: 610 units (82.5%)

Total units: 739
Building area: 34.91 acres

Comparison of Housing Mix

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Comparison of BUILDING HEIGHT

April 2005 Plan

- 19.21%: 142 units (6 floors)
- 19%: 141 units (5 floors)
- 62%: 456 units (10 floors)

Total: 739 units

2008 Enhanced Buffer Plan

- 2.3%: 17 units (1 floor)
- 55.7%: 412 units (5 floors)
- 28.5%: 210 units (6 floors)
- 13.5%: 100 units (5 floors)

Total: 739 units

Comparison of WSU LID TECHNICAL WORKSHOP | FAIRHAVEN HIGHLANDS
Examples of SINGLE FAMILY ATTACHED / DETACHED
Examples of LOW RISE MULTI FAMILY
Examples of MID RISE MULTI FAMILY

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05.21.13 79
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
QUESTIONS?
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

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...
How would a butterfly inspire your next design?

Butterflies exhibit vibrant colors and stay clean using nano-scale structures on their wings. Designers and engineers have emulated this strategy to create self-cleaning coatings, fabrics and paints, and electronic display screens. AskNature can help you solve your design challenges.

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