

REQUIRED

| | | |
|---|--------------------|---------------|
| Total Site Area | 32.39 | Acres |
| Existing Impervious | 24.03 | Percent |
| New Impervious | 2.65 | 0.10 |
| Total Impervious | 27.28 | |
| Unmanaged open space | 0 | |
| New managed open space | 5.11 | |
| Total Open space | 5.11 | |
| Unmanaged open space allocated to existing impervious | 0.00 | |
| Managed open space allocated to existing impervious | 4.61 | |
| Unmanaged open space allocated to new impervious | 0.00 | |
| Managed open space allocated to new impervious | 0.50 | |
| | 5.11 | |
| N Annual Load | existing developed | new developed |
| N load from unmanaged open space @ 0.6 lbs/ac/yr | 0.00 | 0.00 lbs/yr |
| N load from managed open space @ 1.2 lbs/ac/yr | 5.94 | 0.50 lbs/yr |
| N load from impervious area @ 21.2 lbs/ac/yr | 522.16 | 56.18 lbs/yr |
| | 527.69 | 56.78 lbs/yr |
| "site expansion" area | 3.15 | acres |
| N Loading Rate = Annual load / site expansion area | 18.04 | lbs/ac/yr |
| Initial Target | 10.00 | lbs/ac/yr |
| Amount controlled by BMP | 8.04 | lbs/ac/yr |
| Final Target | 3.60 | lbs/ac/yr |
| Remaining N | 6.40 | lbs/ac/yr |
| Offset Payment | \$6,645.17 | |
| SITE SUMMARY | | |
| Total Site Area | 32.39 | acres |
| Actual Load from Site | 594.47 | lbs/yr |
| Loading Rate | 18.04 | lbs/ac/yr |
| Annual N load that must be treated by BMP | 25.31 | lbs/yr |

BMP DESIGN

| DRAINAGE AREA #1 - Bioretention | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
|---|---------------------|---------------------------------|------------------------|
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0.29 | 1.2 | 0.348 |
| Impervious Area | 0.78 | 21.2 | 16.536 |
| TOTAL | 1.07 | 23 | 16.884 |
| BMP removal efficiency | 35.00% | Bioretention | |
| N Load = Export / Area | 15.78 lbs/ac/yr | | |
| Amount controlled by BMP | 5.52 lbs/ac/yr | | |
| N Load controlled by BMP | 5.91 lbs/yr | | |
| DRAINAGE AREA #3 - Bioretention | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0 | 1.2 | 0 |
| Impervious Area | 0.85 | 21.2 | 18.02 |
| TOTAL | 0.85 | 23 | 18.02 |
| BMP removal efficiency | 35.00% | Bioretention | |
| N Load = Export / Area | 21.20 lbs/ac/yr | | |
| Amount controlled by BMP | 7.42 lbs/ac/yr | | |
| N Load controlled by BMP | 6.31 lbs/yr | | |
| DRAINAGE AREA #4 - Bioretention | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0 | 1.2 | 0 |
| Impervious Area | 0.33 | 21.2 | 6.996 |
| TOTAL | 0.33 | 23 | 6.996 |
| BMP removal efficiency | 35.00% | Bioretention | |
| N Load = Export / Area | 21.20 lbs/ac/yr | | |
| Amount controlled by BMP | 7.42 lbs/ac/yr | | |
| N Load controlled by BMP | 2.45 lbs/yr | | |
| DRAINAGE AREA #5 - Grassed Swale #1 | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0 | 1.2 | 0 |
| Impervious Area | 0.58 | 21.2 | 11.66 |
| TOTAL | 0.58 | 23 | 11.66 |
| BMP removal efficiency | 20.00% | Grassed Swale | |
| DRAINAGE AREA #6 - Grassed Swale #2 | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0 | 1.2 | 0 |
| Impervious Area | 0.75 | 21.2 | 15.9 |
| TOTAL | 0.75 | 23 | 15.9 |
| BMP removal efficiency | 20.00% | Grassed Swale | |
| N Load = Export / Area | 21.20 lbs/ac/yr | | |
| Amount controlled by BMP | 4.24 lbs/ac/yr | | |
| N Load controlled by BMP | 3.18 lbs/yr | | |
| DRAINAGE AREA #7 - Sand Filter #1 | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0 | 1.2 | 0 |
| Impervious Area | 0.58 | 21.2 | 11.66 |
| TOTAL | 0.58 | 23 | 11.66 |
| BMP removal efficiency | 35.00% | Sand Filter | |
| N Load = Export / Area | 21.20 lbs/ac/yr | | |
| Amount controlled by BMP | 7.42 lbs/ac/yr | | |
| N Load controlled by BMP | 4.08 lbs/yr | | |
| DRAINAGE AREA #8 - Sand Filter #2 | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Undisturbed open space (forest, unowned meadow) | 0 | 0.6 | 0 |
| Managed open space (grass, landscaping, etc.) | 0 | 1.2 | 0 |
| Impervious Area | 0.75 | 21.2 | 15.9 |
| TOTAL | 0.75 | 23 | 15.9 |
| BMP removal efficiency | 35.00% | Sand Filter | |
| N Load = Export / Area | 21.20 lbs/ac/yr | | |
| Amount controlled by BMP | 7.42 lbs/ac/yr | | |
| N Load controlled by BMP | 5.57 lbs/yr | | |
| SUMMARY | | | |
| Total Area (area #1 through area #8) | 4.85 | acres | |
| Total Nitrogen Load (area #1 through #8) | 87.02 | lbs/yr | |
| Nitrogen Treated by BMPs | 29.82 | lbs/yr | |
| Cumulative removal efficiency | 31% | | |

AS - BUILT

| | |
|---|-----------------------|
| Nitrogen Load from New Development | 56.78 lbs/yr |
| Minimum annual N load that must be treated by BMP | 25.31 lbs/yr |
| Maximum annual N load that must be treated by BMP | 45.45 lbs/yr |
| Annual N load that must be treated by BMP | 25.31 lbs/yr |
| Removal efficiency | 44.58% percent |
| 1) If efficiency is much less than 25%, but a BMP is required, consider installing a BMP to treat a larger area and reduce the required payment | |
| 2) If the efficiency is much greater than 25%, consider installing a BMP to treat a larger area to avoid placing BMPs in series | |
| BMP treatment area | 4.85 acres |
| Nitrogen load from BMP treatment area | 87.02 lbs/yr |
| Removal efficiency | 31% percent |
| Actual N load removed | 30.88 lbs/yr |
| Remaining N load from new development | 25.70 lbs/yr |
| "site expansion" area | 3.15 acres |
| N Loading Rate = Annual load / site expansion area | 18.04 lbs/ac/yr |
| Initial Target | 10.00 lbs/ac/yr |
| N remaining after treatment | 8.48 lbs/ac/yr |
| Final Target | 3.60 lbs/ac/yr |
| Remaining N to offset | 4.89 lbs/ac/yr |
| Offset Payment | \$5,072.97 |
| Cumulative Nitrogen removed by BMPs | 9.88 lbs/ac/yr |

6-11-2007

Steven M. Rice DATE
PROFESSIONAL ENGINEER

Waverly Place Redevelopment

IN
Town of Cary North Carolina
Wake County
PROPOSED NITROGEN LOADING CALCULATIONS

JUNE 11, 2007

WORKSHEET

| Waverly Place Redevelopment | Pre-development Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
|---|------------------------------|---------------------------------|------------------------|
| Type of Land Cover | | | |
| Unmanaged open space (forest, unowned meadow) | 0.00 | 0.60 | 0.00 |
| Managed open space (grass, landscaping, etc.) | 7.75 | 1.20 | 9.31 |
| Impervious Area incl. RW | 24.63 | 21.20 | 522.16 |
| TOTAL | 32.39 | 23.00 | 531.47 |
| N Load = Export / Area | 16.41 | | |
| Post-development Area | Area (acres) | Export Coeff (lbs/ac/yr) | Export (lbs/yr) |
| Type of Land Cover | | | |
| Unmanaged open space (forest, unowned meadow) | 0.00 | 0.60 | 0.00 |
| Managed open space (grass, landscaping, etc.) | 5.11 | 1.20 | 6.13 |
| Impervious Area incl RW | 27.28 | 21.20 | 578.34 |
| TOTAL | 32.39 | 23.00 | 584.47 |
| Calculated site expansion area | 3.15 ac | | |
| N Load = Export / Area | 18.04 lbs/ac/yr | | |
| Initial Target | 10.00 lbs/ac/yr | | |
| Amount controlled by BMP | 9.58 lbs/ac/yr | | |
| Final Target | 3.60 lbs/ac/yr | | |
| Remaining N | 4.89 lbs/ac/yr | | |
| Offset Payment | \$5,072.96 | | |
| Net Change in on-site N load (post-dev less pre-dev less removal) | 22.99 lbs/yr | | |

| NO. | DATE | DESC. |
|-----|----------|---------------------|
| 1 | 10-30-06 | 1ST MUSB SUBMISSION |
| 2 | 3-8-07 | 2ND MUSB SUBMISSION |
| 3 | 4-2-07 | 3RD MUSB SUBMISSION |
| 4 | 5-1-07 | 4TH MUSB SUBMISSION |
| 5 | 6-11-07 | 5TH MUSB SUBMISSION |

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

PREPARED FOR:
Zopolski + Rudd, LLC
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Durham, North Carolina 27701

BSC RICE
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Raleigh, North Carolina
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919-854-0811

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APPROVED BY: DRG DATE: 05-11-07
PLANNING: JBS DATE: 06-19-07
ENGINEERING: TS DATE: 6-22-07

FILE:
DWG. NO: C.3.2 SHEET 10 OF 30
JOB. NO: 06017.00