#### Case Study City of Raleigh Transit Operations Facility



Presented by:

#### **David Eatman**

Transit Administrator, City of Raleigh





## **Project Overview**







- 23 Acre Project Site
- 200 Bus Capacity / 90,500 Square Feet
- Design-Build Project Delivery
- \$24.5 Million Project Cost
- APWA 2012 Project of the Year
- LEED Platinum Achieved



#### **Process Overview**











**Initial Planning** 

**Completion of Bridging Documents** 65% Design 100% Site Civil Design & Permits

Selection Design Build Team

Notice to Proceed Site Construction



**Project Utilization** 



**Building Construction** 





**Building Permits** and Acceptance of Construction Drawings

- 25 month Process from Start of Design thru Utilization
  Effective Quality and Cost Control
  State of The Art Facility

### **Initial Planning**





Identify Need and Budget





Transportation & Infrastructure

ARCHITECTS, PA

BRASFIE

**Funding Sources Federal Requirements** 

**Community Out Reach** Start Rezoning



Design Build Approval

The Right Team for Success... WSP · SELLS WILLIARD FERM Selection of Initial **Design Team** 

- 4 Month Process
- Unanimous Community Support
  89% Funding Participation from Outside Sources

#### **Integrated Programming**



SEL







**Design Charrette** 

Site Constraints

**Equipment Inventory** and Selection

- 4 Week processIntensive User ParticipationSchedule and Cost Control

#### Integrated Design Strategies







- Identify Site Constraints, before planning charrette
  Develop "working envelope"
  Partnership with Regulatory Agencies early on

# Integrated Design Strategies willing the second sec



BRASFIELD

Grading ConcernsBalanced SiteGrading Scenarios as Charrette progressed

#### **Integrated Design Charrette**







- 5 Day Design Charrette
  End User Participation/Design Reviews
  Community Participation

#### **Integrated Development**





- 3 Dimensional Development of Design Utilizing BIM
  Site and Buildings Developed Simultaneous
  Continues Cost Feed Back to Control Budget





- Tiered Site to Provide Separation, Security, and Minimize Impact on Neighborhood Properties
  Three Dimensional Site Analysis to Provide Balanced Cut/Fill on Site
  Use of AutoTURN Software to Verify Vehicular Turning Radiuses

## **Bridging Documents**



WSP · SEL



- 65% Design with Full Length Specifications
  100% Civil Design with Site Permits
  Complete Material and Equipment Selection

### **Bridging Documents**





IARD FERM SP-SELL





- Sustainable Requirements
  100% Civil Design with Site Permits
  Complete Material and Equipment Selection





#### Safety:

- Partnered with OSHA/NCDOL
- Extensive pre-planning

#### Cost:

- Bonding
- D/B Packages
- Lien waivers

#### Quality:

- Running Completion List
- Weekly walks by Owner, Designers

#### Schedule:

- In-house
- Aggressive front end





Site subcontractor went out of business.Overcame winter of '09/'10

Zero litigation, On-Time Turnover

#### **Other Requirements**



IARD FERM SP-SELLS

LEED for New Construction v2.2

Registered Project Checklist





**FTA Buy America** 



**Certified Payroll** 

ARRA Reporting

| BRASFIELD                                    | Transit Operation Facility - DBE/MWBE Log | 10 have not | 31-May-11                   |  |            |                                 |   |  |                      |       |                         |          |   |                          |                     |       |                      |             |
|--|---|-------------|-----------------------------|--|------------|---------------------------------|---|--|----------------------|-------|-------------------------|----------|---|--------------------------|---------------------|-------|----------------------|-------------|
| C annu menerum                               |   |             |                             |  |            |                                 |   |  | м                    |       | w                       |          |   |                          | м                   |       | w                    |             |
| 1st Tier Constacts                           | 2nd Tier Contracts                        | DBE?        | Category                    | Classification                                 | F<br>C0    | rojected DBE<br>ntracts to Date |   | Projected MWBE<br>Contracts to Date                  | MBE                  |       | WBE                     | Ċ        | Total<br>DBE/MWBE<br>Contracts to<br>Date | DBE                      | MBE                 |       | WB                   | e           |
|  |   |             |                             |  |            |                                 | H |  |                      |       |                         |          |   |                          |                     | _     |                      |             |
| Large & Small Graphics                       |   | Y           | M                           | R  | 5          | 5.200.00                        | H | \$ 5,200.00  | \$ 5.20              | 0.00  | s .                     | 5        | 7.395.10                                  | \$ 7,385.10              | \$ 7.3              | 25.10 | \$                   |             |
| Tables, Chairs, Staging/Piedmont Portable    | 6   |             | w                           | Ē  | ÷.         |                                 | H | \$ 5,000.00  | 3                    |       | \$ 5,000.00             | 8        | 11,382.55                                 | 3 .                      | \$                  |       | <u> </u>             | 392.55      |
| Arrow Exterminators                          |   |             | w                           | F  | 5          |                                 | Ħ | \$ 5,200.00  | \$                   |       | \$ 5,200.00             | \$       | 5,200.00                                  | 5 -                      | \$                  |       | \$ 5,                | 200.00      |
| Allied Fence                                 |   |             | w                           | F  | 5          |                                 |   | \$ 159,635.00  | \$                   |       | \$ 159,635.00           | \$       | 175,298.75                                | 5 -                      | \$                  |       | \$ 175.              | 298.75      |
| Thomason Contracting                         | Carolina Pipe Company Inc.                | Y           | M                           | B  | 5          | 430,000.00                      |   | \$ 430,000.00  | \$ 430,00            | 0.00  | \$ .                    | \$       | 430,000.00                                | \$ 430,000.00            | \$ 430.00           | 00.00 | \$                   |             |
| Thomason Contracting                         | Debnam Clearing & Grading                 | Y           | M                           | B  | 5          | 39,000.00                       |   | \$ 39,000.00   | \$ 39,00             | 0.00  | \$ .                    | \$       | 39,000.00                                 | \$ 39,000.00             | \$ 39.0             | 00.00 | \$                   |             |
| Thompson Contracting                         | D & Q Trucking                            | Y           | M                           | B  | 5          | 10,600.00                       |   | \$ 10,600.00   | \$ 10,60             | 0.00  | \$ .                    | \$       | 10,600.00                                 | \$ 10,600.00             | \$ 10.0             | 00.00 | \$                   |             |
| Thompson Contracting                         | Seal Brothers Contracting, LLC            |             | w                           | F  | \$         |                                 |   | \$ 5,500.00  | \$                   |       | \$ 5,500.00             | \$       | 5,500.00                                  | \$ -                     | \$                  |       | \$ 5,                | 500.00      |
| Thompson Contracting                         | Woodell Transport, Inc.                   |             | w                           | F  | \$         |                                 |   | \$ 35,375.00   | \$                   |       | \$ 35,375.00            | \$       | 35,375.00                                 | \$ -                     | \$                  |       | \$ 35,               | 375.00      |
| Thompson Contracting                         | D&Q Hauling                               | Y           | M                           | B  |            |                                 |   |  | \$                   |       | \$ .                    | \$       | 10,000.00                                 | \$ 10,000.00             | \$ 10,00            | 00.00 | \$                   |             |
| Thomason Contracting                         | Thomas L. Lyons                           | Y           | M                           | B  |            |                                 |   |  | \$                   | -     | \$ .                    | \$       | 1,725.89                                  | \$ 1.725.89              | \$ 17               | 25.89 | \$                   |             |
| Thompson Contracting                         | Fitzgerald Trucking                       | Y           | M                           | B  |            |                                 |   |  | \$                   | -     | \$ .                    | \$       | 1,146.69                                  | \$ 1,146.69              | S 1.14              | 16.69 | \$                   |             |
| Thompson Contracting                         | Final Grade, Inc.                         | Ŷ           | M                           | F  |            |                                 |   |  | \$                   |       | \$ .                    | \$       | 957.00                                    | \$ 957.00                | \$ 9                | 57.00 | 5                    |             |
| Lithko                                       | National Erectors                         | Ŷ           | M                           |  | \$         | 202.341.42                      |   | \$ 202.341.42  | \$ 202.34            | 1.42  | \$ .                    | \$       | 202 341.42                                | \$ 202.341.42            | \$ 202.3            | 1.42  | \$                   |             |
| Tindall Corporation                          | Buckner Crane                             |             | w                           | F  | \$         |                                 |   | \$ 278,604,00  | \$                   |       | \$ 278,604,00           | \$       | 213, 300.00                               | \$ -                     | 5                   |       | \$ 213.              | 300.00      |
| Tindall Corporation                          | Paul D. Williams Hauling                  | Y           | M                           | В  | Ś          | 154,790.00                      |   | \$ 154,780.00  | \$ 154.79            | 0.00  | s -                     | Ś        | 183,240.00                                | \$ 183.240.00            | \$ 183.2            | 0.00  | \$                   |             |
| Tindall Composition                          | Economy Waterproofing - TRD               |             | м                           | н  | 3          |                                 |   | \$ .   | \$                   |       |                         | ŝ        | 14,770.00                                 | 8 -                      | \$ 14.7             | 00.00 | i i                  |             |
| Pinnaria Masonry                             | Johnson Concrete Company                  |             | w                           | F  | 3          |                                 |   | \$ 7,300.00  | 3                    |       | \$ 7,300.00             | ŝ        | 9 168 77                                  | s -                      | 5                   |       | \$ 9                 | 168.77      |
| Conomy Waterproofing                         |   |             | M                           | Ĥ  | 3          |                                 |   | \$ 85,354,00   | \$ 85.35             | 4.00  | \$ .                    | 1.5      | 88 104.00                                 |                          | \$ 98.1             | 4.00  |                      |             |
| Bakar Boofing                                | Cardinal Distributing                     |             | w                           | F  | 3          |                                 |   | \$ 68,394,00   | 3                    |       | \$ 68,394.00            | ŝ        | 69.526.47                                 | š -                      | 5                   |       | s 69.                | 528.47      |
| Custom Stone & Tile                          | Naivers Inc.                              |             | M                           | Å  | 12         |                                 |   |  | 1                    | -     |                         | 1.5      | 23,822,00                                 | •                        | \$ 23.8             | 200   |                      |             |
| Custom Overhead Doors                        |   |             | w                           | F  | 3          |                                 | H | \$ 90,000,00   | 3                    |       | \$ 90,000,00            | ŝ        | 91,160,00                                 | 4 -                      | 5                   |       | \$ 91.               | 160.00      |
| 595  | Commercial Glass Contracting              |             | Ŵ                           | Ē  | 1 Å        |                                 |   | \$ 149.971.00  | ă.                   |       | \$ 149.971.00           | 1 Š      | 189,711,87                                | <u>.</u>                 | i.                  |       | 1.09                 | 711.97      |
| SPS (DBF State)                              | Maxxim, inc.                              | Y           | M                           | R  | 3          | 150.000.00                      | H | \$ 150,000,00  | \$ 150.00            | 0.00  | \$ .                    | ŝ        | 185 225 55                                | \$ 185,225,55            | \$ 185.2            | 25.55 | 1                    |             |
| Second Construction Company                  |   |             | w                           | Ē  | 1 à        |                                 |   | ¢ 479,405,00   | 4                    |       | s 479.405.00            | 1÷       | 247,257,00                                | 4                        |                     |       | 8 247                | 257.00      |
| Production Database                          |   | v           | - M                         |  | 14         | 179.950.00                      |   | ¢ 179,950,00   | 6 179.95             | 0.00  | e .                     | Ť        | 260 224 00                                | 4 200 224 00             | \$ 260.2            | 100   | 4 U.I.,              |             |
| Challengett Sociabler                        |   | <u> </u>    | <u><u></u></u>              | Å  | 1 d        |                                 | H | 4 120,651,00   | \$ 120.65            | 4.00  |                         | ě        | 120 990 00                                | 4 .                      | \$ 120.00           | 0.00  | <u>.</u>             | -           |
| Sime Pe Decim                                |   | x           | 14                          | Ê.   | 12         | 4,800,00                        |   | \$ 4,900,00  | 4 100,00             |       | £ 4,900.00              | <u>۲</u> | 100,000,000                               |                          | 5                   |       | -                    | -           |
| John I. Field                                | Air Flow Experts                          | *           | w                           | Ē  | 4          |                                 | H | \$ 12,000,00   | 4                    |       | \$ 12,000,00            | 1.0      | 11,912,00                                 | 4 .                      |                     |       | E 11                 | 912.00      |
| Idea I Visite                                | Energy Automation Technologies            |             | 34/                         | E.   | 12         |                                 |   | 5 12,000.00  | 4                    | -     | 5 12,000.00             | 1ž       | 1001200                                   | 8                        | -                   | -     |                      | 112.00      |
| John I. Kirile                               | E.IP insulators                           |             | w                           | Ē  | i.         |                                 | H | \$ 175,000,00  | 4                    |       | \$ 175,000,00           | ÷.       | 224.464.00                                | 4 .                      |                     |       | \$ 221               | 181.00      |
| lake I Kirile                                | Engineered Deskin, Inc.                   | ~           | w                           | E  | 1.         | 85,000,00                       |   | <ul> <li>65.000.00</li> </ul>                        | 4                    | -     | 5 65,000,00             | ۲ř.      | 140 769 00                                | 4 440 769 00             | 1.                  |       | 140                  | 789.00      |
| Brann Brathar Bruching                       | Engineered Design, Inc.                   | ÷           |                             | Ē  | 13         | 29,700,00                       |   | e 29,700,00  | -                    | -     | s 29,700,00             | 18       | 39,700,00                                 | 9 39 700.00              |                     | -     |                      | 700.00      |
| Brown Brothers Planting                      | Eligneered beorge, inc.                   | ÷ ·         |                             | P  | 1.         | 450,000,00                      | н | \$ 450,000,00  | 8 450.00             | 0.000 | \$ 20,700.00            | ÷        | 150,000,00                                | \$ 150,000,00            | * +50.00            | n m   | • ••                 | 100.00      |
| Endersond Decker Inc.                        | ra ougyly                                 | · ·         |                             | Ē  |            | 100,000.00                      |   | 4 20,000,00  | 4 100,00             |       | s 20.000.00             | 18       | 20,000,00                                 | 4                        | 1                   |       | . m                  | 000.00      |
| Callie Canatouties                           |   | v           |                             | 0  | 4          | 1 588 947 00                    | н | 4 4 598 047 00                                       | 0 1 588.04           | 7 00  |                         | ÷        | 2 462 428 00                              | 4 2 482 426 00           | 6 2 462 4           | 8.00  | • • •                | 700.00      |
| Accepting incompanyed                        | ULS Walla                                 |             | - <del>.</del>              |  | 11         | 1,000,017.000                   |   | <ul> <li>(300,017.00</li> <li>(300,017.00</li> </ul> | 4 92.50              | 0.000 |                         | •        | 2,403,430.00                              | 9 2,400,400.00           |                     |       | -                    |             |
| Code Electric                                | Sarvice Linksing J. Sunnik                |             | w                           | E  | 1          |                                 | H | \$ 225,000,00  | 4                    |       | \$ 325,000,00           | •        | 437, 500,00                               | 4                        |                     | -     | ¢ 427                | 500.00      |
| Nexts State Read Inc.                        | Uarris Seal Encions                       |             | w                           | r<br>E   | 4          |                                 | H | \$ 102,750,00  | -                    |       | \$ 192,750,00           | ÷        | 198,620,00                                | 4                        | 1                   | -     | e 108                | 820.00      |
| References films                             |   |             | Ŵ                           | Ē  | <b>.</b> . |                                 | H | + 163,730.00   | -                    | -     | p 100,750.00            | 18       | 58 250 00                                 |                          | 1                   | -     | e 58                 | 250.00      |
| Ferrer marrier states<br>Estada taxa Missian |   | v           | w                           | Ē  | 4          |                                 | H |  |                      |       |                         | 1÷       | 12 792 49                                 | g 12702.40               |                     | -     | e 12                 | 792.40      |
| Schutz iron works                            |   | 1           | - "                         | r  | 13         |                                 | H | P -  | 1                    |       |                         | 18       | 16,792.48                                 | 9 13,792.48              | :                   | -     | a 13,<br>t           | 102.48      |
|  |   |             | l<br>Percentage (<br>Minimu | Totals<br>of total contract<br>m goal per City | \$         | 2,988,188,42<br>12,2%<br>5%     |   | \$ 4,998,827.42<br>20.4%<br>15%                      | \$ 3,187,19<br>13,0% | 8.42  | \$ 1,799,634.00<br>7.4% | \$       | 6,413,472.54<br>28.2%                     | \$ 4,099,643.13<br>16.9% | \$ 4,202,9<br>17.2% | 77.65 | \$<br>2,210,<br>9.09 | 494.89<br>6 |
|  |   |             |                             |  |            |                                 |   |  |                      |       |                         |          |   |                          |                     |       |                      |             |

| Ym         Ym         Ym           10         4         Sustainable Sites           10         Costsuction Activity Pollution Prevention         Site Selection           11         Cost1         Site Selection         Site Selection           11         Cost1         Development Density & Community Connectivity           12         Cost1         Alternative Transportation, Biode Storage & Changing Rooms           11         Cost1         Alternative Transportation, David Endexage & Changing Rooms           12         Cost1         Alternative Transportation, David Capachy           13         Cost1         Site Development, Macine Open Space           14         Cost1         Site Development, Macine Open Space           15         Cost1         Site Development, Macine Open Space           16         Cost1         Site Development, Macine Open Space           17         Cost1         Stormwater Design, Quanity Control           16         Cost1         Water Efficient Landscaping, Reduce by 50%           17         Cost1         Water Efficient Landscaping, No Potable Use or No Irrigation           16         Cost1         Water Efficient Landscaping, No Potable Use or No Irrigation           17         Cost1         Water Use Reduction, 30% Reduction  | 14 Poin<br>Requir |
|---|-------------------|
| 10     4     Sustainable Sites       10     4     Sustainable Sites       11     Costuction Activity Pollution Prevention     Site Selection       11     Cost 2     Development Density & Community Connectivity       11     Cost 2     Development Density & Community Connectivity       11     Cost 4     Alte mative Transportation, Budge Storage & Changing Coms       11     Cost 4     Alte mative Transportation, David Coage & Changing Coms       11     Cost 4     Alte mative Transportation, David Coage & Changing Coms       11     Cost 4     Alte mative Transportation, David Coage & Changing Coms       11     Cost 5     Site Development, Musice Open Space       11     Cost 6     Stornwater Design, Quanity Control       11     Cost 1     Stornwater Design, Quality Control       11     Cost 1     Upt Pollution Reduction       12     Cost 1     Water Efficient Landscaping, Reduce by 50%       13     Cost 1     Water Efficient Landscaping, Ne Dotable Us or No Irrigation       14     Cost 2     Water Use Reduction, 30% Reduction       13     Cost 1     Water Use Reduction, 30% Reduction       14     Cost 2     Water Use Reduction, 30% Reduction       15     Water Use Reduction, 30% Reduction       16     Cost 2     Water Use Reduction, 20% Reductio  | 14 Poir<br>Requir |
| Presq 1         Construction Activity Pollution Prevention<br>Stat 1           Image: State Sta   | Requir            |
| Creat 1         Site Selection           1         Creat 2         Development Density & Community Connectivity           1         Creat 3         Development Density & Community Connectivity           1         Creat 4.         Alternative Transportation, Build Canaportation & Goode Storage & Changing Rooms           1         Creat 4.         Alternative Transportation, Duvis Transportation & Goode Storage & Changing Rooms           1         Creat 4.         Alternative Transportation, Davis Transportation, Goode Storage & Changing Rooms           1         Creat 4.         Alternative Transportation, Davis Transportation, Goode Storage & Changing Rooms           1         Creat 5.         Site Development, Maximize Open Space           1         Creat 6.         Stormwater Design, Quality Control           1         Creat 7.         Heat Island Effect, Roof           1         Creat 7.         Utght Pollution Reduction           1         Creat 7.         Water Efficient Landscaping, Ne Potable Use or No Irrigation Innovative Wastewater Technologies           1         Creat 7.         Water Efficient Landscaping, Ne Potable Use or No Irrigation Innovative Wastewater Technologies           1         Creat 7.         Water Berger Commissioning of the Building Energy Systems Freeson           1         Creat 7.         Water Use Reduction, 20% Benduction   |                   |
| 1     Cost 2     Development Density & Community Connectivity       1     Cost 4.1     Alte mative Transportation, Public Transportation Access       1     Cost 4.1     Alte mative Transportation, Biode Storage & Changing Coms       1     Cost 4.1     Alte mative Transportation, Device Torage & Changing Coms       1     Cost 4.2     Alte mative Transportation, Device Torage & Changing Coms       1     Cost 4.3     Alte mative Transportation, Device Torage & Changing Coms       1     Cost 5.1     Site Development, Microtor Restore Habitat       1     Cost 5.1     Site Development, Microtor Restore Habitat       1     Cost 6.1     Stornwater Design, Quanity Control       1     Cost 6.1     Stornwater Design, Quality Control       1     Cost 7.1     Heat Island Effect, Non-Roof       1     Cost 1.1     Water Efficient Landscaping, Reduce by 50%       1     Cost 1.1     Water Efficient Landscaping, No Potable Us or No Irrigation       1     Cost 1.1     Water Use Reduction, 30% Reduction       1     Cost 1.2     Water Use Reduction, 30% Reduction       1     Cost 1.2     Water Use Reduction, 30% Reduction       1     Cost 1.2     Water Use Reduction, 30% Reduction       1     Cost 2.2     Water Use Reduction, 30% Reduction       1     Cost 2.4     Water Use Reduction, 20% Re   |                   |
| Image: Construction         Deventifield Redevelopment           Image: Construction         Alle mattive Transportation, Public Transportation Access           Image: Construction         Alle mattive Transportation, Development, Transportation, Access           Image: Construction         Alle mattive Transportation, Development, Totango & Changing Rooms           Image: Construction         Alle mattive Transportation, Development, Pototo Possore           Image: Construction         Step Development, Maximize Open Space           Image: Construction         Step Developmen   |                   |
| i         Creat 4.1         Alte mative Transportation, Public Transportation, Biode Storage & Changing Rooms           i         Creat 4.         Alte mative Transportation, Biode Storage & Changing Rooms           i         Creat 4.         Alte mative Transportation, Daving Gazale (Changing Rooms           i         Creat 4.         Alte mative Transportation, Daving Gazale (Changing Rooms           i         Creat 4.         Alte mative Transportation, Daving Gazale (Changing Rooms           i         Creat 4.         Alte mative Transportation, Daving Gazale (Changing Rooms           i         Creat 5.1         Site Development, Muximize Open Space           i         Creat 6.1         Stormwater Design, Quanity Control           i         Creat 6.1         Stormwater Design, Quality Control           i         Creat 7.1         Heat Island Effect, Non-Roof           i         Creat 1.1         Water Efficient Landscaping, Reduce by 50%           i         Creat 1.2         Water Efficient Landscaping, No Potable Use or No Irrigation           i         Creat 1.1         Water Wester Reduction, 30%. Reduction           i         Creat 2.2         Water Wester Reduction, 30%. Reduction           i         Creat 3.2         Water Wester Reduction, 30%. Reduction           i         Creat 1.2         Water Efficient Lands   |                   |
| 1     Creat 1.2     Alte mative Transportation, Bicycle Storage & Changing Rooms       1     Creat 1.4     Alte mative Transportation, Dav-Entiting & Fuel-Efficient Vehicles       1     Creat 1.4     Alte mative Transportation, Davis finiting & Fuel-Efficient Vehicles       1     Creat 1.5     Site Development, Plotect or Restore Habitat       1     Creat 1.5     Site Development, Maximize Open Space       1     Creat 1.5     Stormwater Design, Quality Control       1     Creat 2.5     Water Efficient Landscaping, Reduce by 50%.       1     Creat 1.1     Water Efficient Landscaping, No Potable Use or No Irrigation Innovative Wastewater Technologies       1     Creat 1.1     Water Use Reduction, 20%. Reduction       1     Creat 2.5     Water Use Reduction, 20%. Reduction       1     Creat 3.1     Water Use Reduction, 20%. Reduction       1     Creat 3.1     Water Use Reduction, 20%. Reduction       1     Creat 3.2     Water Use Reduction, 20%. Reduction       1     Creat 3.4     Fundamental Refreger and Masagement       1     Creat 3.5  |                   |
| 1     Creat-3.     Alte mative Transportation, Low-Emitting & Fuel-Efficient Vehicles       1     Creat-3.     Alte mative Transportation, Parking Capacity       1     Creat-5.     Site Development, Munice Open Space       1     Creat-5.     Stormwater Design, Quality Control       1     Creat-7.     Heat Island Effect, Non-Roof       1     Creat-1.     Water Efficient Landscaping, Reduce by 50%       1     Creat-1.     Water Efficient Landscaping, Neo Dotable Use or No Irrigation       1     Creat-1.     Water Berdeuction, 30% Reduction       1     Creat-1.     Water Use Reduction, 30% Reduction       1     Creat-1.     Water Berdeuction, 30% Reduction       1     Creat-1.     Water Use Reduction, 30% Reduction       1     Creat-1.     Water Berdeuction, 30% Reduction       1     Creat-1.     Water Efficient Landscaping, 10000 Renovations       1     Creat-1.     Mater Be   |                   |
| 1     Creat 4.4     Alle mative Transportation, Parking Capacity       1     Creat 5.     Site Development, Protect or Restore Habitat       1     Creat 5.2     Site Development, Maximize Open Space       1     Creat 5.2     Site Development, Maximize Open Space       1     Creat 5.2     Site Development, Maximize Open Space       1     Creat 5.2     Stormwater Design, Quality Control       1     Creat 5.2     Stormwater Design, Quality Control       1     Creat 5.2     Light Pollution Reduction       1     Creat 1.1     Water Efficient Landscaping, Reduce by 50%.       1     Creat 1.1     Water Efficient Landscaping, Reduce by 50%.       1     Creat 1.1     Water Efficient Landscaping, No Dotable Use or No Irrigation       1     Creat 1.1     Water Use Reduction, 20%. Reduction       1     Creat 3.1     Water Use Reduction, 20%. Reduction       1     Creat 3.1     Water Use Reduction, 20%. Reduction       1     Creat 3.2     Water Use Reduction, 20%. Reduction       1     Creat 3.2     Water Use Reduction, 20%. Reduction       1     Creat 3.2     Water Use Reduction, 20%. Reduction       1     Creat 3.1     Water Use Reduction, 20%. Reduction       1     Creat 3.1     Water Use Reduction, 20%. Reduction       1     Prescq 2     Fu   |                   |
| I Great 51     Site Development, Ancine Open Space     Site Development, Maxime Open Space     Great 61     Great 52     Site Development, Maxime Open Space     Great 61     Great 52     Stornwater Design, Quanity Control     I Great 7.1     Heat Island Effect, Non-Roof     Great 6     Great 7     Gr |                   |
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| 24.5% New Buildings or 17.5% Existing Building Renovations     26% New Buildings or 21% Existing Building Renovations     31.5% New Buildings or 23.5% Existing Building Renovations     35% New Buildings or 31.5% Existing Building Renovations     35% New Buildings or 35% Existing Building Renovations     42% New Buildings or 35% Existing Building Renovations     1 1 1 Creat 2     On-Site Renewable Energy     7 5% Renewable Energy  | 1 to              |
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| 1 Credit 4 Enhanced Befrigerant Management  | 1 to<br>1 t       |
| 1 Credit 5 Measurement & Verification   | 1 to<br>1 to      |
| 1 Credit 6 Green Power  | 1 to<br>1 t       |
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|   | 110               |

**LEED Tracking** 

#### **DBE & MWBE Goals**

 Significant reporting and tracking requirements due to funding sources and project goals

## Site / Stormwater



# Challenge: Facility Requires Significant Amounts of Impervious Surfaces

#### Solution: Onsite Detention and Re-Use



Strategies Rainwater Harvesting & Re-UseBioretention Stormwater BMPs

- Cisterns for Landscaping Irrigation



#### Challenge: Heat Island Effect

#### Solution: High Albedo / Thermally Emissive Materials



Strategies - Low E, Energy Star White Roofing Systems
Concrete Paving in Lieu of Asphalt



Challenge: Expense of Heating/Cooling Large Spaces : Multiple Shifts / Variable Demand for Service Bays

Solution: Zoned Environmental Control



Strategies 

Dedicated HVAC Controls for Each Work Bay

- Separate Lighting Sensors for Work Bays
  Zoned Radiant Flooring Heat



#### Challenge: Cooling Large Spaces of Maintenance Buildings

Solution: Spot Cooling in Occupied Areas



Strategies Displacement VentilationDedicated HVAC Controls for Work Bays



Challenge: 100% Fresh Air Requirements and Open Maintenance Doors Result in Loss of Conditioned Air Solution: Radiant Heat in Maintenance Bays



- Strategies Hydronic Coils in Concrete Slabs
  Ground Source Geothermal HVAC for Enhanced Efficiency
  Energy Recovery System to Capture Energy from Exhaust Air Stream



# Challenge: Reduce Lighting Energy Consumption

Solution: Provide Daylight & View Openings in Roof and Walls



- Strategies Horizontal View Panels at All Service Bay Doors
  Daylighting at Work & Circulation Areas
  Occupancy/Photo Sensor Controls Integrated with Daylighting

# **Maintenance Building Interior**



# **Interior Office Space**



#### **Materials**



# Challenge: Design for 50+ Year Facility

Solution: Durable & Reliable Materials & Equipment



- Strategies
  Regional Materials
  Recycled and Recyclable Materials
  Extensive Material and Equipment Evaluation

# **Break Room**



**Indoor Environmental Quality** 



#### Improve Indoor Environmental Quality for Staff Health and Enhanced Productivity



- Natural Light & ViewsSpot Cooling
- Ventilate Hazardous Work & Storage Areas
- 100% Fresh Air System
- CO2 Monitoring

# Integrating Community Art











- Art On The Move
- Local Artists
- Established City of Raleigh Art Initiative

# **Raleigh Transit Operations Facility**



