



**E** **Appendix -**  
**Water Resource**  
**Calculations**

**APPENDIX E – WATER RESOURCES CALCULATIONS**

Growth Estimates per Planning Area

Planning Area 1 - Aberdeen

Zoning Class	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
High Density Residential	224.91	361.31	52.14	20	10	587	1456	782
Medium Density Residential	509.27	594.78	135.61	10	3.5	687	1704	1017
Low Density Residential	703.65	672.15	64.23	3.5	1	108	268	168
Mixed Use	117.63	410.95	158.35	20	5	1485	3683	2375
<b>Residential Total</b>	<b>1,555.46</b>	<b>2,039.19</b>	<b>410.33</b>			<b>2867</b>	<b>7,111</b>	<b>4342</b>
Non-Residential Zoning Class			Projected Developable Area*	Estimated Lot Coverage (ac)	EDU Conversion Ratio (# of EDU per acre of land cover)	Resulting EDUs		Resulting EDUs
Commercial	441.88	477.54	78.56	32.4	11.92 EDUs per ac of land cover	386		456
Industrial	605.01	600.08	63.52	26.2	18.76 EDUs per ac of land cover	492		580
Institutional	234.94	271.55	16.11	6.65	33.25 EDUs per ac of land cover	221		261
Open Space /Recreation/ Forested	987.55	436.48	0	N/A	N/A	0		0
Transportation	55.82	55.82	0	N/A	N/A	0		1,297
<b>Non-Residential Total</b>	<b>2,325.20</b>	<b>1,841.47</b>	<b>158.19</b>	<b>374.61</b>		<b>1,099</b>		<b>2,594</b>
<b>Total</b>	<b>3,880.66</b>	<b>3,880.66</b>	<b>568.52</b>			<b>3,966</b>		<b>6,936</b>

# Appendix E- Water Resources Calculations



## Planning Area 2 – Swan Creek

Land Use	Current Acreage	Future Acreage	Future Developable Area	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	360.55	360.55	0.00			0	0	0
<b>Total</b>	<b>360.55</b>	<b>360.55</b>	<b>0.00</b>			<b>0</b>	<b>0</b>	<b>0</b>

## Planning Area 3 - Pulaski

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	47.75	47.75	27.1	3.5	1	46	114	71
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
High Intensity Commercial	120.85	120.85	21.79	N/A	8.98	107	0	126
Industrial	53.05	53.05	3.02	N/A	1.24	23	0	27
<b>Total</b>	<b>221.65</b>	<b>221.65</b>	<b>51.9</b>	<b>N/A</b>	<b>N/A</b>	<b>176</b>	<b>114</b>	<b>224</b>

## Planning Area 4 - Barkess

Land Use Category	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	141.21	84.64	0.00	0.05	0.05	0	0	
Low Density Residential	4.66	4.65	0	3.5	1	0	0	
Medium Density Residential	45.21	234.59	166.52	10	3.5	843	2091	1248.00
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	194.87	62.06	0.00	N/A	N/A	0	0	
<b>Total</b>	<b>385.95</b>	<b>385.94</b>	<b>166.52</b>	<b>N/A</b>	<b>N/A</b>	<b>843</b>	<b>2091</b>	<b>1248</b>

# Appendix E- Water Resources Calculations



## Planning Area 5 – Old Robinhood

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	384.73	0	0	N/A	N/A	0	0	
Medium Density Residential	0	384.73	229.49	10	3.5	1,162	2,882	1,721
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	168.97	168.97	0	N/A	N/A	0	0	
<b>Total</b>	<b>553.7</b>	<b>553.7</b>	<b>229.49</b>	<b>N/A</b>	<b>N/A</b>	<b>1,162</b>	<b>2,882</b>	<b>1,721</b>

## Planning Area 6 – Titan Terrace

Land Use	Current Acreage	Future Acreage	Future Developable Area	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	166.70	178.43	80.69	3.50	1.00	148	367	235
Medium Density Residential	114.44	114.44	11.72	10.00	3.50	59	146	88
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	83.26	71.54	0.00			0	0	
<b>Total</b>	<b>364.40</b>	<b>364.41</b>	<b>92.41</b>			<b>207</b>	<b>513</b>	<b>323</b>

## Planning Area 7 - Paradise

Land Use	Current Acreage	Future Acreage	Future Developable Area	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	135.44	0.67	0	N/A	N/A	0	0	
Low Density Residential	75.86	0	0	N/A	N/A	0	0	
Medium Density Residential	0	210.63	129.52	10	3.5	656	1,627	971
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Open Space / Forested	40.81	40.81	0	N/A	N/A	0	0	
<b>Total</b>	<b>252.11</b>	<b>252.11</b>	<b>129.52</b>	<b>N/A</b>	<b>N/A</b>	<b>656</b>	<b>1,627</b>	<b>971</b>

# Appendix E- Water Resources Calculations

## Planning Area 8 – Aldino-Stepney

Land Use Category	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
<b>Agriculture</b>	387.60	169.83	149.90	0.05	0.05	6	15	5
<b>Low Density Residential</b>	109.55	0	0	3.5	1	0	0	
<b>Medium Density Residential</b>	0.00	440.49	273.56	10	3.5	1385	3435	2051.00
<b>(Non-Residential Land Uses)</b>						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
<b>Open Space / Forested</b>	289.34	176.17	0.00	N/A	N/A	0	0	
<b>Total</b>	<b>786.49</b>	<b>786.49</b>	<b>423.46</b>	<b>N/A</b>	<b>N/A</b>	<b>1391</b>	<b>3450</b>	<b>2056</b>

## Planning Area 9 - Gilbert

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
<b>Low Density Residential</b>	212.87	100.16	17.35	3.5	1	29	72	45
<b>Medium Density Residential</b>	0	112.72	28.36	10	3.5	144	357	212
<b>Mixed Use</b>	0	38.88	33.01	20	5	309	766	495
<b>(Non-Residential Land Uses)</b>						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
<b>Open Space / Forested</b>	38.89	0	N/A	N/A	0	0	0	0
<b>Total</b>	<b>251.76</b>	<b>251.76</b>		<b>N/A</b>	<b>N/A</b>	<b>482</b>	<b>1,195</b>	<b>752</b>

## Planning Area 10 – Long/Heat

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	102.06	0	0	N/A	N/A	0	0	
Mixed Use	0	102.06	37.43	20	5	350	868	561
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Institutional	151.14	151.14	68.89	N/A	37.89	945	0	1116
Open Space / Forested	40.91	40.91	0	N/A	N/A	0	0	
<b>Total</b>	<b>294.11</b>	<b>294.11</b>	<b>133.5</b>	<b>N/A</b>	<b>N/A</b>	<b>1,294</b>	<b>868</b>	<b>1,677</b>

## Planning Area 11 – Grays

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	280.78	360.92	272.77	3.5	1	460	1141	715
(Non-Residential Land Uses)						Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units	
Open Space / Forested	556.05	475.91	0	N/A	N/A	0	0	
Institutional	0.04	0.04	0	N/A	N/A	0	0	
<b>Total</b>	<b>836.87</b>	<b>836.87</b>	<b>272.77</b>	<b>N/A</b>	<b>N/A</b>	<b>460</b>	<b>1141</b>	<b>715</b>

# Appendix E- Water Resources Calculations

## Planning Area 12 – Bush Chapel

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Agriculture	235.12	0	0	N/A	N/A	0	0	
Low Density Residential	132.63	0	0	N/A	N/A	0	0	
Medium Density Residential	0	247.42	148.68	10	3.5	753	1,867	1,115
High Density Residential	0	132.63	78.48	20	10	883	2,190	1,177
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
Industrial	9.33	9.33	7.85	N/A	3.23	61	0	71
Open Space / Forested	391.48	355.58	0	N/A	N/A	0	0	
<b>Total</b>	<b>775.93</b>	<b>775.93</b>	<b>235.01</b>	<b>N/A</b>	<b>N/A</b>	<b>1,697</b>	<b>4,057</b>	<b>2,363</b>

## Planning Area 13 – Old Philadelphia

Land Use	Current Acreage	Future Acreage	Projected Developable Area*	Maximum Density Yield (du/ac)	Minimum Density Yield	Average Density Dwelling Units Created	Associated Population Yield (Avg)	Total EDUs Max Density
Low Density Residential	35.94	0	0	N/A	N/A	0	0	
Medium Density Residential	0	55.89	26.44	10	3.5	134	332	198
(Non-Residential Land Uses)					Resulting Avg Lot Coverage (ac)	Estimated Equivalent Dwelling Units		
High Intensity Commercial	57.86	57.86	2.98	N/A	1.22	15	0	17
Industrial	5.34	5.34	0	N/A	N/A	0	0	
Open Space / Forested	67.45	47.5	0	N/A	N/A	0	0	
<b>Total</b>	<b>166.59</b>	<b>166.59</b>	<b>29.57</b>	<b>N/A</b>	<b>N/A</b>	<b>149</b>	<b>332</b>	<b>215</b>

# Appendix E- Water Resources Calculations



## Water Flows for City of Aberdeen & Proposed Growth Areas (in GPD) for Average Density Yield

Location		EDU	City		No Planned Service <sup>4</sup>		Total (City + No Planned Service)	
			AD <sup>1</sup>	PD <sup>2</sup>	AD <sup>1</sup>	PD <sup>2</sup>	AD <sup>1</sup>	PD <sup>2</sup>
Planning Area 1—Aberdeen	Existing <sup>3</sup>	5,301	1,325,268	1,709,596			1,325,268	1,709,596
	Infill	3,966	991,500	1,279,035			991,500	1,279,035
Planning Area 2—Swan Creek		0	0	0			0	0
Planning Area 3—Pulaski		114	28,500	36,765			28,500	36,765
Planning Area 4—Barkess		843	210,750	271,868			210,750	271,868
Planning Area 5—Old Robinhood		1,162	290,500	374,745			290,500	374,745
Planning Area 6—Titan Terrace		207	51,750	66,758			51,750	66,758
Planning Area 7—Paradise		656	164,000	211,560			164,000	211,560
Planning Area 8—Aldino-Stepney		1,391			347,750	448,598	347,750	448,598
Planning Area 9—Gilbert		482			120,500	155,445	120,500	155,445
Planning Area 10—Long/Heat		1,294	323,500	417,315			323,500	417,315
Planning Area 11—Grays		460			115,000	148,350	115,000	148,350
Planning Area 12—Bush Chapel		1,697	424,250	547,283			424,250	547,283
Planning Area 13—Old Philadelphia		149			37,250	48,053	37,250	48,053
<b>New Demand</b>		<b>12,421</b>	<b>2,484,750</b>	<b>3,205,328</b>	<b>620,500</b>	<b>800,445</b>	<b>3,105,250</b>	<b>4,005,773</b>
<b>Total (Existing + New)</b>		<b>17,722</b>	<b>3,810,018</b>	<b>4,484,363</b>	<b>620,500</b>	<b>800,445</b>	<b>4,096,750</b>	<b>5,284,808</b>
Currently Available from City Sources (wells and bulk purchase)			<b>3,300,000</b>	<b>4,000,000</b>			<b>3,300,000</b>	<b>4,000,000</b>
<b>80% Permit Capacity</b>			<b>2,640,000</b>	<b>3,200,000</b>			<b>2,640,000</b>	<b>3,200,000</b>

<sup>1</sup>Average Day (AD) demand determined as 248 gpd/EDU.

<sup>2</sup>Peaking Factor of 1.29 and is used to determine Peak Day (PD) demand. See Table 10-2 for Peak Factor calculation.

<sup>3</sup>Existing EDUs based on average daily influent flow from 2017 to 2021 (5-yr average) divided by 250 gpd/EDU.

<sup>4</sup>Areas mapped as “No Planned Service” in the Harford County Water and Sewer Master Plan. Proposed EDU’s for these growth areas is zero. Infrastructure extension to these areas is not expected in the near future.



# Appendix E- Water Resources Calculations



## Wastewater Flows for City of Aberdeen & Proposed Growth Areas (in GPD) for Average Density Yield

Location	EDU	City		No Planned Service <sup>4</sup>		Total AWWTP Flows (City + No Planned Service)	
		AD <sup>1</sup>	PD <sup>2</sup>	AD <sup>1</sup>	PD <sup>2</sup>	AD <sup>1</sup>	PD <sup>2</sup>
Planning Area 1—Aberdeen	Existing <sup>3</sup>	7,133	1,783,333	6,520,000		1,783,333	6,520,000
	Infill	3,966	991,500	3,618,975		991,500	3,618,975
Planning Area 2—Swan Creek <sup>4</sup>	0	0	0			0	0
Planning Area 3—Pulaski	114	28,500	104,025			28,500	104,025
Planning Area 4—Barkess	843	210,750	769,238			210,750	769,238
Planning Area 5—Old Robinhood	1,162	290,500	1,060,325			290,500	1,060,325
Planning Area 6—Titan Terrace	207	51,750	188,888			51,750	188,888
Planning Area 7—Paradise	656	164,000	598,600			164,000	598,600
Planning Area 8—Aldino-Stepney	1,391			347,750	1,269,288	347,750	1,269,288
Planning Area 9—Gilbert	482			120,500	439,825	120,500	439,825
Planning Area 10—Long/Heat	1,294	323,500	1,180,775			323,500	1,180,775
Planning Area 11—Grays	460			115,000	419,750	115,000	419,750
Planning Area 12—Bush Chapel	1,697	424,250	1,548,513			424,250	1,548,513
Planning Area 13—Old Philadelphia	149			37,250	135,963	37,250	135,963
<b>New Demand</b>	<b>12,421</b>	<b>2,484,750</b>	<b>9,069,338</b>	<b>620,500</b>	<b>2,264,825</b>	<b>3,105,250</b>	<b>11,334,163</b>
<b>Total (Existing + New)</b>	<b>19,554</b>	<b>4,268,083</b>	<b>12,688,313</b>	<b>620,500</b>	<b>2,264,825</b>	<b>4,888,583</b>	<b>17,854,163</b>
<b>WWTP Permit Capacity</b>		<b>4,000,000</b>				<b>4,000,000</b>	
<b>WWTP 80% Permit Capacity</b>		<b>3,200,000</b>				<b>3,200,000</b>	

<sup>1</sup>Average Day (AD) demand determined as 248 gpd/EDU.

<sup>2</sup>Peaking Factor of 3.65 and is used to determine Peak Day (PD) demand. See Table 10-5 for Peak Factor calculation.

<sup>3</sup>Existing EDUs based on average daily influent flow from 2019 to 2021 (3-yr average) divided by 250 gpd/EDU.

<sup>4</sup>Areas mapped as “No Planned Service” in the Harford County Water and Sewer Master Plan. Proposed EDU’s for these growth areas is zero. Infrastructure extension to these areas is not expected in the near future.

## STORMWATER ASSESSMENT

The non-point source pollution and stormwater management discussion in Chapter 10 is intended to inform the land use process by evaluating receiving waters and ensuring that the land use planning and management process is used as an instrument to manage non-point source pollution. This process aims to support anti-degradation goals for water quality by balancing the assimilative capacity of receiving waters with estimated pollutant loads stemming from current, and future, point- and non-point sources of water pollution. The calculations and data featured in Chapter 10 utilized the following assumptions and criteria.

- Pollutant loads from primary sources for the existing condition scenario were estimated using the Simple Method<sup>1</sup> calculations for each of the three watersheds covering Aberdeen and the Planning Areas. These existing conditions were compared to estimated pollutant loads from primary sources associated with the future growth scenarios for each watershed.
  - Primary sources of pollutant load in this context are total nitrogen (TN), total phosphorous (TP), total suspended solids (TSS) and Fecal Coliform (FC). This Appendix contains calculations for all four primary sources of pollutant loads.
  - Nutrient pollution is defined as excess amounts of nitrogen and phosphorous in aquatic systems. Therefore, the comparisons within the text of Chapter 10 focus on the nitrogen and phosphorous loads.
- The only secondary pollutant load sources that were considered in this analysis were those sites with an active NPDES Discharge permit. Tables detailing wastewater treatments plants, permitted pollutant loads and permit thresholds are listed in Chapter 10.
- To develop an estimate of the non-point source pollutant loading stemming from projected future growth scenarios, impervious cover percentages associated with each generalized land use designation were derived from materials created by the Center for Watershed Protection and are shown below<sup>2</sup>:

<sup>1</sup> The Simple Method estimates pollutant loads for chemical constituents as a product of annual runoff volume and pollutant concentration, as:

$$L=0.266 \times R \times C$$

Where:

L = Annual load (lbs)

R = Annual runoff (inches)

C = Pollutant concentration (mg/l)

A = Area (acres)

0.226 = A conversion factor

<sup>2</sup> See Cappiella, K. and K. Brown. 2000. *Derivations of Impervious Cover for Suburban Land Uses in the Chesapeake Bay Watershed*. Center for Watershed Protection. Ellicott City, MD.

Land Use Category	Sample Number (N)	Mean Impervious Cover (%)
Agriculture	8	2
Open Urban Land	11	9
2 Acre Lot Residential	12	11
1 Acre Lot Residential	23	14
1/2 Acre Lot Residential	20	21
1/4 Acre Lot Residential	23	28
1/8 Acre Lot Residential	10	33
Townhome Residential	20	41
Multifamily Residential	18	44
Institutional	30	34
Light Industrial	20	53
Commercial	23	72
Roadway*	--	80

\* % for roadway was obtained using best professional judgment

- Converting the impervious cover to quantifiable pollutant loads for each land use class also utilized research from the Center for Watershed Protection in conjunction with the University of Alabama.
  - The pollutant concentrations from urban land<sup>3</sup> uses were calculated using the following values<sup>4</sup>:
    - Total Nitrogen (mg/l)
      - Residential 2.1
      - Commercial 2.1
      - Roadway 2.3
      - Industrial 2.2
    - Total Phosphorus (mg/l)
      - Residential 0.31
      - Commercial 0.22

<sup>3</sup> Urban land includes seven general categories: residential, commercial, industrial, forest, rural and open water. Residential land use is then broken into four more detailed land use categories: low-, medium-, and high-density and multifamily.

<sup>4</sup> Values obtain from Pitt, R., Maestre, A., Morquecho, R., Brown, T., Schueler, T., Cappiella, K., and Sturm, P. (2005). *Evaluation of NPDES Phase I Municipal Stormwater Monitoring Data*. University of Alabama and the Center for Watershed Protection.

- Roadway 0.25
- Industrial 0.25
- The pollutant concentrations from the non-urban<sup>5</sup> land uses were calculated using the following values<sup>6</sup>:
  - Total Nitrogen (lbs/acre/year)
    - Forest 2.0
    - Rural 5.0
  - Total Phosphorus (lbs/acre/year)
    - Forest 0.2
    - Rural 0.5
- For the purposes of these calculations:
  - “Park” land use was considered “Forest”
  - “Agricultural” land use was considered “Rural”
  - “Municipal,” “Mixed Office,” “University,” and “Military” land uses were considered “Commercial”
  - “Transportation” land use was considered “Roadway”
- The analysis to compare the pollutant loads associated with the existing conditions against pollutant loads from proposed conditions did not integrate (as a discount or credit) any existing or proposed stormwater control programs such as public education efforts, erosion and sediment controls, street sweeping, impervious cover disconnection, stream restoration, or similar direct and indirect treatment methods.

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<sup>5</sup> Non-urban land includes rural land and forest.

<sup>6</sup> Values utilized are roughly the average of the values noted in Lizarraga, J. 1997. Estimation and Analysis of Nutrient and Suspended Sediment Loads at Selected Sites in the Potomac River Basin, 1993-1995. USGS. *Water Resources Investigations Report*. 97-4154 .

# Appendix E- Water Resources Calculations

## Stormwater Pollutant Source Primary Loads

### Current Land Use by Watershed

Row Labels	Sum of REV_ACRES
<b>Aberdeen Proving Ground</b>	<b>420.955666</b>
High-Density Residential	4.845200871
Highway Commercial	94.86369644
Industrial	96.35528298
Institutional	5.421981418
Low-Density Residential	32.39558846
Medium-Density Residential	164.6882365
Open Space / Forested	13.3458302
Recreation/Open Space	5.127945258
Transportation	3.911903828
<b>Bush River</b>	<b>1019.740474</b>
High-Density Residential	57.1204676
Highway Commercial	181.2867892
Industrial	446.1799794
Institutional	20.15514882
Low-Density Residential	94.64862772
Medium-Density Residential	125.1168393
Mixed-Use	0.344505063
Open Space / Forested	74.21370903
Recreation/Open Space	16.71095798
Transportation	3.963450191
<b>Swan Creek</b>	<b>2439.984748</b>
High-Density Residential	162.943621
Highway Commercial	160.6508585
Industrial	62.48182204
Institutional	209.3678257
Low-Density Residential	576.606243
Medium-Density Residential	219.4630016
Mixed-Use	117.287577
Neighborhood Commercial	5.079642621
Open Space / Forested	644.0901212
Recreation/Open Space	234.0651388
Transportation	47.94889629
<b>Grand Total</b>	<b>3880.680888</b>

# Appendix E- Water Resources Calculations

## Future Land Use by Watershed

Row Labels	Sum of REV_ACRES
<b>Aberdeen Proving Ground</b>	<b>420.955666</b>
High-Density Residential	41.19451543
Highway Commercial	84.85621531
Industrial	96.35528298
Institutional	5.421981418
Low-Density Residential	4.255489376
Medium-Density Residential	155.366382
Mixed-Use	18.24273342
Neighborhood Commercial	0.537269513
Open Space / Forested	5.685947412
Recreation/Open Space	5.127945258
Transportation	3.911903828
<b>Bush River</b>	<b>1019.740474</b>
High-Density Residential	109.1263634
Highway Commercial	191.6012356
Industrial	446.1799794
Institutional	28.51476069
Low-Density Residential	74.45781537
Medium-Density Residential	124.4488654
Open Space / Forested	27.06495158
Recreation/Open Space	14.38305268
Transportation	3.963450191
<b>Swan Creek</b>	<b>2439.984748</b>
Central Commercial	0.47611436
High-Density Residential	210.9843561
Highway Commercial	195.7165748
Industrial	57.54861904
Institutional	237.6227182
Integrated Business Commercial	0.332467952
Low-Density Residential	593.444159
Medium-Density Residential	314.9637524
Mixed-Use	392.7025389
Neighborhood Commercial	4.024399231
Open Space / Forested	330.4778303
Recreation/Open Space	53.74232127
Transportation	47.94889629
<b>Grand Total</b>	<b>3880.680888</b>

# Appendix E- Water Resources Calculations

Planning Area Current Land Use	
Row Labels	Sum of REV_Acres
<b>Aldino-Stepney</b>	<b>786.4945455</b>
<b>Agriculture</b>	<b>387.6046386</b>
Swan Creek	387.6046386
<b>Low Density Residential</b>	<b>109.5491604</b>
Swan Creek	109.5491604
<b>Open Space / Forested</b>	<b>289.3407464</b>
Swan Creek	289.3407464
<b>Barkess</b>	<b>385.9570118</b>
<b>Agriculture</b>	<b>141.2135892</b>
Swan Creek	141.2135892
<b>Low Density Residential</b>	<b>4.657025699</b>
Swan Creek	4.657025699
<b>Medium Density Residential</b>	<b>45.21427774</b>
Swan Creek	45.21427774
<b>Open Space / Forested</b>	<b>194.8721192</b>
Swan Creek	194.8721192
<b>Bush Chapel</b>	<b>764.7412286</b>
<b>Agriculture</b>	<b>235.1213822</b>
Bush River	235.1213822
<b>Industrial</b>	<b>9.338940663</b>
Bush River	9.338940663
<b>Low Density Residential</b>	<b>132.6297306</b>
Bush River	132.6297306
<b>Open Space / Forested</b>	<b>387.6511752</b>
Bush River	387.6511752
<b>Gilbert</b>	<b>251.7561097</b>
<b>Low Density Residential</b>	<b>212.8684396</b>
Swan Creek	212.8684396
<b>Open Space / Forested</b>	<b>38.88767009</b>
Swan Creek	38.88767009
<b>Grays</b>	<b>836.8679489</b>
<b>Institutional</b>	<b>0.038025123</b>
Bush River	0.038025123
<b>Low Density Residential</b>	<b>280.7849032</b>
Bush River	280.7849032
<b>Open Space / Forested</b>	<b>556.0450206</b>
Bush River	556.0450206

# Appendix E- Water Resources Calculations

<b>Long/Heat</b>	<b>290.701212</b>
<b>Agriculture</b>	<b>0.000168708</b>
Swan Creek	0.000168708
<b>Institutional</b>	<b>150.1096867</b>
Bush River	147.1380964
Swan Creek	2.971590276
<b>Low Density Residential</b>	<b>99.68120042</b>
Bush River	38.16236244
Swan Creek	61.51883798
<b>Open Space / Forested</b>	<b>40.91015622</b>
Bush River	40.91015622
<b>Old Philadelphia</b>	<b>167.0524376</b>
<b>High Intensity Commercial</b>	<b>58.31520099</b>
Bush River	58.31520099
<b>Industrial</b>	<b>5.350898289</b>
Bush River	5.350898289
<b>Low Density Residential</b>	<b>35.9384194</b>
Bush River	35.9384194
<b>Open Space / Forested</b>	<b>67.44791895</b>
Bush River	67.44791895
<b>Old Robinhood</b>	<b>508.3018718</b>
<b>Low Density Residential</b>	<b>339.3261119</b>
Swan Creek	339.3261119
<b>Open Space / Forested</b>	<b>168.9757599</b>
Swan Creek	168.9757599
<b>Paradise</b>	<b>252.0239972</b>
<b>Agriculture</b>	<b>135.5024113</b>
Swan Creek	135.5024113
<b>Low Density Residential</b>	<b>75.70923824</b>
Swan Creek	75.70923824
<b>Open Space / Forested</b>	<b>40.81234772</b>
Swan Creek	40.81234772
<b>Pulaski</b>	<b>221.5622667</b>
<b>High Intensity Commercial</b>	<b>120.9054864</b>
Swan Creek	120.9054864
<b>Industrial</b>	<b>52.98841982</b>
Swan Creek	52.98841982
<b>Low Density Residential</b>	<b>47.66836045</b>
Swan Creek	47.66836045
<b>Swan Creek</b>	<b>360.5587927</b>



# Appendix E- Water Resources Calculations

<b>Agriculture</b>	<b>360.5587927</b>
Swan Creek	360.5587927
<b>Titan Terrace</b>	<b>409.1225955</b>
<b>Low Density Residential</b>	<b>166.6884158</b>
Swan Creek	166.6884158
<b>Medium Density Residential</b>	<b>113.7499464</b>
Swan Creek	113.7499464
<b>Open Space / Forested</b>	<b>128.6842333</b>
Swan Creek	128.6842333
<b>Grand Total</b>	<b>5235.140018</b>

## Planning Area Future Land Use

Row Labels	Sum of REV_Acres
<b>Aldino-Stepney</b>	<b>786.4945455</b>
<b>Agriculture</b>	<b>169.8316571</b>
Swan Creek	169.8316571
<b>Medium Density Residential</b>	<b>440.4910325</b>
Swan Creek	440.4910325
<b>Open Space / Forested</b>	<b>176.1718558</b>
Swan Creek	176.1718558
<b>Barkess</b>	<b>385.9570118</b>
<b>Agriculture</b>	<b>84.64145381</b>
Swan Creek	84.64145381
<b>Low Density Residential</b>	<b>4.657025699</b>
Swan Creek	4.657025699
<b>Medium Density Residential</b>	<b>234.5931431</b>
Swan Creek	234.5931431
<b>Open Space / Forested</b>	<b>62.06538918</b>
Swan Creek	62.06538918
<b>Bush Chapel</b>	<b>764.7412286</b>
<b>High Density Residential</b>	<b>132.6297306</b>
Bush River	132.6297306
<b>Industrial</b>	<b>9.338940663</b>
Bush River	9.338940663
<b>Medium Density Residential</b>	<b>247.4263093</b>
Bush River	247.4263093
<b>Open Space / Forested</b>	<b>375.346248</b>
Bush River	375.346248

# Appendix E- Water Resources Calculations

<b>Gilbert</b>	<b>251.7561097</b>
<b>Low Density Residential</b>	<b>100.1436726</b>
Swan Creek	100.1436726
<b>Medium Density Residential</b>	<b>112.7247671</b>
Swan Creek	112.7247671
<b>Mixed Use</b>	<b>38.88767009</b>
Swan Creek	38.88767009
<b>Grays</b>	<b>836.8679489</b>
<b>Institutional</b>	<b>0.038025123</b>
Bush River	0.038025123
<b>Low Density Residential</b>	<b>360.9150392</b>
Bush River	360.9150392
<b>Open Space / Forested</b>	<b>475.9148846</b>
Bush River	475.9148846
<b>Long/Heat</b>	<b>290.701212</b>
<b>Agriculture</b>	<b>0.000168708</b>
Swan Creek	0.000168708
<b>Institutional</b>	<b>150.1096867</b>
Bush River	147.1380964
Swan Creek	2.971590276
<b>Mixed Use</b>	<b>99.68120042</b>
Bush River	38.16236244
Swan Creek	61.51883798
<b>Open Space / Forested</b>	<b>40.91015622</b>
Bush River	40.91015622
<b>Old Philadelphia</b>	<b>167.0524376</b>
<b>High Intensity Commercial</b>	<b>58.31520099</b>
Bush River	58.31520099
<b>Industrial</b>	<b>5.350898289</b>
Bush River	5.350898289
<b>Medium Density Residential</b>	<b>55.89070391</b>
Bush River	55.89070391
<b>Open Space / Forested</b>	<b>47.49563444</b>
Bush River	47.49563444
<b>Old Robinhood</b>	<b>508.3018718</b>
<b>Low Density Residential</b>	<b>0.026819838</b>
Swan Creek	0.026819838
<b>Medium Density Residential</b>	<b><del>339.299292</del></b>
Swan Creek	<del>339.299292</del>
<b>Open Space / Forested</b>	<b>168.9757599</b>

# Appendix E- Water Resources Calculations

Swan Creek	168.9757599
<b>Paradise</b>	<b>252.0239972</b>
<b>Agriculture</b>	<b>0.674371808</b>
Swan Creek	0.674371808
<b>Medium Density Residential</b>	<b>210.5372777</b>
Swan Creek	210.5372777
<b>Open Space / Forested</b>	<b>40.81234772</b>
Swan Creek	40.81234772
<b>Pulaski</b>	<b>221.5622667</b>
<b>High Intensity Commercial</b>	<b>120.9054864</b>
Swan Creek	120.9054864
<b>Industrial</b>	<b>52.98841982</b>
Swan Creek	52.98841982
<b>Low Density Residential</b>	<b>47.66836045</b>
Swan Creek	47.66836045
<b>Swan Creek</b>	<b>360.5587927</b>
<b>Agriculture</b>	<b>360.5587927</b>
Swan Creek	360.5587927
<b>Titan Terrace</b>	<b>409.1225955</b>
<b>Low Density Residential</b>	<b>223.8328734</b>
Swan Creek	223.8328734
<b>Medium Density Residential</b>	<b>113.7499464</b>
Swan Creek	113.7499464
<b>Open Space / Forested</b>	<b>71.53977567</b>
Swan Creek	71.53977567
<b>Grand Total</b>	<b>5235.140018</b>

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

APG Watershed - Aberdeen Existing

PRIMARY SOURCES - Land Use				Concentrations				Annual Loading Rates				Annual Load			
		Area (Acres)	Impervious Cover %	TN	TP	TSS	FC	TN	TP	TSS	FC	TN	TP	TSS	FC
				mg/l	mg/l	mg/l	MPN/100 ml	lb/acre	lb/acre	lb/acre	billion/acre	lb/year	lb/year	lb/year	# billion/ye
Residential	LDR (<1du/acre)	32.39558846	11	2	0.26	55	20000	2.8	0.4	90	130	92	12	2,916	4,206
	MDR (1-4 du/acre)	164.6882365	21	2	0.26	55	20000	4.6	0.6	126	208	753	98	20,695	34,298
	HDR (>4 du/acre)	4.845200871	33	2	0.26	55	20000	6.6	0.9	182	302	32	4	884	1,465
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
Commercial		94.86369644	72	2	0.26	55	20000	13.3	1.7	367	608	1,266	165	34,815	57,698
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Roadway		3.911903828	80	2	0.26	55	20000	14.7	1.9	405	671	58	7	1,584	2,625
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Industrial		101.7772644	53	2	0.26	55	20000	10.1	1.3	277	459	1,026	133	28,202	46,738
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Forest		18.47377546						2.5	0.2	100	12	46	4	1,847	222
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
												-	-	-	
Open Water								12.8	0.5	155		-	-	-	
Active Construction															
Vacant Lots								0	0	0	0				
<b>Total</b>		<b>420.955666</b>	<b>39.22510342</b>					<b>7.773454</b>	<b>1.005063</b>	<b>216.0385</b>	<b>349.8033</b>	<b>3,272</b>	<b>423</b>	<b>90,943</b>	<b>147,252</b>

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	420.955666
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

APG Watershed - Aberdeen Future Growth - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/ac	TN lb/year	TP lb/year	TSS lb/year	FC # billion/ye
Residential	LDR (<1du/acre)	4.255489376	11	2	0.26	55	20000	2.8	0.4	90	130	12	2	383	553
	MDR (1-4 du/acre)	155.366382	21	2	0.26	55	20000	4.6	0.6	126	208	710	92	19,524	32,357
	HDR (>4 du/acre)	41.19451543	33	2	0.26	55	20000	6.6	0.9	182	302	273	36	7,516	12,456
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		103.6362182	72	2	0.26	55	20000	13.3	1.7	367	608	1,383	180	38,035	63,034
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway		3.911903828	80	2	0.26	55	20000	14.7	1.9	405	671	58	7	1,584	2,625
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		101.7772644	53	2	0.26	55	20000	10.1	1.3	277	459	1,026	133	28,202	46,738
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		10.81389267						2.5	0.2	100	12	27	2	1,081	130
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
Total		420.955666	42.37471993					8.287333	1.074142	228.8223	375.0784	3,489	452	96,324	157,891

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	420.955666
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Bush Watershed - Aberdeen Existing - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/ye
Residential	LDR (<1du/acre)	94.6486	11	2	0.26	55	20000	2.8	0.4	90	130	270	35	8,518	12,289
	MDR (1-4 du/acre)	125.1168	21	2	0.26	55	20000	4.6	0.6	126	208	572	74	15,723	26,057
	HDR (>4 du/acre)	57.1205	33	2	0.26	55	20000	6.6	0.9	182	302	379	49	10,422	17,271
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
Commercial		181.287	72	2	0.26	55	20000	13.3	1.7	367	608	2,419	315	66,532	110,263
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Roadway		3.96345	80	2	0.26	55	20000	14.7	1.9	405	671	58	8	1,605	2,659
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Industrial		466.335	53	2	0.26	55	20000	10.1	1.3	277	459	4,699	611	129,217	214,149
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Forest		90.9247						2.5	0.2	100	12	227	18	9,092	1,091
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
<b>Total</b>		<b>1019.39605</b>	<b>42.80873847</b>					<b>8.460072</b>	<b>1.08866</b>	<b>236.5217</b>	<b>376.4773</b>	<b>8,624</b>	<b>1,110</b>	<b>241,109</b>	<b>383,779</b>

Pollutant Fraction as Storm Load	TN	TP	TSS	FC
	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	1019.39605
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Bush Watershed - Aberdeen Future Growth - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/ye
Residential	LDR (<1du/acre)	74.45781537	11	2	0.26	55	20000	2.8	0.4	90	130	212	28	6,701	9,667
	MDR (1-4 du/acre)	124.4488654	21	2	0.26	55	20000	4.6	0.6	126	208	569	74	15,639	25,918
	HDR (>4 du/acre)	109.1263634	33	2	0.26	55	20000	6.6	0.9	182	302	724	94	19,910	32,996
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		191.6012356	72	2	0.26	55	20000	13.3	1.7	367	608	2,557	332	70,318	116,536
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway		3.963450191	80	2	0.26	55	20000	14.7	1.9	405	671	58	8	1,605	2,659
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		474.69474	53	2	0.26	55	20000	10.1	1.3	277	459	4,783	622	131,534	217,988
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		41.44800426						2.5	0.2	100	12	104	8	4,145	497
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
Open Water								12.8	0.5	155		-	-	-	-
Active Construction												-	-	-	-
Vacant Lots								0	0	0	0	-	-	-	-
Total		1019.740474	45.40843431					8.832458	1.143139	245.0139	398.3979	9,007	1,166	249,851	406,262

Partitioning Coefficients for Rural and Forest Land				
Pollutant Fraction as Storm Load	TN	TP	TSS	FC
	50%	70%	90%	100%

Watershed Data	
Annual Rainfall (inches)	47
Watershed Area (acres)	1019.740474
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Swan Watershed - Aberdeen Existing - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/year
Residential	LDR (<1du/acre)	576.606	11	2	0.26	55	20000	2.8	0.4	90	130	1,643	214	51,895	74,864
	MDR (1-4 du/acre)	219.463	21	2	0.26	55	20000	4.6	0.6	126	208	1,003	130	27,579	45,705
	HDR (>4 du/acre)	162.9436	33	2	0.26	55	20000	6.6	0.9	182	302	1,081	141	29,729	49,269
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		283.018	72	2	0.26	55	20000	13.3	1.7	367	608	3,777	491	103,868	172,138
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway		47.9489	80	2	0.26	55	20000	14.7	1.9	405	671	706	92	19,412	32,172
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		271.8496	53	2	0.26	55	20000	10.1	1.3	277	459	2,739	356	75,327	124,838
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		878.1552						2.5	0.2	100	12	2,195	176	87,816	10,538
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
												-	-	-	-
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
Total		2439.9843	22.52054023					5.386929	0.655313	162.1423	208.8228	13,144	1,599	395,625	509,524

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	2439.9843
Stream Length (miles)	
Planning Horizon (years)	20



# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Swan Watershed - Aberdeen Future Growth - Infill

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/year
Residential	LDR (<1du/acre)	593.444	11	2	0.26	55	20000	2.8	0.4	90	130	1,691	220	53,410	77,050
	MDR (1-4 du/acre)	314.964	21	2	0.26	55	20000	4.6	0.6	126	208	1,439	187	39,580	65,594
	HDR (>4 du/acre)	210.984	33	2	0.26	55	20000	6.6	0.9	182	302	1,400	182	38,494	63,795
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		200.55	72	2	0.26	55	20000	13.3	1.7	367	608	2,676	348	73,602	121,979
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway		47.949	80	2	0.26	55	20000	14.7	1.9	405	671	706	92	19,413	32,172
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		687.874	53	2	0.26	55	20000	10.1	1.3	277	459	6,931	901	190,604	315,884
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		384.22						2.5	0.2	100	12	961	77	38,422	4,611
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
<b>Total</b>		<b>2439.985</b>	<b>30.67127134</b>					<b>6.476916</b>	<b>0.822316</b>	<b>185.8713</b>	<b>279.1349</b>	<b>15,804</b>	<b>2,006</b>	<b>453,523</b>	<b>681,085</b>

Partitioning Coefficients for Rural and Forest Land				
Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Watershed Data	
Annual Rainfall (inches)	47
Watershed Area (acres)	2439.985
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Bush - Existing - Growth Areas

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/ye
Residential	LDR (<1du/acre)	487.5154157	11	2	0.26	55	20000	2.8	0.4	90	130	1,389	181	43,876	63,297
	MDR (1-4 du/acre)	21	21	2	0.26	55	20000	4.6	0.6	126	208	-	-	-	-
	HDR (>4 du/acre)	33	33	2	0.26	55	20000	6.6	0.9	182	302	-	-	-	-
	Multifamily	44	44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
Commercial		58.31520099	72	2	0.26	55	20000	13.3	1.7	367	608	778	101	21,402	35,469
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway			80	2	0.26	55	20000	14.7	1.9	405	671	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		161.8659605	53	2	0.26	55	20000	10.1	1.3	277	459	1,631	212	44,852	74,332
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		1052.054271						2.5	0.2	100	12	2,630	210	105,205	12,625
Rural		235.1213822						4.6	0.7	100	39	1,082	165	23,512	9,170
Open Water								12.8	0.5	155					
Active Construction															
Vacant Lots								0	0	0	0				
<b>Total</b>		<b>1994.87223</b>	<b>9.09344452</b>					<b>3.764526</b>	<b>0.435488</b>	<b>119.7306</b>	<b>97.69626</b>	<b>7,510</b>	<b>869</b>	<b>238,847</b>	<b>194,892</b>

Pollutant Fraction as Storm Load	TN	TP	TSS	FC
	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	1994.87223
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Bush - Future Growth - Growth Areas

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/ye
Residential	LDR (<1du/acre)	360.915	11	2	0.26	55	20000	2.8	0.4	90	130	1,028	134	32,482	46,860
	MDR (1-4 du/acre)	303.317	21	2	0.26	55	20000	4.6	0.6	126	208	1,386	180	38,116	63,169
	HDR (>4 du/acre)	132.6297	33	2	0.26	55	20000	6.6	0.9	182	302	880	114	24,198	40,103
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
							1.3	0.1	90	12	-	-	-	-	
Commercial		58.315	72	2	0.26	55	20000	13.3	1.7	367	608	778	101	21,402	35,469
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Roadway			80	2	0.26	55	20000	14.7	1.9	405	671	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Industrial		200.028	53	2	0.26	55	20000	10.1	1.3	277	459	2,015	262	55,426	91,856
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Forest		939.6669						2.5	0.2	100	12	2,349	188	93,967	11,276
Rural								4.6	0.7	100	39	-	-	-	
Open Water								12.8	0.5	155		-	-	-	
Active Construction															
Vacant Lots								0	0	0	0				
<b>Total</b>		<b>1994.8716</b>	<b>14.79627365</b>					<b>4.229367</b>	<b>0.490938</b>	<b>133.1367</b>	<b>144.7373</b>	<b>8,437</b>	<b>979</b>	<b>265,591</b>	<b>288,732</b>

Pollutant Fraction as Storm Load	TN	TP	TSS	FC
	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	1994.8716
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Swan - Existing - Growth Areas

PRIMARY SOURCES - Land Use		Area (Acres)	Impervious Cover %	Concentrations				Annual Loading Rates				Annual Load			
				TN mg/l	TP mg/l	TSS mg/l	FC MPN/100 ml	TN lb/acre	TP lb/acre	TSS lb/acre	FC billion/acre	TN lb/year	TP lb/year	TSS lb/year	FC # billion/year
Residential	LDR (<1du/acre)	1017.98559	11	2	0.26	55	20000	2.8	0.4	90	130	2,900	377	91,619	132,171
	MDR (1-4 du/acre)	158.9642241	21	2	0.26	55	20000	4.6	0.6	126	208	726	94	19,976	33,106
Multifamily	HDR (>4 du/acre)		33	2	0.26	55	20000	6.6	0.9	182	302	-	-	-	-
			44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial		120.9054864	72	2	0.26	55	20000	13.3	1.7	367	608	1,614	210	44,372	73,538
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Roadway			80	2	0.26	55	20000	14.7	1.9	405	671	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Industrial		55.96	53	2	0.26	55	20000	10.1	1.3	277	459	564	73	15,506	25,698
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
								0.0	0.0	0	-	-	-	-	-
Forest		861.57287						2.5	0.2	100	12	2,154	172	86,157	10,339
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
Rural		1024.8796						4.6	0.7	100	39	4,714	717	102,488	39,970
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
Open Water							12.8	0.5	155		-	-	-	-	
Active Construction															
Vacant Lots							0	0	0	0					
<b>Total</b>		<b>3240.267771</b>	<b>8.087962808</b>					<b>3.91086</b>	<b>0.507437</b>	<b>111.1385</b>	<b>97.15899</b>	<b>12,672</b>	<b>1,644</b>	<b>360,118</b>	<b>314,821</b>

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	3240.267771
Stream Length (miles)	
Planning Horizon (years)	20

# Appendix E- Water Resources Calculations



## Loads from Primary Sources - Simple Method Calculations

Swan - Future Growth - Growth Areas

PRIMARY SOURCES - Land Use				Concentrations				Annual Loading Rates				Annual Load			
	Area (Acres)	Impervious Cover %		TN	TP	TSS	FC	TN	TP	TSS	FC	TN	TP	TSS	FC
				mg/l	mg/l	mg/l	MPN/100 ml	lb/acre	lb/acre	lb/acre	billion/acre	lb/year	lb/year	lb/year	# billion/year
Residential	LDR (<1du/acre)	380.8419	11	2	0.26	55	20000	2.8	0.4	90	130	1,085	141	34,276	49,447
	MDR (1-4 du/acre)	1446.855	21	2	0.26	55	20000	4.6	0.6	126	208	6,612	859	181,817	301,322
	HDR (>4 du/acre)		33	2	0.26	55	20000	6.6	0.9	182	302	-	-	-	-
	Multifamily		44	2	0.26	55	20000	8.5	1.1	235	389	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
								1.3	0.1	90	12	-	-	-	-
Commercial	120.905	72	2	0.26	55	20000	13.3	1.7	367	608	1,614	210	44,372	73,537	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Roadway		80	2	0.26	55	20000	14.7	1.9	405	671	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Industrial	156.3665	53	2	0.26	55	20000	10.1	1.3	277	459	1,576	205	43,328	71,806	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
								0.0	0.0	0	-	-	-	-	
Forest	519.565							2.5	0.2	100	12	1,299	104	51,957	6,235
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
Rural	615.706							4.6	0.7	100	39	2,832	431	61,571	24,013
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
								-	-	-	-	-	-	-	
Open Water								12.8	0.5	155		-	-	-	
Active Construction															
Vacant Lots								0	0	0	0				
<b>Total</b>	<b>3240.2394</b>	<b>15.91419461</b>						<b>4.634449</b>	<b>0.601817</b>	<b>128.7929</b>	<b>162.4446</b>	<b>15,017</b>	<b>1,950</b>	<b>417,320</b>	<b>526,359</b>

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Annual Rainfall (inches)	47
Watershed Area (acres)	3240.2394
Stream Length (miles)	
Planning Horizon (years)	20