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BALTIMORE-WASHINGTON RAPID RAIL

BALTIMORE-WASHINGTON SCMAGLEV PROJECT

Maryland High-Quality Waters (Tier II)

Social and Economic Justification Report

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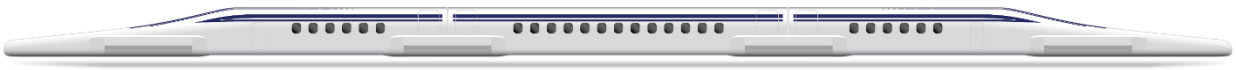

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1. INTRODUCTION

1.1. PROJECT SUMMARY

The Baltimore-Washington Superconducting Maglev (SCMAGLEV) Project plans to build a new high-speed passenger train between Washington D.C. and Baltimore, MD with an intermediary stop at Baltimore-Washington International Airport (BWI Airport). The project will provide new infrastructure, passenger stations and other ancillary facilities for the SCMAGLEV system. Of twelve different Build Alternatives presented in the Federal Railroad Administration's (FRA) Draft Environmental Impact Statement (DEIS), Baltimore Washington Rapid Rail's (BWRR) preferred alignment and project proposal is Build Alternative J-03 which includes the Washington D.C. station in Mount Vernon East, Alignment J (which is approximately 70% tunnel and 30% above-ground viaduct that runs along the eastern edge of the Baltimore-Washington Parkway); a train maintenance facility (TMF) located on United States Department of Agricultural Beltsville Agricultural Research Center (USDA BARC) land west of the Baltimore Washington Parkway; and a Baltimore City Station in the Cherry Hill neighborhood.

As currently planned, the Final Environmental Impact Statement (FEIS) will be published in early 2022 with the Record of Decision (ROD) to follow soon after. The FEIS and ROD are expected to be completed before the nontidal wetlands permit would be issued jointly by the US Army Corps of Engineers and Maryland Department of Environment. These federal and state permits must be finalized and granted before construction could begin.

The project has location specific restrictions that prevent complete avoidance of Tier II watersheds. (See the Alternatives Analysis – No-Discharge Alternative document for more details).

1. The Study area for the project was mandated by the federal funding source for the project and includes Tier II Catchment watersheds.
2. The SCMAGLEV technology requirements complying with Federal safety requirements.
3. There is No reasonable alternative alignment outside of the Tier II Catchment watersheds.

1.2. IMPACTS

The limits of disturbance (LOD) presented are worst case scenario and include both permanent and temporary impacts. The single largest impact is from the Train Maintenance Facility (TMF), which needs to be located as near to the DC terminus station as possible and cannot be disaggregated or otherwise manipulated. Environmental impacts have been minimized and avoided to the greatest extent possible. Further refinement is anticipated as the design develops. The minimization and avoidance efforts are detailed in the Tier II Alternatives Analysis Minimization Report.

The SCMAGLEV project permanent impacts to forest cover and waterways within Tier II Watersheds are summarized in the following table:

Table 1: Summary of Impacts to Tier II Watersheds

Total Impact Type	Tier II Catchment Watersheds		Total
	Beaverdam Creek 2	Patuxent River 1	
Forest (Acers)	216	40	256
New Impervious Surfaces (Acers)	167	3	170
Stream Buffer (LF)	2,808	1,526	4,334

1.2.1 MINIMIZATION & AVOIDANCE

The following measures were incorporated during conceptual design to reduce impacts to forest cover, streams, and their buffers. A more comprehensive list is available in the Tier II Alternatives Analysis Minimization Report.

1) Earlier plans for the TMF located in Tier II waters called for a 235-acre facility footprint. BWRR, in consultation with Central Japan Railway, redesigned the TMF to require only 180-acres. This is a 55-acre reduction in impacts to Tier II waters.
2) The above ground guideway uses viaduct construction resulting in small periodic impacts for pier foundations, rather than continuous impacts from embankment used in traditional rail projects.
3) The viaduct will be a minimum of 32' above ground and reach heights over 100' above ground, minimizing effects of shading and impervious structures.
4) A Maintenance-of-Way (MOW) facility is co-located with the TMF making use of the TMF ramps rather than creating additional ramps to the MOW. This minimizes land disturbance that would occur if the MOW facility were at separate locations.
5) The stormwater management design in the vicinity of the south portal was redesigned to minimize wetland and stream impacts. This area will be replanted upon completion of the construction.
6) Selecting the BARC West TMF with the J alignment alternative results in approximately 4 acres of permanent wetland impact avoidance and minimization as compared with pairing the J alignment to the BARC East-Airstrip alternative.
7) The project overall has committed approximately 70% of the alignment to deep tunneling to avoid impacts to the environment and communities between Washington DC and Baltimore City. The DEIS notes "Build Alternatives largely avoid fisheries resources and migration paths associated with major stream systems and/or high-quality Tier II Waters (Anacostia, Patuxent, and Patapsco Rivers, Beaverdam Creek, Baltimore Harbor, and tributaries) by tunneling below or spanning over the systems. FRA has considered Environmental Site Design (ESD) in planning and placement of piers to avoid and minimize impacts to wetlands and waterways to the extent possible" (4.12-22). The project tunnels approximately 1-mile under the Beaverdamcreek Tier II Watershed.

1.2.2 MITIGATION MEASURES

To evaluate options available for mitigating impacts, BWRR performed a GIS analysis that identified properties conducive to reforestation and mailed letters to the owners of these properties. The letters described BWRR's reforestation goals and invited interested property owners to contact BWRR. After meeting with interested respondents, BWRR found willing property owners of 64.5 acres of land for reforestation in the Patuxent River I Watershed. BWRR personnel have been conducting in-person site visits to evaluate their potential. BWRR will proceed to negotiations after complete assessments of the properties and with approval of the project.

No landowners in the Beaverdam Creek 2 Watershed replied to BWRR's outreach. However, BWRR consulted the Region 11 General Services Administration, the Maryland Department of Natural Resources, and the Maryland National Capital Park and Planning Commission (M-NCPPC) to better understand reforestation and conservation opportunities in the area. No clear opportunities for reforestation or conservation are currently available. BWRR will continue its search until all mitigation options are exhausted. Table two summarizes mitigation opportunities by watershed. Table three refines the summary into the Maryland Department of the Environment (MDE) mitigation preference hierarchy.

Table 2: BWRR's Mitigation Site Search Results: Summary of Mitigation Opportunities

Build Alternative	Mitigation Type	Tier II Mitigation Summary		
		Beaverdam Creek 2	Patuxent River 1	Total (Acres)
J-03	Reforestation	81.98	80.5*	162.48
	Conservation	327.18	N/A	327.18
			Total	489.66

***Acreage available through six property owners interested in reforesting with BWRR**

Table 3: Summary of Tier II Mitigation Opportunities by MDE Preference Hierarchy

Patuxent 1 Watershed			
Proposed Tier II Mitigation Type		Mitigation Amount	Mitigation Location
In-kind, on-site	Reforestation	16	Patuxent River I watershed
In-kind, off-site	Reforestation	64.5	Patuxent River I watershed
	Total	80.5	
Beaverdam Creek 2 Watershed			
Proposed Tier II Mitigation Type		Mitigation Amount	Mitigation Location
In-kind, on-site	Reforestation	41	Beaverdam Creek 2 watershed
In-kind, off-site	Reforestation	40.98	Beaverdam Creek 2 watershed
In-kind, on-site	Conservation	26.5	Beaverdam Creek 2 watershed
In-kind, off-site	Conservation	300.68	Beaverdam Creek 2 watershed
	Total	409.16	

1.3. ANTIDEGRADATION POLICY

Federal regulations (40CFR131.12) require states to develop and adopt a statewide antidegradation policy. The Maryland antidegradation implementation procedures are found in the Code of Maryland Regulations (COMAR) 26.08.02.04-1, and the regulation states that high-quality waters shall be maintained. Fish and Benthic Index of Biotic Integrity (IBI) scores from the Maryland Biological Stream Survey (MBSS) were used to designate Tier II waters. Tier II review is focused on impacts to these scores.

Impacts are assessed through changes in assimilative capacity (AC), which is the difference between the measured IBI score when designated as Tier II (Scores above 4) and the Tier I water quality criterion (Score of 3). MDE evaluates impacts to forest cover, given that forests are key to healthy watersheds, to infer on the use of assimilative capacity. MDE has determined that the Beaverdam Creek 2 and Patuxent River 1 Tier II Watersheds both have assimilative capacity.

Regulations specify that Tier II water quality is considered diminished if the AC is reduced by more than 25%. This analysis identifies the Tier II stream's assimilative capacity threshold and the lowest possible Tier II benthic and fish IBI scores. When data is above the assimilative capacity threshold, MDE determines that there is some capacity remaining. Conversely, if there is a decline in scores to a level at or below the AC threshold, the stream is determined to have no remaining assimilative capacity.

Antidegradation policy directs applicants to minimize the use of assimilative capacity. If impacts remain after all reasonable efforts have been made to minimize the use of assimilative capacity, applicants are required to submit a social and economic justification (SEJ).

Section L of 26.08.02.04-1 outlines the components of an SEJ. Section M defines the department's responsibilities when reviewing an SEJ, and Section K describes when the requirement for social and

economic justification is met. BWRR has worked with MDE to ensure that this project's submission provides adequate information on the socioeconomic contributions of the project.

1.4. DOCUMENT PURPOSE

The purpose of this document is to provide the Social and Economic justification because there is no cost-effective alternative to the discharge in the Beaverdam Creek and Patuxent Tier II watersheds. Although SCMAGLEV project impacts have been avoided, minimized, and mitigated to the greatest extent practicable, some impacts, particularly in the Beaverdam Creek 2 Tier II watershed, are unavoidable. BWRR will demonstrate that the socioeconomic contributions of the SCMAGLEV project are extraordinary and provide benefits that outweigh the ecological services and water quality benefits that the impacted segments of the Tier II watersheds provide.

2. SOCIOECONOMIC CONTRIBUTIONS OF THE PROJECT

The purpose of the SCMAGLEV Project is to provide new, reliable, safe, high-speed passenger transportation and significantly reduce travel time to meet the capacity and ridership needs of the Baltimore-Washington region. The project will improve redundancy and mobility options, connections to existing modes of transportation, complimentary alternative rail expansion opportunities to adjacent corridors, and support local/regional economic growth.

SCMAGLEV is needed to address regional congestion, increased development, and the following transportation issues and challenges (from the SCMAGLEV DEIS Purpose and Need 2021):

1.. **Increasing population and employment:** The Baltimore-Washington region makes up one of the largest and densest population centers in the United States. Between 2015 and 2040, the population in this region is projected to increase 23 percent between 2015 and 2045, along with a 33 percent increase in employment workforce

2.. **Growing demands on the existing transportation network:** Travel demand will continue to increase in the Project Study Area along major roadways and railways, including Interstate 95 (I-95), the Baltimore-Washington Parkway (BWP), MD 295, I-295, US 29, US 1, and the Northeast Corridor (NEC)

3.. **Inadequate capacity of the existing transportation network:** All of the major roadway corridors between Baltimore and Washington, D.C. include roadway segments that operate at level of service (LOS) E/F (heavy congestion) or LOS F (severe congestion) during AM and PM peak hours. Heavy congestion within the peak AM and PM hours is likely to spill over to non-peak hours because travelers shift their departure times to avoid peak period congestion. With the increased demand on the roadway network, the number of severe congestion segments is projected to increase.

   Likewise, the NEC FUTURE Tier 1 FEIS documented the increasing demand for improved rail service between Baltimore and Washington, DC. It also demonstrated that multiple portions of the NEC, including those in the SCMAGLEV study area, are experiencing congestion and delays due to capacity constraints and other maintenance needs.

4.. **Increasing travel times:** According to the 2015 Maryland State Highway Mobility Report, fourteen of the 30 most unreliable roadway segments in Maryland are located between Baltimore and Washington, DC. These segments can experience travel time delays totaling more than 50-minutes per trip between Baltimore and Washington.

   Rail transit between Baltimore and Washington, DC is more consistent than vehicular travel based on scheduling and the dedicated transit right-of-way. However, emergency repairs, deferred maintenance, and heavy use of the NEC have affected on-time performance. Bus service in the corridor, specifically Metrobus B30 from Greenbelt Metrorail Station to BWI Marshall Airport, has less consistent travel times, related to congestion issues along the BWP.

   For transit and airport users, trips to and from transit stations, park and ride lots, or airports are also impacted by travel time delays. As congestion on the roadway network increases, the total travel time for all modes is anticipated to increase.

5.. **Decreasing mobility:** The increase in demand, travel time delays, and worsening levels of service directly impact the reliability of transportation options and the mobility of travelers within the Baltimore-Washington region.

6.. **Maintaining economic viability:** The Baltimore-Washington area is an important economic engine in the Mid-Atlantic region. Improvements to the transportation network are needed to help support the predicted population and employment growth and to sustain the economic health of the region.

2.1. ECONOMIC IMPORTANCE & BENEFITS

The SCMAGLEV project will bring widespread benefits to the surrounding communities. These include economic, environmental, and quality of life improvements. Throughout the project footprint, the main economic benefit will be the generation of numerous temporary and permanent jobs. Additional benefits stem from reductions in vehicle miles travelled (VMT). Within the Beaverdam Creek 2 Watershed (BC2), an estimated 300+ permanent jobs are anticipated for operations and maintenance work at the TMF. Additionally, BWRR's *Diversity, Equity, and Inclusion Plan* provides EJ communities in BC2 and elsewhere a direct link to the economic uplift of the project.

As stated in Maryland COMAR 26.08.02.04-1(M)(2), *"Evaluation of the SEJ shall consider the relative magnitude of costs and benefits of development, recognizing the difficulty in quantifying benefits."* The SCMAGLEV system is not expected to begin operations until 2030. Considerable variation in job forecasts should be expected (given technology improvements, wage changes, etc.) However, BWRR has provided estimates in broader categories of temporary and permanent jobs with additional refinements to County and Tier II Watershed levels.

The Beaverdam Creek watershed, which encompasses the proposed TMF location, is relatively small at 14.1 square miles and is wholly within Prince George's County. The Patuxent watershed is approximately 168 square miles and straddles Prince George's and Anne Arundel Counties as well as three other counties not impacted by the SCMAGLEV project. Economic data has been refined to the greatest extent possible. Most economic calculations shown are presented at a county level since more refined data is rarely available.

2.1.1 REDUCTIONS IN VEHICLE MILES TRAVELLED (PROJECT-WIDE):

Based on the SCMAGLEV ridership forecast, during the first year of operation, 2030, between 11.38 and 12.61 million annual passengers are expected to divert from cars to SCMAGLEV (DEIS 4.2-7).

Economic benefits are reaped from reduced VMT, which decreases congestion, accidents, noise, and pavement maintenance costs. The value of this improvement is measured by estimating the damage cost from highway VMT. Table 4 provides the typical economic cost, per VMT, of congestion, accidents, noise, and pavement maintenance.

Table 4: Damage Rates for Vehicle Miles Traveled

Benefit (Avoided Damage)	Avoided Damage Cost per VMT (2020-$'s)
Congestion	$0.3895*
Accidents	$0.2856**
Noise	$0.0056***
Pavement	$0.0015***

*Rate derived from previous studies and in line with USDOT guidance
** Rate used from (NHTSA) 2016 Traffic Safety Facts
***The value for reduced noise and pavement maintenance cost was based on previous studies and accepted methodology from the USDOT.

DEIS Appendix A Table D.2-3 notes that in 2030 with a Cherry Hill Station 284,918,509 VMT are expected to be diverted to SCMAGLEV and forecasts an increase to 393,149,002 VMT by 2045. Table 5 below provides the economic benefits of VMT reductions for 2030 and 2045 using rates from table 4.

Table 5: Summary of Reduction in VMT Economic Benefits

Non-User Benefits	2030 Present Value ($millions)	2045 Present Value ($millions)
Congestion Reduction	$110.98	$153.13
Safety Benefits	$81.37	$112.28
Noise Pollution and Reduction	$1.60	$2.20
Pavement Maintenance Cost Savings	$0.43	$0.60

As Table 5 shows, in its first year of operation, the SCMAGLEV will generate more than $182 million in congestion relief and safety benefits for the region. This applies to impacted Tier II Watersheds along the overcrowded Baltimore-Washington Parkway and I-95. By 2045, these congestion and safety benefits will grow to more than $265 million per year. This congestion relief, according to local County, State, and Federal planning documents (see Appendix 2), is absolutely needed.

2.1.2 TEMPORARY JOBS:

Employment Presented in this Report

The employment numbers throughout this report have been produced based on an evaluation of various other railroad manpower requirements and will be refined as Project planning advances and operating details are finalized.

RIMS Method

According to the DEIS, whose methodology relied on the Bureau of Economic Analysis Regional Input-Output Modeling System Series 2018 Multiplier (RIMS II), the SCMAGLEV project is anticipated to generate 161,000 job-years of temporary labor to build (i.e., one job-year equals one-job per person per year) for Build Alternative J-03 (DEIS Chapter 4.6). This is composed of 123,000 temporary construction job-years and 38,000 professional services job-years. This means the SCMAGLEV project is expected to produce approximately 23,000 jobs per year for the expected seven-year construction period.

Construction of the SCMAGLEV Project would add temporary jobs to the local economy through hiring construction workers, renting or purchasing equipment, and procurement of materials for the duration of the construction period. Professional services include architectural engineering, project management, and planning services.

According to the DEIS (4.6-16), this construction effort will produce $8.8 billion direct labor earnings, potentially resulting in an average annual salary of $54,658.39 ($8,800,000/161,000).

IMPLAN Method

BWRR commissioned an independent economic analysis in March 2021 to look at temporary job estimates at a State and County-level. This analysis used an industry-accepted input-output model, IMPLAN[1], which is widely used and was originally developed by the U.S. Forest Service.

The analysis shows that across the Washington-Baltimore-Arlington CSA, more than 243,840 job-years of employment, or an average of 34,830 jobs per year over a 7-year construction period, will be generated by the SCMAGLEV construction project. Most of these jobs – an estimated 222,590 person-years of employment – were estimated to be within the local study area, which consists of Washington DC, Baltimore City, Baltimore County, Anne Arundel County and Prince George's County, Maryland.

Table 6 refines temporary job estimates to where Tier II impacts occur - Prince George's and Anne Arundel Counties. The average annual wage for someone building the SCMAGLEV in Prince George's County is forecasted to be approximately $62,559 and in Anne Arundel County $70,689[1]. **The current average income for the two impacted Tier II Counties, by industries, are presented in**

Table 7.

[1] IMPLAN uses data from public sources, including from the U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, U.S. Bureau of Census, and the U.S. Department of Agriculture. The system uses advanced modeling techniques to develop customized analyses based on geography, industry detail, and time. The study includes:

1 Direct Impacts: wages construction/professional services workers

2 Indirect Impacts: supporting industries who supply goods and services to enable the direct spending on SCMAGLEV—including industries supplying construction materials; equipment; and the steel, concrete, wood, and plastic materials that are needed for building guideways, and station facilities)

3 Induced Impacts (industries that are supported by the re-spending of SCMAGLEV direct and indirect worker income and salaries on consumer goods and services – including food, shelter, recreation, education and personal services

Based on the DEIS RIMS analysis and the BWRR Commissioned IMPLAN analysis, the SCMAGLEV anticipated wages are on par with the existing market wages in each County. BWRR's expected average wage in Anne Arundel County, $70,689 (see Table 6) is within 1% of the current market rate average in Anne Arundel County, $71,462 (See

Table 7). Current wages in Prince George's County are $60,819 (see Table 7) while BWRR anticipates wages to be approximately 2.86% higher at $62,559 (see Table 6).

Table 6: ***Prince George's and Anne Arundel Expected Temporary Economic Impact.***

Study Area	Employment (in job-years)	Labor Income ($millions)	Average Annual Wages/ person	GDP ($millions)	Economic Output or Sales ($millions)	State and County Tax Revenue ($millions)
Prince George's County	54,365	3,401	$62,559	2,939	5,980	250
Anne Arundel County	91,966	6,501	$70,689	5,914	11,138	543
State of Maryland	193,329	13,166	$68,102	12,845	24,168	1,111

Table 7: Employment and Wages by Industry*

Annual Wages by Industry	Anne Arundel County ($2019)	Prince George's County ($2019)
Utilities	118,256	102,304
Construction	67,801	73,171
Manufacturing	110,379	62,079
Wholesale Trade	80,537	64,908
Retail Trade	33,063	33,881
Transportation and Warehousing	61,611	49,770
Finance and Insurance	91,699	71,002
Real Estate and rental/leasing	54,064	50,208
Professional and Technical Services	111,013	97,298
Administrative and Waste Services	49,598	43,491
Health Care and Social Assistance	55,010	55,075
Accommodation and Food Services	24,516	26,641
Unweighted County Average	**$71,462**	**$60,819**

* Source: Quarterly Census of employment and Wages - Annual Averages 2019

2.1.3 BEAVERDAM CREEK 2 - PERMANENT OPERATIONS AND MAINTENANCE JOBS:

As noted in the DEIS Appendix G15: *Operations and Maintenance Memorandum*, permanent direct employment for SCMAGLEV operations is anticipated to be approximately 690-750 jobs across the entire system. This estimate is based on a thorough evaluation of various other railroad manpower requirements and will be refined as project planning advances and operating details are finalized.

Table 8: Permanent Operations and Maintenance Jobs*

Type of Job	Approximate Number of Employees
General Management and Administration	40-50
Security	60-70
Railway/Stations Operations	290-310
Train Maintenance Facility/Maintenance of Way	300-320
TOTAL	**690-750**

* Source DEIS Appendix G15

The permanent jobs located specially in impacted Tier II Watersheds will be the 300-320 TMF and MOW jobs. Using the IMPLAN model, BWRR has extrapolated estimated wages and economic impacts of TMF jobs in the Tier II watersheds from the project's overall direct operations and maintenance.

Table 9: Beaverdam Creek 2 Watershed Economic Impact Projections. Source IMPLAN Modeling.

Study Area	Employment (O&M/year in $2020)	Labor Income ($millions)	Average Annual Wage/person	State/County Tax Revenue ($millions)
Beaverdam Creek 2	300-320	$20.31-$21.66	$67,700	$1.23 - $1.31

SCMAGLEV's projections are reasonable and comparable to other large-scale passenger rail operating numbers. Worth noting is that California High Speed Rail's 2020 Business Plan' *Operations and Maintenance Cost Model Documentation* Technical supporting document includes anticipated staffing levels at their rolling stock depot and track inspection teams. The expectations outlined in that document are similar to staffing for the SCMAGLEV TMF and MOWs[2].

2.1.4 BEAVERDAM CREEK 2 – DIVERSITY, EQUITY AND INCLUSION PLAN

As the DEIS Chapter 4.5 *Environmental Justice* highlights, most of the communities that the SCMAGLEV alignment travels under are EJ communities. BC2 communities around the proposed BARC TMF's are considered EJ Communities (DEIS Appendix D.3, Figure D.3-7, also in Appendix #1 of this report). To ensure that local EJ populations reap the economic rewards of this project, on March 1st, 2021, BWRR announced a Diversity, Equity, and Inclusion Plan that laid out the following goals:

a. At least 40% of the construction workforce will be from diverse populations in which the route travels through;

b. At least 25% of construction spending will be on Minority-Business Enterprises (MBEs) and Women Business Enterprises (WBEs);

c. At least 25% permanent workforce from minority and women populations.

> Darryl Barnes, the Chair of the Legislative Black Caucus of Maryland, endorsed the SCMAGLEV project's plan highlighting, *"the current pandemic shows that communities of color are particularly vulnerable during hard times, which is why a project like the SCMAGLEV train offering tens of thousands of jobs and billions of dollars of investment must be taken seriously. Prince George's will benefit from approximately 500 proposed permanent jobs making it the largest concentration of jobs along the route […] jobseekers, contract seekers, and others will be better off thanks to these pathways for county residents to grow and sustain wealth."*

Thus, those adjacent to the project will have the opportunity to benefit from SCMAGLEV construction. Spending for the project will be filtered back through integral local businesses.

Also, there will be particular emphasis to work within EJ communities to establish training and apprenticeship programs. Places of learning, such as Capitol Technology University (located in BC2), are well positioned for their students to benefit from the unique engineering and construction opportunities presented by the SCMAGLEV project.

BWRR's *Diversity, Equity, and Inclusion* vision aligns with local efforts to enhance opportunities for all. For example, Prince George's *Plan2035* has several policies that connect with BWRR's *Diversity, Equity,*

[2] 2020 Business Plan Operations and Maintenance Cost Model Documentation (ca.gov)

and Inclusion Plan. Economic Prosperity Policy 6.3 calls *to "Connect potential employees and innovation activities […] with local minority business enterprise development. Enhance opportunities for qualified job seekers and attract employers to local talent…" (*P. 132) while Economic Prosperity Policy 9.2 seeks to *"establish workforce-based partnerships, including internships, apprenticeships, and work study programs to connect students to future employers, particularly in industry clusters."* Additional information on compatibility of the project with county master plans is in Appendix 2 of this report.

2.1.5 METHOD OF FINANCING AND CATEGORIZED PROJECT COSTS:

Costs for SCMAGLEV in Tier II watersheds will come from the construction of the Train Maintenance Facility (TMF), ramps to the TMF, ramps to the Maintenance of Way (MOW) facility, and a segment of the mainline viaduct guideway.

Financing for construction will come from a mix of sources. BWRR anticipates the Japanese government will provide low interest financing for a significant portion of the Baltimore-Washington SCMAGLEV project. BWRR anticipates the remainder of funding will come from U.S. government loans, U.S. government Maglev Deployment Program grants (administered by the Federal Railroad Administration), and the private sector.

BWRR does not anticipate any cash investment or loans from the State of Maryland.

The civil construction costs within Tier II watersheds for BWRR's preferred alternative, J-03, are estimated (using DEIS Appendix G9 Capital and Construction Costs Memorandum) at $1,070,555,955 and are split between the two watersheds:

- Beaverdam Creek 2 at $834, 843, 545
- Patuxent River 1 at $235,712,410

Table 10: Categorized costs based on the SCMAGLEV DEIS Economic Impact Analysis

Categorized Project Costs			
Category	**Beaverdam Creek 2**	**Patuxent River I**	**Both**
Civil Construction	$834,843,545	$235,712,410	$1,070,555,955*
Professional Services (30% of Civil Construction)*	$250,453,063	$70,713,723	$321,166,786
Civil Construction Contingency (20%)**	$166,968,709	$47,142,482	$214,111,191
Professional Services Contingency (20%)**	$50,090,613	$14,142,745	$64,233,357
Total	**$1,302,355,930**	**$367,711,360**	**$1,670,067,289**

* Does not include core system cost
** Rates based on DEIS estimate (Appendix D.4, page D-20)

Furthermore, BWRR anticipates operating costs for the system will be covered by farebox revenues. The SCMAGLEV service will not be subsidized by the Maryland Transportation Trust Fund (TTF), as is MDOT MARC service. The most likely allocation of funding is summarized below:

Table 11: SCMAGLEV Source and Use Matrix

Source	Use
Maglev Deployment Program	Development and Construction
Japanese Government	Development and Construction

US Government Grants	Construction
US Government Loans	Construction
Private Sector Investment	Construction
SCMAGLEV Riders	Operation and Maintenance

2.1.5.1 *FAREBOX REVENUE*

While BWRR's economic models are proprietary, they show sufficient demand with ticket prices anticipated to be between less than $1 per mile to around $2 mile. For comparison, Acela tickets are $1.30 per mile (DEIS 4.6-13).

Though it is too early to predict exact ticket pricing – as route selection, detailed engineering, permitting, and mitigation methods all need to be finalized – ticket prices will vary based on several factors including destination, expected capacity, day of the week and time of day. While a last-minute purchased ticket for a weekday rush-hour business traveler will likely be higher than a ticket bought two weeks in advance for a Saturday afternoon ride, we anticipate opportunities to provide specialized pricing to local employers, university students, and government employees.

The range of ticket prices and variety of trip options make it financially feasible for communities within the affected watersheds and counties to use the SCMAGLEV system.

2.1.6 ANNUALIZED COST OF MINIMIZATION IMPLEMENTATION:

The estimated cost for mitigation is $50,042,824 (see section 3). Based on a conservative 50-year project life, the annualized cost of mitigation is $1,000,856 (Calculation: $50,042,824/50). This cost of minimization is attainable given the project's current budget estimates. These mitigation expenses are not included in project cost estimates presented in this document but will be included in the final budget once approved.

2.2. SOCIAL IMPORTANCE AND BENEFIT

The social importance and benefits of the SCMAGLEV project are widespread and include both economic and environmental gains for many of the communities near the impacted Tier II Watersheds. Benefits apply to both riders and non-riders. SCMAGLEV riders will benefit from increased speed and reliability. Corridor-wide diverted auto trips to SCMAGLEV will result in travel time savings and reduced local emissions for residents who don't ride the service.

The SCMAGLEV project brings three key improvements to the Tier II watersheds and their encompassing counties:

1 Transportation improvements resulting in shorter and more reliable commutes.

2 Better air quality through reduction of vehicle traffic on roadways.

3 Job creation (both with short-term construction and long-term operations).

Furthermore, the SCMAGLEV project will meet its purpose and need while avoiding widespread impacts to residential communities. This feature cannot be overstated. Along a nearly 40-mile alignment with strict operational requirements, project designers have ensured that no homes are taken. Other significantly smaller linear projects, such as the B & P tunnel, are proposing to displace residential displacements as part of their project development.

2.2.1 TRANSPORTATION IMPROVEMENTS (PROJECT-WIDE)

2.2.1.1 *ROADWAY NETWORK*

The State of Maryland is ranked first in the nation in terms of longest commuting times (32.5 minutes each way), according to the 2016 U.S. Census American Community Survey. Washington, D.C., which includes many Maryland commuters, is fourth in the nation with commuting times on average of 29.9 minutes each way. Travel times can range from 45 minutes to well over an hour during peak hours for the 30-mile trip from Washington to BWI Marshall Airport. Due to non-recurring congestion, (i.e., an unexpected incident) travel times by automobile could range from 90 minutes to two hours (DEIS 2-13). Given the volume and congestion along the major corridors such as I-95, the Baltimore-Washington Parkway, MD 295, US 29 and US 1, an accident can severely inhibit travel. This often results in unreliable and unpredictable estimated travel times and complicates transportation mode decisions.

National Capital Region Long Range Transportation Plan: "the Baltimore Washington-Parkway has the worst traffic of the National Capital Region parkways (P.100)".

The Fort Meade Alliance recently noted that the BW-Parkway was designed for 50,000 cars per day and now sees traffic frequently exceeding 120,000 users per day. The National Park Service *National Capital Region Long Range Transportation* presents no viable solutions to mitigate this traffic.

The Northeast Corridor Commission notes[1] that I-95 crowding issues are set to become so severe in the region that 24% of it will operate at speeds lower than 27mph at peak hours by 2030.

The *2040 Maryland State Transportation Plan* notes that the State's VMT has risen 6.6% in recent years. Moreover, according to the State's plan, vehicle hours travelled are expected to increase 73% in the DC region and 48% in the Baltimore region from 2015 to 2040 (P.11). Travel Time Index (TTF) predictions show that central MD roadways will have 50% worse traffic in 2040 compared to now, especially I-95 and BWP (P.14).

The SCMAGLEV provides a highly desirable alternative to automobile travel. Per the SCMAGLEV DEIS, the SCMAGLEV is expected to divert between 11.38 million to 12.61 million cars off the road by its opening year and up to 16.48 million cars per year by 2045 (Table 4.2-3). This will be up to approximately 57,000 diverted daily trips (4.2-20). This translates to a reduction of overall regional vehicle miles traveled (VMT) in a range of 9% to 12% during 2027 and 2045 (4.16-10), which will help alleviate the increasing congestion in the corridor.

2.2.1.2 *ROADWAY NETWORK-TIER II*

Reducing the number of cars travelling between D.C. and Baltimore is also important for the Tier II watersheds. The Baltimore-Washington Parkway has an interchange at Powder Mill Rd (BC2) and MD-197 (PR1). Also of note is its 495 Interchange, which is just outside of BC2. Through reduced vehicle congestion on the Baltimore Washington Parkway, the project can help reduce commute times for those who move to and from destinations in the watersheds and increase travel safety by reducing accidents from congestion[3].

[3] Based on the National Highway Traffic Safety Administration (NHTSA) 2016 Traffic Safety Facts, there were 1.18 traffic fatalities and 99 traffic injuries per million VMT.

2.2.1.3 *RAIL NETWORK*

The MARC train service between Baltimore and Washington DC shares tracks with Amtrak and CSX trains which creates added capacity limitations. MDOT forecasts that 70% of MARC stations will be at capacity by 2025. According to the 2010 NEC Infrastructure Master Plan, by 2030 passenger rail between Baltimore and Washington, D.C. could realize capacity utilization higher than 100 percent[4] while the 2014 NEC Commission added that multiple segments of the NEC are experiencing critical infrastructure challenges due to capacity constraints[5]. On a more regional level, MDOT-MTA expects at least 70 percent of all MARC system stations to be at capacity by 2025[6] . Also noted is that scheduling more trains to meet increasing ridership demands of 2-3% per year is increasingly difficult as the high volume of Amtrak trains prevent the number of MARC trips that can be provided on the NEC[7]. These capacity constraints mean that the number of MARC trips will remain stagnant even as demand for MARC service grows. This is supported by a February 2021 Johns Hopkins 21st Century Cities Initiative report, which found that the only realistic option to increase express rail speeds between DC and Baltimore would be to cut out local MARC commuter stops (due to track capacity and rolling stock limitations).[8] The report also notes that expanding MARC Service would be difficult because Washington Union Station and Baltimore Penn Station are already at capacity with station train parking – particularly acute for DC since Union Station is to soon undergo major construction.

The above facts combined with forecasted population increases within the corridor will result in low level of service as there is little room for additional trains on existing tracks. Since SCMAGLEV will operate within its exclusive right-of-way, trains will not be dependent on the capacity restraints seen by other modes of travel, and SCMAGLEV service will provide the fastest, most reliable connection between D.C and Baltimore. An additional high-quality travel mode will help relieve some of the capacity burdens plaguing other passenger rail services. It will also finally provide the transportation options that have been standard in other metropolitan areas around the world.

2.2.1.4 *RAIL NETWORK-TIER II*

Communities in Tier II watersheds will benefit from SCMAGLEV relieving MARC service concerns. The Johns Hopkins report referenced above highlights two ways for MARC Service to change in a way that benefits D.C and Baltimore: (1)added trains and (2) local trains converted to express trains. SCMAGLEV is capable of fulfilling the demand for express service. The MARC Camden Line provides local service to Laurel, Muirkirk, and Greenbelt - all stops located just outside the impacted Tier II Watersheds. Riders from the nearby communities within Tier II watersheds like Laurel (Patuxent Watershed), Montpelier (BC2), and Greenbelt (BC2) would benefit from preserved local MARC service. This reflects the indirect benefit of having multiple, redundant modes of travel throughout the region.

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[4] The NEC Master Plan Working Group consisted of FRA, Amtrak, 12 northeast states, and the District of Columbia. Northeast Corridor Infrastructure Master Plan.

[5] Northeast Corridor Infrastructure and Operations Advisory Commission. (February 2014). State of the Northeast Corridor Region Transportation System

[6] Maryland Department of Transportation, Maryland Transit Administration. MARC Growth and Investment Plan Update 2013 to 2050. Retrieved March 2017 from https://mta.maryland.gov/sites/default/files/mgip_update_2013-09- 13.pdf.)

[7] MDOT_MTA MARC Cornerstone Plan P.58

[8] Investing in High-Speed Rail to Washington D.C. to Boost Baltimore's Economy (Ronald J. Hartman and Mac McComas, Johns Hopkins 21st Century Cities Initiative, February 2021(P.5)

2.2.2 PRESERVING COMMUNITIES (PROJECT-WIDE AND IN BC2):

The DEIS notes that *"the above-ground viaduct would not bisect communities"* (4.4-4). Historically, few large, linear transportation projects could make this claim (of note are the 94,000 displaced Marylanders of select highway projects of the past century[9]). In fact, a previous Maglev proposal for the region (i.e., 2003 TransRapid) was planned entirely at-grade. At significant cost to BWRR, approximately 70% of the SCMAGLEV project has been designed in deep tunnel to avoid and minimize disruptive impacts to communities.

To better understand the added cost impact on the project, BWRR analyzed the financial burden that tunneling creates (See Appendix 3). Given that most of the alignment extends through EJ communities, BWRR focused its review on the tunneling costs specifically below EJ communities. The approximate cost for tunnels underneath EJ communities rather than above-ground viaducts through these EJ communities increased costs by approximately $1,487,700,000.

In addition to preserving communities by tunneling, the 30% above-ground portion (viaduct), which includes most of BC2 and PR1, is designed entirely next to the Baltimore Washington Parkway. Thus, SCMAGLEV's viaduct segment avoids homes while concentrating visual and noise impacts near an established transportation route that already carries more than 120,000 cars per day.

By placing the viaduct's southernmost point close to the TMF, severe impacts and displacements were avoided for approximately 125 homes all located in the BC2 Watershed. These homes are primarily located in the Glen Oaks Apartments (approximately 25 residences) and Greenbriar Condominiums (approximately 99 homes). These impacts can be seen in DEIS Appendix G.01 Part A Pages 23 and 24 of 85. The would-be impacted Parcel IDs are 24226 through 24385 (properties east of the parking lot and north of State Highway 193) and 25055 through 25540 (northeast of Mandan Road and east of the Baltimore Washington Parkway).

2.3. ENVIRONMENTAL & QUALITY OF LIFE BENEFITS

2.3.1 IMPROVED AIR QUALITY:

Improvements in air quality begin in the first year of SCMAGLEV operation by reducing car VMT by 9%-12% in the region. Reductions in emissions are urgent as the EPA notes that most of the SCMAGLEV project area is already in non-attainment status air quality, including Prince George's County and Anne Arundel County[10].

Prince George's County Masterplan *Plan2035* notes that the American Lung Association gave the County a grade of "F" for its number of high ozone days[11]. Ozone is a byproduct of reactions between vehicle emissions, other pollutants, and sunlight. Furthermore, *Plan2035* notes that 41% of the County's CO2 comes from single-occupancy vehicles. (P.140). Reduction in vehicle emissions would help ensure progress towards the county's goal for cleaner air..

[9] Not in My Neighborhood: How Bigotry Shaped a Great American City (2010). Antero Pietila. Page 219.

[10] Non-attainment Areas for Criteria Pollutants (Green Book) | US EPA

[11] https://www.lung.org/research/sota/city-rankings/states/maryland/prince-george-s

By taking DC-Baltimore through traffic off the major roadways between Washington DC and Baltimore, communities in between, specifically those within and around the impacted Tier II watersheds, will benefit as there will be fewer passing cars leaving behind emissions, noise, and congestion.

As mentioned in 2.1.1, there will be a significant amount of reduced VMT derived from the SCMAGLEV project, steadily rising from approximately 284,918,509 VMT in 2030.

Table 12: Emission Reduction Economics from VMT Reductions

Type of Pollutant	Emission Reduction (in metric ton)*	Damage Cost ($2030/metric ton)	Present Value of Emission Reduction Benefit
CO2e	2,199,369	$62	$78,640,000
VOC	30	$2,161	$30,000
NOx	118	$8,849	$530,000
SO2	15	$51,549	$440,000
PM2.5	89	$398,501	$16,380,000
Total			**$95,940,000**

*To split the difference between the 284 to 393 million expected VMT reductions per year between 2030 and 2045, this table assumes 328 million VMT per year with a 3% discount rate from 2020$s.

Although primarily a quality-of-life benefit, reductions in emissions also translate into economic benefits. Regionally, $96 million in economic benefits are derived from the environmental gains of reduced tailpipe emissions. According to the EPA[12], the economic benefits of cleaner air are derived through fewer premature deaths and illnesses, lower medical expenses, and better work productivity among others. A county level analysis is not available. However, many of these gains can be realized by the impacted the Tier II Watersheds. They are located between the Baltimore Washington Parkway and Route I-95, the two busiest through-roadways between Baltimore City and Washington DC.

2.3.2 REDUCTION IN POLLUTANTS FROM OBSOLETE BARC BUILDINGS

In January 2020, the USDA announced their intention to demolish twenty-two obsolete BARC buildings to reduce long-term operating costs[13]. USDA concedes that these twenty-two buildings are no longer mission critical, and their removal would have no adverse impact on BARC. Moreover, USDA notes that the buildings are dangerous containing a mix of asbestos, mercury, lead, and refrigerant among others and must be demolished for BARC's overall safety (Sections 2.3.1; 3.6.2.2).

Fourteen of these buildings fall within the footprint of BWRR's preferred BARC West TMF (located in the Tier II Catchment watershed) and would be demolished as part of the SCMAGLEV project. BWRR shares the concerns with USDA regarding toxic asbestos, mercury, lead, and refrigerant leaking into the surrounding community – especially Tier II Catchment watersheds. BWRR would remove these obsolete and dangerous buildings so that aging and leaking buildings do not spill toxins into the fragile ecosystem. Furthermore, this offer frees up funds for mission critical research at BARC.

NOTE: Portions of BARC are Environmental Superfund sites. DEIS Pages 4.15-4 and 4.15-5 highlight USDA CERCLA activities at BARC.

[12] The Clean Air Act and the Economy | US EPA

[13] *Demolition of 22 Buildings at the Henry A. Wallace Beltsville Agricultural Research Center (January 2020). USDA-ARS*

2.3.3 PROPERTY VALUE (BC2):

Most SCMAGLEV property impacts are concentrated around stations. There are no residences near the proposed BARC East TMF, and there are several residences within a 0.5-mile buffer of the proposed BARC West TMF. As noted on page 4.6-6 of the DEIS, property premium and tax revenue impacts are expected to be small.

At the BARC TMF's, impacts on property value would not translate to negative tax impacts because the proposed facilities are located on government lands exempt from property taxes. The annual tax revenue impact around BARC West is approximately -$7,000 while there is no estimated annual tax revenue impact at the BARC East Airstrip TMF (Appendix D.4, pgs. D-61-62).

3. SOCIOECONOMIC BENEFITS OF HIGH-QUALITY WATERS

3.1. BENEFIT OF MAINTAINING HIGH-QUALITY WATERS:

Healthy watersheds provide social and economic benefits to the surrounding community. The EPA outlines such socioeconomic benefits[14]:

- Reduced drinking water treatment costs
- Reduced flood mitigation costs
- Increased revenues from recreation and ecotourism
- Increased property values
- Enhanced capacity for climate change mitigation and adaptation

Referencing the value added through the above metrics, BWRR reconciled the specific benefits of healthy waters to the communities in BC2 as follows.

Beaverdam Creek is designated as a Use Class I water body, which does not serve as a public water supply. The Anacostia, to which the Beaverdam Creek eventually flows, is designated as a Use Class II Water Body and also does not serve as a public water supply. Thus, the drinking water treatment costs do not apply for impacts to Beaverdam Creek specifically.

FEMA's readily available Nation Flood Hazard Layer (NFHL) and the Flood Insurance Rate Map (FIRM) for (See Appendix 4) indicates that the BARC West TMF footprint is outside of the special flood hazard areas (SFHAs). Parts of the viaduct would cross SFHA's. DEIS page 4.10-23 notes that the BARC West TMF would have limited impact to floodplains. Although the forest cover in BC2 could help mitigate flooding, the map suggests that the TMF footprint is not located in an area vulnerable to flooding.

Recreational opportunities for Beaverdam Creek are limited. Most of the creek is confined to USDA property (as gathered from SDAT parcel info and aerial imagery), and there are not clear points of public water access. Beaverdam Road appears to offer scenic views to bike commuters[15]. However, available data on the creek does not suggest that the creek is a significant revenue producer.

3.2. COSTS OF 1:1 IN-KIND MITIGATION FOR ALL NET FOREST COVER LOSS BASED ON AREA MARKET VALUE:

The unit cost of mitigation for forest cover loss based on market value is approximately $35,000/ acre plus real estate costs. The estimated cost to mitigate loss of permanent forest cover within the Beaverdam Creek 2 and Patuxent River 1 t watersheds, based on approximate impacts of 256 acres is $38,458,379.

[14] https://www.epa.gov/hwp/benefits-healthy-watersheds#economic

[15] https://www.chesapeakebay.net/news/blog/tributary_tuesday_beaverdam_creek_laurel_md

Table 13: Estimated Costs of Tier II Reforestation

Mitigation Type	Cost Estimate Category	Amount
Tier II Reforestation	Real Estate*	$28,602,379
	Site Prep/Invasive Control	$1,792,000
	Plantings	$5,376,000
	Maintenance/Warranty	$1,792,000
	Site Design	$896,000
	Total	**$38,458,379**
Stream Restoration	Real Estate*	$2,244,676
	Design and Permitting	$704,275
	Construction	$7,801,200
	Post-Construction Monitoring	$54,175
	Post-Construction Remediation	$780,120
	Total	**$11,584,446**
	Grand Total	**$50,042,824**

*Real estate cost based on estimates presented in similar project.

3.3. ESTIMATED COST OF STREAM RESTORATION, PER LINEAR FOOT, BASED ON AREA MARKET VALUE:

The unit cost for stream restoration ranges from $1,500-$2,300/ linear foot. The estimated cost of necessary stream restoration in the Beaverdam Creek 2 and Patuxent River 1 catchments, based on permanent impacts to 4,334 linear feet (lf) of streams within these watersheds is $11,584,446.

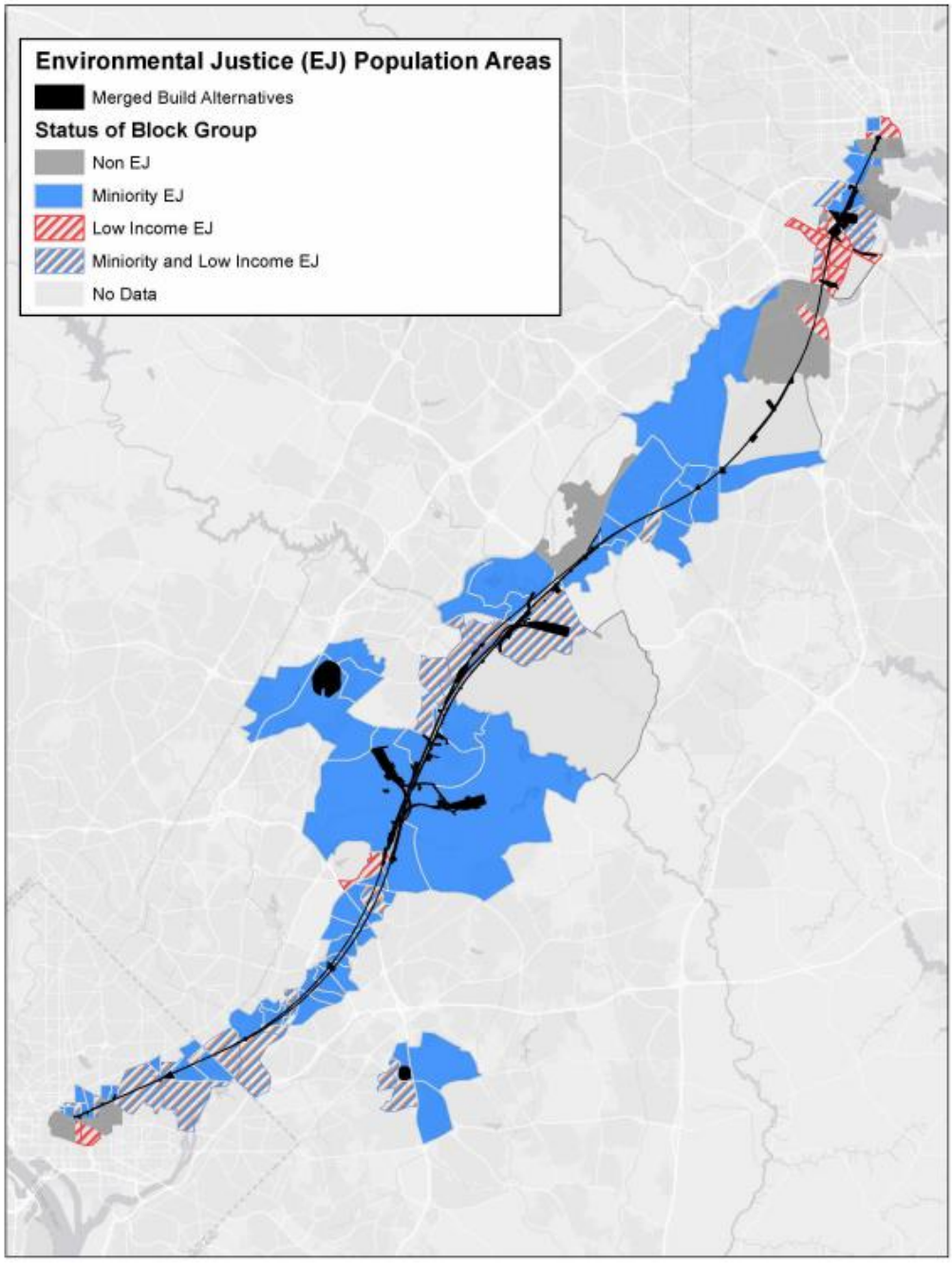
4. CONCLUSION

As this document has demonstrated, although SCMAGLEV will impact Tier II watersheds, these impacts will result in significant social and economic benefits that will outweigh the current benefit of affected Tier II waters. The public benefits to those in BC2 and PR1 include:

- Reduced emissions and better air quality
- Diverted auto trips that reduce congestion and travel times
- Major sources of temporary and permanent jobs
- Accomplished transportation goals without the displacement of residential communities
- Enhanced opportunities for EJ communities and local educational providers

Appendix -1-Environmental Justice Areas - DEIS App. D.3

Figure D.3-7: Environmental Justice Population Areas



Draft Environmental Impact Statement and Section 4(f) Evaluation E-116

Appendix -2- Compatibility of County Master Plans

COMAR 26.08.02.04-1(K)(D) notes that one component for justifying SEJ impacts to Tier II Waters is if *"development is consistent with the applicable county master plan."* The SCMAGLEV project is compatible with many aspects of both Prince George's and Anne Arundel Counties' current masterplans.

Within Prince George's and Anne Arundel Counties, the SCMAGLEV project will bring high-quality jobs, promote hiring locally, and take cars off the road reducing congestion. These are key facts that make the SCMAGLEV project compatible with the respective counties' planning goals.

The SCMAGLEV is compatible with the following planning goals:

- Maryland State Transportation Plan: Goal #2 – Facilitate economic opportunity and reduce congestion through strategic system expansion
- Prince George's County Plan2030: Policy Transportation Mobility 7 - Promote the use of low-carbon transportation methods countywide to improve air quality and traffic congestion (P.159)
- Anne Arundel Plan2040: Goals Built Environment 10 and 15 – Both seek to reduce growing congestion through more multimodal and environmentally transportation options (P.41)
- Anne Arundel Plan2040: Goals Built Environment 15.1 - Seeks to reduce preventable deaths from accidents. SCMAGLEV will provide millions in external safety benefits.

ECONOMIC BENEFITS TO PRINCE GEORGE'S COUNTY PLAN2035:

Plan2035 notes the declining jobs-to-population ratio and the declining employment base in Prince George's County's share of the Washington Metropolitan area. (P.64). Moreover, wages in Prince George's County increased by 29% between 2002-2012, while statewide they increased by 37.3% (P.67).

Plan2035 seeks to boost investment and jobs in a County "Innovation Corridor" stretching from College Park UMD to Greenbelt (P.254) near the BARC TMF (P.123). The plan specifically calls for *"targeted infrastructure improvements to retain existing and attract new employers"* (P.257). BWRR's TMF would be in the area of the Innovation Corridor and bring 300-320 permanent jobs. Additionally, Table 6 estimates the SCMAGLEV will produce approximately 54,365 job-years generating $3.4 billion in labor earnings, or $62,559 per worker, over a seven-year construction period. This is the type of upward economic opportunity that Plan2035 seeks.

> *"… This area is well positioned to capitalize on the synergies that derive from businesses, research institutions, and incubators locating in close proximity to one another and on existing and planned transportation investment"* (P.23)

ANNE ARUNDEL COUNTY PLAN2040:

Plan2040 makes clear that the county is at a critical juncture with its land consumption and transportation strategies, with an expected population increase of 50,000 by 2040, along with 68,000 new jobs, and 86,950 new daily trips (P.24). At its core, *Plan2040* revolves around six key themes:

- build environmentally sustainable and resilient communities with zero net gas emissions via conservation and renewable power;
- build new infrastructure including roads and mass transit,

- develop transit-oriented development;
- boost the county's innovation and tech abilities;
- protect and conserve the natural environment; and
- encourage inclusive government full of engagement.

Related to Key Elements #2, #3, & #4's goal: SCMAGLEV will fuel the economic engine of BWI airport with new mass transit infrastructure, open up transit-oriented development opportunities, and bring skilled innovation-oriented jobs to the area.

Plan2040's Goals Built Environment (BE)10 and (BE)15 seek to have more multimodal travel that is safe, environmentally friendly, and can reduce growing congestion (page 43). BWRR will help achieve this goal, by diverting more than 11.3 million cars off regional roadways (DEIS 4.2), many of which cut right through Anne Arundel County's Patuxent River Tier II watershed.

Additionally, Table 6 estimates the SCMAGLEV project will produce approximately 91,166 job-years generating $6.5 billion in labor earnings, or $70,689 per worker, over a seven-year construction period.

Table 14: ***Prince George's and Anne Arundel Expected Temporary Economic Impact.***

Study Area	Employment (in job-years)	Labor Income ($millions)	Average Annual Wages/ person	GDP ($millions)	Economic Output or Sales ($millions)	State and County Tax Revenue ($millions)
Prince George's County	54,365	3,401	$62,559	2,939	5,980	250
Anne Arundel County	91,966	6,501	$70,689	5,914	11,138	543
State of Maryland	193,329	13,166	$68,102	12,845	24,168	1,111

Appendix -3- Economic Analysis on Tunnels vs Viaducts in EJ Communities

EJ COMMUNITIES

BWRR identified EJ communities using the University of Maryland's School of Public Health's Community, Engagement, Environmental Justice, and Health (CEEJH) *Maryland EJ Screen Mapper* (screenshot below). The approximate cost to tunnel underneath EJ communities throughout the project in comparison to above-ground viaducts increased costs by approximately $1,487,700,000.

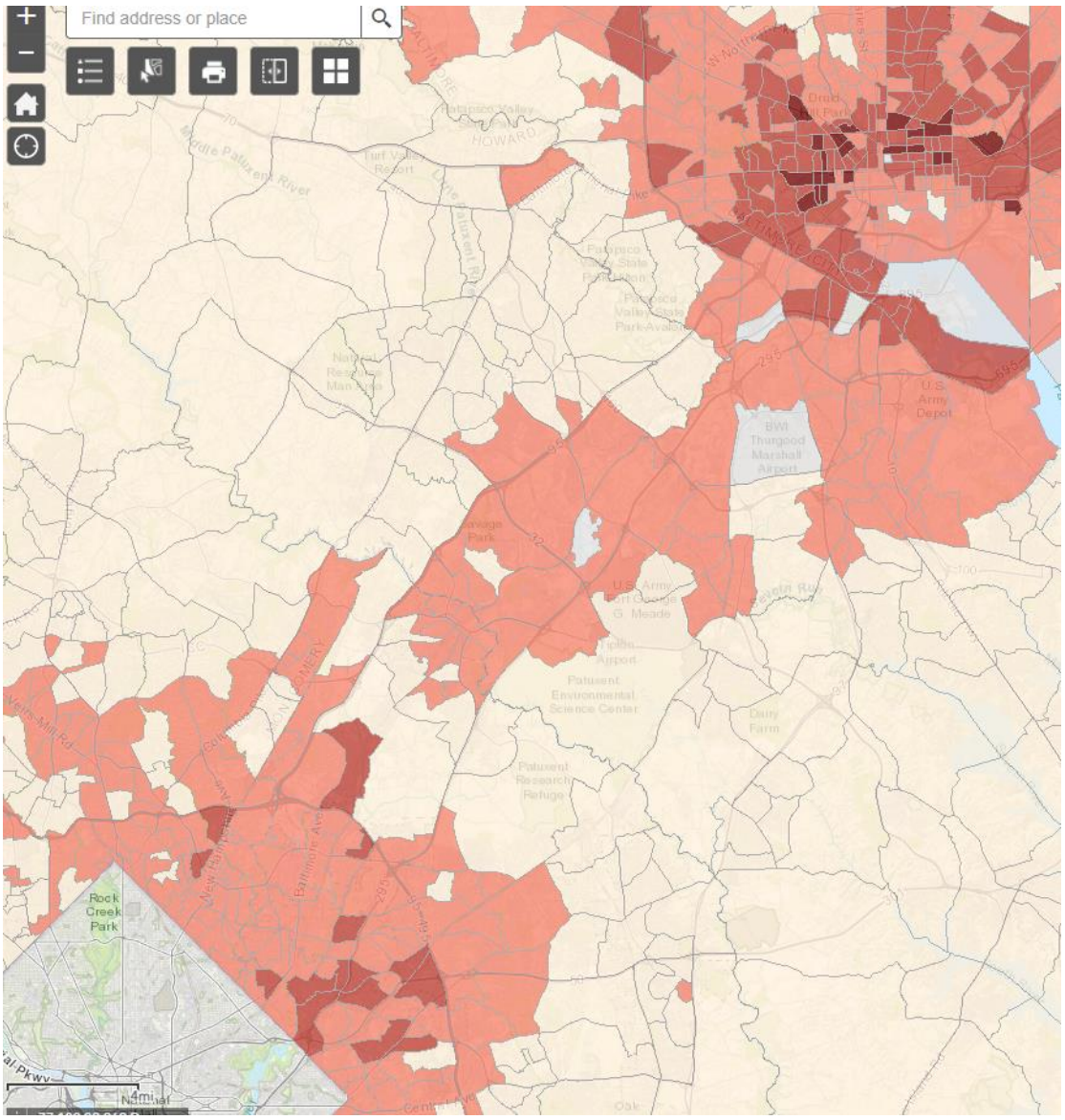
Table 15: Increased Cost of Tunneling Under EJ Communities vs Viaduct

County	***Added Cost* of Tunneling***
Prince George's	*$738,000,000*
Anne Arundel	*$595,800,000*
Baltimore County	*$126,000,000*
Baltimore City	*$27,900,000*
Total	***$1,487,700,000***

*Costs are based on the DEIS Appendix G9 Capital and Construction Costs Memorandum and do not include soft costs or contingency.

BWRR's preferred alternative with J Alignment and a Cherry Hill Station will have ~10.24 linear miles of above-ground guideway and ~24.85 miles of underground tunnel. Per the memorandum, the unit cost per linear mile of above-ground viaduct is $75,000,000 while underground tunnel is $165,000,000. Thus, one mile of tunnel is $90,000,000 more expensive than a viaduct.

Map # 1: University of Maryland's School of Public Health's Community, Engagement, Environmental Justice, and Health (CEEJH) Maryland EJ Screen Mapper


Find address or place
Rock Creek Park
4mi

Appendix - 4- FEMA Flood Insurance Rate Map (FIRM)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18. The **horizontal datum** was NAD 83, GRS 80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information about the **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit their website at www.ngs.noaa.gov.

Base map files were obtained in digital spatial data format from Prince George's County. Road centerlines were provided by the Prince George's County Office of Information Technology and Communications. Road centerlines were produced at a scale of 1"=200' using geodetic control and aerial photography. Political boundaries and streamlines were provided by the Prince George's County Department of Environmental Resources. Streamlines were rectified to match 2007 digital aerial photography for Prince George's County.

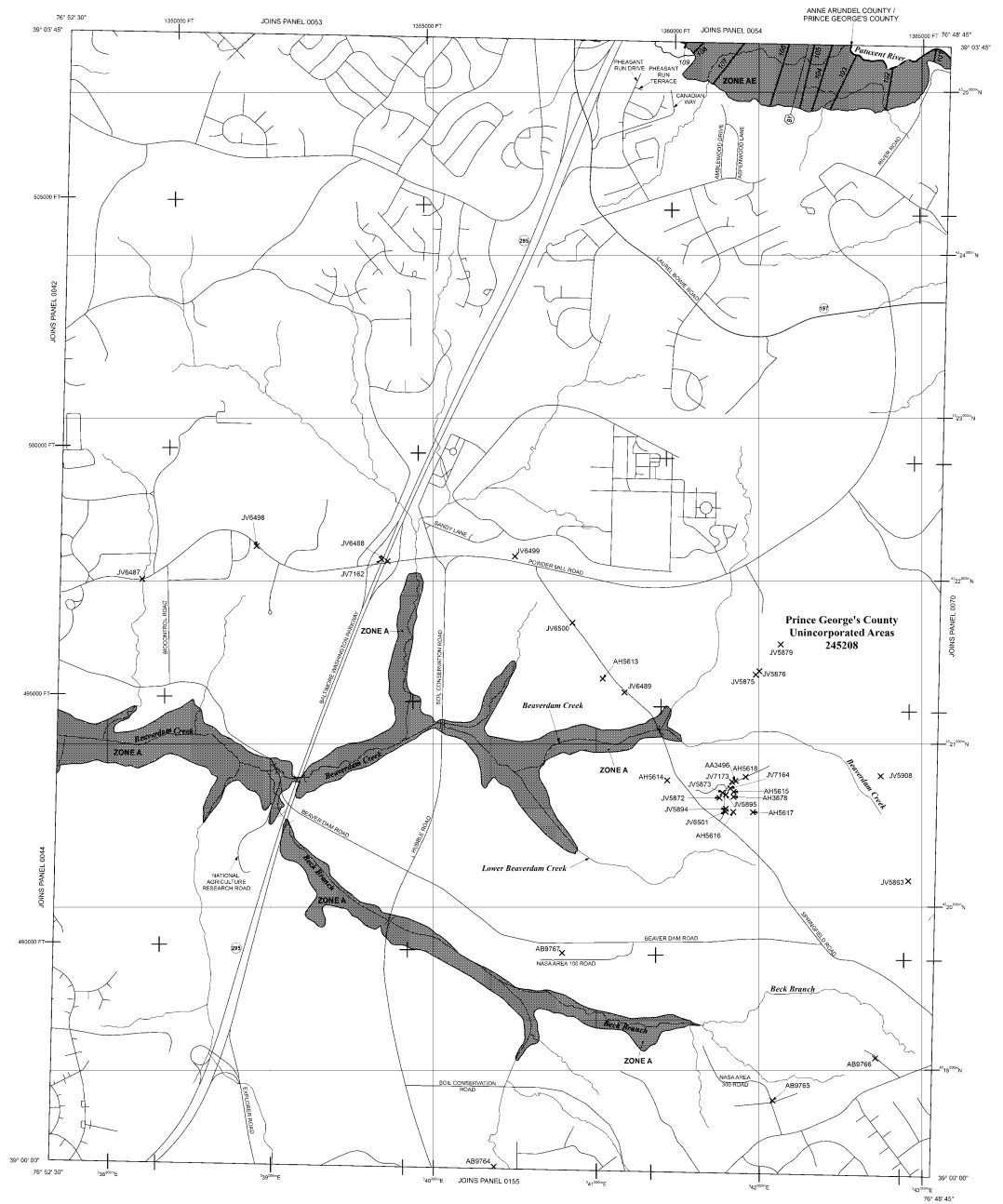
This map reflects more detailed and up-to-date **stream channel configurations and redelineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the *Flood Insurance Study* report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/nol-flood-insurance-program.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** — No Base Flood Elevations determined.
- **ZONE AE** — Base Flood Elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths and flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Bridge
- Footbridge
- Culvert
- A — A — Cross section line
- 23 — 23 — Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4276000 M — 1000-meter Universal Transverse Mercator grid values, zone 18
- 600000 FT — 5000-foot grid ticks: Maryland State Plane coordinate system (FIPSZONE 1900), Lambert Conformal Conic projection
- DX5610 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
September 19, 2016

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

PANEL 0065E

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
PRINCE GEORGE'S COUNTY, MARYLAND
AND INCORPORATED AREAS

PANEL 65 OF 466

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PRINCE GEORGE'S COUNTY	245208	0065	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
24033C0065E
EFFECTIVE DATE
SEPTEMBER 16, 2016

Federal Emergency Management Agency