

**Programmatic Environmental Assessment for the Marketing
Orders for Two New Combusted Filtered Cigarettes
Manufactured by Philip Morris USA, Inc.**

**Prepared by Center for Tobacco Products,
U.S. Food and Drug Administration**

September 6, 2018

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1. Applicant and Manufacturer Information

Applicant Name:	Altria Client Services LLC
Applicant Address:	2325 Bells Road Richmond, Virginia 23234
Manufacturer Name:	Philip Morris USA Manufacturing Center
Product Manufacturing Address:	3601 Commerce Road Richmond, Virginia 23234

2. Product Information

New Product Names, Submission Tracking Numbers (STNs), and Predicate Product Names

New Product Name	STN	Predicate Product Name
Parliament Menthol (White Pack) 100's Box	SE0014626	Parliament Menthol Lights 100's Box
Parliament Menthol (Silver Pack) Box	SE0014627	Parliament Menthol Ultra Lights Box

Product Identification

Product Type	Cigarette
Product Subtype	Combusted, filtered
Number of Products per Retail Unit	Twenty cigarettes per pack with ten packs per paperboard carton.
Product Package	The hard pack consists of an outer board blank, foil inner liner, pack inner frame, polypropylene outer film, and tear tape.

3. The Need for the Proposed Actions

The proposed actions, requested by the applicant, are for the Food and Drug Administration (FDA) to issue marketing orders under the provisions of sections 910 and 905(j) of the Federal Food, Drug, and Cosmetic Act after finding the new tobacco products substantially equivalent to the corresponding predicate products. The applicant wishes to introduce the new tobacco products into interstate commerce for commercial distribution in the United States. The Agency shall issue marketing orders if, after considering the substantial equivalence (SE) reports submitted by the applicant, the new products are found substantially equivalent to the corresponding predicate products. The predicate products were on the market as of February 15, 2007.

The applicant stated that the only difference between the new and corresponding predicate products is an ingredient change (Confidential Appendix 1).

4. Alternative to the Proposed Actions

The no-action alternative is FDA does not authorize marketing of the new tobacco products in the United States.

5. Potential Environmental Impacts of the Proposed Actions and Alternative –Manufacturing the New Products

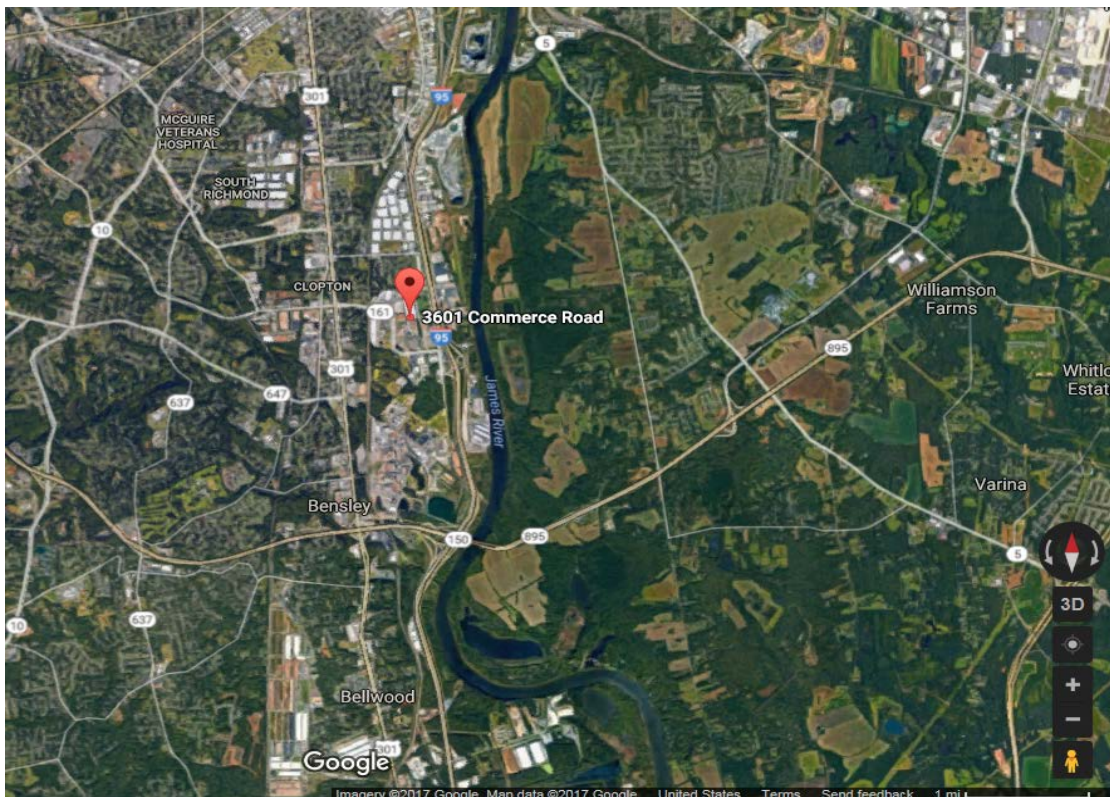
The Agency evaluated potential environmental impacts that may be caused by manufacturing the new products and found no significant impacts, based on Agency-gathered information and the following information submitted by the applicant:

- The packaging materials, ingredients, and tobacco blend of the new products are commonly used in other cigarettes currently manufactured at the facility.
- The new products are intended to compete with or replace other tobacco products currently manufactured at the facility and in the United States.
- No facility expansion or new construction is expected due to manufacturing the new products.
- No increase in the facility production beyond current permitted production capacity is expected due to manufacturing the new products.

5.1 Affected Environment

The new products are manufactured at the address listed in section 1 of this document (Figure 1).

Figure 1. Location of the Manufacturer



The affected environment includes human and natural environments surrounding the facility.

The manufacturing facility is surrounded by a residential development across a road to the north; a two-lane divided road and an interstate freeway (I-95) to the east; two hotels, a fast food restaurant, and a gas station at the southeast corner; undeveloped forested land and a petroleum product pumping station and delivery terminal to the south; and a railroad to the west with a spur into the manufacturing facility.¹

The facility is located in the James River watershed, which occupies the central portion of Virginia and covers approximately 10,265 square miles (24% of total land area of the state of Virginia).^{2, 3} Land use within the watershed is predominantly forest (65%). Agriculture and farming account for approximately 19% of the remaining land use, and 12% is urbanized area.⁴

5.2 Air Quality

The Agency does not anticipate any new substances or new type of emissions would be released into the environment because of manufacturing the new products. The applicant stated that manufacturing the new products is not expected to result in changes in air emissions; accordingly, the applicant concluded that manufacturing the new products would not require revised or new air permits.

5.3 Water Resources

The Agency does not anticipate that manufacturing the new products would cause any new chemicals to be discharged into the water. The applicant stated that manufacturing the new products is not expected to result in changes in wastewater discharge; accordingly, the applicant concluded that manufacturing the new products would not require revised or new wastewater discharge permits.

5.4 Soil, Land Use, and Zoning

The Agency does not anticipate that manufacturing the new products would lead to changes in soil, or land use and zoning. The applicant stated that facility expansion or new construction due to manufacturing the new products would not be expected. Therefore, no zone changes or land conversion of prime farmland, unique farmland, or farmland of statewide importance to non-agricultural use would be expected.

¹ Google. 2018. Map of 3601 Commerce Road, Richmond, VA 23234. Retrieved from Google Maps: www.google.com/maps. June 5, 2018.

² A watershed is an area of land where all bodies of water, such as; surface water from lakes, streams, reservoirs and wetlands, the underlying ground water, and rainfall, drain to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. See <https://water.usgs.gov/edu/watershed.html> and

³ Virginia Department of Environmental Quality. Available at: <http://deq.state.va.us/Portals/0/DEQ/Water/SWRP/App%20B%20James%20River%20Basin%20Summary.pdf>. Accessed September 6, 2018

⁴ See Virginia Department of Conservation and Recreation at: <http://www.dcr.virginia.gov/soil-and-water/wsheds>. Accessed September 6, 2018.

5.5 Biological Resources

The Agency does not anticipate manufacturing the new products would jeopardize the continued existence of any listed species or result in the destruction or adverse modification of the habitat of any such species identified under the Endangered Species Act (ESA). The applicant stated that there are no plans to expand the facility production beyond current permitted level. The applicant consulted the U.S. Fish and Wildlife Services' (U.S. FWS) critical habitat and endangered species maps. According to the maps, three threatened species (two plants, and one northern long-eared bat), and one endangered freshwater mussel species are listed in the city of Richmond and the bordering counties (Henrico and Chesterfield Counties).^{5,6} However, the applicant stated that none of these species are found near the manufacturing facility. The Agency searched the U.S. FWS maps and verified the accuracy of the listed species.

5.6 Regulatory Compliance

The applicant stated that the manufacturing facility complies with all federal, state, and local environmental regulations, including the Clean Air Act, the Clean Water Act and the Resource Conservation and Recovery Act. The applicant provided detailed information for the following air emission and wastewater permits:

- (1) Air permits: Title V Air Permit number PRO50076 and a Stationary Source Permit, issued in accordance with applicable U.S. Environmental Protection Agency (EPA) and Virginia Department of Environmental Quality (VA DEQ) regulations.
- (2) Wastewater permit: Industrial User Permit number 2149 from the local publicly owned treatment works (POTW) in the City of Richmond. The permit requires compliance with the relevant effluent limitations (40 C.F.R. §§ 400 – 699) to ensure the wastewater is of a certain quality for effective treatment at the POTW facility. The applicant stated that the facility submits regular discharge monitoring reports to VA DEQ.

The Agency's search of EPA's Enforcement and Compliance History Online (ECHO) database did not reveal any violations of the environmental laws and regulations.⁷

The applicant stated that the facility complies with the ESA and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

5.7 Socioeconomics and Environmental Justice

No changes on socioeconomics are anticipated due to manufacturing the new products. The Agency does not anticipate any impacts on employment, revenue, or taxes because the new products are intended to replace similar tobacco products currently manufactured at the facility.

No changes in impacts on environmental justice are anticipated. The applicant stated that the manufacturing facility is operating below its permitted capacity and the future year projections of

⁵ U.S. Fish and Wildlife Services (U.S. FWS), available at: <https://www.fws.gov/endangered/>.

⁶ Critical habitat map available at: <https://databasin.org/datasets/d579d87eb54f4374a77ea53e7ef66449>

⁷ EPA ECHO Detailed Facility Report: Philip Morris USA Facility, Richmond, VA. Available at: <https://echo.epa.gov/detailed-facility-report?fid=110000869793>. Accessed April 18, 2018.

cigarette production at the facility, including the new products, are within the existing capacity and therefore the facility would not require expansion. Also, as discussed, the emissions and discharges from the facility are not expected to change because of manufacturing the new products. Thus, though 2010 U.S. Census and American Community Survey data show that 80% of the population within a three-mile radius of the manufacturing facility is minority,⁸ no disproportionate impacts to environmental justice populations would occur as a result of manufacturing the new products. In addition, the facility is not located within an Indian reservation.

5.8 Solid Waste and Hazardous Materials

The Agency does not foresee the introduction of the new products would notably affect the current manufacturing waste generated from the facility's production of all combusted, filtered cigarettes. The Agency anticipates the waste generated due to manufacturing the new products would be released to the environment, transferred to a POTW, and disposed of in landfills in the same manner as any other waste generated from any other products manufactured in the same facility or from any other combusted, filtered cigarettes manufactured in the United States.

5.9 Floodplains, Wetlands, and Coastal Zones

There would be no facility expansion due to manufacturing the new products and the applicant did not propose any land disturbance; therefore, there would be no effects on floodplains, wetlands, or coastal zones.

5.10 Cumulative Impacts

The Agency does not anticipate the proposed actions to incrementally increase or change the chemicals released to the air from the facility' due to tobacco manufacturing. A search in EPA's Toxic Release Inventory (TRI) database showed that in 2017, Philip Morris USA manufacturing facility in Richmond, Virginia released 18,713 pounds of ammonia and 10,683 pounds of nicotine and nicotine salts to air, (a total of 29,396 pounds), but released no other hazardous air pollutants at reportable levels (Table 1).⁹ Ammonia's adverse health effects are ocular and respiratory; nicotine and nicotine salts have known developmental effects.¹⁰ The applicant stated that the facility does not anticipate any future increased production beyond its current permitted capacity and therefore, a revised or new air permit would not be required. The TRI database search did not show that the Philip Morris USA manufacturing facility disposed of, treated, or released into the environment any other toxicants associated with manufacturing tobacco products. In addition, EPA's ECHO database did not show that the facility released the following reportable criteria pollutants: ozone, lead, particulate matter, or sulfur dioxide, at or above the reportable threshold levels to air.

⁸ EPA ECHO Detailed Facility Report: Demographic profile of surrounding area (3 miles). Available at: <https://echo.epa.gov/detailed-facility-report?fid=110000869793>. Accessed September 6, 2018.

⁹ U.S. Environmental Protection Agency (EPA). *TRI Data Form R & A Download*. Available at: https://www3.epa.gov/enviro/facts/tri/form_ra_download.html. Searched on September 6, 2018.

¹⁰ EPA. myRight-to-Know, available at: <https://myrtk.epa.gov/info>. The site allows for searching the industrial facilities that manage toxic waste chemicals by entering the facility's address and clicking on the facility's location on the map. Accessed September 6, 2018.

Table 1 Management of Chemical Waste Associated with Manufacturing Tobacco Products at Philip Morris USA Facility

Production-Related Waste Managed or Released		Chemical Mass (Pounds)	
Recycled		126,020	
Energy Recovery		0	
Treated		104,427	
<i>Subtotal Waste Managed</i>		<i>230,447</i>	
On-site Release	Air	Ammonia	18,713
		Nicotine and Nicotine Salts	10,683
	Water	Ammonia	0
		Nicotine and Nicotine Salts	0
Land	Ammonia	0	
	Nicotine and Nicotine Salts	0	
Off-site Release		60,822	
<i>Subtotal Waste Released</i>		<i>90,218</i>	
Total Production-Related Waste		320,665	

The applicant does not anticipate manufacturing the new products would require a revised or new waste water permit.

5.11 No Action Alternative

The environmental impact of the no-action alternative would not change the existing condition of manufacturing cigarettes, as many similar tobacco products would continue to be marketed in the United States.

6. Potential Environmental Impacts of the Proposed Actions and Alternative – Use of the New Products

The Agency evaluated potential impacts to resources in the environment that may be affected by use of the new products and found no significant impacts based on Agency-gathered information and the applicant’s submitted information. Included in the information the Agency considered were the projected market volumes for the new products and the documented decline in cigarette use in the United States.

6.1. Affected Environment

The affected environment includes human and natural environments in the United States; the marketing orders will allow for the new tobacco products to be sold to consumers nationwide.

6.2. Air Quality

The Agency does not anticipate new chemicals would be released into the environment as a result of use of the new products, relative to other cigarettes already on the market, because: (1) the combustion products from the new products would be released in the same manner as the combustion products of other marketed cigarettes; (2) the new products are expected to compete with or replace

other currently marketed cigarettes, so the Agency does not expect that new or increased air emissions would be associated with use of the new products (Confidential Appendix 2); and (3) the ingredients in the new products are used in other currently marketed tobacco products.

Although there are changes in tobacco blend in the new products compared to the corresponding predicate products (Confidential Appendix 1) which could affect air quality, these changes fall within industry standards.

6.3. Environmental Justice

No new emissions are expected due to use of the new products. Therefore, there would be no new disproportionate impacts on minority or low-income populations.

6.4. Cumulative Impacts

The impacts from use of combusted tobacco products include exposure to secondhand smoke (SHS) produced from burned cigarettes. Particles emitted by smoking may remain on surfaces, be re-emitted back into the gas phase, or react with oxidants and other compounds in the environment to yield secondary pollutants, thirdhand smoke (THS). These pollutants coexist in a mixture in the environment alongside SHS (Burton, 2011; Matt et al., 2011).

There is no safe level of exposure to SHS (U.S. Department of Health and Human Services, 2006a and 2006b). Even low levels of SHS can harm children and adults in many ways, including the following:

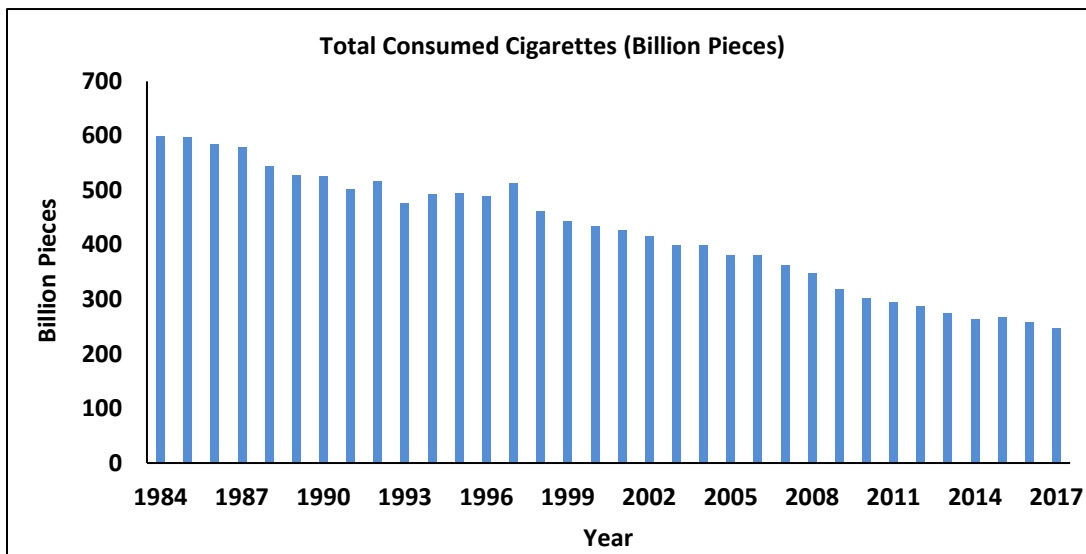
- The U.S. Surgeon General estimates that living with a smoker increases a nonsmoker's chances of developing lung cancer by 20 to 30% (U.S. Department of Health and Human Services, 2014).
- Exposure to SHS increases school children's risk for ear infections, lower respiratory illnesses, more frequent and more severe asthma attacks, and slowed lung growth. Such exposure can cause coughing, wheezing, phlegm, and breathlessness (U.S. Department of Health and Human Services, 2006a and 2006b).
- SHS causes more than 40,000 deaths a year (U.S. Department of Health and Human Services, 2014).

However, use of cigarettes in the United States is declining according to the U.S. Alcohol and Tobacco Tax and Trade Bureau (TTB) Statistical Release reports (Figure 2).¹¹ This likely is responsible for the decline in SHS exposure observed in several studies that evaluated the levels of SHS exposure in children and nonsmokers living in homes of smokers (Homa et al., 2015; Yao et al., 2016; other studies). Despite the considerable ethnic and racial disparities in SHS exposure in vulnerable populations, data from the National Health and Nutrition Examination Survey showed a decline in SHS exposure from 1999-2000 to 2011-2012 with the highest prevalence of exposure among non-Hispanic subpopulations (46.8%), compared to Mexican Americans (23.9%) and non-Hispanic whites (21.8%) in 2011-2012 (Homa et al., 2015). There were also significant declines in SHS exposure prevalence noted in the 2000 and 2010 National Health Interview Survey Cancer Control Supplements. Exposure to SHS declined in Hispanics from 16.3% in 2000 to 3.1% in 2010, non-Hispanic Asians from 13.4% in 2000 to 3% in 2010, and non-

¹¹ U.S. Alcohol and Tobacco Tax and Trade Bureau (TTB) statistical data available at: <https://www.ttb.gov/tobacco/tobacco-stats.shtml>. Accessed March 7, 2018.

Hispanic blacks from 31.2% in 2000 to 11.5% in 2010 as compared to exposures in non-Hispanic whites, which declined from 25.8% in 2000 to 9.7% in 2010 (Yao et al., 2016).

Figure 2. Use of Cigarettes in the United States, 1984 – 2017



As of December 2015, 26 states and the District of Columbia have implemented comprehensive smoke-free laws (Tynan, Holmes, Promoff, Hallett, Hopkins, & Frick, 2016). Such laws are also expected to reduce the levels of non-users' exposure to SHS and THS.

6.5 No Action Alternative

The environmental impact of the no-action alternative would not change the existing condition of use of cigarettes, as many similar tobacco products would continue to be marketed.

7. Potential Environmental Impacts of the Proposed Actions and Alternative – Disposal of the New Products

The Agency evaluated potential impacts to resources in the environment that may be affected by disposal of the new products. Based on publicly available information such as the documented continuous decline in use of cigarettes in the United States, and the applicant's submitted information, including the projected market volumes for the new products, the Agency found no significant impacts.

7.1. Affected Environment

The affected environment includes human and natural environments in the United States; the marketing orders will allow for the new tobacco products to be sold to consumers nationwide.

7.2. Air Quality

The Agency does not anticipate disposal of the new products or the packaging material would lead to the release of new or increased chemicals into the air.

No changes in air quality are anticipated from disposal of the cigarette butts of the new products. The chemicals in the cigarette butts are commonly used in other currently marketed cigarettes. Because the new products are anticipated to compete with or replace other currently marketed cigarettes, the butt waste generated from the new products would replace the same type of waste (Confidential Appendix 3). Therefore, the fate and effects of any materials emitted into the air from disposal of the new products are anticipated to be the same as any materials from other cigarettes disposed of in the United States.

No changes in air quality from disposal of the packaging materials of the new products would be expected because (1) the paper and plastic components of the packages are more likely to be recycled, or at least a portion of the packaging waste is likely to be recycled; (2) the packaging materials are commonly used in the United States; and (3) the waste generated due to disposal of the new products is a minuscule portion of the municipal solid waste based on FDA's experience in evaluating the packaging waste generated from cigarettes.

7.3. Biological Resources

The proposed actions are not expected to change the continued existence of any endangered species, or result in the destruction or adverse modification of the habitat of any such species, as prohibited under the U.S. ESA. Although disposal of smoldering cigarettes has been implicated in many fire incidents,^{12 13} the disposal of the new products is not expected to change the fire frequency as the disposal would be the same as the disposal of cigarettes that are currently marketed in the United States.

7.4. Water Resources

No changes in impacts on water resources are expected due to disposal of the cigarette butts from the new products because the chemicals in the new products are the same as or similar to currently marketed cigarettes.

7.5. Socioeconomics and Environmental Justice

The Agency does not anticipate changes in impacts on socioeconomic conditions or environmental justice from disposal of the new products. The waste generated due to disposal of the new products is expected to be handled in the same manner as the waste generated from other cigarettes in the United States. No new emissions are expected due to disposal of the new products; therefore, there would be no new disproportionate impacts on minority or low-income populations.

7.6. Cumulative Impacts

A major existing environmental consequence of the use of the new products as well as other conventional cigarettes is littering of discarded cigarette filters or butts, which can persist in the environment for more than 10 years (Novotny and Zhao, 1999). Cigarette butts are among the most common forms of litter found on beaches (Claereboudt, 2004; Smith, Livingston and Doolittle, 1997),

¹² National Fire Protection Association. The smoking-material fire problem. Available at: <https://www.nfpa.org/News-and-Research/Fire-statistics-and-reports/Fire-statistics/Fire-causes/Smoking-Materials>. Accessed May 22, 2018.

¹³ UC Davis Health News. Available at: <https://www.ucdmc.ucdavis.edu/publish/news/newsroom/2763>. Accessed May 22, 2018.

near streams, night clubs (Becherucci and Pon, 2014), bus stops (Wilson, Oliver, and Thomson, 2014), roads, and streets (Healton, Cummings, O'Connor and Novotny, 2011; Patel, Thomson and Wilson, 2013). Cigarette butts have been found at densities averaging more than four cigarette butts per meter squared of urban environments (Seco Pon and Becherucci, 2012).

Compounds in cigarette butts can leach out into water, potentially threatening human health and the environment, especially marine ecosystems (Kadir and Sarani, 2015). The environmental toxicity of cigarette butts due to air emissions is not well studied. The chemicals in cigarette butts can be the original chemicals in the unsmoked cigarettes or the pyrolysis and distillation product deposited in the cigarette butts. Airborne emissions from cigarette butts after disposal depend on the environmental conditions and the chemicals in the butts. These emissions can be influenced by several factors, such as the cigarette brand, cigarette length, filter material, types of tobacco, ingredients in the cigarette and tobacco fillers, number of butts, and the mass transfer behavior of combustion product along the cigarette.¹⁴

However, the cumulative impacts from cigarette butts are declining because the use of cigarettes in the United States is declining.

7.8 No Action Alternative

The environmental impact of the no-action alternative would not change the existing condition of disposal of cigarettes and cigarette packaging, as many other similar tobacco products would continue to be marketed in the United States.

8. List of Preparers

The following individuals were primarily responsible for preparing and reviewing this programmatic environmental assessment (PEA):

Preparer:

Mehran Niazi, Ph.D., Center for Tobacco Products

Education: Ph.D. in Environmental Sciences

Experience: Twelve years in environmental fate and transport and environmental modeling

Expertise: water quality modeling, environmental fate and transport modeling

Reviewer:

Hoshing W. Chang, Ph.D., Center for Tobacco Products

Education: M.S. in Environmental Science and Ph.D. in Biochemistry

Experience: Ten years in NEPA practice

Expertise: NEPA analysis, environmental risk assessment, wastewater treatment

9. A Listing of Agencies and Persons Consulted

Not applicable.

¹⁴ NIST Technical Report 8147 available at: <http://dx.doi.org/10.6028/NIST.IR.8147>. Accessed April 24, 2018.

10. References

Burton, B. (2011). Does the smoke ever really clear? Thirdhand smoke exposure raises new concerns. *Environmental Health Perspectives*, 119(2), A70-A74.

Becherucci, M. E., and J. P. S., Pon. (2014). What is left behind when the lights go off? Comparing the abundance and composition of litter in urban areas with different intensity of nightlife use in Mar del Plata, Argentina. *Waste Management*, 34(8): 1351-1355.

Claereboudt, M. R. (2004). Shore litter along sandy beaches of the Gulf of Oman. *Marine Pollution Bulletin*, 49(9-10): 770-777.

Healton, C. G., K. M., Cummings, R. J., O'Connor, and T. E., Novotny. (2011). Butt really? The environmental impact of cigarettes. *Tobacco Control*. 20: 11-11.

Homa, D.M., Neff, L.J., King, B.A., Caraballo, R.S., Bunnell, R.E., Babb, S.D., Garrett, B.E. Sosnoff C.S., and Wang, L. (2015). Vital signs: disparities in nonsmokers' exposure to secondhand smoke —United States, 1999–2012. *MMWR Morbidity Mortality Weekly Report*, 64(4), 103-108.

Kadir, A. A., and N. A., Sarani. (2015). Cigarette butts pollution and environmental impact - a review. *Applied Mechanics and Materials*, 773-774: 1106-1110.

Matt, G.E., Quintana, P.J.E., Destailats, H., Gundel, L.A., Sleiman, M., Singer, B.C., Jacob, P., Benowitz N, Winickoff JP, Rehan V, Talbot P, Schick SF, Samet J, Wang Y, Hang B, Martins-Green M, Pankow JF, and Hovell, M.E. (2011). Thirdhand tobacco smoke: emerging evidence and arguments for a multidisciplinary research agenda. *Environmental Health Perspectives*, 119(9), 1218-1226.

Novotny, T. E., and F., Zhao. (1999). Consumption and production waste: Another externality of tobacco use. *Tobacco Control*. 8(1): 75-80.

Patel, V., G. W., Thomson, and N., Wilson. (2013). Cigarette butt littering in city streets: A new methodology for studying and results. *Tobacco Control*. 22(1): 59-62.

Seco Pon, J. P., and M. E., Becherucci. (2012). Spatial and temporal variations of urban litter in Mar del Plata, the major coastal city of Argentina. *Waste Management*. 32(2): 343-348.

Smith, C. J., S. D., Livingston, and D. J., Doolittle. (1997). An international literature survey of "IARC Group 1 carcinogens" reported in mainstream cigarette smoke. *Food and Chemical Toxicology*. 35(10-11): 1107-1130.

Tynan, M.A., Holmes, C.B., Promoff, G., Hallett, C., Hopkins, M., and Frick, B. (2016). State and Local comprehensive smoke-free laws for worksites, restaurants, and bars—United States, 2015. *MMWR Morbidity Mortality Weekly Report*, 65(24), 623-626.

U.S. Department of Health and Human Services. 2014. The Health Consequences of Smoking—50 Years of Progress. A Report of the Surgeon General. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Atlanta, GA.

U.S. Department of Health and Human Services. 2006a. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Coordinating Center for Health Promotion, Office on Smoking and Health. Atlanta, GA.

U.S. Department of Health and Human Services. 2006b. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General—Secondhand Smoke: What It Means to You (Consumer Booklet). Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Coordinating Center for Health Promotion, Office on Smoking and Health. Atlanta, GA.

U.S. Environmental Protection Agency. (2016). Advancing Sustainable Material Management: Facts and Figures. Washington, DC: U.S. Environmental Protection Agency, Office of Land and Emergency Management. November 2016.

Wilson, N., J., Oliver, and G., Thomson. (2014). Smoking close to others and butt littering at stops: Pilot observational study. *PeerJ*. 2014;2:e272.

Yao, T., Sun, H.Y., Wang, Y., Lightwood, J., & Max, W. (2016). Sociodemographic differences among U.S. children and adults exposed to secondhand smoke at home: National Health Interview Surveys 2000 and 2010. *Public Health Reports*, 131, 357-366.

CONFIDENTIAL APPENDIX 1

Comparison of the New Products to the Corresponding Predicate Products

STN	Change from Predicate Products
SE0014626	Removal of (b) (4) from the tobacco filler
SE0014627	Removal of (b) (4) from the tobacco filler

CONFIDENTIAL APPENDIX 2

First- and Fifth-Year Market Volume Projections for the New Products and Percentage of Cigarette Use in the United States Projected to be Attributed to the New Products

First- and fifth-year market volume projections for the new products were compared to the total forecasted use of cigarettes in the United States.¹⁵ Although the projected use of the new products would account for approximately (b) (4) of the forecasted cigarette use in the United States, the applicant stated that the new products would compete with or replace other combusted cigarettes currently on the market.

STN	Projected Market Volume			
	First-Year		Fifth-Year	
	New Products (# of Cigarettes)	New Products as a Percent of Total Cigarettes Used ¹⁶	New Products (# of Cigarettes)	New Products as a Percent of Total Cigarette Used
SE0014626	(b) (4)	(b) (4)	(b) (4)	(b) (4)
SE0014627	(b) (4)	(b) (4)	(b) (4)	(b) (4)
Total	(b) (4)	(b) (4)	(b) (4)	(b) (4)

¹⁵ The Agency used historical data regarding total use of cigarettes from 2002 to 2017 to mathematically estimate the total number of cigarettes used in the United States. Using the best-fit trend line with an R² value of 0.9786, the forecasted number of cigarettes that will be used in the United States is estimated at (b) (4) billion cigarettes in the first year and (b) (4) billion cigarettes in the fifth year of marketing the new product.

¹⁶ Projected Market Occupation of the New Product in the United States (%) = $\frac{\text{Projected Market Volume of the New Product (cigarette pieces)}}{\text{Projected Use of Cigarettes in United States (cigarette pieces)}} \times 100$

CONFIDENTIAL APPENDIX 3

Projected Waste of Cigarette Butts in the First and Fifth-Year of Marketing the New Products

$\sum_{i=1}^2 A_i = \sum_{i=1}^2 (B_i * C_i) D_i$	<i>A_i</i> : Projected total waste generation of the products (metric tons) <i>B_i</i> : Market volume (Pieces) <i>C_i</i> : Cigarette butt weight (grams) <i>D_i</i> : 1.0 x 10 ⁻⁶ metric tons/gram
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STN	Projected Year	<i>Projected Market Volume (Pieces)</i> <i>B_i</i>	<i>Cigarette Butt Weight (Grams)</i> <i>C_i</i>	<i>Cigarette Butt Waste (Tons)</i> <i>A_i</i>
SE0014626	First-Year	(b) (4)	0.79	9.20
	Fifth-Year	(b) (4)	0.79	7.81
SE0014627	First-Year	(b) (4)	0.79	8.99
	Fifth-Year	(b) (4)	0.79	7.63
Total	First-Year			18.19
	Fifth-Year			14.44

If all the projected cigarette butt waste generated from use of the new products is disposed of in landfills, the projected waste of (b) (4) metric tons in the first year and (b) (4) metric tons in the fifth year of marketing the new products would be negligible fractions of the 238.05 million metric tons of total waste reported in the United States in 2015 (U.S. Environmental Protection Agency, 2018).