APPENDIX E: BACKGROUND ANALYSIS OF LITTER DATA

The Project Team examined the data that are often cited in the literature to support the assumption that deposits reduce litter. The ***first*** is a table apparently used in a report to the U.S. Senate Committee on Environment and Public Works in 2002[1] which presents "self-reported" litter data[2] for beverage containers before and after implementation of deposit legislation in a number of the states which adopted deposit legislation. This 2002 table has been cited by the University of Maryland Environmental Finance Center[3], and by the Container Recycling Institute[4] as proof that deposit legislation significantly reduces litter.

Unfortunately, data provided in the Senate Public Works table are, with the exception of California, thirty to thirty-five years old (when a nickel deposit was worth considerably more than it is today, and when DUI laws were much less stringent). In addition, the data are not rigorous studies but instead anecdotal data reported by highway departments performing cleanups along state highways.

The ***second*** set of data consistently referred to is the State of Hawaii report on the impact of implementation of Hawaii's bottle bill in 2005.[5] For example, according to a report prepared by the Container Recycling Institute and the Vermont Public Research Interest Group[6] "*In Hawaii, a new deposit return program was introduced in 2005. From 2004 to 2008, the number of metal cans, plastic bottles, and glass bottles in the litter stream was reduced by 65% (on a unit-count basis); the share of beverage container litter as a percent of marine litter (by count) declined from 14.5% to 5.7% during the same time period.*"

The problem is that the Hawaii data are not street litter data but beach clean-up data sponsored by the Ocean Conservancy using clean up volunteers. While the Ocean Conservancy has one of the most comprehensive citizen clean-up beach data bases in the world, the data need to be interpreted (and applied) with these limitations in mind: (1) the data represent only beach litter, which are subject to both litter and deposition from the marine environment, and excludes all other litter in the State; (2) the level of effort per mile and miles of beach cleaned vary from year to year, which has a significant impact on the volume of materials collected each year ; and, (3) there is no attempt to collect rigorous data which can be used to draw statistically valid conclusions and to ensure consistency between years. Instead, it represents citizens volunteering to clean up beaches – much like Vermont's Green Up Day – and is subject to the limitations associated with volunteer labor providing data.

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[1] *2011 Impact Analysis of a Beverage Container Deposit Program in Maryland,* Prepared by the University of Maryland Environmental Finance Center, December 15, 2011.

[2] State Highway Department reports from: Oregon; Vermont; Maine; Michigan; and, Iowa, circa 1977 (Vermont) to 1980 (Oregon).

[3] *2011 Impact Analysis of a Beverage Container Deposit Program in Maryland, p.18*

[4] http://www.bottlebill.org/about/benefits/litter/bbstates.htm

[5] *Report on Activities of the Deposit Beverage Container Program,* Department of Health, State of Hawaii, December 2009.

[6] *A Clean and Green Vermont, A Special Report on the Environmental and Economic Benefits of Vermont's Bottle Bill*, February, 2013

If one examines the Ocean Conservancy data for the time period 2001 through 2012 it appears that the ratio of beverage containers has dropped from an average of 35 percent of total litter prior to the deposit being enacted in 2005 to an average of 26 percent of total beach litter in the years subsequent to 2005.[7] However, comparing these two time periods, the person effort per mile has increased from 17 to 28 persons per mile and the pounds per mile of litter collected has also increased, reflecting in part the increased effort. This may explain the reduction in the ratio of beverage containers to total litter. And the drop in the pounds per mile of beverage containers can just as easily be attributed to an increase in plastic bottles and decrease in glass bottles as it can be described as a result of the deposit legislation.

The bottom line is that volunteer citizen beach cleanup data for Hawaii, while being a very useful data set for some purposes, are not sufficiently rigorous to support any conclusions about the impact of deposits on litter quantities or composition in other states. This can be said for many other litter studies as well which are fraught with problems when trying to determine what the data say about specific materials.

For example, the Container Recycling Institute and VPIRG also cite, in their February 2013 report that "*deposits reduce littering of used beverage containers by 70%-80% (by volume), and total littering by 30%-40%."* The footnote for these statistics cites "*Perchard (2005) Deposit Return Systems for Packaging Applying International Experience in the U.K".* A careful reading of this report shows that the data are from rigorous studies of litter conducted by Dan Syrek of the Institute of Applied Research during the late 1970's to early 1980's – when the initial deposit laws were adopted. Quoting the Perchard report, "*Syrek's cautious conclusion from this was that when adjustments are made for traffic volume, income levels and state highway clean-up frequency, 'the differences between states are not great…While it appears that states with deposit legislation, as well as those with total litter control programs, appear to have lower rates than those surveyed which did not have total litter control programs, it is impossible to assert at this time that this can be demonstrated at even moderate levels of statistical significance."* In other words, Syrek concludes what most research on litter concludes, that we simply don't know with any statistical certainty whether litter is reduced because of deposit legislation.[8]

Finally, the February 2013 report by the Container Recycling Institute and VPIRG states that *"Litter associated with deposit-bearing containers is lower in Vermont than in neighboring states*," citing the *Northeast 2010 Litter Survey*[9]. While it is true that the unadjusted data show that Vermont has a lower litter rate per mile, the study states, *"Once litter rates were adjusted to reflect differences in variables such as population and traffic levels, Vermont yielded the highest litter rate of the three states."* It is true that beverage containers subject to the deposit were lower in Vermont than in New Hampshire (which does not have deposit legislation) by 1.5 percentage points, or about 20 percent, but given the many variables associated with litter counts, as described below, a change of 20 percent is within the range of probability that the actual litter rates are the same.

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[7] Data supplied to DSM from the Ocean Conservancy for the period 2001 to 2012 for Hawaii beach clean ups.

[8] See for example, *The Link between Recycling and Litter: A Field Study,* Reams, MA, J.P. Geaghan and R.C. Gendron, Environment and Behavior, 1996 where they quote Syrek as stating "*However, when the entire litter stream has been taken into account, no correlation between recycling and overall litter reduction has been demonstrated."*

[9] *Northeast 2010 Litter Survey, A Baseline Survey of Litter at 288 Street and Highway Locations in Maine, New Hampshire and Vermont,* Conducted for the American Beverage Association by Environmental Resources Planning, LLC, 2010.

The largest, most rigorous and comprehensive study on litter conducted in the United States is the 2009 *National Visible Litter Survey and Litter Cost Study* prepared for Keep America Beautiful.[10] The national average for beverage container litter as a percent of all litter 4 inches and greater in size (therefore eliminating the impact of cigarette butts) is 14.5 percent of litter by count.[11] This can be compared against data collected by the Association of Vermont Recyclers for ANR in 2009 of Vermont Green Up Day waste collected along roadsides in Vermont which indicates that beverage containers (deposit and non-deposit) represent 20 percent by weight of all litter collected. While weight and count data will be different, the general conclusion again is that the data do not demonstrate that Vermont's bottle deposit has an impact on litter.

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[10] Prepared by MSW Consultants. Note that John Culbertson, lead author of the KAB report has stated (telephone call, July 19, 2013) that he is not aware of any statistically valid analysis of deposit versus non-deposit state litter data which conclusively demonstrate that there is a difference in beverage container litter rates between deposit and non-deposit states.

[11] IBID, p 3-6