Draft Amendments to Statewide Water Quality Control Plans for Trash July 9, 2014

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General Comments

The Draft Amendment to Statewide Water Quality Control Plans for Trash (*Draft Staff Report*) details regulatory method that is focused on reducing the amount of trash discharged to surface water by amending existing discharge permits and prohibiting the discharge of preproduction plastics by manufacturers and transports. These steps seem to be necessary in that exiting laws, regulations, and permitting processes are not successfully reducing the amount of trash and preproduction plastics being discharged to surface waters.

I found this *Draft Staff Report* to be very well written. A thorough case was made as to why action to address the discharge of trash is needed at this time. Methods that can be used to comply with the amendment were adequately discussed. Moreover, the authors cited pertinent literature throughout the document. This review addresses three scientific conclusions from the *Draft Staff Report*:

1) Trash threatens public health and safety, reduces appeal, degrades aquatic habitats, and endangers wildlife in surface water.
2) Different land uses have different rates of trash generation.
3) A full capture system is an effective method for capturing trash greater than 5 mm from entering a surface water body via storm water.

In addition I have included some general comments on the *Draft Staff Report* in my review.

Conclusion 1 – Trash threatens public health and safety, reduces appeal, degrades aquatic habitats, and endangers wildlife in surface water

My expertise only allows me to address the public health and safety aspects related to this conclusion. A reasonable definition of pollutant is a species that has some undesired consequence associated with its presence (Nazaroff and Cohen, 2001). With this definition it is easy to see that trash can be defined as a pollutant. Discharges of trash and preproduction plastics to streams, rivers, lakes, and oceans are an immense and global problem (Leous and Parry, 2005). Numerous studies have documented the presence of trash, in particular plastics owing to its predominance among marine trash (Gregory and Ryan, 1997; Derraik, 2002; Thompson et al., 2004). The ultimate impact these discharges have on aquatic life and wildlife is well documented and well cited in the *Draft Staff Report*.

The human health and safety risks resulting from improperly discarded solid waste have been understood since the 19th century (Tchobanoglous et al., 1993). The main health impact is disease caused by rats, flies, and other disease vectors breeding in trash-impacted areas and then spreading disease to humans. Hanks (1967) details the relationship between solid waste and human disease, tracing the connection between improper solid waste management and 22 human diseases. Though high amounts of putrescible organic wastes are generally not contained in common trash (litter), discarded fast food bags containing unfinished food, diapers, improperly disposed household wastes, among other items will contain waste that will degrade attracting rodents and flies. Since the study conducted by Hanks (1967) additional public health concerns have come into focus concerning improperly discarded trash, in particular hypodermic needles and plastics (Phillip, 1993; Halden, 2010). It is well understood that trash can impact human health and public safety.

Conclusion 2 - Different land uses have different rates of trash generation.

Limited studies have been reported in the refereed literature on waste generation rates classified by land use. A study conducted by Cutter et al. (1991) in New Jersey shows a difference in trash generation rates depending upon land use. In this study the authors divided land use into the following categories

- Residential
    - Urban
    - Suburban
    - Rural
- Commercial
    - Urban
    - Suburban
    - Rural
- Industrial
- Roads
    - Rural/county
    - State/federal highway
    - Interstate/toll road
- Beaches
    - Undeveloped bay
    - Developed bay
    - Developed Ocean
- Watercourses
- State Parks
- Landfills

The authors sampled at two-week intervals over a four-week period during the summer of 1989. Each site was visited three times. In their study, the only collected litter larger than one inch (~2.5 cm).

Results from this study show a clear difference in generation rates according to the land uses the authors defined. Commercial sites were the most littered. The next most littered land use areas (in order of generation rate) are as follows: state parks, roads, landfills, beaches, industrial areas, residential areas, and finally watercourses. The authors also found that there was not statistical difference between the overall generation rates in rural areas in comparison to suburban areas. However, there was a clear statistical difference between the generation rates in urban areas in comparison to suburban and rural areas. This result makes intuitive sense since the overall solid waste generation rates are high in populated urban areas in comparison to relatively less populated suburban and rural areas.

Stein and Syrek (2005) conducted a litter survey for the New Jersey Clean Communities Council. In this study the authors divided the land use into the following categories:

- Rural freeways and tollways,
- Other state rural highways,
- Rural and local roads,
- Urban freeways and tollways,
- Vacant, industrial or un-maintained street frontages,
- Commercial street frontages,
- Public facility street frontage, and
- Residential street frontage.

The authors performed litter counts in each land use category with each site been visited once. Results from their study show that the category "other state rural highways" had the greatest amount of litter. The authors attributed this result to the frequency of cleaning up litter. As the authors state, "the street in front of the courthouse is cleaned more often than a Rural Local Road." The next highest litter accumulation was found in the category "vacant, industrial or un-maintained street frontages" followed by the category "rural freeways and tollways."

One difference between the study by Stein and Syrek (2005) and Cutter et al. (1991) is Cutter et al. (1991) removed the litter they counted so that in subsequent visits the authors were collecting litter that had accumulated over the previous two week period (during the survey litter was not removed by road or maintenance crews at any of the sites). In the study by Stein and Syrek (2005) each site was visited only once. Hence, the influence of the difference between active litter cleanup activities between the different land use categories on litter generation rates (litter quantity/time) was most likely not as great in the study performed by Cutter et al. (1991). This difference in study methodology means that the results from Cutter et al. (1991) are most likely more reflective of litter generation rates as a function of land use category than the study by Stein and Syrek (2005).

Results from a study performed by Black and Veatch (2012), which is cited in the *Draft Staff Report*, indicates that litter generation rates is a function of land use area. In this study the authors divided the entire study area into five land use categories: open space/parks, low density single family residential, commercial, industrial, and high density single family residential. Each site was visited once per week

for eight weeks. The authors selected a consecutive four week period from the eight week study to be representative of typical litter generation over a 30 day period. The authors found that commercial land use category had the greatest litter accumulation rate over the representative 30 day period followed by industrial areas. As in the study performed by Cutter et al. (1991) these authors collected and removed the litter. Following this methodology the litter collected and counted during the next sampling period was most likely not greatly impacted by litter cleanup activities performed by maintenance crews.

Results from these three studies strongly indicate that trash generation rates are a function of land use. Further, according to the results from the study performed by Cutter et al. (1991) and by Black and Veatch (2012), commercial areas have the greatest trash generation rates.

Conclusion 3 - A full capture system is an effective method for capturing trash greater than 5 mm from entering a surface water body via storm water.

Processes for the separation of solids from liquids are well known and used in many different industries. Removing trash from storm water is just another application of the fundamentals of separation. The challenges in the development of these type of capture systems are the system should have no moving parts or require external power source. Moreover, the system must be reliable, economic, have minimal water head requirements, and have high removal efficiency. Most importantly, the system most not increase the flood levels in the vicinity of the structure (Armitage, 1998).

Given the complexity of capturing trash down to a size of 5 mm, most likely no trap will be 100% effective under all conditions (Armitage, 2003). However, many systems will be effective under defined conditions. An example of a defined condition in which the full capture system is evaluated against is provided by the Los Angeles Regional Water Quality Control Board for Ballona Creek (State of California, 2004). Several likely systems were evaluated by the County of Los Angeles (2004), hence it is my belief that full capture systems will be effective under defined conditions. Further, if the NPDES process is amended to include trash as detailed in this *Draft Staff Report*, then more about these systems will be learned and improvements to existing full capture systems will most likely occur as well.

Specific Comments on the *Draft Staff Report*

Comment on Section 1.6 – Current Efforts to Address Concerns Related to Trash in California Waters

In this section the authors discuss current laws, ordinances, and permitting processes directed at trash. The authors included in this section short discussions on the existing NPDES permitting processes adopted by the Los Angeles Water Board and the permitting process adopted by the San Francisco Water Board. I believe it would be beneficial to include in this section (or a different section) an expanded discussion on these two attempts to control the discharge of trash. How successful have these attempts been? What has been the associated implementation cost? Most importantly, is the proposed process of eliminating trash discharges feasible? It seems that much can be (and already has

been) learned from these case studies. I believe it would be beneficial to include a detailed discussion of the knowledge gained from these case studies in this report.

Comment on Section 2.4.2 - Nonpoint Source Dischargers

In this subsection the authors address the requirements for nonpoint source (NPS) dischargers who are subject to Waste Discharge Requirements (WDRs) or waivers to WDRs. Does this cover all the NPS dischargers? If not, how will the Water Board regulate and enforce NPS dischargers who are not subject to these requirements or waivers?

Comment on Section 4.10 – Issue 10: How should the Trash Amendments structure monitoring and reporting of trash control efforts?

In this section the authors discusses different options for monitoring requirements for MS4 permittees complying under Track 2 and for Caltrans. MS4 permittees will be required to conduct baseline and annual monitoring to demonstrate the effectiveness of their selected controls. I recommend a statewide standard method for developing the baseline be established to provide consistency among the different Water Boards. I also recommend that a statewide standard method for annual monitoring be developed. I recommend that the monitoring programs be constructed such that the conclusions derived from these monitoring events be statistically defensible. To illustrate why I believe such a standard method is required we can use the following references that were cited in the *Draft Staff Report*:

- Los Angeles Water Board. 2007f. *Trash Total Maximum Daily Load for the Los Angeles River Watershed*. Revised Draft. July 27, 2007.
- Black and Veatch. 2012. *Quantification study of institutional measures for Trash TMDL compliance – Interim Report: Year 1 – 2012*. Prepared for by the City of Los Angeles.

The Los Angeles Water Board has classified land use into 13 different categories. Baseline waste load allocations developed for each jurisdiction in the Los Angeles River watershed is reported in Los Angeles Water Board (2007). Table 1 provides the volumes of trash collected in the baseline study for each land use category and the area measured for each land use category reported in Los Angeles Water Board (2007). The total baseline trash volume resulting from this study is 1,374,845 gallons.

Black and Veatch (2012) conducted an extensive assessment of performance of institutional measures employed by the City of Los Angeles to reduce discharges of trash. These authors measured trash volumes in representative land use category areas over a representative 30-day period. They report the litter generation rates generated for the following land use categories: Open Space/Parks, Low Density Residential, Commercial, Industrial, and High Density Residential (Table 2). We can determine the representative trash volumes for each of the reported land use categories be multiplying each 2012

measured litter generation rate by their respective area reported by Los Angeles Water Board (2007). Table 2 provides these values.

Table 1. Land Use Areas and Baseline Volumes for Los Angeles

Land Use Category	Land Area[1] (acre)	Volume[1] (gallons)	Litter Generation Rate[2] (gallons/acre)
Open Space	29,344	170494	5.81
Low Density Residential	4,390	13302	3.03
Commercial Services	10,906	161072	14.77
Industrial	10,758	164951	15.33
High Density Residential	94,048	523851	5.57
Public Facilities	5,651	86603	15.32
Educational Institutions	4,941	72974	14.77
Military Institutions	83	0	0
Transportation	7,462	114426	15.33
Mixed Urban	1,382	21170	15.31
Agriculture	1,670	9692	5.802
Water	3,270	0	0
Recreational	6,253	36310	5.807
	Total	1,374,845	

[1] From Appendix II, Los Angeles Water Board (2007)
[2] terminology used in Black and Veatch (2012)

Table 2. Measured Litter Generation Rates and Calculated Trash Volumes for Los Angeles Measured in 2012

Land Use Category	Land Area[1] (acre)	Litter Generation Rate (gallons/acre)	Volume (gallons)
Open Space[2]	29,344	1.90	55,754
Low Density Residential[2]	4,390	0.98	4,302
Commercial Services[2]	10,906	18.52	201,979
Industrial[2]	10,758	7.65	82,299
High Density Residential[2]	94,048	2.86	268,977
Public Facilities[3]	5,651	7.65	43,230
Educational Institutions[3]	4,941	18.52	91,507
Military Institutions	83	0.00	0
Transportation[3]	7,462	7.65	57,084
Mixed Urban[3]	1,382	7.65	10,572
Agriculture[3]	1,670	1.90	3,173
Water	3,270	0.00	0
Recreational[3]	6,253	1.90	11,881
		Total	832,771

[1] From Appendix II, Los Angeles Water Board (2007)
[2] From Black and Veatch (2012)
[3] Estimated using the assumptions provided in Los Angeles Water Board (2007)

Using assumptions for litter generation rates provided in Los Angeles Water Board (2007), we can determine the representative trash volumes for the remaining land use categories (Table 2). A

summation of the volumes for each land use category results in the total volume of trash generated over a 30-day period in 2012 equal to 832,771 gallons.

The authors of the Black and Veatch (2012) study calculated the total volume differently from the method described above. In their study they present a representative litter generation rate as the ratio of the total trash volume measured at each of their representative land use category sites to the total area of all of the sites. Using this method they calculate a representative land use generation rate equal to 6.80 gallons/acre. They then determine the representative trash volume for each land use category in Los Angeles by multiplying this ratio by the land area for each category. Summing these trash volumes results in a total volume of trash generated over a 30-day period equal to 1,203,031 gallons, which is over 40% greater than the value determined by the first method described above.

Each analysis method is a valid approach to comparing the volume of trash generated in comparison to the baseline. However, the results are greatly different between the two methods. At the extreme, one calculation method may show that a jurisdiction is out of compliance, while the other method may indicate otherwise. Hence, I believe a standard monitoring (and analysis) method is required for both the development of the baseline and for annual monitoring. Furthermore, given the heterogeneous nature of trash generation, a comparison of generated trash volumes to a baseline value needs to be statistically defensible. I believe that to be truly successful in eliminating trash discharges very close attention needs to be paid to the monitoring and analysis procedures used to track progress towards this goal and eventual attainment of this goal.

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