Public Comment (11/16/10 Wrkshp)
Policy for Toxicity Assessmnt
Deadline: 1/21/11 by 12 noon

City of Downey

FUTURE UNLIMITED

RECEIVED
JAN 21 2011
SWRCB EXECUTIVE

January 20, 2011

Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
1001 I Street, Sacramento, CA 95814

Subject: **Comment Letter – Policy for Toxicity Assessment and Control**

Dear Ms. Townsend,

The City of Downey appreciates the opportunity to comment on the proposed draft Policy for Toxicity Assessment and Control. We recognize the effort that State Board staff has put into the proposed Draft Policy for Toxicity Assessment and Control; however, we continue to have significant concerns about this Draft Policy and its application to stormwater and urban drainage.

The inclusion of WET testing in MS4 permits is inappropriate. Whole Effluent Toxicity (WET) test requirements have traditionally been applied to wastewater dischargers, which now have extensive experience with conducting WET tests and substantial reference datasets. The Draft Policy extends these testing requirements to MS4 runoff discharges, which differ significantly from wastewater effluent and industrial discharges in several aspects:

- MS4 Permittees have little control over pollutants sources, including other Permittees.
- Urban runoff is far more variable, both in flow rate and constituent concentrations.
- Wastewater treatment processes are rarely applicable to controlling runoff discharges.

WET testing by MS4 Permittees has not been validated. Neither the USEPA, nor the State Board, has referenced studies that substantiate the application of WET methods or results to stormwater and therefore, the WET methods proposed for use by the Draft Policy have not been validated for application to urban and stormwater discharges. Nor has either agency provided evidence to support the need to expand WET testing methods within the MS4 permitting context.

The scientific information conveyed by MS4 Permittee WET testing is of doubtful relevance. In a 1996 Freedom-of-Information Act response, USEPA stated that it has "no information" demonstrating that whole effluent toxicity test endpoints are correlated with biological conditions in effluent-dominated streams, stormwater channels or agricultural drains.[1]

[1] USEPA. Response to Freedom of Information Act request (submitted 5/28/96 and resubmitted 7/24/96). Letter to Mark Pifher, attorney of record for Western Coalition of Arid States. September 11, 1996.

11111 BROOKSHIRE AVENUE POST OFFICE BOX 7016 DOWNEY, CALIFORNIA 90241-7016 www.downeyca.org

We are unaware of any additional evidence or data obtained subsequent to this request; in fact, as far as we are aware, the evidence contained in this letter constitutes the first application of the TST method of the Draft Policy to stormwater discharges. In a soon to be released 2009 Annual Report of Regional Monitoring in the San Gabriel River, observed *Ceriodaphnia dubia* toxicity was most common in water from relatively pristine foothill and mountainous watershed areas. The WET methodology appears to, at least occasionally and for reasons that are unknown, be sensitive to constituents that have nothing to do with urban watershed characteristics.

Lack of implementation and regulatory clarity. The Draft Policy provides little guidance for MS4 permittees and leaves many significant details to the discretion and interpretation of Regional Board staff. Few details are provided regarding monitoring requirements or the procedures to be followed in determining compliance with the Draft Policy and associated numeric effluent limitations. The chronic sub-lethal toxicity test requires a change of test water every day with new effluent samples for a minimum of seven days. It will be extremely difficult, or impossible, to collect a representative volume of stormwater for chronic testing, because stormwater discharges can last for several hours to days. Regional Board staff may require the construction of mass emission stations, which for the Los Angeles River Metals TMDL cost $70,000 each, to collect representative mass integrated stormwater samples.

Violation of assumptions for chronic WET testing. The composition of stormwater varies significantly during the course of a storm flow event and is in violation of the fundamental assumption underlying a chronic toxicity test method—i.e., that effluent characteristics and exposures in the environment are relatively constant. Assuming the use of autosampler, water collected early in a storm series might be very stale and altered days, when finally mixed with water from the declining limb of the hydrograph. It is unclear whether cities in southern California, where dry-weather flows are increasing non-existent, will be able to collect a sufficient volume of runoff for twice per year dry-weather compliance monitoring. This problem if further exacerbated when an effluent limitation is observed, as the Draft Policy requires six (6) accelerated tests within the 12-week period following the initial exceedence. The Draft Policy, in these circumstances, would also require that a toxicity reduction evaluation (TRE) be conducted following a test failure, even though it is highly unlikely that whatever agent or compound caused the test failure would be present in samples collected for follow-up testing.[2]

Financial burden on small cities will be tremendous. Our estimates show that the cost of WET testing for small cities will be tremendous. A single violation, potentially from some upstream community, triggers the accelerated monitoring and TRE Draft Policy requirements. TREs typically exceed, by an order of magnitude, the cost estimates contained in the Draft Staff Report that accompanies the Draft Policy. The City of San Bernardino spent over $100,000 on accelerated monitoring and preliminary Toxic Identification Evaluations (TIEs) over the last 10 years. In every instance, it appears that the initial failure of the chronic sub-lethal toxicity test for reproduction was due to routine (annual) *C. dubia* culture crashes at the analytical laboratory. The Inland Empire Utilities Agency (Chino, CA) spent over $300,000 on a 1997-98 TIE/TRE, to address sporadic failures of the chronic sub-lethal toxicity test using *C. dubia* for reproduction.

---

[2] As noted below, the rate of false violations is unacceptably high with the proposed Draft Policy. However, the Draft Policy provides no method for distinguishing between false violations (i.e., a finding of toxicity in a sample that is, in reality, not toxic) and actual violations (i.e., a finding of toxicity in sample that is actually toxic).

Draft Staff Report underestimates Policy induced costs. The cost and environmental analysis grossly underestimates the economic and environmental impacts of the Draft Policy. While the Staff Report underestimates monitoring costs, the economic and environmental impact analyses fail to consider the reasonably foreseeable compliance costs. The "reasonably foreseeable" standard could include any number of treatment processes that might reduce toxicity test failures, including the construction of treatment facilities, use of activated carbon to remove organics, reverse osmosis (RO) to reduced hardness, alkalinity and total dissolved solids (TDS). All of these treatments are expensive, consume significant energy, generate greenhouse gases, have their own significant construction impacts, and generate waste streams that require disposal.

The use of USEPA's TST analysis protocol is unsound. The Draft Policy is primarily based on a new USEPA's Test of Significant Toxicity (TST) method, which is scientifically unsound and will lead to significant increase in enforcement actions and related appeals.

- **The TST method reverses the "presumption of innocence" doctrine**: The method guidance (i.e., NPDES TST Implementation Document) was released in June, 2010 by USEPA without public review or comment. It assumes an effluent is toxic, unless demonstrated otherwise, a significant departure of normal legal and enforcement practice.
- **Initial false positives are more common using the TST method**: To evaluate the TST method, our consultants applied it to USEPA WET blank data, which by definition are non-toxic. These evaluations showed that the TST method falsely indicated toxicity at 15% for chronic toxicity tests using *C. dubia* reproduction (see Table 1 in Attachment). Given its significant repercussions, this false result rate is unacceptably high and would lead to unnecessary permit violations and accelerated testing/TRE requirements.
- **Initial toxicity assessments are more common with TST than other methods**: Our consultants applied the TST analysis to other datasets and found higher toxicity rates than using current WET methods (e.g., NOEC, IC25). These findings are more likely due to inherent variability in the toxicity methods, inter-laboratory differences, sample matrix variability (e.g., hardness, pH, TDS of receiving water), and variability inherent in the hypothesis testing in the TST method, ***not*** to actual toxicity in the samples themselves.
- ***C. dubia*** **toxicity rates in stormwater datasets match those of USEPA blank data**: Table 2 in the Attachment to this letter, presents the summary of a validation evaluation of the (*C. dubia*, reproduction endpoint) TST method for 123 receiving water samples collected by the County of Los Angeles from 2005 through 2010. The TST method found toxicity in 12% of samples and the Draft Policy methods would have led to findings of reasonable potential in 15% of the dataset. These rates are comparable to those in the USEPA blank dataset (see Table 1 in Attachment) and more than twice that found using the NOEC and IC25 methods (4% and 7%, respectively) on the same dataset. It is therefore likely that the rate of apparent toxicity from the TST method, as applied to "real world" data, will be similar to the rate of toxicity in non-toxic blank samples, and higher than the rates of toxicity in the NOEC and IC25 methods approved by USEPA.

These observations highlight the need to evaluate the TST method for various species and toxicity endpoints both in ambient samples, particularly stormwater samples, and in non-toxic blank samples. It is premature to apply the TST method to urban runoff and stormwater.

The Draft Policy Reasonable Potential Analysis (RPA) results in unnecessary application of effluent limitations. The Draft Policy results in a finding of reasonable potential under either of two conditions: 1) if an effluent sample fails the TST method; or 2) if the percent effect (the response difference between sample and control) is greater than 10%. Method variability results in frequent exceedence of the second criteria. A false RPA failure rate of 25% was observed, for chronic reproductive toxicity analysis in *C. dubia* using control (blank) water. This false failure rate is far too high and will result in the unnecessary application of numeric effluent limitations.

The proposed Draft Policy should be adopted through a formal rule-making process. Data collected under the proposed Draft Policy may be used by local agencies for upstream discharger enforcement and must therefore be adopted through a formal rule-making process. The State Board must comply with the requirements in California Water Code Sections 13241 and 13242, particularly since the TST method was not adopted through a formal rule-making public process.

Implementation of the Draft Policy as numeric effluent limitations in permits is foreseeable. The Draft Policy requires whole effluent toxicity (WET) tests, using chronic <u>sub-lethal</u> toxicity endpoints, to be included in SWMP or MS4 permit and allows the Regional Boards discretion in applying numeric effluent limitations for toxicity. Unless the Draft Policy is modified, the Board must assume that toxicity numeric effluent limitations will be included in future MS4 permits, requiring Permittees to conduct four (two wet and two dry weather) compliance monitoring toxicity tests per year on the most sensitive species identified via the RPA. If the permittee fails a single compliance monitoring test, it will be considered a permit violation triggering the need to complete six more toxicity tests and a toxicity reduction evaluation (TRE) within 12 weeks.

In conclusion, the City of Downey strongly recommends that the State Board should <u>not adopt</u> the Draft Policy, because neither the State Board nor USEPA have conducted the necessary studies and analyses needed to support application of the Draft Policy and TST method to discharges regulated by MS4 permits. We believe that a single test failure, on a single surrogate species using a method that suffers from a high false failure rate, should not be allowed to be construed as a permit violation. Municipal budgets are under enormous pressure, resulting in furloughs and pay cuts, which be exacerbated by your adoption of the proposed Draft Policy. We hope to collaborate with State Water Board staff in developing revisions to the Draft Policy. Please feel free to contact Dr. Gerald Greene, of our City of Downey staff, at 562-904-7112, if you have any questions regarding the information or comments provided in this letter.

Sincerely,

Desi Alvarez, PE
Deputy City Manager

ATTACHMENT

Table 1. Summaries of *Ceriodaphnia dubia* reproduction "blank" data from the USEPA Inter-Laboratory Validation Study. Samples that were determined invalid by USEPA were not included.

Row #	Sample ID	Analysis Using the Proposed New TST Method					Current 40 CFR 136 Method	
		Mean Control Response	Mean Sample Response	% Effect	TST Results	Discharger has Reasonable Potential (RP) according to Draft Policy for Toxicity Assessment and Control	NOEC	IC 25
1	9330	25.4	25.0	1.5	Non-Toxic	No	100	>100
2	9332	16.6	16.3	1.8	Non-Toxic	No	100	>100
3	9337	20.1	19.4	3.5	Non-Toxic	No	100	>100
4	9338	24.2	21.3	12.0	Non-Toxic	**Yes**	100	>100
5	9340	15.3	19.8	-29.4	Non-Toxic	No	100	>100
6	9341	23.5	21.3	9.4	Non-Toxic	No	100	>100
7	9344	11.1	17.0	-53.2	Non-Toxic	No	100	>100
8	9349	30.8	30.3	1.6	Non-Toxic	No	100	>100
9	9350	29.5	22.9	22.4	**Toxic**	**Yes**	100	>100
10	9356	24.1	22.4	7.1	Non-Toxic	No	100	>100
11	9367	22.2	16.7	24.8	Non-Toxic	**Yes**	100	>100
12	9371	19.9	21.3	-7.0	Non-Toxic	No	100	>100
13	9376	20.4	17.8	12.7	Non-Toxic	**Yes**	100	>100
14	9379	24.9	26.8	-7.6	Non-Toxic	No	100	>100
15	9381	26.5	25.6	3.4	Non-Toxic	No	100	>100
16	9382	26.1	25.7	1.5	Non-Toxic	No	100	>100
17	9384	15.5	18.7	-20.6	Non-Toxic	No	100	>100
18	9402	16.0	16.2	-1.3	Non-Toxic	No	100	>100
19	9409	22.2	26.3	-18.6	Non-Toxic	No	100	>100
20	9410	24.8	22.8	8.1	Non-Toxic	No	100	>100
21	9429	31.0	31.1	-0.3	Non-Toxic	No	100	>100
22	9432	17.0	18.2	-7.1	Non-Toxic	No	100	>100
23	9436	28.1	31.8	-13.2	Non-Toxic	No	100	>100
24	9439	18.9	12.1	36.0	**Toxic**	**Yes**	100	>100
25	9445	23.6	22.4	5.1	Non-Toxic	No	100	>100
26	9446	22.2	18.3	17.6	**Toxic**	**Yes**	100	>100
27	9450	19.4	4.1	78.9	**Toxic**	**Yes**	25	15.9
Summary Statistics	N	27	27	27			27	27
# of Blank Samples Incorrectly Declared Toxic or Triggering Reasonable Potential					**4**	**7**	**1**	**1**
Error Rate for Non-Toxic Blank Samples					**14.8**	**25.9**	**3.7**	**3.7**

Table 2. Los Angeles County Stormwater WET data of *Ceriodaphnia dubia* Chronic reproduction toxicity from 2005-2010. Total number of samples = 123.

Row #	Sample ID	Analysis Using the Proposed New TST Method					Current 40 CFR 136 Method	
		Mean Control Response	Mean Sample Response	% Effect	TST Results	Discharger has Reasonable Potential (RP) according to Draft Policy for Toxicity Assessment and Control	NOEC	IC25
1	PW9528-08	16.6	22.7	-37	Non-Toxic	No	100	>100
2	PW9527-08	16.6	20.5	-23	Non-Toxic	No	100	>100
3	PW9526-08	16.3	25.5	-56	Non-Toxic	No	100	>100
4	PW9525-08	15.8	7.8	51	**Toxic**	Yes	**50**	**72.15**
5	PW9524-08	16.3	22	-35	Non-Toxic	No	100	>100
6	PW9523-08	16.3	11.7	28	**Toxic**	Yes	100	**30.87**
7	PW4810-06	14	31.8	-127	Non-Toxic	No	100	>100
8	PW4809-06	16.7	15.6	7	Non-Toxic	No	100	>100
9	PW4808-06	19.3	35.2	-82	Non-Toxic	No	100	>100
10	PW4807-06	16.9	37.5	-122	Non-Toxic	No	100	>100
11	PW4806-06	17.9	33.8	-89	Non-Toxic	No	100	>100
12	PW4805-06	18	12.2	32	**Toxic**	Yes	100	**32.3**
13	PW4804-06	17	17.5	-3	Non-Toxic	No	100	>100
14	PW14212-05	17.1	21	-23	Non-Toxic	No	100	>100
15	PW14211-05	17.1	6.6	61	**Toxic**	Yes	**56**	**73.3**
16	PW14210-05	19	22.9	-21	Non-Toxic	No	100	>100
17	PW14209-05	19.2	24.8	-29	Non-Toxic	No	100	>100
18	PW14208-05	24.8	28.8	-16	Non-Toxic	No	100	>100
19	PW14207-05	17.1	23.6	-38	Non-Toxic	No	100	>100
20	PW14206-05	17.1	25.4	-49	Non-Toxic	No	100	>100
21	PW13346-07	19.2	23.7	-23	Non-Toxic	No	100	>100
22	PW13335-07	18.2	32.9	-81	Non-Toxic	No	100	>100
23	PW13334-07	23.9	23.5	2	Non-Toxic	No	100	>100
24	PW13333-07	22.6	17.9	21	**Toxic**	Yes	100	>100
25	PW13332-07	20.1	25.4	-26	Non-Toxic	No	100	>100
26	PW13331-07	18.7	29.9	-60	Non-Toxic	No	100	>100
27	PW13324-07	18.9	33.7	-78	Non-Toxic	No	100	>100
28	PW13196-07	15.1	15.3	-1	Non-Toxic	No	100	>100
29	PW13060-07	15.3	17.9	-17	Non-Toxic	No	100	>100
30	PW13059-07	15.3	20.3	-33	Non-Toxic	No	100	>100
31	PW13058-07	22.1	20	10	Non-Toxic	No	100	>100
32	PW13053-07	19.6	18.7	5	Non-Toxic	No	100	>100
33	PW13052-07	19.6	22.7	-16	Non-Toxic	No	100	>100

34	PW12725-06	18.9	24.2	-28	Non-Toxic	No	100	>100
35	PW12469-06	22.3	14.3	36	Toxic	Yes	100	6.8
36	PW12468-06	15.9	16.4	-3	Non-Toxic	No	100	>100
37	PW12467-06	15.9	10.9	31	Toxic	Yes	100	39.88
38	PW12466-06	15.9	15.2	4	Non-Toxic	No	100	>100
39	PW12465-06	19.5	26.4	-35	Non-Toxic	No	100	>100
40	PW12464-06	19.5	25.9	-33	Non-Toxic	No	100	>100
41	PW12310-06	17.4	19.8	-14	Non-Toxic	No	100	>100
42	PW10715-07	17	25.6	-51	Non-Toxic	No	100	>100
43	PW10714-07	17	18.8	-11	Non-Toxic	No	100	>100
44	PW10713-07	17	24.1	-42	Non-Toxic	No	100	>100
45	PW10712-07	17	13.1	23	Toxic	Yes	100	>100
46	PW10711-07	17.1	25.7	-50	Non-Toxic	No	100	>100
47	PW10710-07	22	3.3	85	Toxic	Yes	25	23.38
48	PW10709-07	18.3	22.4	-22	Non-Toxic	No	100	>100
49	PW1018-06	17.8	40.5	-128	Non-Toxic	No	100	>100
50	PW1017-06	18.8	32.6	-73	Non-Toxic	No	100	>100
51	PW1016-06	17.3	23.8	-38	Non-Toxic	No	100	>100
52	PW1015-06	26.2	37.1	-42	Non-Toxic	No	100	>100
53	PW1014-06	31.3	34.8	-11	Non-Toxic	No	100	>100
54	PW1-06	38.2	32.6	15	Non-Toxic	Yes	100	>100
55	PW-6749-07	24.1	27.1	-12	Non-Toxic	No	100	>100
56	PW-6748-07	25.6	19.5	24	Toxic	Yes	100	>100
57	PW-6640-07	17.6	18.3	-4	Non-Toxic	No	100	>100
58	PW-6639-07	15.8	25.2	-59	Non-Toxic	No	100	>100
59	PW-6638-07	15.8	20.6	-30	Non-Toxic	No	100	>100
60	PW-4450-07	16.9	16.4	3	Non-Toxic	No	100	>100
61	PW-3797-07	21.1	22.3	-6	Non-Toxic	No	100	>100
62	PW-3796-07	21.5	22.5	-5	Non-Toxic	No	100	>100
63	PW-3553-07	18.7	23.1	-24	Non-Toxic	No	100	>100
64	PW-3418-07	23.5	27.5	-17	Non-Toxic	No	100	>100
65	PW-3417-07	27.4	27.4	0	Non-Toxic	No	100	>100
66	PW-3416-07	22.2	27.4	-23	Non-Toxic	No	100	>100
67	PW-3360-07	17.9	20	-12	Non-Toxic	No	100	>100
68	PW-2077-07	20.7	16.2	22	Toxic	Yes	100	>100
69	PW-2076-07	20.7	26.6	-29	Non-Toxic	No	100	>100
70	PW-2073-07	20.7	26.5	-28	Non-Toxic	No	100	>100
71	PW-2063-07	18.4	30.3	-65	Non-Toxic	No	100	>100
72	PW-1808-07	15.8	19	-20	Non-Toxic	No	100	>100
73	PW-17384-05	35.2	38.2	-9	Non-Toxic	No	100	>100
74	PW-17383-05	31.4	37.1	-18	Non-Toxic	No	100	>100
75	PW-17382-05	26.7	38.1	-43	Non-Toxic	No	100	>100

76	PW-17381-05	34.3	35.9	-5	Non-Toxic	No	100	>100
77	PW-15997-05	17.4	21.6	-24	Non-Toxic	No	100	>100
78	PW-15996-05	17.7	6.6	63	Toxic	Yes	50	67.7
79	PW-15995-05	16.5	16.2	2	Non-Toxic	No	100	>100
80	PW-15994-05	20	16.9	16	Toxic	Yes	100	>100
81	PW-15993-05	15.2	14.1	7	Non-Toxic	No	100	>100
82	PW-15992-05	12.6	11.9	6	Non-Toxic	No	100	>100
83	PW-15991-05	15.5	4.1	74	Toxic	Yes	50	60.6
84	PW-1529-07	15.2	25.9	-70	Non-Toxic	No	100	>100
85	PW-1527-07	18.6	38.5	-107	Non-Toxic	No	100	>100
86	PW-1526-07	22.5	32.8	-46	Non-Toxic	No	100	>100
87	PW-15206-05	18.5	36.2	-96	Non-Toxic	No	100	>100
88	PW-15205-05	23.4	38.1	-63	Non-Toxic	No	100	>100
89	PW-13982-06	17.4	15.3	12	Non-Toxic	Yes	100	>100
90	PW-13978-06	15.3	17.3	-13	Non-Toxic	No	100	>100
91	PW-13977-06	15	22.4	-49	Non-Toxic	No	100	>100
92	PW-13976-06	15	13.7	9	Non-Toxic	No	100	>100
93	PW 302-09	20.4	24.6	-21	Non-Toxic	No	100	>100
94	PW 301-09	18.9	16.8	11	Toxic	Yes	100	>100
95	PW 234-09	17.7	19.7	-11	Non-Toxic	No	100	>100
96	E1000628003	27.1	31.2	-15	Non-Toxic	No	100	>100
97	E1000628002	26.9	35.4	-32	Non-Toxic	No	100	>100
98	E1000628001	23.4	25.9	-11	Non-Toxic	No	100	>100
99	E1000626001	20.8	26.1	-25	Non-Toxic	No	100	>100
100	E1000616002	20.7	24.7	-19	Non-Toxic	No	100	>100
101	E1000616001	23.4	25.4	-9	Non-Toxic	No	100	>100
102	E1000604001	23.9	35.6	-49	Non-Toxic	No	100	>100
103	E1000142001	25.2	21.7	14	Non-Toxic	Yes	100	>100
104	E1000141001	18.8	23.9	-27	Non-Toxic	No	100	>100
105	E1000117001	17.9	25.6	-43	Non-Toxic	No	100	>100
106	E0900760004	28.9	32.4	-12	Non-Toxic	No	100	>100
107	E0900760003	28.9	30.4	-5	Non-Toxic	No	100	>100
108	E0900760002	28.9	34.9	-21	Non-Toxic	No	100	>100
109	E0900760001	28.9	28.1	3	Non-Toxic	No	100	>100
110	E0900758003	28.9	30.7	-6	Non-Toxic	No	100	>100
111	E0900758002	28.9	28.4	2	Non-Toxic	No	100	>100
112	E0900758001	28.8	26	10	Non-Toxic	No	100	>100
113	E0900419003	19.3	19.5	-1	Non-Toxic	No	100	>100
114	E0900419002	15.5	28.7	-85	Non-Toxic	No	100	>100
115	E0900419001	21.6	24.9	-15	Non-Toxic	No	100	>100
116	E0900418003	22.2	28.8	-30	Non-Toxic	No	100	>100
117	E0900418002	19.9	27.5	-38	Non-Toxic	No	100	>100

118	E0900418001	25	25.6	-2	Non-Toxic	No	100	>100
119	E0900417001	20.7	34.5	-67	Non-Toxic	No	100	>100
120	2677	14.3	14.7	-3	Non-Toxic	No	100	>100
121	2675	18	16.5	8	Non-Toxic	No	100	>100
122	2673	18	18.1	-1	Non-Toxic	No	100	>100
123	2671	26.3	26.5	-1	Non-Toxic	No	100	>100
Summary Statistics	N	123	123	123				
	Min	12.6	3.3	-127.5				
	Max	38.2	40.5	85.0				
	Median	18.8	24.2	-16.1				
	Mean	20.3	24.0	-19.5				
	# of Samples Declared Toxic				**15**	**18**	**5**	**9**
	Rate for Toxic Samples				**12**	**15**	**4**	**7**