****
SOURCE 6
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 18.7919 UPSTREAM FLOW (ML/DAY)= 1358.0000

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	10.3000	N	7.6891	.3804	********	**********
PH-MIN	5.8000	N	7.6891	.3377	.0378	1.0000
OIL-GREASE	251.8800	N	95.7457	100.3298	3.7626	.9402
PHENOL	.9072	L	-.0200	.6685	3.4322	.4867

PIPE= 2 MEAN DISCHARGE (ML/DAY)= 34.2089 UPSTREAM FLOW (ML/DAY)= 1358.0000

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	10.3000	N	7.7908	.3885	********	**********
PH-MIN	5.8000	N	7.7908	.3283	********	1.0000
OIL-GREASE	458.2050	N	137.1951	63.3132	********	1.0000
PHENOL	1.3608	L	-.0998	.5186	********	.6738

****
SOURCE EXPECTED DAMAGE 3.7626
SOURCE PROBABILITY OF NO VIOLATION .3083
****

****
SOURCE 7
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 2.8958 UPSTREAM FLOW (ML/DAY)= 28.3690

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.5000	N	6.9933	.4946	********	**********
PH-MIN	6.5000	N	6.9933	.6821	.2903	.7652
SUSPENDED SOLIDS	42.5835	N	12.5510	6.6731	.0404	1.0000
PHOSPHORUS	5.6778	N	1.4573	.4256	.9317	1.0000
FLUORIDE	2.8389	N	5.6674	4.9540	.0004	.2840
COPPER	1.4194	N	.2221	.1116	.7131	1.0000
LEAD	.8517	L	-.0866	.4972	3.5172	.5136

****
SOURCE EXPECTED DAMAGE 3.5172
SOURCE PROBABILITY OF NO VIOLATION .1116
****

****
SOURCE 8
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .0005 UPSTREAM FLOW (ML/DAY)= 195.7400

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.5000	N	8.6556	.3375	********	**********
PH-MIN	6.5000	N	8.6556	.3978	.0001	.9938
SUSPENDED SOLIDS	15.8982	N	3.6418	2.5472	.0019	1.0000
PHOSPHORUS	1.0599	L	-1.6940	.4735	.0037	.9999
CYANIDE	.1325	L	-1.2287	.1800	.0658	.9744
FLUORIDE	9.5389	N	23.5479	12.2286	.0000	.1260
CHROMIUM	.2650	L	-.6769	.4964	.2042	.5799
COPPER	.5299	L	-.7528	.5214	.1812	.8199
LEAD	.0530	L	-.1176	.4263	1.5139	.0033
CHLOROFORM EXTRACT	7.9491	N	.2652	.2454	.0722	1.0000

****
SOURCE EXPECTED DAMAGE 1.5139
SOURCE PROBABILITY OF NO VIOLATION .0002
****

****
SOURCE 9
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 5.5546 UPSTREAM FLOW (ML/DAY)= 78.2990

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	189.2700	N	426.1681	269.2156	4.6290	.1694
PH-MAX	9.5000	N	8.9937	1.1545	********	**********
PH-MIN	6.5000	N	8.9937	1.1431	2.7035	.6549
SUSPENDED SOLIDS	473.1750	L	1.2750	.3221	.0296	1.0000
CHROMIUM	5.6781	L	1.3116	.8830	4.5256	.2639
NICKEL	5.6781	L	-1.6607	.8699	.2358	.9972
CHLOROFORM EXTRACT	283.9050	N	83.8446	58.0347	8.7244	.9997

****
SOURCE EXPECTED DAMAGE 8.7244
SOURCE PROBABILITY OF NO VIOLATION .0326
****

****
SOURCE 10
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 1.2848 UPSTREAM FLOW (ML/DAY)= 112.5600

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	10.5000	N	8.2339	.7128	********	**********
PH-MIN	6.5000	N	8.2339	.8945	.2517	.9730
SUSPENDED SOLIDS	46.3715	L	1.4912	.2836	.0337	.7314
PHOSPHORUS	1.3249	L	.0772	.2934	.2637	.5609
CHLOROFORM EXTRACT	19.8735	L	1.3489	.3418	5.6230	.4411
OIL-GREASE	19.8735	L	1.3559	.3183	3.9552	.4282

****
SOURCE EXPECTED DAMAGE 5.6230
SOURCE PROBABILITY OF NO VIOLATION .0754
****

****
SOURCE 11
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 2.6909 UPSTREAM FLOW (ML/DAY)= 26.1180

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	10.5000	N	8.4380	.5413	********	**********
PH-MIN	6.5000	N	8.4630	.6752	1.2346	.9981
CYANIDE	.6530	L	-1.6157	.5629	.3756	.9945
CHROMIUM	5.2238	L	-1.2009	.2271	.2506	1.0000
COPPER	2.6119	L	-.1407	.3479	2.0994	.9455
NICKEL	13.0595	L	-.5753	.3994	1.5146	1.0000

****
SOURCE EXPECTED DAMAGE 2.0994
SOURCE PROBABILITY OF NO VIOLATION .9385
****

****
SOURCE 12
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 4.9209 UPSTREAM FLOW (ML/DAY)= 183.5200

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	41.6380	N	49.8479	41.6894	.7471	.4219
PH-MAX	9.0000	N	7.4458	.4485	********	**********
PH-MIN	6.0000	N	7.4458	.6880	.0699	.9819
SUSPENDED SOLIDS	104.0950	L	1.4247	.5307	.0298	.8680
CHLOROFORM EXTRACT	41.6380	N	45.7137	80.2100	5.3977	.4797

****
SOURCE EXPECTED DAMAGE 5.3977
SOURCE PROBABILITY OF NO VIOLATION .1725
****

****
SOURCE 13
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .4444 UPSTREAM FLOW (ML/DAY)= 2.4468

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	4.8830	N	3.1851	2.5917	3.5355	.7438
PH-MAX	10.5000	N	7.7968	.2909	********	**********
PH-MIN	6.0000	N	7.7968	.2994	.4554	1.0000

****
SOURCE EXPECTED DAMAGE 3.5355
SOURCE PROBABILITY OF NO VIOLATION .7438
****

****
SOURCE 14
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .1514 UPSTREAM FLOW (ML/DAY)= 19.5750

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.5000	N	7.8169	.3460	********	**********
PH-MIN	6.5000	N	7.8169	.3183	.0287	1.0000
SUSPENDED SOLIDS	50.3440	N	2.4780	1.5581	.0127	1.0000
CYANIDE	.3596	N	.0177	.0284	.2265	1.0000
CHROMIUM	4.3152	L	-1.9036	1.0644	.4666	.9915
COPPER	2.8768	L	-1.0361	.2755	.5661	1.0000
CHLOROFORM EXTRACT	21.5760	N	1.2122	.5944	2.2673	1.0000

****
SOURCE EXPECTED DAMAGE 2.2673
SOURCE PROBABILITY OF NO VIOLATION .9914
****

****
SOURCE 15
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .9024 UPSTREAM FLOW (ML/DAY)= 66.0650

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.0000	N	8.4552	1.8041	********	**********
PH-MIN	6.0000	N	8.4552	1.6307	1.5457	.5526
LEAD	.0084	L	-.2231	.6257	2.3758	.0016

****
SOURCE EXPECTED DAMAGE 2.3758
SOURCE PROBABILITY OF NO VIOLATION .0009
****

****
SOURCE 16
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .7253 UPSTREAM FLOW (ML/DAY)= 6.9649

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.5000	N	7.9801	.2045	********	**********
PH-MIN	6.5000	N	7.9801	.2307	.8128	1.0000
SUSPENDED SOLIDS	24.3771	N	4.6869	2.8447	.0617	1.0000
OIL-GREASE	10.8473	N	4.3342	1.9318	4.1203	.9992
MERCURY	.0035	L	-3.0912	.2410	.2459	.9957

****
SOURCE EXPECTED DAMAGE 4.1203
SOURCE PROBABILITY OF NO VIOLATION .9949
****

****
SOURCE 17
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 1.8632 UPSTREAM FLOW (ML/DAY)= 293.6200

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
CHLOROFORM EXTRACT	40.1240	L	1.0787	.3438	3.9864	.9365

PIPE= 2 MEAN DISCHARGE (ML/DAY)= .4707 UPSTREAM FLOW (ML/DAY)= 293.6200

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
CHLOROFORM EXTRACT	9.3118	L	.3197	.2984	********	.9852

PIPE= 3 MEAN DISCHARGE (ML/DAY)= .6279 UPSTREAM FLOW (ML/DAY)= 293.6200

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
CHLOROFORM EXTRACT	10.3718	L	.2606	.3847	********	.9752

PIPE= 4 MEAN DISCHARGE (ML/DAY)= .0035 UPSTREAM FLOW (ML/DAY)= 293.6200

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.5000	N	7.1147	.8449	********	**********
PH-MIN	6.5000	N	7.1147	.6790	.0573	.8150
SUSPENDED SOLIDS	156.7100	L	1.1375	.3960	.0070	.9962
PHOSPHORUS	31.3420	N	33.4686	23.3815	2.2395	.4638
ALUMINUM	62.6840	N	1.4133	2.3094	1.0358	1.0000
CHLOROFORM EXTRACT	62.6840	L	1.1260	.4472	********	.9333

****
SOURCE EXPECTED DAMAGE 3.9864
SOURCE PROBABILITY OF NO VIOLATION .3162
****

****
SOURCE 18
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 35.5519 UPSTREAM FLOW (ML/DAY)= 132.1300

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	3000.0000	N	29419.5886	25906.2375	9.1068	.1539
SUSPENDED SOLIDS	4445.2015	N	69835.1699	61766.1953	7.8145	.1449
AMMONIA	272.1552	N	98.9812	82.4698	4.3696	.9821
DISSOLVED SOLIDS	213188.2383	N	111935.8633	39127.6113	4.5693	.9952

****
SOURCE EXPECTED DAMAGE 9.1068
SOURCE PROBABILITY OF NO VIOLATION .0218
****

****
SOURCE 19
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .1330 UPSTREAM FLOW (ML/DAY)= 4.8937

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
SUSPENDED SOLIDS	123.0225	L	.4025	.8625	.2858	.9748
CHLOROFORM EXTRACT	73.8135	L	-.2913	.3790	3.8226	1.0000

****
SOURCE EXPECTED DAMAGE 3.8226
SOURCE PROBABILITY OF NO VIOLATION .9748
****

****
SOURCE 20
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .8176 UPSTREAM FLOW (ML/DAY)= 195.7500

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
PH-MAX	9.5000	N	6.6901	.5338	********	**********
PH-MIN	6.5000	N	6.6613	.4555	.0161	.6384
SUSPENDED SOLIDS	49.8725	N	33.5698	22.4706	.0174	.7659
PHOSPHORUS	9.9745	N	6.4118	7.5453	.7368	.6816

****
SOURCE EXPECTED DAMAGE .7368
SOURCE PROBABILITY OF NO VIOLATION .3333
****

****
SOURCE 22
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 40.7535 UPSTREAM FLOW (ML/DAY)= 203.0900
MEAN DO CONCENTRATION (MG/L)= 4.3690

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	1360.7760	N	1537.6694	1462.6501	5.3891	.4519
SUSPENDED SOLIDS	907.1840	L	2.9206	.5022	.6357	.5294
PHOSPHORUS	378.5300	L	1.6472	.4858	3.6289	.9723

****
SOURCE EXPECTED DAMAGE 5.3891
SOURCE PROBABILITY OF NO VIOLATION .2326
****

****
SOURCE 23
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= .4251 UPSTREAM FLOW (ML/DAY)= 14.9260

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	184.1583	N	64.2895	29.6657	3.8687	1.0000
SUSPENDED SOLIDS	104.7798	N	42.5845	22.5484	.2791	.9971
PHOSPHORUS	4.3152	N	4.6613	1.3021	4.6290	.3952

****
SOURCE EXPECTED DAMAGE 4.6290
SOURCE PROBABILITY OF NO VIOLATION .3940
****

****
SOURCE 24
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 3.0492 UPSTREAM FLOW (ML/DAY)= 269.1600

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	408.2328	N	196.4388	68.8322	.9234	.9990
SUSPENDED SOLIDS	272.1552	N	139.3360	92.8147	.0522	.9238

****
SOURCE EXPECTED DAMAGE .9234
SOURCE PROBABILITY OF NO VIOLATION .9228
****

****
SOURCE 25
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 164.9721 UPSTREAM FLOW (ML/DAY)= 1827.8000

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	4535.9200	N	5085.6584	2481.7704	3.5719	.4123
SUSPENDED SOLIDS	3628.7360	L	3.7497	.2959	.3556	.2605

****
SOURCE EXPECTED DAMAGE 3.5719
SOURCE PROBABILITY OF NO VIOLATION .1074
****

****
SOURCE 26
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 7.1535 UPSTREAM FLOW (ML/DAY)= 1862.1000
MEAN DO CONCENTRATION (MG/L)= 5.9653

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	278.9591	L	2.0957	.4399	.1345	.7868
SUSPENDED SOLIDS	302.0923	L	2.2366	.3561	.0129	.7530
PHOSPHORUS	72.2990	N	43.0084	32.3824	.4750	.6171

****
SOURCE EXPECTED DAMAGE .4750
SOURCE PROBABILITY OF NO VIOLATION .4841
****

****
SOURCE 27
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 5.5699 UPSTREAM FLOW (ML/DAY)= 349.9000

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	272.1552	N	3603.6948	817.3356	6.5243	.0000
SUSPENDED SOLIDS	272.1552	N	3382.8377	1500.1360	.9534	.0191
PHOSPHORUS	58.2940	N	311.0573	64.9729	6.6753	.0001

****
SOURCE EXPECTED DAMAGE 6.6753
SOURCE PROBABILITY OF NO VIOLATION .0000
****

****
SOURCE 28
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 110.8503 UPSTREAM FLOW (ML/DAY)= 266.7100
MEAN DO CONCENTRATION (MG/L)= 4.8551

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	4989.5120	N	1413.0719	845.8808	4.6933	1.0000
SUSPENDED SOLIDS	4082.3280	N	3151.0186	2321.0495	.8593	.6559
PHOSPHORUS	529.9500	N	301.2218	148.7913	6.2030	.9379

****
SOURCE EXPECTED DAMAGE 6.2030
SOURCE PROBABILITY OF NO VIOLATION .6151
****

****
SOURCE 29
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 4.1106 UPSTREAM FLOW (ML/DAY)= 12.2340

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	170.0970	N	93.4627	77.9805	6.5963	.8371
SUSPENDED SOLIDS	170.0970	L	1.7007	.3274	.4079	.9473

****
SOURCE EXPECTED DAMAGE 6.5963
SOURCE PROBABILITY OF NO VIOLATION .7930
****

****
SOURCE 30
****

PIPE= 1 MEAN DISCHARGE (ML/DAY)= 35.0425 UPSTREAM FLOW (ML/DAY)= 1862.1000

CONSTITUENT	STANDARD	DIST	EST. MEAN	EST. SIGMA	EXPECTED DAMAGE	PROB. OF NO VIOLATION
BOD5	1587.5720	N	1625.9873	759.3214	1.1913	.4798
SUSPENDED SOLIDS	1360.7760	N	1654.7131	720.3438	.0874	.3416

****
SOURCE EXPECTED DAMAGE 1.1913
SOURCE PROBABILITY OF NO VIOLATION .1639
****

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/5-75-015	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE A QUANTITATIVE METHOD FOR EFFLUENT COMPLIANCE MONITORING RESOURCE ALLOCATION		5. REPORT DATE September 1975
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Arthur I. Cohen, Yaakov Bar-Shalom, Wendy Winkler, G. Paul Grimsrud		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Systems Control, Inc. 1801 Page Mill Road Palo Alto, California 94304		10. PROGRAM ELEMENT NO. 1HC619
		11. CONTRACT/GRANT NO. 68-01-2232
12. SPONSORING AGENCY NAME AND ADDRESS Office of Research and Development U.S. Environmental Protection Agency Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Final
		14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report develops and demonstrates a quantitative method for the preliminary design of effluent standard surveillance systems. The principal output of the report is a procedure to be used in the state or EPA water quality programs to determine the frequency of effluent compliance monitoring visits. The procedure allocates compliance monitoring budgetary resources so as to minimize environmental damage. It utilizes a statistical model of the effluents that is obtained from self-monitoring and compliance monitoring data. The procedure is demonstrated on an example river basin using data supplied by the State of Michigan.

This report is submitted in fulfillment of Contract Number 68-01-2232 by Systems Control, Inc., under the sponsorship of the Office of Research and Development Environmental Protection Agency. Work was completed as of January 1975.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Wastewater Monitoring, Wastewater Standards, Effluent Monitoring, Water Quality Control, Effluent Compliance Monitoring, Resource Allocation, Statistical Analysis, Michigan Water Resources, Cost Effectiveness	Resource Allocation Program, Effluent Standards Compliance Monitoring	14A Methods and Equipment/ Cost Effectiveness

18. DISTRIBUTION STATEMENT UNLIMITED	19. SECURITY CLASS (This Report) UNCLASSIFIED	21. NO. OF PAGES
	20. SECURITY CLASS (This page) UNCLASSIFIED	22. PRICE

EPA Form 2220-1 (9-73)

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