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Status Report: Alternative Techniques for Defining Station Clusters

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STATUS REPORT: ALTERNATIVE TECHNIQUES FOR DEFINING STATION CLUSTERS

Prepared for

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LIST OF ACRONYMS

CSO	combined sewer overflow
RPD	relative percent difference
RPS	relative proportional similarity
SQS	sediment quality standards
TIN	triangulated irregular network

1.0 EXECUTIVE SUMMARY

The Sediment Management Standards (WAC 173-204) specify that the first step in the cleanup process is to identify clusters of contiguous stations that exceed the listed sediment quality standards (SQS). The rule does not provide detailed instructions for identifying station clusters, and several alternative approaches are discussed and evaluated in this technical memorandum.

Contiguous stations are defined as those stations that share an edge of a Thiessen polygon, where the Thiessen polygon about each station encloses all points closer to that station than to any other.

Identification of station clusters is expected to be accomplished by applying professional judgment to the result of an objective numerical assessment. The identities of the chemicals that exceed the SQS, and the factors by which they exceed, is the only information that is sure to be available for all stations and upon which a numerical assessment can be based.

A simple objective technique for defining station clusters is to examine the similarity of chemicals and exceedance factors at adjacent stations. Four similarity indices and two similarity tests were evaluated by applying them to data from Elliott Bay. Clusters can be defined based on similarity indices by grouping into a single cluster all contiguous stations that have a similarity that exceeds some critical value. Selection of an appropriate index and critical value requires professional judgment.

Two important criteria for evaluating the similarity indices are their coverage (i.e., what proportion of stations exceeding the SQS are included in a cluster) and their definition (i.e., how well does one value of a similarity index discriminate different clusters compared to another). Because for most sites, coverage will probably not be complete except possibly at very low critical values, the groups of stations identified on the basis of a critical value of a similarity index might be best referred to as cluster fragments. Professional judgment may dictate that fragments be combined to form clusters, and that stations that exceed the SQS and adjoin one or more fragments, but are not included because of low similarity, also be added to a fragment to make a cluster.

Two of the similarity indices evaluated (identified as SIMI2 and SIMI4) have the greatest coverage of the alternatives evaluated. At equal critical values, SIMI2 has slightly greater coverage in Elliott Bay and SIMI4 has greater definition. SIMI2 has considerably better coverage in the area of West Point and the Four-Mile Rock disposal area, and is recommended for application to other sites.

The use of similarity indices as an objective technical basis for cluster identification seems to be a useful approach, as the results (for some indices) can provide good coverage and definition, and conform to the expectations of best professional judgment. Further work may focus on the refinement of the similarity indices and alternative methods for displaying and interpreting the results.

2.0 INTRODUCTION

Section 173-204-510 of the Sediment Management Standards rule specifies that station clusters shall be identified prior to cluster screening and site identification. The rule does not describe any specific method for identifying station clusters. Alternative techniques for identifying clusters include: 1) best professional judgment, 2) a deterministic (i.e., consistently computable) calculation, or 3) a combination of the two methods. This document describes the search for a deterministic method of defining station clusters that may be used either alone or in combination with professional judgment. This document does not describe all of the elements of professional judgment that may be applied in addition to, or instead of, the deterministic methods that are evaluated.

3.0 DESCRIPTION OF THE APPROACH

The technical approach that was followed to evaluate methods of identifying station clusters entailed the following four steps:

1. Define contiguity
2. Determine a technical basis for grouping contiguous (adjacent) stations into a cluster of concern
3. Propose alternative methods that are consistent with the technical basis
4. Test the alternatives.

Contiguity alone was presumed to be insufficient to determine station clusters because of the possibility that a chain or network of contiguous contaminated stations might extend over large portions of the sound. This presumption was confirmed after contiguity was defined and the definition applied to the area selected to test station clustering alternatives.

3.1 DEFINITION OF CONTIGUITY

Stations with sediment chemistry data are located irregularly throughout Puget Sound, depending on the various purposes of the studies that established them. Within a single general area, such as an urban bay, stations may be as close as a few tens of feet or as far apart as several thousands of feet. The distances between stations are even larger—many miles—in the main basin of the sound.

One approach to defining contiguity would be to establish a criterion for linear separation. For example, two stations might be defined to be contiguous if they are less than 250 feet apart. The large variance in inter-station distances renders this approach infeasible as a primary means of establishing contiguity. A small distance criterion would isolate many stations, leaving them with no neighbors. A large distance criterion would not allow use of all the data in intensively sampled areas, where clusters of a size less than the distance criterion might be otherwise discriminated. A modification of this approach would be to adjust the distance criterion according to some set of rules, perhaps dependent upon the actual spacing between stations in an area or on the distance from shore.

This approach was not adopted because of the likely complexity, and possibly controversial nature, of any such rules. However, a distance criterion might be used to modify the approach selected, as described below.

Another approach to defining contiguity would be to establish a criterion for the number of neighbors that are defined to be contiguous to each station. Using this scheme, the four or six (or some other number) nearest neighbors to a given station would be considered contiguous. The absence of a technical basis for selecting any single nearest-neighbor criterion led to the rejection of this approach.

For this study contiguity was evaluated by constructing about each station a polygon that enclosed all points closer to that station than to any other (a Thiessen polygon). Two stations were judged to be contiguous if the Thiessen polygons of each shared an edge. If the Thiessen polygons of two stations shared only a vertex, they were not considered contiguous. This approach should be combined with a distance cutoff criterion so that no two stations separated by a distance greater than this criterion could be considered contiguous under any circumstances. Such a distance cutoff criterion was not used in this study; the study area boundary (described below) established the limit to the number of stations that were to be considered.

The Thiessen polygons for a set of stations can be constructed graphically using the following procedure:

1. Construct straight lines (radii) from each station to every other nearby station that can be reached without crossing any other lines

2. Construct the perpendicular bisectors of each of the radii created in step 1 (edges)

3. Remove all portions of each edge except the segment that lies between the intersections with the edges associated with the radii immediately to the left and right. Edges that intersect the neighboring edges distal to the intersection of the neighboring edges with each other or that are completely outside the smallest polygon around the station should be removed entirely.

Stations at the border of an area will not be completely enclosed by polygons. To complete the polygons around the border stations, a set of imaginary stations may be constructed outside the border. It is recommended that the distance from the imaginary stations to the border be equal to the distance from the border stations to the closest interior station. Closure of the border polygons is not strictly necessary to identify the stations contiguous to the border stations, but may be important to calculate other attributes of the stations, such as the area associated with each station.

3.2 THE TECHNICAL BASIS FOR IDENTIFYING STATION CLUSTERS OF CONCERN

Development of a technical basis for clustering stations is predicated on the assumption that the stations in a cluster should have something in common other than simple contiguity. Because the long-term effectiveness of sediment cleanup depends upon source control, the source of sediment contamination is the most reasonable basis for commonality. Ideally, stations contaminated by the same sources should not be clustered with stations contaminated by different sources. In practice, identification of a direct link from each station to a source (or sources) is likely to be impossible to achieve, and would require more information than is available in the database of sediment chemistry and biology measurements.

Stations that are affected by the same source(s) of contaminants are expected to be characterized by similar suites of contaminants present at concentrations above the sediment quality standards (SQS) listed in the rule. Although the amount by which each contaminant exceeds its SQS (the exceedance factor) is likely to vary with distance from the source, the suite of chemicals, and their relative exceedance factors, are expected to be similar at all stations affected by the same source(s). The list of chemicals and the relative exceedance factors is expected to serve as a fingerprint to identify related stations. Contiguous stations with similar chemical fingerprints should be clustered together, and apart from stations with different fingerprints.

Two different approaches to using this fingerprint information could be taken:

1. Generate a numerical representation of the fingerprint for each station and compare these numbers at each pair of adjacent stations
2. Directly compare the fingerprint information at each pair of adjacent stations.

Both of these approaches require a comparison of adjacent stations. The first approach requires comparison of two single numbers, and the second approach requires a comparison of two lists of chemical names and exceedance factors. Both comparisons must be measured against some established criteria. Because stations in a cluster are not expected to be identical, a comparison must be made with respect to a criterion that dictates how similar two stations must be if they are to be included in the same cluster.

Although the first approach involves a simpler comparison, it requires development of an algorithm that will generate a unique value for every possible combination of chemicals and exceedance factors. Diversity indices that are commonly applied to biological communities were evaluated for their applicability to stations with contaminated sediments. Species diversity indices are based on

a data set that contains a number of species, each of that has an integer number of members. This situation is superficially similar to a station that has a number of chemicals exceeding the SQS, each of which has a (non-integer) exceedance factor. Most species diversity indices depend on the fact that the number representing each variable (species abundance, in the case of biological data) is an integer (e.g., by reliance on factorials or properties of the binomial distribution). These indices cannot be applied to stations where the number representing each chemical is a non-integer, such as the concentration or exceedance factor. Other species diversity indices lack clear biological relevance; their analogues, if applied to a contaminated station, would also be difficult to justify.

The second approach requires adoption or development of an algorithm that will generate a similarity value for each pair of adjacent stations. This similarity value directly represents the results of a comparison between the two stations. Two stations that have exactly the same suite of chemicals might be assigned a similarity value of 1.0; two other stations might also have a similarity value of 1.0 based on the common occurrence of a different suite of chemicals. Similarity values need only be evaluated locally, rather than compared across the entire site, as a diversity index or analogous value would. A similarity index therefore need not produce a unique value for each possible combination of chemicals and exceedance factors. This less rigorous requirement of the second approach resulted in its adoption for this study.

The following variables, effects, or factors might be included (either individually or in combination) in a similarity index:

- The number of chemicals (exceeding the SQS) common to the two stations
- The number of chemicals (exceeding the SQS) not common to the two stations
- The rank ordering of exceedance factors at the stations, individually or in combination
- The actual magnitude of the exceedance factors
- The degree of adjacency of the two stations (e.g., the length of the common edge of the Thiessen polygons about the stations).

Concentration values, rather than exceedance factors, could be used as a basis for the calculation of similarity indices. This approach would allow a comparison of fingerprints even when most of the chemicals at one or both stations do not exceed the SQS.

3.3 ALTERNATIVE METHODS

Six alternative methods were chosen for testing. Four methods produce a numerical similarity index for each pair of adjacent stations, and two methods produce a yes-or-no indication of similarity based on statistical tests. All six methods are described in Section 4.

3.4 TESTING OF THE ALTERNATIVES

Elliott Bay was selected as a site for testing the alternative approaches. Elliott Bay is a complex site, with potentially many sources, station separations ranging from tens of feet to over 11,000 feet, and contiguous contaminated stations that extend throughout much of the bay. Elliott Bay is expected to be representative of the most complex conditions to which the station clustering method will be applied.

The major sources known to exist in Elliott Bay are:

- Industrial activities on Harbor Island
- The Denny Way combined sewer overflow (CSO)
- The West Point sewage treatment plant outfall
- The Four-Mile Rock dredged material disposal site.

In addition, numerous small sources are presumed to exist to the west of Harbor Island and along the Seattle waterfront.

Previous reviews conducted for Ecology of the distributions of contaminants in Elliott Bay have revealed fairly distinct regions of contamination that are associated with Harbor Island, the Denny Way CSO, the West Point outfall, and the Four-Mile Rock site. Contaminated sediments are also present in Elliott Bay off the mouth of the Duwamish River and along the Seattle waterfront. Evaluation of the alternative methods was therefore focused on:

- Their ability to clearly delineate a cluster in each of the areas of Harbor Island, the Denny Way CSO, the West Point outfall, and the Four-Mile Rock site
- Their ability to produce distinct clusters on the Seattle waterfront and off the mouth of the Duwamish River.

These two points require that the results of the clustering method be 1) in accord with expectations based on a prior application of professional judgment (where applicable), and 2) supported by subsequent application of professional judgment where no prior application has been performed.

4.0 DESCRIPTION OF THE ALTERNATIVES

Six similarity measures were selected for evaluation. These similarity measures are described in the following sections. To allow concise references to the similarity measures, they have been designated SIMI1, SIMI2, SIMI3, SIMI4, SIMI5, and SIMI6.

Each description of one of the similarity measures in the following sections includes a formula or series of steps for calculating the similarity measure. These formulas express the calculation of the similarity index for two stations, A and B. Other symbols used in these formulas have the following meanings:

N_A = the number of chemicals that exceed the SQS at station A

N_B = the number of chemicals that exceed the SQS at station B

C_{AB} = the number of chemicals that exceed the SQS at both A and B (i.e., are common to both A and B)

T_{AB} = the total number of (unique) chemicals that exceed the SQS at either A or B

F_{Ai} = the exceedance factor for chemical i at station A, where i ranges from 1 to N_A

F_{Bi} = the exceedance factor for chemical i at station B, where i ranges from 1 to N_B.

Additional terms are introduced in the following sections as needed.

Several of the similarity indices employ a measure known as the relative proportional difference (RPD). The RPD of two numbers x and y is calculated as:

$$\frac{|x-y|}{\left(\frac{x+y}{2}\right)}$$

That is, the RPD is the difference between the two values divided by the mean of the two values. (This value is sometimes multiplied by 100 and called a relative percent difference.) The RPD is analogous to the coefficient of variation which can be computed for multiple (normally distributed) observations. An RPD of zero indicates that the two numbers (e.g., x and y) are equal. Larger values of the RPD indicate greater differences between the two numbers. Although an RPD cannot be greater than 2.0, an RPD of 1.0, means that the difference between the two numbers is twice as great as the smaller number. An RPD of 1.0 is treated as a practical upper bound for the similarity indices presented here. The expression ***1.0*** **- RPD** is used to express the similarity [or relative proportional similarity (RPS)] between two individual numbers.

These similarity measures each include one or more of the effects listed in Section 3.2, with the exception of the degree of adjacency of the two stations. The degree of adjacency is regarded as a factor that could be used to modify some of the similarity measures below. Because it affects the two stations as a whole, and does not have different effects on individual chemicals at one or the other station, the degree of adjacency could be applied to the similarity indices described below as a single multiplicative factor. The similarity measures to which this factor might be applied all have a fixed upper bound (1.0) that represents perfect similarity. If degree of adjacency were represented simply by the length of the common edge of the Thiessen polygon (e.g., in meters), the fixed upper bound of these similarity measures would be lost. Scaling of the degree-of-adjacency factor would preserve a fixed upper bound to these similarity measures. Selection of an appropriate scaling factor is difficult, given the wide variety of station densities, for the same reasons discussed in Section 3.1 with regard to contiguity. During the evaluation of these similarity measures, no modifying factor based on the degree of adjacency was applied.

4.1 THE FIRST SIMILARITY INDEX (SIMI1)

This is the simplest of the six similarity indices; it consists of the ratio of the chemicals common to the two stations to the total number of chemicals at both stations, or:

$$SIMI1 = \frac{C_{AB}}{T_{AB}}$$

This similarity index takes into account only the numbers of chemicals in common and the total number of unique chemicals at the two stations. SIMI1 does not take into account the rank order or the magnitudes of the exceedance factors at

the two stations. Values of SIMI1 can range from 0 (no similarity) to 1.0 (perfect similarity). A modifying factor based on degree of adjacency could be applied to this similarity measure.

4.2 THE SECOND SIMILARITY INDEX (SIMI2)

In addition to the numbers of chemicals in common and not in common at the two stations, the second similarity index takes the relative ordering of exceedance factors at the two stations into account. It is based on a comparison of the rank at each station of each chemical that exceeds the SQS at each station. The comparisons are made using an RPD, and the results are averaged for all chemicals in common at the two stations.

This similarity index can be expressed by the formula:

$$SIMI2 = \frac{\sum_{i=1}^{C_{AB}} \left(1.0 - \frac{|R_{Ai} - R_{Bi}|}{\left(\frac{R_{Ai} + R_{Bi}}{2} \right)} \right)}{C_{AB}}$$

where

R_{Ai} = the proportional rank of chemical i at station A.

The following procedure is used to calculate this similarity index:

1. Rank the chemicals at each station by their exceedance factors. The chemical at each station with the lowest exceedance factor should have a rank of 1; the chemical with the highest exceedance factor should have a rank equal to the number of chemicals that exceed the SQS at that station.
2. Compute the proportional rank of each chemical at each station by dividing the rank (computed in step 1) by the number of chemicals that exceed the SQS at that station.
3. For every chemical that exceeds the SQS at both stations, compute the RPS of the proportional ranks at the two stations.
4. Sum all of the RPS values.
5. Divide the sum by the number of chemicals that exceed the SQS at both stations.

5.0 EVALUATION OF THE ALTERNATIVES

After the six similarity measures were formulated, they were all applied to Elliott Bay stations using data from the SEDQUAL database. This data set included measurements at approximately 500 stations from 21 different surveys. Data completeness has a potentially large impact on all of the similarity measures to be evaluated. For example, if chemicals that exceed the SQS at one station were not measured at an adjacent station, the similarity index of the two stations will be based on incomplete data (if it can be calculated at all). For the purpose of this evaluation, no attempt was made to define data completeness or to eliminate stations with incomplete data sets.

5.1 COMPUTATION

Values for all six similarity indices for all adjacent stations in Elliott Bay were calculated by a computer program written for that purpose. This calculation requires two types of data:

- A list of the chemicals that exceed the SQS at each station, including the exceedance factor for each chemical
- A list of all adjacent pairs of stations in Elliott Bay.

Chemical exceedance factors were produced by performing a comparison of the SQS criteria to all stations in Elliott Bay using SEDQUAL's built-in routines, saving the results as a text file in the form of SEDQUAL's standard output table for sediment quality value comparisons, and transforming this table to a form that would be more easily read by custom software. The table of exceedance factors, in the form that it was used for computation of similarity indices, is listed in Appendix A. Included in that appendix is a description of the technique used to transform the SEDQUAL output table to the form shown.

A list of all adjacent station pairs in Elliott Bay was produced by generating Thiessen polygons for all stations and a triangulated irregular network (TIN) for all stations using ARC/INFO®. The TIN is the inverse of the set of Thiessen polygons—in the TIN, each station is connected to each of its nearest neighbors by a line. Using the Thiessen polygons as a reference, spurious lines (such as those that crossed land areas) were removed from the TIN. ARC/INFO® was then used to produce a list of all pairs of stations connected by a line in the TIN. This list of station pairs is presented in Appendix B, in exactly the form used for the calculation of similarity indices.

The computer program used to calculate similarity among stations is listed in Appendix C. This program was run once using the data shown in Appendices A and B as input.

5.2 EVALUATION

The calculated similarity values for all pairs of adjacent stations in Elliott Bay that exceed the SQS criteria are shown in Table 1. Two aspects of the results can be noted from examination of the table:

- A value for SIMI5 was not computable in most cases because too few chemicals (fewer than six) exceeded the SQS criteria at adjacent stations to allow statistically valid interpretation
- Negative values occur for SIMI2, SIMI3, and SIMI4 (most often for SIMI4) as a consequence of RPDs greater than 1.0 (that is, the difference between the two values is greater than their mean).

Two conclusions can be drawn from these observations:

- SIMI5 should not be further considered for use in defining clusters, as it is rarely applicable. This limitation may be reduced if concentrations, including those below the SQS, are used instead of exceedance factors.
- RPD values should be subtracted from 2.0 rather than 1.0 and then re-scaled (e.g., by division by 2.0) to fall within the range of 0.0 to 1.0.

Station pairs with negative similarity indices have some chemical(s) in common and are therefore more similar than station pairs with a similarity index of zero, which have no chemical(s) in common. This "hole" in the distribution of similarity values can be easily remedied by reformulating the expression for relative percent similarity. Such a change would not affect the relative magnitudes of the non-zero similarity values shown in Table 1.

5.2.1 Correlations

Pearson correlation coefficients between all combinations of the first four similarity indices were computed as an indication of the relative impact of the different weights given by the different similarity indices to the number of chemicals in common, the number of chemicals not in common, and the magnitudes of exceedance factors. SIMI1, SIMI2, and SIMI3 were all significantly correlated with one another ($p < 0.001$); SIMI1 and SIMI3 were most highly correlated, with a coefficient of 0.879. SIMI4 was not significantly correlated with any of the other indices.

TABLE 1. SIMILARITY INDICES FOR ALL STATION PAIRS

Station 1		Station 2		SIMI1	SIMI2	SIMI3	SIMI4	SIMI5[a]	SIMI6[a]
PSDDA1	EBB02	EBCHEM	SS-03	0.063	0.44	0.027	0.381	NC	SIM
PSDDA1	EBB02	EBCHEM	SS-04	0.2	1	0.2	-0.193	NC	SIM
EBCHEM	SS-04	EBCHEM	SS-03	0.235	0.553	0.13	0.756	NC	SIM
PSDDA1	EBB02	EBCHEM	SS-05	0.25	1	0.25	-0.12	NC	SIM
EBCHEM	SS-05	EBCHEM	SS-04	0.5	0.825	0.412	0.676	NC	SIM
MALINS	10015	EBCHEM	SS-06	0.125	1	0.125	0.288	NC	SIM
MALINS	10015	EBCHEM	SS-07	0.25	0.6	0.15	0.202	NC	SIM
EBCHEM	SS-07	EBCHEM	SS-06	0.111	0.6	0.067	0.899	NC	SIM
EBCHEM	SS-08	EBCHEM	SS-09	0.222	0.359	0.08	-0.21	SIM	DIS
TPPS3AB	WP-10	TPPS3AB	WP-12	0.333	0.786	0.262	-0.068	NC	DIS
TPPS3AB	WP-10	TPPS3AB	WP-01	0.375	0.567	0.212	-0.262	DIS	DIS
TPPS3AB	WP-01	TPPS3AB	WP-12	0.5	0.399	0.199	0.123	NC	DIS
TPPS3AB	WP-01	TPPS3AB	WP-13	0.333	0.77	0.257	0.301	NC	DIS
TPPS3AB	WP-13	TPPS3AB	WP-12	0.4	0.633	0.253	0.539	NC	SIM
TPPS3AB	WP-01	TPPS3AB	WP-02	0.278	0.186	0.052	0.087	NC	SIM
TPPS3AB	WP-02	TPPS3AB	WP-13	0.389	0.251	0.098	-0.287	DIS	DIS
TPPS3AB	WP-02	TPPS3AB	WP-04	0.5	0.482	0.241	-0.026	DIS	DIS
TPPS3AB	WP-04	TPPS3AB	WP-13	0.538	0.226	0.122	0.243	SIM	DIS
TPPS3AB	WP-04	TPPS3AB	WP-14	0.214	0.264	0.057	0.155	NC	DIS
TPPS3AB	WP-14	TPPS3AB	WP-13	0.154	0.353	0.054	-0.206	NC	DIS
EBCHEM	EW-03	EBCHEM	EW-02	0.2	0.417	0.083	0.933	NC	SIM
EBCHEM	EW-09	EBCHEM	EW-11	0.75	0.827	0.621	0.456	NC	SIM
EBCHEM	EW-13	EBCHEM	EW-14	0.067	-0.529	-0.035	0.548	NC	SIM
PSDDA1	EBP06	PSDDA1	EBB02	1	1	1	0.983	NC	SIM
PSDDA1	EBP06	PSDDA1	EBP05	0.25	0.333	0.083	0.597	NC	SIM
PSDDA1	EBP05	PSDDA1	EBB02	0.25	0.333	0.083	0.614	NC	SIM
PSDDA1	EBP05	MALINS	10015	0.2	0.333	0.067	0.761	NC	SIM
MALINS	10015	PSDDA1	EBB02	0.5	1	0.5	0.389	NC	SIM
MALINS	10015	EBCHEM	SS-05	0.2	1	0.2	0.386	NC	SIM
PSDDA1	EBP04	EBCHEM	SS-08	0.056	0.231	0.013	0.21	NC	SIM
PSDDA1	EBP04	EBCHEM	SS-09	0.067	0.778	0.052	-0.363	NC	DIS
EBCHEM	SS-10	EBCHEM	SS-09	0.313	0.541	0.169	0.499	NC	SIM
EBCHEM	NS-03	EBCHEM	NS-05	0.5	1	0.5	0.434	NC	SIM
EBCHEM	NS-04	EBCHEM	NS-07	0.125	0.499	0.062	0.621	NC	SIM
EBCHEM	NS-07	EBCHEM	NS-08	0.25	0.532	0.133	0.678	NC	SIM

TABLE 1. SIMILARITY INDICES FOR ALL STATION PAIRS (Continued)

Station 1		Station 2		SIMI1	SIMI2	SIMI3	SIMI4	SIMI5[a]	SIMI6[a]
TPPS3AB	WP-11	TPPS3AB	WP-10	0.667	0.427	0.284	-0.585	DIS	DIS
TPPS3AB	WP-11	TPPS3AB	WP-02	0.714	0.649	0.464	-0.612	DIS	DIS
TPPS3AB	WP-02	TPPS3AB	WP-10	0.722	0.631	0.456	0.667	SIM	SIM
TPPS3AB	WP-11	TPPS3AB	WP-03	0.143	-0.064	-0.009	0.403	NC	DIS
TPPS3AB	WP-03	TPPS3AB	WP-02	0.053	1	0.053	-0.186	NC	SIM
TPPS3AB	WP-03	TPPS3AB	WP-04	0.154	0.416	0.064	0.195	NC	SIM
TPPS3AB	WP-03	TPPS3AB	WP-05	0.154	0.209	0.032	0.203	NC	SIM
TPPS3AB	WP-05	TPPS3AB	WP-04	0.692	0.41	0.284	0.673	SIM	SIM
TPPS3AB	WP-05	TPPS3AB	WP-15	0.533	0.54	0.288	0.534	SIM	SIM
TPPS3AB	WP-15	TPPS3AB	WP-04	0.643	0.359	0.231	0.586	SIM	SIM
TPPS3AB	WP-15	TPPS3AB	WP-14	0.385	0.38	0.146	0.196	NC	DIS
TPPS3AB	WP-15	TPPS3AB	WP-16	0.25	0.831	0.208	0.171	NC	SIM
TPPS3AB	WP-15	TPPS3AB	WP-07	0.625	0.552	0.345	0.067	DIS	DIS
TPPS3AB	WP-07	TPPS3AB	WP-16	0.214	0.374	0.08	-0.225	NC	DIS
TPPS3AB	WP-07	TPPS3AB	WP-09	0.429	0.565	0.242	-0.013	DIS	DIS
TPPS3AB	WP-09	TPPS3AB	WP-16	0.286	1	0.286	0.396	NC	SIM
EBCHEM	KG-06	EBCHEM	KG-05	0.143	0	0	-0.108	NC	SIM
EBCHEM	KG-09	EBCHEM	KG-11	0.5	0.333	0.167	0.142	NC	SIM
EBCHEM	WW-02	EBCHEM	WW-01	0.333	0.6	0.2	0.611	NC	SIM
EBCHEM	WW-01	EBCHEM	KG-11	1	1	1	0.809	NC	SIM
EBCHEM	EW-04	EBCHEM	EW-03	0.182	0.375	0.068	0.571	NC	SIM
EBCHEM	EW-04	EBCHEM	EW-05	0.133	0.24	0.032	-0.205	NC	DIS
EBCHEM	EW-05	EBCHEM	EW-08	0.5	0.459	0.23	-0.176	NC	DIS
EBCHEM	EW-08	EBCHEM	EW-09	1	1	1	0.971	NC	SIM
EBCHEM	EW-12	EBCHEM	EW-11	0.125	0.176	0.022	0.921	NC	SIM
EBCHEM	EW-10	EBCHEM	EW-11	0.75	0.827	0.621	0.591	NC	SIM
EBCHEM	NH-01	EBCHEM	NH-11	0.1	0.333	0.033	-0.002	NC	SIM
EBCHEM	EW-16	EBCHEM	EW-14	0.063	0.778	0.049	0.707	NC	SIM
PSDDA1	EBP04	PSDDA1	EBP05	0.25	0.333	0.083	0.96	NC	SIM
PSDDA1	EBS01	PSDDA1	EBP04	1	1	1	0.812	NC	SIM
EBCHEM	SS-11	EBCHEM	SS-10	0.167	0.818	0.136	1	NC	SIM
TPPS3AB	EB-35	TPPS3AB	EB-33	0.571	0.569	0.325	0.225	DIS	DIS
MALINS	10041	EBCHEM	NS-02	0.333	0.333	0.111	0.141	NC	SIM
MALINS	10041	TPPS3AB	EB-34	0.067	0.455	0.03	0.629	NC	SIM
TPPS3AB	EB-34	EBCHEM	NS-02	0.143	0.286	0.041	0.431	NC	SIM
TPPS3AB	EB-34	TPPS3AB	EB-30	0.786	0.606	0.476	0.284	DIS	DIS

TABLE 1. SIMILARITY INDICES FOR ALL STATION PAIRS (Continued)

Station 1		Station 2		SIMI1	SIMI2	SIMI3	SIMI4	SIMI5[a]	SIMI6[a]
TPPS3AB	EB-30	EBCHEM	NS-02	0.083	-0.385	-0.032	0.981	NC	SIM
DUWAM84	U127	EBCHEM	NS-07	0.091	0.556	0.051	0.839	NC	SIM
EBCHEM	NS-07	EBCHEM	NS-05	0.091	-0.143	-0.013	0.476	NC	SIM
EBCHEM	MG-03	EBCHEM	MG-04	1	1	1	0.187	NC	SIM
TPPS3AB	WP-06	TPPS3AB	WP-03	0.2	0.345	0.069	0.27	NC	SIM
TPPS3AB	WP-06	TPPS3AB	WP-05	0.583	0.495	0.288	0.778	SIM	SIM
TPPS3AB	WP-06	TPPS3AB	WP-07	0.571	0.762	0.436	-0.151	DIS	DIS
TPPS3AB	WP-07	TPPS3AB	WP-05	0.667	0.311	0.207	-0.038	DIS	DIS
TPPS3AB	WP-06	TPPS3AB	WP-08	0.412	0.586	0.241	0.424	SIM	DIS
TPPS3AB	WP-08	TPPS3AB	WP-07	0.579	0.446	0.258	-0.24	SIM	DIS
TPPS3AB	WP-08	TPPS3AB	WP-09	0.375	0.702	0.263	0.495	SIM	DIS
EIGHTBAY	EL-09	EIGHTBAY	EL-10	0.4	0.8	0.32	0.554	NC	SIM
GAMPONIA	LTKD03	EBCHEM	WW-06	0.167	0.5	0.083	0.984	NC	SIM
EBCHEM	WW-08	EBCHEM	WW-06	0.286	0.477	0.136	0.722	NC	SIM
EBCHEM	WW-08	EBCHEM	WW-05	0.2	1	0.2	-0.04	NC	SIM
EBCHEM	WW-05	EBCHEM	WW-06	0.167	0.778	0.13	-0.352	NC	DIS
EBCHEM	WW-11	EBCHEM	WW-12	0.231	0.331	0.076	0.408	NC	SIM
EBCHEM	EW-07	EBCHEM	EW-05	0.429	0.432	0.185	-0.31	NC	DIS
EBCHEM	EW-07	EBCHEM	EW-08	0.75	0.866	0.649	0.759	NC	SIM
EBCHEM	WW-14	EBCHEM	WW-18	0.333	0.27	0.09	0.333	NC	SIM
EBCHEM	NH-02	GAMPONIA	LTHE02	0.333	0.333	0.111	0.925	NC	SIM
GAMPONIA	LTHE02	PSDDA1	EBP08	0.333	1	0.333	0.811	NC	SIM
PSDDA1	EBP08	EBCHEM	NH-01	0.091	0.333	0.03	-0.033	NC	SIM
PSDDA1	EBP08	EBCHEM	NH-11	0.5	1	0.5	0.958	NC	SIM
PSDDA1	EBP08	PSDDA1	EBP07	1	1	1	0.479	NC	SIM
PSDDA1	EBP07	EBCHEM	NH-11	0.5	1	0.5	0.368	NC	SIM
PSDDA1	EBP08	DUWAM84	U122	0.333	0.333	0.111	0.897	NC	SIM
DUWAM84	U122	PSDDA1	EBS02	0.111	1	0.111	-0.646	NC	DIS
PSDDA1	EBS02	PSDDA1	EBZ01	0.25	0.889	0.222	0.222	NC	DIS
PSDDA1	EBZ01	PSDDA1	EBS01	0.5	1	0.5	-0.161	NC	SIM
TPPS3AB	EB-39	EBCHEM	SS-12	0.056	-0.273	-0.015	0.272	NC	SIM
TPPS3AB	EB-39	TPPS3AB	EB-38	0.35	0.442	0.155	-0.075	SIM	DIS
TPPS3AB	EB-38	EBCHEM	SS-12	0.111	0.231	0.026	0.362	NC	SIM
TPPS3AB	EB-36	TPPS3AB	EB-35	0.5	0.387	0.194	-0.047	DIS	DIS
MALINS	10041	TPPS3AB	EB-33	0.077	-0.2	-0.015	0.906	NC	SIM
TPPS3AB	EB-36	MALINS	10041	0.077	0.176	0.014	0.649	NC	SIM

TABLE 1. SIMILARITY INDICES FOR ALL STATION PAIRS (Continued)

Station 1		Station 2		SIMI1	SIMI2	SIMI3	SIMI4	SIMI5[a]	SIMI6[a]
TPPS3AB	EB-36	TPPS3AB	EB-34	0.529	0.416	0.22	0.077	SIM	DIS
TPPS3AB	EB-31	TPPS3AB	EB-30	0.579	0.443	0.257	0.118	DIS	DIS
DUWAM84	U127	TPPS3AB	EB-30	0.091	-0.667	-0.061	0.736	NC	SIM
EBCHEM	MG-02	EBCHEM	MG-03	1	1	1	1	NC	SIM
TPPS3AB	WP-08	EBCHEM	MG-04	0.063	0.867	0.054	0.507	NC	SIM
DUWAM84	U134	EIGHTBAY	EL-10	0.4	0.8	0.32	0.593	NC	SIM
DUWAM84	U134	EIGHTBAY	EL-17	0.667	0.467	0.311	0.484	NC	SIM
EIGHTBAY	EL-17	EIGHTBAY	EL-10	0.2	0.333	0.067	0.379	NC	SIM
EIGHTBAY	EL-17	DUWAM85	LSBQ01	0.5	0.333	0.167	0.771	NC	SIM
EIGHTBAY	EL-17	EIGHTBAY	EL-20	0.667	0.857	0.571	0.702	NC	SIM
EIGHTBAY	EL-20	DUWAM85	LSBQ01	0.333	0.6	0.2	0.483	NC	SIM
EBCHEM	NH-08	EBCHEM	NH-07	0.158	0.105	0.017	0.371	NC	SIM
GAMPONIA	LTIC05	EBCHEM	WW-13	0.5	1	0.5	0.789	NC	SIM
GAMPONIA	LTKD04	EBCHEM	WW-08	0.2	-0.2	-0.04	0.675	NC	SIM
EBCHEM	WW-04	EBCHEM	WW-08	0.053	0.538	0.028	0.529	NC	SIM
EBCHEM	WW-04	EBCHEM	WW-05	0.125	0.703	0.088	0.372	NC	SIM
EBCHEM	WW-13	EBCHEM	WW-11	0.25	1	0.25	0.553	NC	SIM
EBCHEM	WW-10	EBCHEM	WW-11	0.5	0.667	0.333	0.72	NC	SIM
EBCHEM	WW-10	EBCHEM	WW-12	0.231	0.125	0.029	0.575	NC	SIM
EBCHEM	WW-10	MALINS	10030	0.4	0.714	0.286	0.845	NC	SIM
MALINS	10030	EBCHEM	WW-12	0.214	0.242	0.052	0.386	NC	SIM
MALINS	10030	GAMPONIA	LTID04	0.429	0.042	0.018	0.278	NC	DIS
GAMPONIA	LTID04	EBCHEM	WW-12	0.357	0.535	0.191	0.378	NC	DIS
GAMPONIA	LTID04	EBCHEM	WW-14	0.231	0.07	0.016	0.425	NC	SIM
GAMPONIA	LTID04	EBCHEM	WW-16	0.125	-0.2	-0.025	0.78	NC	SIM
EBCHEM	WW-16	EBCHEM	WW-14	0.3	0.189	0.057	0.142	NC	SIM
EBCHEM	WW-16	EBCHEM	WW-18	0.5	0.733	0.367	0.582	NC	SIM
EBCHEM	WW-16	EBCHEM	WW-17	0.4	0.257	0.103	0.473	NC	SIM
EBCHEM	WW-17	EBCHEM	WW-18	0.667	0.461	0.307	0.685	NC	SIM
EBCHEM	WW-17	EBCHEM	WW-19	0.364	0.095	0.034	0.587	NC	SIM
EBCHEM	WW-19	EBCHEM	WW-18	0.417	0.458	0.191	0.612	NC	SIM
EPA8283	4	EPA8283	37	0.2	0.333	0.067	0.959	NC	SIM
MALINS	10016	GAMPONIA	LTHE02	0.333	0.333	0.111	0.098	NC	SIM
MALINS	10016	PSDDA1	EBP08	0.333	0.333	0.111	0.256	NC	SIM
MALINS	10016	DUWAM84	U122	0.333	1	0.333	0.346	NC	SIM
TPPS3AB	EB-32	PSDDA1	EBB03	0.333	0	0	1	NC	SIM

TABLE 1. SIMILARITY INDICES FOR ALL STATION PAIRS (Continued)

Station 1		Station 2		SIMI1	SIMI2	SIMI3	SIMI4	SIMI5[a]	SIMI6[a]
TPPS3AB	EB-37	PSDDA1	EBB03	0.056	0.677	0.038	-0.488	NC	DIS
TPPS3AB	EB-37	TPPS3AB	EB-39	0.636	0.485	0.309	0.199	SIM	DIS
TPPS3AB	EB-39	PSDDA1	EBB03	0.056	-0.273	-0.015	0.792	NC	SIM
TPPS3AB	EB-36	TPPS3AB	EB-38	0.4	0.754	0.302	0.225	SIM	DIS
TPPS3AB	EB-32	TPPS3AB	EB-31	0.158	0.418	0.066	-0.087	NC	DIS
EIGHTBAY	EL-22	EIGHTBAY	EL-23	0.5	1	0.5	0.059	NC	SIM
EIGHTBAY	EL-22	DUWAM85	LSAT01	0.5	0.333	0.167	0.942	NC	SIM
DUWAM84	U135	DUWAM84	U134	0.333	0.6	0.2	0.598	NC	SIM
EIGHTBAY	EL-20	DUWAM84	U134	1	0.733	0.733	0.641	NC	SIM
EBCHEM	AB-01	EBCHEM	AB-02	0.118	0.448	0.053	0.037	NC	SIM
EBCHEM	NH-06	EBCHEM	NH-08	0.95	0.638	0.606	0.527	DIS	SIM
EBCHEM	NH-06	EBCHEM	NH-07	0.15	0.635	0.095	0.291	NC	SIM
EBCHEM	NH-06	EPA8283	43	0.05	-0.333	-0.017	1	NC	SIM
EBCHEM	WW-16	GAMPONIA	LTIC05	0.333	0.6	0.2	0.716	NC	SIM
EBCHEM	WW-16	GAMPONIA	LTID05	0.25	0.6	0.15	0.992	NC	SIM
GAMPONIA	LTID05	GAMPONIA	LTIC05	0.5	1	0.5	0.707	NC	SIM
GAMPONIA	LTID05	MALINS	10030	0.5	0.857	0.429	0.727	NC	SIM
MALINS	10030	GAMPONIA	LTIC05	0.25	0.714	0.179	0.909	NC	SIM
MALINS	10030	EBCHEM	WW-13	0.2	0.714	0.143	0.699	NC	SIM
GAMPONIA	LTID05	GAMPONIA	LTID04	0.333	0.086	0.029	0.546	NC	SIM
EBCHEM	NH-05	EBCHEM	NH-04	0.2	0.259	0.052	0.729	NC	SIM
EBCHEM	NH-04	EBCHEM	WW-17	0.158	0.789	0.125	0.862	NC	SIM
EBCHEM	NH-04	EBCHEM	WW-09	0.409	0.263	0.108	0.659	SIM	SIM
EBCHEM	WW-09	EBCHEM	WW-17	0.308	-0.035	-0.011	0.44	NC	SIM
EBCHEM	WW-09	EBCHEM	WW-19	0.5	0.576	0.288	0.711	SIM	SIM
EBCHEM	NH-03	EPA8283	4	0.158	0.66	0.104	0.192	NC	SIM
EBCHEM	NH-03	EPA8283	39	0.105	0.869	0.091	0.344	NC	SIM
EPA8283	39	EPA8283	4	0.4	0.608	0.243	-0.093	NC	DIS
EPA8283	39	DUWAM84	U121	0.125	0.778	0.097	0.868	NC	SIM
DUWAM84	U121	EPA8283	4	0.25	0.614	0.154	-0.397	NC	DIS
DUWAM84	U121	MALINS	10016	0.143	0.6	0.086	0.272	NC	SIM
DUWAM84	U121	PSDDA1	EBP09	0.333	0.857	0.286	0.735	NC	SIM
PSDDA1	EBP09	MALINS	10016	0.333	0.333	0.111	-0.045	NC	SIM
PSDDA1	EBP09	PSDDA1	EBP10	1	1	1	0.941	NC	SIM
PSDDA1	EBP10	MALINS	10043	0.333	1	0.333	0.88	NC	SIM
DUWAM84	U120	EBCHEM	NH-06	0.1	0.571	0.057	0.351	NC	SIM

TABLE 1. SIMILARITY INDICES FOR ALL STATION PAIRS (Continued)

Station 1		Station 2		SIMI1	SIMI2	SIMI3	SIMI4	SIMI5[a]	SIMI6[a]
DUWAM84	U120	EPA8283	43	0.5	0.333	0.167	0.88	NC	SIM
DUWAM84	U120	EBCHEM	NH-05	0.143	1	0.143	0.907	NC	SIM
EPA8283	42	EBCHEM	NH-04	0.158	0.49	0.077	-0.123	NC	DIS
EPA8283	42	EBCHEM	WW-09	0.133	0.545	0.073	-0.309	NC	DIS
GAMPONIA	LTHD03	EBCHEM	WW-09	0.071	0.576	0.041	0.869	NC	SIM
GAMPONIA	LTHD03	EBCHEM	WW-20	0.167	0.333	0.056	0.895	NC	SIM
EBCHEM	WW-20	EBCHEM	WW-09	0.286	0.296	0.084	0.615	NC	SIM
EBCHEM	WW-20	EBCHEM	NH-03	0.278	0.61	0.169	-0.188	NC	DIS
EBCHEM	WW-20	GAMPONIA	LTHD04	0.167	1	0.167	0.751	NC	SIM
GAMPONIA	LTHD04	EBCHEM	NH-03	0.111	0.9	0.1	0.007	NC	DIS
GAMPONIA	LTHD04	GAMPONIA	LTHD03	0.333	0.333	0.111	0.648	NC	SIM
DUWAM85	LSCT02	EIGHTBAY	EL-22	0.5	0.333	0.167	0.96	NC	SIM

[a] NC: not computable; SIM: not significantly different; DIS: significantly different

SIMI2 and SIMI3 measure the pattern of exceedances in very similar ways, so a highly significant correlation between them is not surprising. SIMI1 is highest for pairs of stations that have a large proportion of the total number of chemicals in common; the significant correlation of SIMI1 with SIMI2 and SIMI3 indicates that this relationship holds for the latter two similarity indices also. In particular, the use of proportional ranks in SIMI2 and SIMI3 seems to weight chemicals that are not common to the two stations equivalently to SIMI1.

SIMI4 measures the pattern of exceedances in a way very similar to SIMI2 and SIMI3, but with more weight given to the magnitudes of the exceedance factors (rather than just their ranks) and no weight given to chemicals that are not common to the two stations. The lack of a significant correlation between SIMI4 and SIMI2, SIMI3, or SIMI1 indicates that either or both of the following effects are operative:

- The variability of concentrations between similar stations is much greater than the variability of the ranks of concentrations. That is, although the chemicals at several stations may be ranked similarly by concentration, the chemical concentrations at the stations may differ greatly in magnitude.
- The proportion of chemicals that are not in common at the two stations strongly influences SIMI1, SIMI2, and SIMI3.

A highly significant correlation between SIMI1 and SIMI3 is not expected based strictly on the formulation of the similarity indices (as it is for SIMI2 and SIMI3). This observation may mean that there are relatively few discrete suites of chemicals that exceed the SQS in Elliott Bay, and that each suite has a characteristic SIMI1 ratio. If this interpretation is correct, it may be that the number of chemicals in common at two stations (C_{AB}) is also characteristic of a particular suite of chemicals. Also, such a relationship may become weaker as it is extended to more areas with more diverse sources and types of contaminants.

Because of the binary nature of the results of the SIMI5 and SIMI6 statistical similarity measures, a Pearson correlation coefficient cannot be calculated. Examination of the results (Table 1), however, shows that there is generally good agreement between these two methods in the cases when SIMI5 can be calculated. When the two methods yield different conclusions, SIMI6 usually indicates a significant difference (dissimilarity) between the two stations where SIMI5 does not. This observation indicates that SIMI6 is more sensitive to differences between stations and provides more resolution in the definition of clusters.

5.2.3 Frequency Distributions

The distributions of values for each of the first four similarity measures are shown in Figures 1–4. The purpose of generating these frequency distributions was to determine if the values showed a bimodal distribution or other indication of two general classes of similarity values (high and low). The rationale for expecting such a distribution is that a high similarity would be found between pairs of stations within a cluster and a low similarity would be found between pairs of stations in which either both stations were outside a cluster or one station was inside a cluster and the other outside.

Only SIMI2 shows a clearly bimodal distribution, with a division between high and low similarity values at 0.6-0.7. Both SIMI1 and SIMI3 show a distinct decrease in the frequency of values above 0.5. No clear inflection point can be seen in the distribution of SIMI4 values.

5.2.4 Cluster Definition

To evaluate the potential of the similarity measures to identify station clusters, maps were prepared showing the distribution of similarity values throughout Elliott Bay. Several maps were prepared for each of SIMI1-SIMI4, identifying all stations that had a similarity index greater than or equal to some critical value with regard to one or more of its neighbors. For example, because the frequency distribution of SIMI2 values shows an inflection point near 0.6, maps were prepared showing stations that had SIMI2 values greater than or equal to 0.4, 0.5, 0.6, and 0.8. In the case of SIMI6, one map was prepared showing stations that had significant *vs* non-significant similarities with one or more neighbors.

To aid the visual identification of clusters, the polygons of adjacent stations that have a similarity index equal to or above the critical value were shaded similarly. Four different types of shadings were used. For example, if station A is judged highly similar to both B and C, they will all be shaded the same (even if B and C are adjacent and not highly similar with each other). If stations D and E are similar to each other and adjacent to A, B, or C, but not similar to A, B, or C, they will be shaded differently than A, B, and C. Examples of these maps are shown in Figures 5 and 6, which illustrate the groups of stations defined by SIMI2 critical values of 0.4 and 0.8, respectively. All stations that exceed the SQS are shown in Figure 7.

When adjacent stations are highly similar to other stations, but not to each other (either directly or indirectly), best professional judgment will be required to decide if these stations should be in the same cluster. For convenience in the

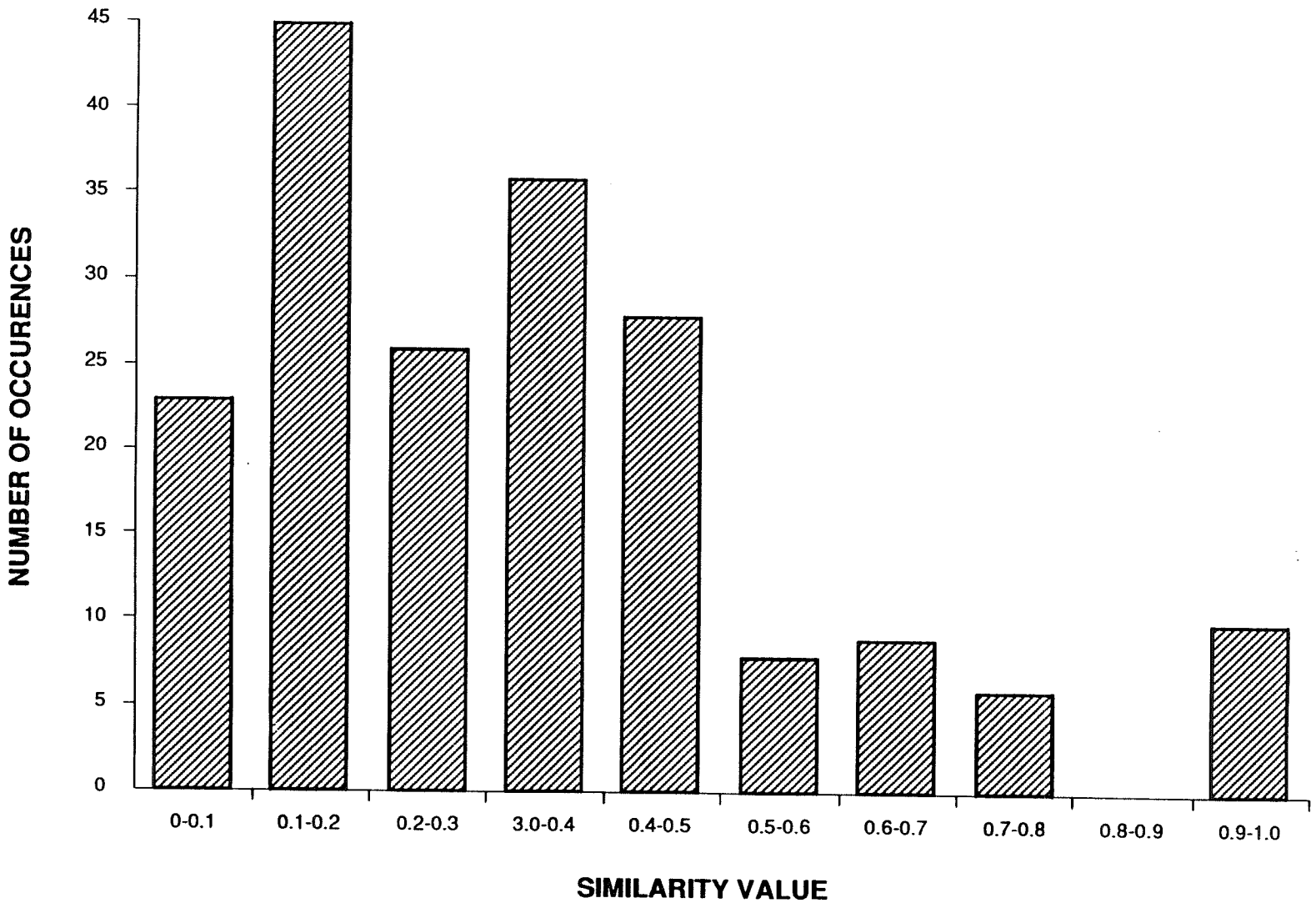


Figure 1. SIMI1 frequency distribution.

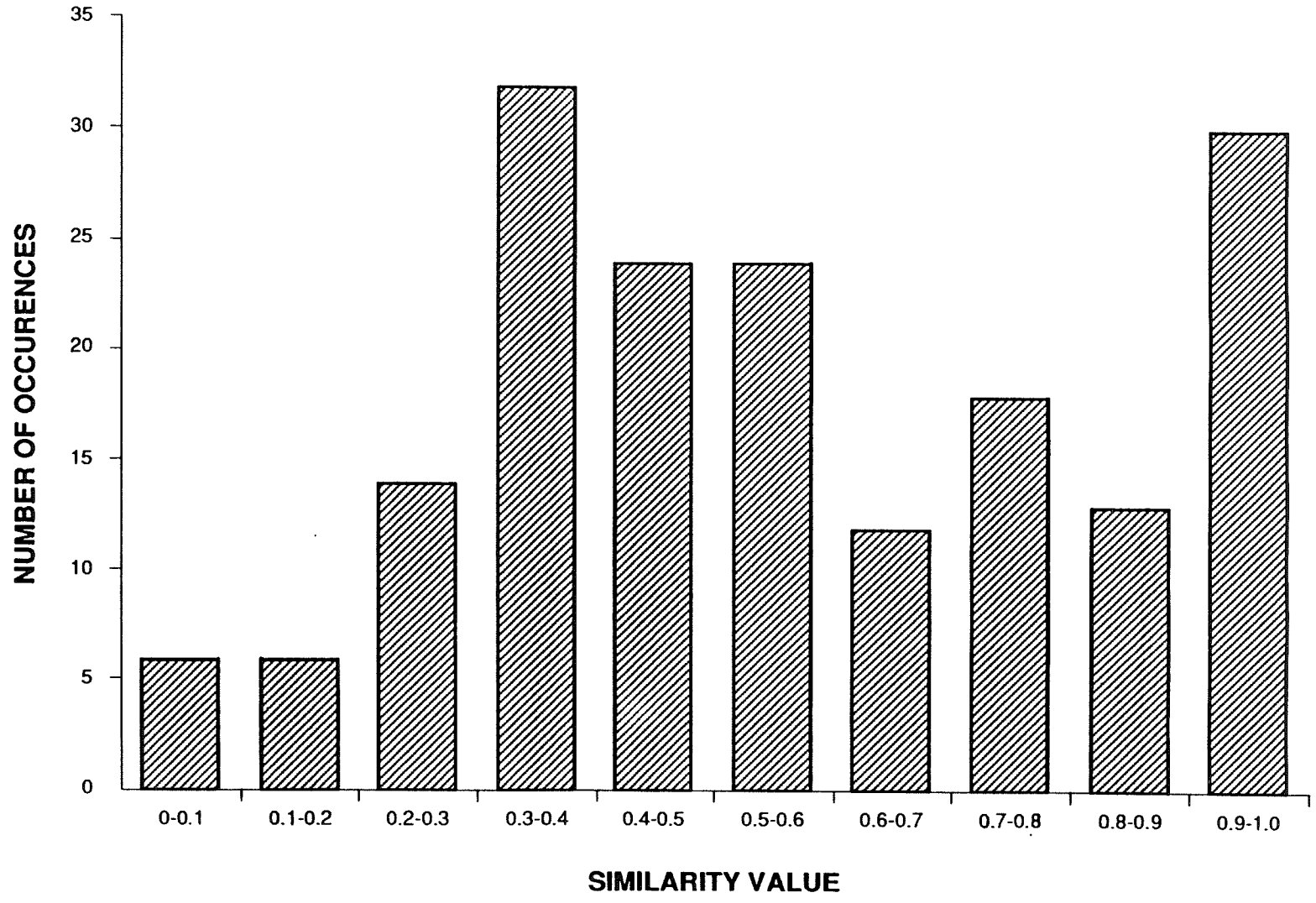


Figure 2. SIMI2 frequency distribution.

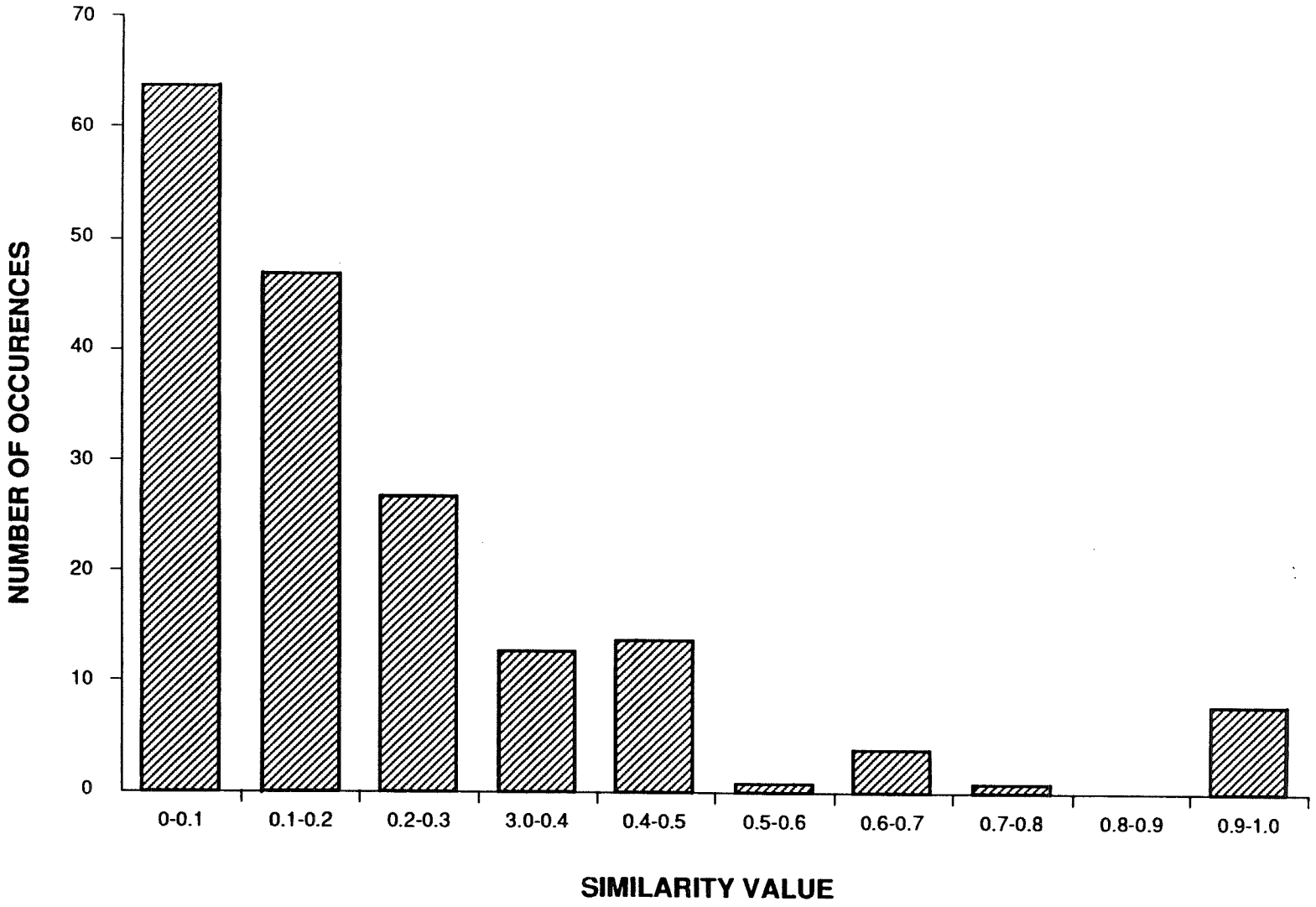


Figure 3. SIMI3 frequency distribution.

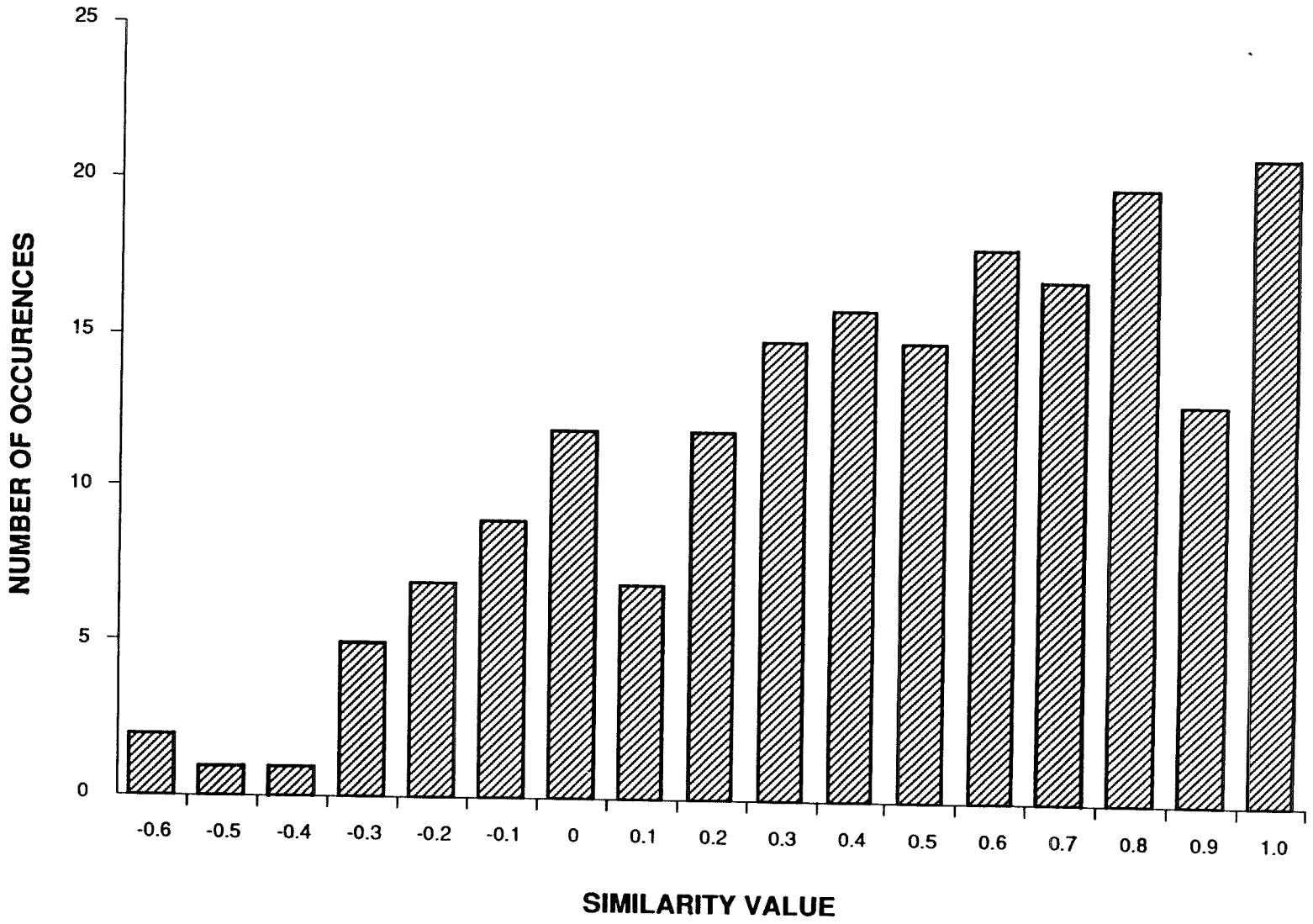
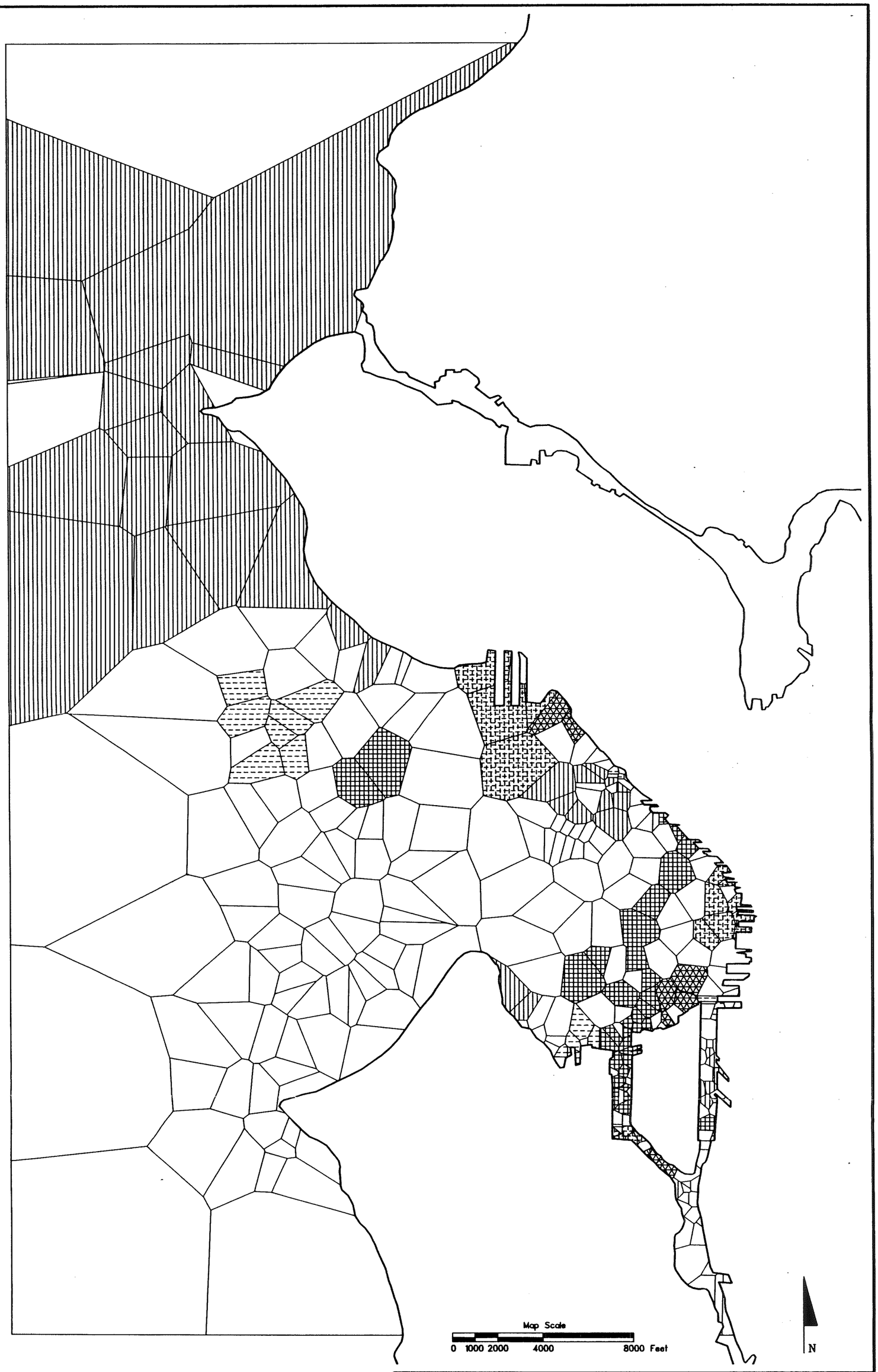


Figure 4. SIMI4 frequency distribution.



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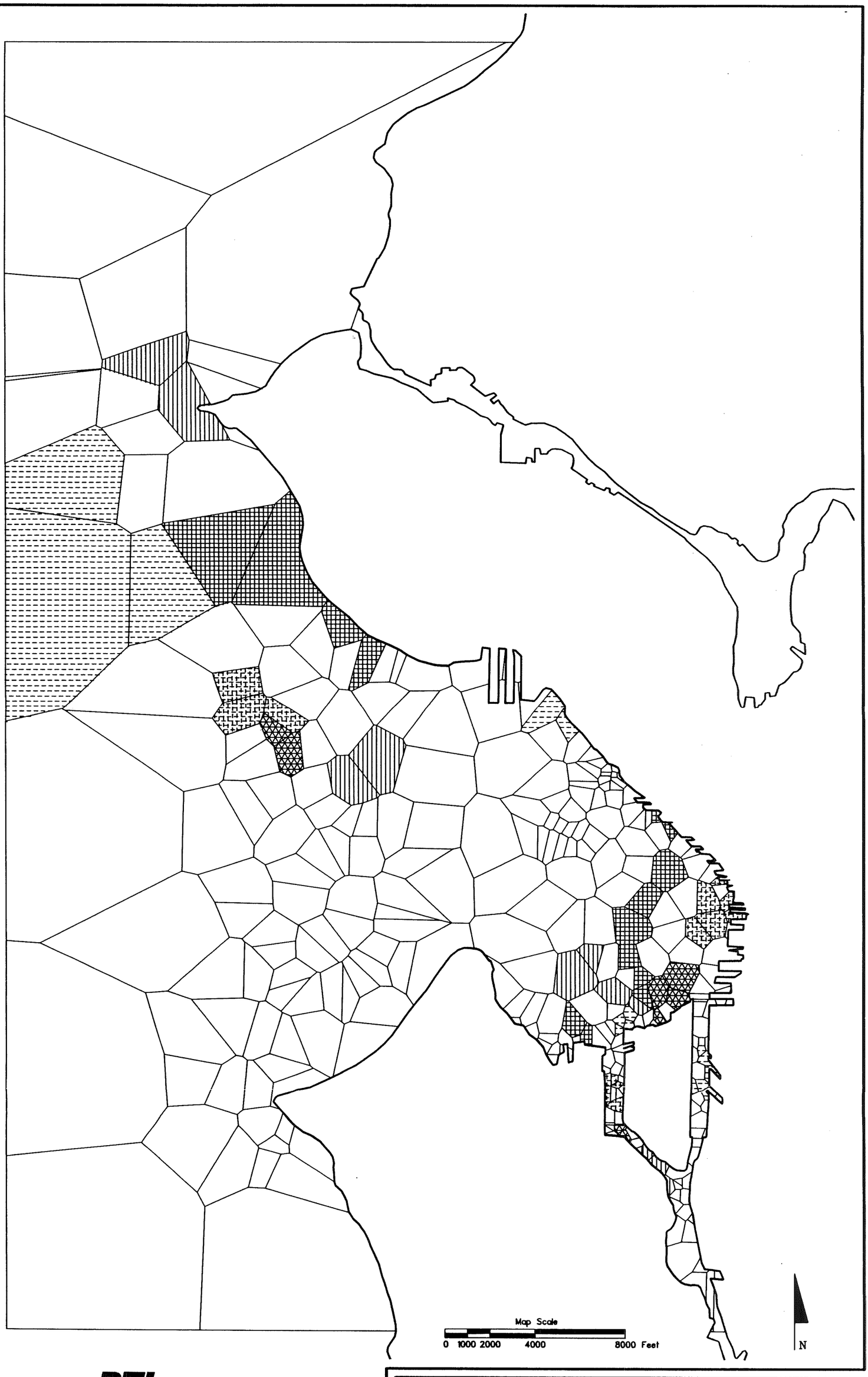
Scale 1 inch = 4000 feet Plot Date: June 05, 1991

Figure 5. Clusters defined by SIMI2 ≥ 0.4.



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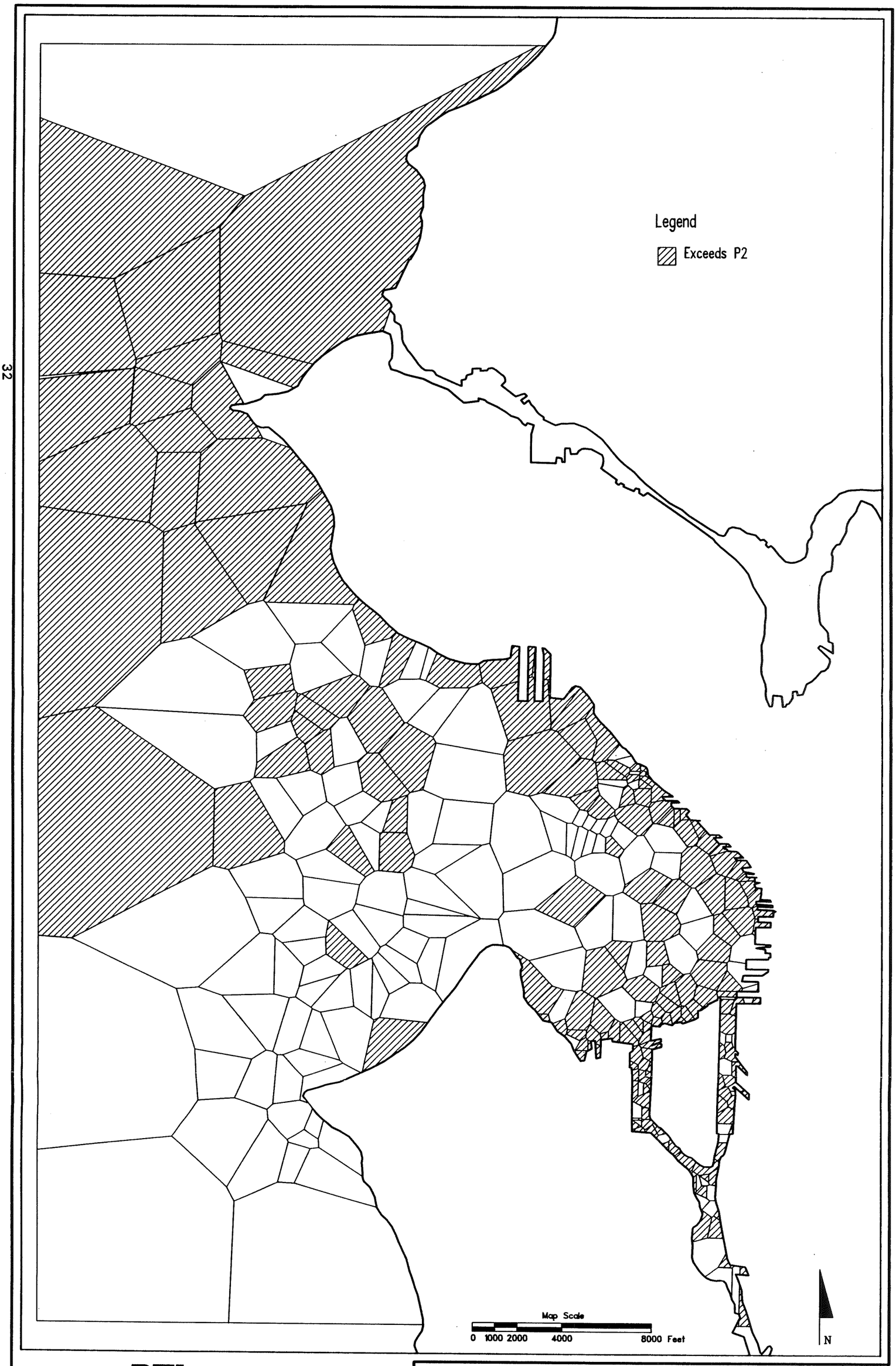
Scale 1 inch = 4000 feet Plot Date: June 05, 1991

Figure 6. Clusters defined by SIMI2 ≥ 0.8.



PTI ENVIRONMENTAL SERVICES

Scale 1 inch = 4000 feet Plot Date: May 27, 1991

Figure 7. All stations exceeding SQS in Elliott Bay.

following discussion, and to avoid presumptions about the final form of clusters, each group of similar polygons will be referred to as a cluster fragment (or simply fragment). Best professional judgment may dictate that distinct fragments be combined to form clusters.

Examination of these maps revealed two important aspects of the distributions of fragments:

- *Coverage*—the proportion of all stations that exceed the SQS that are included in a fragment
- *Definition*—the number of distinct fragments.

An ideal critical value of a similarity index would maximize both coverage and definition.

Even at very low critical values, coverage may not be complete. For example, stations that exceed the SQS but are not adjacent to any other stations that exceed the SQS will never be included in any fragment. In general, however, coverage is greater at lower similarity values. Best professional judgment may dictate stations that exceed the SQS but are not included in any fragment be added to one or another fragment to form a cluster.

Fragments that are distinguished (i.e., shaded differently) at high similarity values may not be distinguished at low similarity values because at low similarity values there may be one or more stations that are similar to both fragments, thereby linking them into a single fragment. In contrast, the greater number of stations included (greater coverage) at low critical values may lead to an increase in the number of distinct fragments at low critical values. Definition therefore does not necessarily vary consistently with the critical value.

Coverage of each of the similarity measures at a variety of critical values is illustrated by Table 2, which shows the numbers of stations that have a similarity equal to or greater than selected critical values. A total of 226 stations exceed the SQS in Elliott Bay. Similarity indices SIMI1 and SIMI3 produced low coverage even at low critical values. SIMI2 and SIMI4 produced the greatest coverage and the least decrease in coverage with increasing critical value.

Table 3 shows the definition of SIMI2 and SIMI4 at a variety of critical values. SIMI4 produces consistently better definition.

Both of these similarity indices produce comparable coverage and definition in the areas of Harbor Island, the Denny Way CSO, the Seattle shoreline, and the shoreline to the west of Harbor Island. SIMI4, at a critical value of 0.8, shows slightly greater coverage in the area of the north Seattle shoreline and greater definition in East and West waterways than does SIMI2. Although SIMI4 shows greater definition at a critical value of 0.8 than does SIMI2, with only slightly

TABLE 2. COVERAGE OF SIMILARITY MEASURES AT SELECTED CRITICAL VALUES[a]

	Critical Value					
Index	0.2	0.4	0.5	0.6	0.8	Not sig. different
SIMI1		78		36	19	
SIMI2	130	116	105	91	60	
SIMI3		43		22	15	
SIMI4	182	110	102	88	58	
SIMI6						51

[a] The table shows the number of stations with a relationship to one or more adjacent stations that is at or above the selected critical value.

TABLE 3. NUMBER OF CLUSTER FRAGMENTS DEFINED BY THE INDICATED CRITICAL VALUE

	Critical Value								
Index	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
SIMI2	12	12	14	19	22	21	22	18	16
SIMI4	15	17	22	21	24	23	24	24	20

less coverage, it does not include any stations in the area of West Point and has considerably less coverage in the area of the Four-Mile Rock disposal site (one fragment of three stations for SIMI4 compared to three fragments of seven stations for SIMI2). The greatest difference between SIMI2 and SIMI4 at a level of 0.4 also occurs in the area of West Point. In this case, SIMI2 identifies a single fragment of 16 stations (excluding Magnolia Bluff), and SIMI4 identifies three fragments with a total of 11 stations.

The better correspondence of SIMI2 with known sources and observed distributions of contaminants indicates that it is preferable to SIMI4 as a basis for defining station clusters. Because definition remains high down to critical values of 0.4 for SIMI2 and 0.3 for SIMI4, low values of these similarity indices can be used to identify cluster fragments. Further definition of some fragments can be achieved by examining the fragments produced by a higher critical value.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the evaluation described in preceding sections indicate that similarity measures can be used as a consistent and technically justifiable basis for identifying station clusters. Other available information, such as the presence of known sources, should be incorporated into the cluster identification process via professional judgment. Professional judgment may suggest that cluster fragments identified on the basis of similarity indices be coalesced into clusters and that clusters may include other stations as well.

Although one of the similarity measures considered here, SIMI2, provides good coverage and definition, selection of a single critical value of any single similarity measure may not be the most appropriate means of using this technique. Examination of the fragments defined by a variety of critical levels of different similarity measures is recommended until additional data are collected to define the performance of these similarity measures at a variety of sites. Consideration of similarity measures other than those evaluated in this report may be appropriate.

Further work in this area could be devoted to:

- Evaluation of additional similarity measures.
- Evaluation of the similarity measures at different sites.
- Evaluation of the effect of using the concentrations of all chemicals, not just those exceeding the SQS, to compare the "fingerprints" of adjacent stations.
- Re-formulation of SIMI2, SIMI3, and SIMI4 to eliminate the possibility of negative values.
- Development of criteria for data completeness, so that stations for which a representative suite of chemicals has not been measured will not be included in the analysis.
- Development of additional techniques and computerized tools to assist interpretation of the results of the similarity analysis. One potential technique is to "grow" clusters outward from locations of high similarity, thus achieving both maximum coverage and maximum definition.
- Development of guidelines for the application of best professional judgment, including consideration of specific chemicals, inter-station distances, and other site-specific information.

REFERENCES

Rohlf, F. J. and J. and R. R. Sokal. 1981. Statistical tables, second edition. W.H. Freeman and Company, San Francisco.

Sokal, R. R. and F. J. Rohlf. 1981. Biometry. W.H. Freeman and Company, San Francisco.

APPENDIX A

Exceedances of Sediment Management Standards in Elliott Bay

APPENDIX A
Exceedances of Sediment Management Standards in Elliott Bay

This appendix lists the chemical data for Elliott Bay used to evaluate the similarity measures SIMI1–SIMI6. The original source for this data is the SEDQUAL database. SEDQUAL was used to compare the chemical data to the SQS criteria and to produce a formatted output table as a computerized text file. The programs in Listings A-1 and A-2 were used to transform this output to another form used for calculation of the similarity values. The final, transformed, data file is shown in Listing A-3.

LISTING A-1. SQRTBL.BAT

This program is an MS-DOS batch file that controls the conversion of SEDQUAL output from a sediment quality values comparison to a form used for the similarity value calculation. The 'strsubst' and 'splitfil' programs are proprietary products of PTI; the 'vp' program is Vedit Plus®, a commercial product.

```
@echo off
rem FILE:  SQRTBL.BAT
rem PURPOSE:     Convert a formatted table of sediment quality value
rem         comparison results produced by SEDQUAL into a
rem         simple table of exceedance factors for a station,
rem         date, and chemical.
rem AUTHOR:      Dreas Nielsen, PTI Environmental Services
rem ARGUMENTS:   1 - Name of the input file--the file must have an
rem              extension of .SQR, and the extension should not
rem              be specified.
rem OUTPUT:      A file with the same name as the input file, but an
rem         extension of .TBL.
rem NOTES:       Uses PTI utility programs, Vedit Plus, and a Vedit Plus
rem         macro (SQRTBL.VDM) designed specifically for this application.
rem HISTORY:
rem          Date              Remarks
rem         ------            ---------
rem         4/3/91            Created.
rem

if %1A == A goto HELP
if not exist %1.SQR goto ERROR
if not exist SQRTBL.VDM goto NOMACRO
echo SQRTBL: Processing %1.SQR
splitfil %1.SQR \sSurvey:\s JUNK.$$$ SQRTBL.$$1
del JUNK.$$$
strsubst [\-=]+\n <SQRTBL.$$1 | strsubst \sSurvey:\s | strsubst Station: | strsubst \n+\s+Date:
\s\s >SQRTBL.$$2
strsubst -l[0-9][0-9]/[0-9][0-9]/[0-9][0-9] [^\n]+\n <SQRTBL.$$2 | strsubst [^\n]+[a-z][^\n]+\n
>SQRTBL.$$1
strsubst [0-9.]+\s+PP(M~B)[^0-9]+ <SQRTBL.$$1 >SQRTBL.$$2
rem ----
rem The program invoked on the following line is Vedit+; change the name
rem as appropriate.
vp -x SQRTBL.VDM SQRTBL.$$2 SQRTBL.$$1
```

```
strsubst \n+ \n <SQRTBL.$$1 >%1.TBL
del SQRTBL.$$?
echo %1.TBL produced.
goto END
:HELP
echo SQRTBL
echo    Converts a formatted table of sediment quality value exceedances
echo produced by SEDQUAL into a simple table of exceedance values for
echo each station and chemical.
echo Syntax:
echo          SQRTBL (filename)
echo The file must have an extension of .SQR (edited from the default
echo SEDQUAL output of .TXT), and the extension should not be specified
echo during invocation of the program, as above.  The output will be a
echo file with the same name but an extension of .TBL.
goto END
:ERROR
echo ERROR (SQRTBL): %1.SQR not found.
goto END
:NOMACRO
echo ERROR (SQRTBL): Vedit Plus macro file SQRTBL.VDM not found.
:END
```

LISTING A-2. SQRTBL.VDM

This program is a Vedit Plus® macro that is used during file conversion.

```
R* FILE:   SQRTBL.VDM
R* PURPOSE:      Join SURVEY, STN_ID, and DATE to following data lines
R*         during conversion of a SEDQUAL formatted table of
R*         sediment quality value comparison results to a simple
R*         table of exceedance factors.
R* PARENT:       SQRTBL.BAT
R*         The input to this program must have been prepared by
R*         the SQRTBL.BAT batch file.
R* AUTHOR:       Dreas Nielsen, PTI Environmental Services
R* HISTORY:       Date            Remarks
R*         ------          ----------
R*         4/3/91          Created.
R*

.es 8 2
[
.pXS1  f/|>/ .erJL .pXS2
Q1,Q2RC2
QL K
[ (.eof ^ (.c=13))JL
  RG2 I/  /
  L
  .erJL
]
[ ((.c<>13) ^ .eof ^ .er)JL
 L .erJL
]
(.eof ^ .er)JL
]
EX
```

LISTING A-3. EBOVRP2.TXT

This is the data file of chemical exceedances of SQS criteria, as used for the calculation of similarity values. Each line contains survey and station identifiers, the chemical code (as used by SEDQUAL), the chemical concentration, the exceedance factor, and the units and measurement basis of the concentration.

```
DUWRIV1 DR-01 B2ETHXPHTH 78.00000 1.66 PPM TOC
DUWRIV1 DR-08 ACENAPTYLE 110.00000 1.67 PPM TOC
DUWRIV1 DR-08 B2ETHXPHTH 130.00000 2.77 PPM TOC
DUWRIV1 DR-08 MERCURY 0.42000 1.02 PPM DRY
DUWRIV1 DR-08 PCBS 180.00000 15.00 PPM TOC
DUWRIV2 DR-10 MERCURY 0.83000 2.02 PPM DRY
DUWRIV2 DR-10 PCBS 380.00000 31.67 PPM TOC
DUWRIV2 DR-11 ARSENIC 69.00000 1.21 PPM DRY
DUWRIV2 DR-11 PCBS 54.00000 4.50 PPM TOC
DUWRIV2 DR-13 MERCURY 0.42000 1.02 PPM DRY
DUWRIV2 DR-13 PCBS 39.00000 3.25 PPM TOC
DUWRIV2 DR-14 ACENAPTHEN 58.00000 3.62 PPM TOC
DUWRIV2 DR-14 FLUORENE 58.00000 2.52 PPM TOC
DUWRIV2 DR-14 LPAH 400.00000 1.08 PPM TOC
DUWRIV2 DR-14 PCBS 18.00000 1.50 PPM TOC
DUWRIV2 DR-14 PHENANTHRN 180.00000 1.80 PPM TOC
DUWRIV2 DR-18 PCBS 19.00000 1.58 PPM TOC
DUWRIV2 DR-19 PCBS 16.00000 1.33 PPM TOC
DUWRIV2 DR-22 PCBS 30.00000 2.50 PPM TOC
DUWRIV2 DR-23 MERCURY 0.68000 1.66 PPM DRY
DUWRIV2 DR-23 PCBS 130.00000 10.83 PPM TOC
DUWRIV2 DR-25 ACENAPTHEN 21.00000 1.31 PPM TOC
DUWRIV2 DR-25 PCBS 110.00000 9.17 PPM TOC
DUWRIV2 DR-25 PHENANTHRN 110.00000 1.10 PPM TOC
DUWRIV2 DR-25 ZINC 520.00000 1.27 PPM DRY
DUWRIV2 DR-26 ARSENIC 98.00000 1.72 PPM DRY
DUWRIV2 DR-26 LEAD 700.00000 1.56 PPM DRY
DUWRIV2 DR-26 PCBS 30.00000 2.50 PPM TOC
DUWRIV2 DR-26 ZINC 1200.00000 2.93 PPM DRY
DUWRIV2 DR-27 ARSENIC 58.00000 1.02 PPM DRY
DUWRIV2 DR-27 CADMIUM 10.00000 1.96 PPM DRY
DUWRIV2 DR-27 LEAD 2700.00000 6.00 PPM DRY
DUWRIV2 DR-27 MERCURY 2.30000 5.61 PPM DRY
DUWRIV2 DR-27 ZINC 2600.00000 6.34 PPM DRY
DUWRIV2 DR-28 ACENAPTHEN 20.00000 1.25 PPM TOC
DUWRIV2 DR-28 PCBS 130.00000 10.83 PPM TOC
DUWRIV2 DR-29 MERCURY 0.46000 1.12 PPM DRY
DUWRIV2 DR-29 PCBS 130.00000 10.83 PPM TOC
DUWRIV2 DR-30 PCBS 61.00000 5.08 PPM TOC
DUWRIV2 DR-31 PCBS 42.00000 3.50 PPM TOC
DUWRIV2 DR-32 PCBS 13.00000 1.08 PPM TOC
DUWRIV2 DR-33 PCBS 96.00000 8.00 PPM TOC
DUWRIV2 DR-34 PCBS 110.00000 9.17 PPM TOC
DUWRIV2 DR-35 MERCURY 0.58000 1.41 PPM DRY
DUWRIV2 DR-35 PCBS 52.00000 4.33 PPM TOC
DUWRIV2 DR-36 MERCURY 1.10000 2.68 PPM DRY
DUWRIV2 DR-36 PCBS 110.00000 9.17 PPM TOC
DUWRIV2 DR-38 PCBS 86.00000 7.17 PPM TOC
DUWRIV2 DR-39 MERCURY 0.85000 2.07 PPM DRY
EBCHEM AB-01 2BANTH 63.00000 1.91 PPM TOC
EBCHEM AB-01 ACENAPTHEN 81.00000 5.06 PPM TOC
EBCHEM AB-01 BAA 140.00000 1.27 PPM TOC
EBCHEM AB-01 BAP 190.00000 1.92 PPM TOC
EBCHEM AB-01 BGHIP 150.00000 4.84 PPM TOC
EBCHEM AB-01 CHRYSENE 170.00000 1.55 PPM TOC
EBCHEM AB-01 COPPER 440.00000 1.13 PPM DRY
EBCHEM AB-01 DIBNZFURAN 36.00000 2.40 PPM TOC
EBCHEM AB-01 FLUORANTHN 670.00000 4.19 PPM TOC
EBCHEM AB-01 FLUORENE 52.00000 2.26 PPM TOC
EBCHEM AB-01 HPAH 2300.00000 2.40 PPM TOC
```

EBCHEM AB-01 ICDP 160.00000 4.85 PPM TOC
EBCHEM AB-01 LPAH 680.00000 1.84 PPM TOC
EBCHEM AB-01 MERCURY 29.00000 70.73 PPM DRY
EBCHEM AB-01 NAPTHALENE 130.00000 1.31 PPM TOC
EBCHEM AB-01 PHENANTHRN 220.00000 2.20 PPM TOC
EBCHEM AB-01 TBFLANTH 360.00000 1.57 PPM TOC
EBCHEM AB-02 BGHIP 34.00000 1.10 PPM TOC
EBCHEM AB-02 PHENANTHRN 110.00000 1.10 PPM TOC
EBCHEM AB-04 BUTBNZ_PHT 11.00000 2.24 PPM TOC
EBCHEM DR-01 PCBS 26.00000 2.17 PPM TOC
EBCHEM DR-03 PCBS 35.00000 2.92 PPM TOC
EBCHEM DR-04 PCBS 28.00000 2.33 PPM TOC
EBCHEM DR-05 PCBS 48.00000 4.00 PPM TOC
EBCHEM DR-06 DIBNZFURAN 49.00000 3.27 PPM TOC
EBCHEM DR-06 PCBS 51.00000 4.25 PPM TOC
EBCHEM DR-07 PCBS 82.00000 6.83 PPM TOC
EBCHEM DR-08 BUTBNZ_PHT 8.70000 1.78 PPM TOC
EBCHEM DR-08 MERCURY 0.61000 1.49 PPM DRY
EBCHEM DR-08 PCBS 170.00000 14.17 PPM TOC
EBCHEM DR-10 PCBS 190.00000 15.83 PPM TOC
EBCHEM DR-11 PCBS 31.00000 2.58 PPM TOC
EBCHEM DR-12 ARSENIC 450.00000 7.89 PPM DRY
EBCHEM DR-12 PCBS 38.00000 3.17 PPM TOC
EBCHEM DR-12 ZINC 970.00000 2.37 PPM DRY
EBCHEM DR-13 PCBS 50.00000 4.17 PPM TOC
EBCHEM DR-14 PCBS 31.00000 2.58 PPM TOC
EBCHEM DR-15 14-2CLBNZ 6.30000 2.03 PPM TOC
EBCHEM DR-15 PCBS 14.00000 1.17 PPM TOC
EBCHEM DR-16 ACENAPTHEN 18.00000 1.13 PPM TOC
EBCHEM DR-16 FLUORANTHN 190.00000 1.19 PPM TOC
EBCHEM DR-16 PCBS 22.00000 1.83 PPM TOC
EBCHEM DR-16 ZINC 430.00000 1.05 PPM DRY
EBCHEM DR-17 PCBS 29.00000 2.42 PPM TOC
EBCHEM DR-25 2-METPHNOL 280.00000 4.44 PPB DRY
EBCHEM DR-25 2NOCTP 96.00000 1.66 PPM TOC
EBCHEM DR-25 4-METPHNOL 1100.00000 1.64 PPB DRY
EBCHEM DR-25 BUTBNZ_PHT 5.70000 1.16 PPM TOC
EBCHEM DR-25 PHENOL 1200.00000 2.86 PPB DRY
EBCHEM EW-01 ACENAPTHEN 23.00000 1.44 PPM TOC
EBCHEM EW-01 PCBS 49.00000 4.08 PPM TOC
EBCHEM EW-02 ACENAPTHEN 180.00000 11.25 PPM TOC
EBCHEM EW-02 ANTHRACENE 280.00000 1.27 PPM TOC
EBCHEM EW-02 DIBNZFURAN 150.00000 10.00 PPM TOC
EBCHEM EW-02 FLUORANTHN 400.00000 2.50 PPM TOC
EBCHEM EW-02 FLUORENE 380.00000 16.52 PPM TOC
EBCHEM EW-02 HPAH 1100.00000 1.15 PPM TOC
EBCHEM EW-02 LPAH 1300.00000 3.51 PPM TOC
EBCHEM EW-02 MERCURY 0.72000 1.76 PPM DRY
EBCHEM EW-02 PCBS 41.00000 3.42 PPM TOC
EBCHEM EW-02 PHENANTHRN 460.00000 4.60 PPM TOC
EBCHEM EW-03 MERCURY 0.68000 1.66 PPM DRY
EBCHEM EW-03 PCBS 38.00000 3.17 PPM TOC
EBCHEM EW-04 BAA 140.00000 1.27 PPM TOC
EBCHEM EW-04 BAP 150.00000 1.52 PPM TOC
EBCHEM EW-04 BGHIP 71.00000 2.29 PPM TOC
EBCHEM EW-04 CHRYSENE 370.00000 3.36 PPM TOC
EBCHEM EW-04 FLUORANTHN 210.00000 1.31 PPM TOC
EBCHEM EW-04 HPAH 1700.00000 1.77 PPM TOC
EBCHEM EW-04 ICDP 87.00000 2.64 PPM TOC
EBCHEM EW-04 MERCURY 0.49000 1.20 PPM DRY
EBCHEM EW-04 PCBS 22.00000 1.83 PPM TOC
EBCHEM EW-04 PHENANTHRN 120.00000 1.20 PPM TOC
EBCHEM EW-04 TBFLANTH 400.00000 1.74 PPM TOC
EBCHEM EW-05 BUTBNZ_PHT 18.00000 3.67 PPM TOC
EBCHEM EW-05 CADMIUM 9.50000 1.86 PPM DRY
EBCHEM EW-05 LEAD 500.00000 1.11 PPM DRY
EBCHEM EW-05 MERCURY 4.60000 11.22 PPM DRY
EBCHEM EW-05 PCBS 24.00000 2.00 PPM TOC
EBCHEM EW-05 ZINC 600.00000 1.46 PPM DRY
EBCHEM EW-05 BUTBNZ_PHT 11.00000 2.24 PPM TOC
EBCHEM EW-05 CADMIUM 15.00000 2.94 PPM DRY
EBCHEM EW-05 MERCURY 3.00000 7.32 PPM DRY
EBCHEM EW-05 PCBS 51.00000 4.25 PPM TOC
EBCHEM EW-05 ZINC 540.00000 1.32 PPM DRY
EBCHEM EW-06 BGHIP 37.00000 1.19 PPM TOC
EBCHEM EW-06 CADMIUM 6.30000 1.24 PPM DRY
EBCHEM EW-06 CHRYSENE 150.00000 1.36 PPM TOC

EBCHEM EW-06 FLUORANTHN 190.00000 1.19 PPM TOC
EBCHEM EW-06 ICDP 49.00000 1.48 PPM TOC
EBCHEM EW-06 MERCURY 0.79000 1.93 PPM DRY
EBCHEM EW-06 PCBS 37.00000 3.08 PPM TOC
EBCHEM EW-06 ZINC 720.00000 1.76 PPM DRY
EBCHEM EW-07 BUTBNZ_PHT 86.00000 17.55 PPM TOC
EBCHEM EW-07 CHRYSENE 140.00000 1.27 PPM TOC
EBCHEM EW-07 MERCURY 0.42000 1.02 PPM DRY
EBCHEM EW-07 PCBS 18.00000 1.50 PPM TOC
EBCHEM EW-08 BUTBNZ_PHT 75.00000 15.31 PPM TOC
EBCHEM EW-08 MERCURY 0.59000 1.44 PPM DRY
EBCHEM EW-08 PCBS 23.00000 1.92 PPM TOC
EBCHEM EW-09 BUTBNZ_PHT 79.00000 16.12 PPM TOC
EBCHEM EW-09 MERCURY 0.57000 1.39 PPM DRY
EBCHEM EW-09 PCBS 23.00000 1.92 PPM TOC
EBCHEM EW-10 BUTBNZ_PHT 13.00000 2.65 PPM TOC
EBCHEM EW-10 MERCURY 0.53000 1.29 PPM DRY
EBCHEM EW-10 PCBS 20.00000 1.67 PPM TOC
EBCHEM EW-11 BUTBNZ_PHT 22.00000 4.49 PPM TOC
EBCHEM EW-11 CHRYSENE 120.00000 1.09 PPM TOC
EBCHEM EW-11 MERCURY 0.78000 1.90 PPM DRY
EBCHEM EW-11 PCBS 28.00000 2.33 PPM TOC
EBCHEM EW-12 ACENAPTHEN 32.00000 2.00 PPM TOC
EBCHEM EW-12 BENZYL-OH 870.00000 15.26 PPB DRY
EBCHEM EW-12 CHRYSENE 130.00000 1.18 PPM TOC
EBCHEM EW-12 FLUORENE 26.00000 1.13 PPM TOC
EBCHEM EW-12 PHENANTHRN 110.00000 1.10 PPM TOC
EBCHEM EW-13 PCBS 27.00000 2.25 PPM TOC
EBCHEM EW-14 ACENAPTHEN 24.00000 1.50 PPM TOC
EBCHEM EW-14 BAA 260.00000 2.36 PPM TOC
EBCHEM EW-14 BAP 150.00000 1.52 PPM TOC
EBCHEM EW-14 BGHIP 71.00000 2.29 PPM TOC
EBCHEM EW-14 BUTBNZ_PHT 8.60000 1.76 PPM TOC
EBCHEM EW-14 CHRYSENE 460.00000 4.18 PPM TOC
EBCHEM EW-14 FLUORANTHN 1200.00000 7.50 PPM TOC
EBCHEM EW-14 FLUORENE 51.00000 2.22 PPM TOC
EBCHEM EW-14 HPAH 3500.00000 3.65 PPM TOC
EBCHEM EW-14 ICDP 81.00000 2.45 PPM TOC
EBCHEM EW-14 LPAH 660.00000 1.78 PPM TOC
EBCHEM EW-14 MERCURY 0.57000 1.39 PPM DRY
EBCHEM EW-14 PCBS 17.00000 1.42 PPM TOC
EBCHEM EW-14 PHENANTHRN 270.00000 2.70 PPM TOC
EBCHEM EW-14 TBFLANTH 390.00000 1.70 PPM TOC
EBCHEM EW-15 BUTBNZ_PHT 5.90000 1.20 PPM TOC
EBCHEM EW-15 MERCURY 0.49000 1.20 PPM DRY
EBCHEM EW-16 5CLPHN 690.00000 1.92 PPB DRY
EBCHEM EW-16 BUTBNZ_PHT 6.40000 1.31 PPM TOC
EBCHEM KG-01 CADMIUM 5.20000 1.02 PPM DRY
EBCHEM KG-01 MERCURY 0.48000 1.17 PPM DRY
EBCHEM KG-01 PCBS 16.00000 1.33 PPM TOC
EBCHEM KG-01 ZINC 960.00000 2.34 PPM DRY
EBCHEM KG-02 DIBNZFURAN 31.00000 2.07 PPM TOC
EBCHEM KG-04 DIBNZFURAN 16.00000 1.07 PPM TOC
EBCHEM KG-05 LEAD 500.00000 1.11 PPM DRY
EBCHEM KG-05 MERCURY 1.60000 3.90 PPM DRY
EBCHEM KG-06 2-METHNAP 120.00000 1.88 PPM TOC
EBCHEM KG-06 ANTIMONY 190.00000 1.27 PPM DRY
EBCHEM KG-06 BUTBNZ_PHT 42.00000 8.57 PPM TOC
EBCHEM KG-06 MERCURY 0.46000 1.12 PPM DRY
EBCHEM KG-06 PCBS 190.00000 15.83 PPM TOC
EBCHEM KG-06 ZINC 450.00000 1.10 PPM DRY
EBCHEM KG-09 4-METPHNOL 1500.00000 2.24 PPB DRY
EBCHEM KG-09 PCBS 16.00000 1.33 PPM TOC
EBCHEM KG-10 BENZOIC_AC 6300.00000 9.69 PPB DRY
EBCHEM KG-11 PCBS 40.00000 3.33 PPM TOC
EBCHEM MG-01 BUTBNZ_PHT 11.00000 2.24 PPM TOC
EBCHEM MG-02 BUTBNZ_PHT 11.00000 2.24 PPM TOC
EBCHEM MG-03 BUTBNZ_PHT 11.00000 2.24 PPM TOC
EBCHEM MG-04 BUTBNZ_PHT 26.00000 5.31 PPM TOC
EBCHEM NH-01 BAA 130.00000 1.18 PPM TOC
EBCHEM NH-01 BAP 100.00000 1.01 PPM TOC
EBCHEM NH-01 BGHIP 53.00000 1.71 PPM TOC
EBCHEM NH-01 BUTBNZ_PHT 5.50000 1.12 PPM TOC
EBCHEM NH-01 CHRYSENE 240.00000 2.18 PPM TOC
EBCHEM NH-01 FLUORANTHN 180.00000 1.13 PPM TOC
EBCHEM NH-01 HPAH 1500.00000 1.56 PPM TOC
EBCHEM NH-01 ICDP 67.00000 2.03 PPM TOC

EBCHEM NH-01 PCBS 16.00000 1.33 PPM TOC
EBCHEM NH-01 TBFLANTH 450.00000 1.96 PPM TOC
EBCHEM NH-02 CHRYSENE 120.00000 1.09 PPM TOC
EBCHEM NH-02 MERCURY 0.57000 1.39 PPM DRY
EBCHEM NH-03 2BANTH 96.00000 2.91 PPM TOC
EBCHEM NH-03 ACENAPTHEN 20.00000 1.25 PPM TOC
EBCHEM NH-03 ANTIMONY 250.00000 1.67 PPM DRY
EBCHEM NH-03 ARSENIC 120.00000 2.11 PPM DRY
EBCHEM NH-03 BAP 130.00000 1.31 PPM TOC
EBCHEM NH-03 BGHIP 160.00000 5.16 PPM TOC
EBCHEM NH-03 CHRYSENE 140.00000 1.27 PPM TOC
EBCHEM NH-03 COPPER 2100.00000 5.38 PPM DRY
EBCHEM NH-03 DIBNZFURAN 16.00000 1.07 PPM TOC
EBCHEM NH-03 FLUORENE 31.00000 1.35 PPM TOC
EBCHEM NH-03 HPAH 1700.00000 1.77 PPM TOC
EBCHEM NH-03 ICDP 190.00000 5.76 PPM TOC
EBCHEM NH-03 LEAD 550.00000 1.22 PPM DRY
EBCHEM NH-03 MERCURY 11.00000 26.83 PPM DRY
EBCHEM NH-03 PCBS 110.00000 9.17 PPM TOC
EBCHEM NH-03 PHENANTHRN 120.00000 1.20 PPM TOC
EBCHEM NH-03 TBFLANTH 390.00000 1.70 PPM TOC
EBCHEM NH-03 ZINC 1300.00000 3.17 PPM DRY
EBCHEM NH-04 2-METPHNOL 240.00000 3.81 PPB DRY
EBCHEM NH-04 24-2MPHN 39.00000 1.34 PPB DRY
EBCHEM NH-04 2BANTH 35.00000 1.06 PPM TOC
EBCHEM NH-04 4-METPHNOL 1000.00000 1.49 PPB DRY
EBCHEM NH-04 5CLPHN 6000.00000 16.67 PPB DRY
EBCHEM NH-04 ACENAPTHEN 33.00000 2.06 PPM TOC
EBCHEM NH-04 ANTIMONY 500.00000 3.33 PPM DRY
EBCHEM NH-04 ARSENIC 170.00000 2.98 PPM DRY
EBCHEM NH-04 BGHIP 74.00000 2.39 PPM TOC
EBCHEM NH-04 COPPER 1800.00000 4.62 PPM DRY
EBCHEM NH-04 DIBNZFURAN 18.00000 1.20 PPM TOC
EBCHEM NH-04 FLUORANTHN 330.00000 2.06 PPM TOC
EBCHEM NH-04 FLUORENE 45.00000 1.96 PPM TOC
EBCHEM NH-04 HPAH 1200.00000 1.25 PPM TOC
EBCHEM NH-04 ICDP 88.00000 2.67 PPM TOC
EBCHEM NH-04 MERCURY 0.87000 2.12 PPM DRY
EBCHEM NH-04 PHENANTHRN 170.00000 1.70 PPM TOC
EBCHEM NH-04 ZINC 990.00000 2.41 PPM DRY
EBCHEM NH-05 ACENAPTHEN 34.00000 2.13 PPM TOC
EBCHEM NH-05 DIBNZFURAN 22.00000 1.47 PPM TOC
EBCHEM NH-05 FLUORENE 38.00000 1.65 PPM TOC
EBCHEM NH-05 MERCURY 0.43000 1.05 PPM DRY
EBCHEM NH-05 NAPTHALENE 100.00000 1.01 PPM TOC
EBCHEM NH-05 PCBS 20.00000 1.67 PPM TOC
EBCHEM NH-06 2-METHNAP 70.00000 1.09 PPM TOC
EBCHEM NH-06 2BANTH 87.00000 2.64 PPM TOC
EBCHEM NH-06 ACENAPTHEN 120.00000 7.50 PPM TOC
EBCHEM NH-06 ANTHRACENE 240.00000 1.09 PPM TOC
EBCHEM NH-06 BAA 230.00000 2.09 PPM TOC
EBCHEM NH-06 BAP 180.00000 1.82 PPM TOC
EBCHEM NH-06 BGHIP 100.00000 3.23 PPM TOC
EBCHEM NH-06 CHRYSENE 390.00000 3.55 PPM TOC
EBCHEM NH-06 DIBNZFURAN 77.00000 5.13 PPM TOC
EBCHEM NH-06 FLUORANTHN 650.00000 4.06 PPM TOC
EBCHEM NH-06 FLUORENE 140.00000 6.09 PPM TOC
EBCHEM NH-06 HPAH 3100.00000 3.23 PPM TOC
EBCHEM NH-06 ICDP 150.00000 4.55 PPM TOC
EBCHEM NH-06 LPAH 1400.00000 3.78 PPM TOC
EBCHEM NH-06 MERCURY 0.68000 1.66 PPM DRY
EBCHEM NH-06 NAPTHALENE 360.00000 3.64 PPM TOC
EBCHEM NH-06 PCBS 14.00000 1.17 PPM TOC
EBCHEM NH-06 PHENANTHRN 480.00000 4.80 PPM TOC
EBCHEM NH-06 TBFLANTH 630.00000 2.74 PPM TOC
EBCHEM NH-06 ZINC 610.00000 1.49 PPM DRY
EBCHEM NH-07 DIBNZFURAN 140.00000 9.33 PPM TOC
EBCHEM NH-07 FLUORANTHN 390.00000 2.44 PPM TOC
EBCHEM NH-07 PHENANTHRN 150.00000 1.50 PPM TOC
EBCHEM NH-08 2-METHNAP 120.00000 1.88 PPM TOC
EBCHEM NH-08 2BANTH 130.00000 3.94 PPM TOC
EBCHEM NH-08 ACENAPTHEN 270.00000 16.88 PPM TOC
EBCHEM NH-08 ANTHRACENE 360.00000 1.64 PPM TOC
EBCHEM NH-08 BAA 420.00000 3.82 PPM TOC
EBCHEM NH-08 BAP 280.00000 2.83 PPM TOC
EBCHEM NH-08 BGHIP 160.00000 5.16 PPM TOC
EBCHEM NH-08 CHRYSENE 560.00000 5.09 PPM TOC

EBCHEM NH-08 DIBNZFURAN 130.00000 8.67 PPM TOC
EBCHEM NH-08 FLUORANTHN 220.00000 1.38 PPM TOC
EBCHEM NH-08 FLUORENE 240.00000 10.43 PPM TOC
EBCHEM NH-08 HPAH 4000.00000 4.17 PPM TOC
EBCHEM NH-08 ICDP 210.00000 6.36 PPM TOC
EBCHEM NH-08 LPAH 1900.00000 5.14 PPM TOC
EBCHEM NH-08 NAPTHALENE 340.00000 3.43 PPM TOC
EBCHEM NH-08 PCBS 66.00000 5.50 PPM TOC
EBCHEM NH-08 PHENANTHRN 660.00000 6.60 PPM TOC
EBCHEM NH-08 TBFLANTH 1000.00000 4.35 PPM TOC
EBCHEM NH-08 ZINC 620.00000 1.51 PPM DRY
EBCHEM NH-09 PCBS 25.00000 2.08 PPM TOC
EBCHEM NH-10 PCBS 34.00000 2.83 PPM TOC
EBCHEM NH-11 PCBS 48.00000 4.00 PPM TOC
EBCHEM NS-01 SILVER 8.30000 1.36 PPM DRY
EBCHEM NS-02 MERCURY 0.44000 1.07 PPM DRY
EBCHEM NS-02 PHENANTHRN 140.00000 1.40 PPM TOC
EBCHEM NS-03 BUTBNZ_PHT 10.00000 2.04 PPM TOC
EBCHEM NS-03 PCBS 43.00000 3.58 PPM TOC
EBCHEM NS-04 4-METPHNOL 1300.00000 1.94 PPB DRY
EBCHEM NS-04 ACENAPTHEN 19.00000 1.19 PPM TOC
EBCHEM NS-04 CHRYSENE 130.00000 1.18 PPM TOC
EBCHEM NS-04 FLUORANTHN 280.00000 1.75 PPM TOC
EBCHEM NS-04 FLUORENE 52.00000 2.26 PPM TOC
EBCHEM NS-04 LPAH 430.00000 1.16 PPM TOC
EBCHEM NS-04 PHENANTHRN 190.00000 1.90 PPM TOC
EBCHEM NS-05 PCBS 24.00000 2.00 PPM TOC
EBCHEM NS-06 2NOCTP 1000.00000 17.24 PPM TOC
EBCHEM NS-07 2BANTH 42.00000 1.27 PPM TOC
EBCHEM NS-07 BAA 150.00000 1.36 PPM TOC
EBCHEM NS-07 BAP 110.00000 1.11 PPM TOC
EBCHEM NS-07 BGHIP 75.00000 2.42 PPM TOC
EBCHEM NS-07 CHRYSENE 150.00000 1.36 PPM TOC
EBCHEM NS-07 FLUORANTHN 530.00000 3.31 PPM TOC
EBCHEM NS-07 HPAH 1800.00000 1.88 PPM TOC
EBCHEM NS-07 ICDP 100.00000 3.03 PPM TOC
EBCHEM NS-07 MERCURY 0.66000 1.61 PPM DRY
EBCHEM NS-07 PCBS 14.00000 1.17 PPM TOC
EBCHEM NS-07 TBFLANTH 250.00000 1.09 PPM TOC
EBCHEM NS-08 ACENAPTHEN 33.00000 2.06 PPM TOC
EBCHEM NS-08 BGHIP 71.00000 2.29 PPM TOC
EBCHEM NS-08 BUTBNZ_PHT 16.00000 3.27 PPM TOC
EBCHEM NS-08 CHRYSENE 160.00000 1.45 PPM TOC
EBCHEM NS-08 DIBNZFURAN 17.00000 1.13 PPM TOC
EBCHEM NS-08 FLUORANTHN 170.00000 1.06 PPM TOC
EBCHEM NS-08 FLUORENE 32.00000 1.39 PPM TOC
EBCHEM NS-08 ICDP 87.00000 2.64 PPM TOC
EBCHEM NS-08 PHENANTHRN 110.00000 1.10 PPM TOC
EBCHEM SS-03 14-2CLBNZ 18.00000 5.81 PPM TOC
EBCHEM SS-03 ACENAPTHEN 20.00000 1.25 PPM TOC
EBCHEM SS-03 ANTIMONY 690.00000 4.60 PPM DRY
EBCHEM SS-03 ARSENIC 580.00000 10.18 PPM DRY
EBCHEM SS-03 BENZYL-OH 1300.00000 22.81 PPB DRY
EBCHEM SS-03 BGHIP 44.00000 1.42 PPM TOC
EBCHEM SS-03 CADMIUM 7.20000 1.41 PPM DRY
EBCHEM SS-03 COPPER 1000.00000 2.56 PPM DRY
EBCHEM SS-03 DIBNZFURAN 19.00000 1.27 PPM TOC
EBCHEM SS-03 FLUORENE 28.00000 1.22 PPM TOC
EBCHEM SS-03 ICDP 61.00000 1.85 PPM TOC
EBCHEM SS-03 LEAD 650.00000 1.44 PPM DRY
EBCHEM SS-03 MERCURY 0.91000 2.22 PPM DRY
EBCHEM SS-03 PCBS 27.00000 2.25 PPM TOC
EBCHEM SS-03 PHENANTHRN 110.00000 1.10 PPM TOC
EBCHEM SS-03 ZINC 4800.00000 11.71 PPM DRY
EBCHEM SS-04 BGHIP 47.00000 1.52 PPM TOC
EBCHEM SS-04 BUTBNZ_PHT 14.00000 2.86 PPM TOC
EBCHEM SS-04 ICDP 64.00000 1.94 PPM TOC
EBCHEM SS-04 MERCURY 1.90000 4.63 PPM DRY
EBCHEM SS-04 PCBS 23.00000 1.92 PPM TOC
EBCHEM SS-05 FLUORANTHN 200.00000 1.25 PPM TOC
EBCHEM SS-05 MERCURY 1.70000 4.15 PPM DRY
EBCHEM SS-05 BUTBNZ_PHT 19.00000 3.88 PPM TOC
EBCHEM SS-05 MERCURY 1.60000 3.90 PPM DRY
EBCHEM SS-05 PCBS 13.00000 1.08 PPM TOC
EBCHEM SS-06 BGHIP 32.00000 1.03 PPM TOC
EBCHEM SS-06 FLUORANTHN 180.00000 1.13 PPM TOC
EBCHEM SS-06 FLUORENE 32.00000 1.39 PPM TOC

EBCHEM SS-06 ICDP 46.00000 1.39 PPM TOC
EBCHEM SS-06 MERCURY 1.90000 4.63 PPM DRY
EBCHEM SS-06 TBFLANTH 240.00000 1.04 PPM TOC
EBCHEM SS-06 ZINC 420.00000 1.02 PPM DRY
EBCHEM SS-07 24-2MPHN 210.00000 7.24 PPB DRY
EBCHEM SS-07 COPPER 530.00000 1.36 PPM DRY
EBCHEM SS-07 MERCURY 2.10000 5.12 PPM DRY
EBCHEM SS-08 2BANTH 45.00000 1.36 PPM TOC
EBCHEM SS-08 ACENAPTHEN 120.00000 7.50 PPM TOC
EBCHEM SS-08 ACENAPTYLE 140.00000 2.12 PPM TOC
EBCHEM SS-08 ANTHRACENE 710.00000 3.23 PPM TOC
EBCHEM SS-08 BAA 1100.00000 10.00 PPM TOC
EBCHEM SS-08 BAP 380.00000 3.84 PPM TOC
EBCHEM SS-08 BGHIP 120.00000 3.87 PPM TOC
EBCHEM SS-08 CHRYSENE 1300.00000 11.82 PPM TOC
EBCHEM SS-08 DIBNZFURAN 27.00000 1.80 PPM TOC
EBCHEM SS-08 FLUORANTHN 4900.00000 30.63 PPM TOC
EBCHEM SS-08 FLUORENE 140.00000 6.09 PPM TOC
EBCHEM SS-08 HPAH 12000.00000 12.50 PPM TOC
EBCHEM SS-08 ICDP 150.00000 4.55 PPM TOC
EBCHEM SS-08 LPAH 2400.00000 6.49 PPM TOC
EBCHEM SS-08 MERCURY 1.70000 4.15 PPM DRY
EBCHEM SS-08 PHENANTHRN 1200.00000 12.00 PPM TOC
EBCHEM SS-08 PYRENE 2800.00000 2.80 PPM TOC
EBCHEM SS-08 TBFLANTH 1100.00000 4.78 PPM TOC
EBCHEM SS-09 14-2CLBNZ 300.00000 96.77 PPM TOC
EBCHEM SS-09 ANTIMONY 680.00000 4.53 PPM DRY
EBCHEM SS-09 ARSENIC 81.00000 1.42 PPM DRY
EBCHEM SS-09 BGHIP 37.00000 1.19 PPM TOC
EBCHEM SS-09 CADMIUM 17.00000 3.33 PPM DRY
EBCHEM SS-09 CHROMIUM 300.00000 1.15 PPM DRY
EBCHEM SS-09 CHRYSENE 190.00000 1.73 PPM TOC
EBCHEM SS-09 HPAH 990.00000 1.03 PPM TOC
EBCHEM SS-09 ICDP 43.00000 1.30 PPM TOC
EBCHEM SS-09 LEAD 71000.00000 157.78 PPM DRY
EBCHEM SS-09 MERCURY 3.90000 9.51 PPM DRY
EBCHEM SS-09 PCBS 32.00000 2.67 PPM TOC
EBCHEM SS-09 PHENOL 440.00000 1.05 PPB DRY
EBCHEM SS-09 TBFLANTH 310.00000 1.35 PPM TOC
EBCHEM SS-09 ZINC 6000.00000 14.63 PPM DRY
EBCHEM SS-10 CHROMIUM 1100.00000 4.23 PPM DRY
EBCHEM SS-10 CHRYSENE 160.00000 1.45 PPM TOC
EBCHEM SS-10 FLUORANTHN 240.00000 1.50 PPM TOC
EBCHEM SS-10 HPAH 1100.00000 1.15 PPM TOC
EBCHEM SS-10 ICDP 40.00000 1.21 PPM TOC
EBCHEM SS-10 MERCURY 1.30000 3.17 PPM DRY
EBCHEM SS-11 MERCURY 1.30000 3.17 PPM DRY
EBCHEM SS-12 MERCURY 1.40000 3.41 PPM DRY
EBCHEM WW-01 PCBS 33.00000 2.75 PPM TOC
EBCHEM WW-02 BENZYL-OH 8800.00000 154.39 PPB DRY
EBCHEM WW-02 DIBNZFURAN 34.00000 2.27 PPM TOC
EBCHEM WW-02 PCBS 49.00000 4.08 PPM TOC
EBCHEM WW-04 14-2CLBNZ 9.00000 2.90 PPM TOC
EBCHEM WW-04 2BANTH 47.00000 1.42 PPM TOC
EBCHEM WW-04 ACENAPTHEN 200.00000 12.50 PPM TOC
EBCHEM WW-04 BAA 240.00000 2.18 PPM TOC
EBCHEM WW-04 BAP 140.00000 1.41 PPM TOC
EBCHEM WW-04 BGHIP 58.00000 1.87 PPM TOC
EBCHEM WW-04 CHRYSENE 410.00000 3.73 PPM TOC
EBCHEM WW-04 DIBNZFURAN 170.00000 11.33 PPM TOC
EBCHEM WW-04 FLUORANTHN 3000.00000 18.75 PPM TOC
EBCHEM WW-04 FLUORENE 360.00000 15.65 PPM TOC
EBCHEM WW-04 HPAH 5300.00000 5.52 PPM TOC
EBCHEM WW-04 ICDP 88.00000 2.67 PPM TOC
EBCHEM WW-04 LPAH 1500.00000 4.05 PPM TOC
EBCHEM WW-04 PCBS 50.00000 4.17 PPM TOC
EBCHEM WW-04 PHENANTHRN 690.00000 6.90 PPM TOC
EBCHEM WW-04 TBFLANTH 270.00000 1.17 PPM TOC
EBCHEM WW-05 14-2CLBNZ 4.80000 1.55 PPM TOC
EBCHEM WW-05 PCBS 98.00000 8.17 PPM TOC
EBCHEM WW-06 MERCURY 0.53000 1.29 PPM DRY
EBCHEM WW-06 PCBS 19.00000 1.58 PPM TOC
EBCHEM WW-06 ANTIMONY 180.00000 1.20 PPM DRY
EBCHEM WW-06 FLUORANTHN 180.00000 1.13 PPM TOC
EBCHEM WW-06 MERCURY 0.45000 1.10 PPM DRY
EBCHEM WW-06 PHENANTHRN 170.00000 1.70 PPM TOC
EBCHEM WW-08 BENZYL-OH 140.00000 2.46 PPB DRY

EBCHEM WW-08 BUTBNZ_PHT 7.90000 1.61 PPM TOC
EBCHEM WW-08 MERCURY 0.57000 1.39 PPM DRY
EBCHEM WW-08 PCBS 31.00000 2.58 PPM TOC
EBCHEM WW-09 ACENAPTHEN 28.00000 1.75 PPM TOC
EBCHEM WW-09 BAP 130.00000 1.31 PPM TOC
EBCHEM WW-09 BGHIP 35.00000 1.13 PPM TOC
EBCHEM WW-09 CHRYSENE 220.00000 2.00 PPM TOC
EBCHEM WW-09 FLUORANTHN 360.00000 2.25 PPM TOC
EBCHEM WW-09 FLUORENE 26.00000 1.13 PPM TOC
EBCHEM WW-09 HPAH 1400.00000 1.46 PPM TOC
EBCHEM WW-09 ICDP 46.00000 1.39 PPM TOC
EBCHEM WW-09 LEAD 710.00000 1.58 PPM DRY
EBCHEM WW-09 MERCURY 0.80000 1.95 PPM DRY
EBCHEM WW-09 PCBS 54.00000 4.50 PPM TOC
EBCHEM WW-09 PHENANTHRN 190.00000 1.90 PPM TOC
EBCHEM WW-09 ZINC 540.00000 1.32 PPM DRY
EBCHEM WW-10 LEAD 470.00000 1.04 PPM DRY
EBCHEM WW-10 MERCURY 0.81000 1.98 PPM DRY
EBCHEM WW-10 PCBS 15.00000 1.25 PPM TOC
EBCHEM WW-11 LEAD 720.00000 1.60 PPM DRY
EBCHEM WW-11 MERCURY 0.93000 2.27 PPM DRY
EBCHEM WW-11 ZINC 470.00000 1.15 PPM DRY
EBCHEM WW-12 ANTIMONY 1200.00000 8.00 PPM DRY
EBCHEM WW-12 ARSENIC 240.00000 4.21 PPM DRY
EBCHEM WW-12 BAA 120.00000 1.09 PPM TOC
EBCHEM WW-12 CHROMIUM 560.00000 2.15 PPM DRY
EBCHEM WW-12 CHRYSENE 320.00000 2.91 PPM TOC
EBCHEM WW-12 COPPER 620.00000 1.59 PPM DRY
EBCHEM WW-12 FLUORANTHN 450.00000 2.81 PPM TOC
EBCHEM WW-12 HPAH 1500.00000 1.56 PPM TOC
EBCHEM WW-12 LEAD 1200.00000 2.67 PPM DRY
EBCHEM WW-12 MERCURY 0.62000 1.51 PPM DRY
EBCHEM WW-12 PCBS 17.00000 1.42 PPM TOC
EBCHEM WW-12 PHENANTHRN 110.00000 1.10 PPM TOC
EBCHEM WW-12 ZINC 1200.00000 2.93 PPM DRY
EBCHEM WW-13 CHRYSENE 120.00000 1.09 PPM TOC
EBCHEM WW-13 MERCURY 0.59000 1.44 PPM DRY
EBCHEM WW-14 ANTIMONY 1400.00000 9.33 PPM DRY
EBCHEM WW-14 BAP 140.00000 1.41 PPM TOC
EBCHEM WW-14 CHRYSENE 190.00000 1.73 PPM TOC
EBCHEM WW-14 HPAH 1200.00000 1.25 PPM TOC
EBCHEM WW-14 ICDP 44.00000 1.33 PPM TOC
EBCHEM WW-14 LEAD 8700.00000 19.33 PPM DRY
EBCHEM WW-14 MERCURY 1.10000 2.68 PPM DRY
EBCHEM WW-14 PCBS 15.00000 1.25 PPM TOC
EBCHEM WW-14 TBFLANTH 310.00000 1.35 PPM TOC
EBCHEM WW-14 ZINC 430.00000 1.05 PPM DRY
EBCHEM WW-15 DIBNZFURAN 170.00000 11.33 PPM TOC
EBCHEM WW-16 ANTIMONY 180.00000 1.20 PPM DRY
EBCHEM WW-16 MERCURY 0.97000 2.37 PPM DRY
EBCHEM WW-16 PCBS 40.00000 3.33 PPM TOC
EBCHEM WW-17 BGHIP 59.00000 1.90 PPM TOC
EBCHEM WW-17 ICDP 88.00000 2.67 PPM TOC
EBCHEM WW-17 MERCURY 0.72000 1.76 PPM DRY
EBCHEM WW-17 PCBS 18.00000 1.50 PPM TOC
EBCHEM WW-18 ANTIMONY 200.00000 1.33 PPM DRY
EBCHEM WW-18 BGHIP 47.00000 1.52 PPM TOC
EBCHEM WW-18 FLUORENE 24.00000 1.04 PPM TOC
EBCHEM WW-18 ICDP 74.00000 2.24 PPM TOC
EBCHEM WW-18 MERCURY 1.60000 3.90 PPM DRY
EBCHEM WW-18 PCBS 20.00000 1.67 PPM TOC
EBCHEM WW-19 4-METPHNOL 2600.00000 3.88 PPB DRY
EBCHEM WW-19 ANTIMONY 190.00000 1.27 PPM DRY
EBCHEM WW-19 BGHIP 32.00000 1.03 PPM TOC
EBCHEM WW-19 CHRYSENE 200.00000 1.82 PPM TOC
EBCHEM WW-19 COPPER 1300.00000 3.33 PPM DRY
EBCHEM WW-19 FLUORANTHN 190.00000 1.19 PPM TOC
EBCHEM WW-19 HPAH 1000.00000 1.04 PPM TOC
EBCHEM WW-19 ICDP 42.00000 1.27 PPM TOC
EBCHEM WW-19 MERCURY 0.74000 1.80 PPM DRY
EBCHEM WW-19 PCBS 25.00000 2.08 PPM TOC
EBCHEM WW-19 ZINC 710.00000 1.73 PPM DRY
EBCHEM WW-20 ANTIMONY 160.00000 1.07 PPM DRY
EBCHEM WW-20 BGHIP 38.00000 1.23 PPM TOC
EBCHEM WW-20 ICDP 62.00000 1.88 PPM TOC
EBCHEM WW-20 MERCURY 0.78000 1.90 PPM DRY
EBCHEM WW-20 PCBS 15.00000 1.25 PPM TOC

EIGHTBAY EL-09 MERCURY 1.70000 4.15 PPM DRY
EIGHTBAY EL-09 PCBS 19.00000 1.58 PPM TOC
EIGHTBAY EL-09 ZINC 430.00000 1.05 PPM DRY
EIGHTBAY EL-10 ACENAPTHEN 27.00000 1.69 PPM TOC
EIGHTBAY EL-10 LEAD 610.00000 1.36 PPM DRY
EIGHTBAY EL-10 MERCURY 1.10000 2.68 PPM DRY
EIGHTBAY EL-10 ZINC 690.00000 1.68 PPM DRY
EIGHTBAY EL-17 MERCURY 0.58000 1.41 PPM DRY
EIGHTBAY EL-17 PCBS 34.00000 2.83 PPM TOC
EIGHTBAY EL-20 MERCURY 0.78000 1.90 PPM DRY
EIGHTBAY EL-20 PCBS 46.00000 3.83 PPM TOC
EIGHTBAY EL-20 ZINC 460.00000 1.12 PPM DRY
EIGHTBAY EL-22 MERCURY 0.51000 1.24 PPM DRY
EIGHTBAY EL-22 PCBS 36.00000 3.00 PPM TOC
EIGHTBAY EL-23 PCBS 13.00000 1.08 PPM TOC
TPPS3AB EB-30 BGHIP 66.00000 2.13 PPM TOC
TPPS3AB EB-30 BUTBNZ_PHT 16.00000 3.27 PPM TOC
TPPS3AB EB-30 ICDP 34.00000 1.03 PPM TOC
TPPS3AB EB-30 MERCURY 0.43000 1.05 PPM DRY
TPPS3AB EB-30 PCBS 40.00000 3.33 PPM TOC
TPPS3AB EB-30 BAA 140.00000 1.27 PPM TOC
TPPS3AB EB-30 BAP 190.00000 1.92 PPM TOC
TPPS3AB EB-30 BGHIP 110.00000 3.55 PPM TOC
TPPS3AB EB-30 CHRYSENE 160.00000 1.45 PPM TOC
TPPS3AB EB-30 FLUORANTHN 180.00000 1.13 PPM TOC
TPPS3AB EB-30 HPAH 1900.00000 1.98 PPM TOC
TPPS3AB EB-30 ICDP 76.00000 2.30 PPM TOC
TPPS3AB EB-30 PCBS 58.00000 4.83 PPM TOC
TPPS3AB EB-30 TBFLANTH 820.00000 3.57 PPM TOC
TPPS3AB EB-31 2NOCTP 850.00000 14.66 PPM TOC
TPPS3AB EB-31 BGHIP 63.00000 2.03 PPM TOC
TPPS3AB EB-31 BUTBNZ_PHT 13.00000 2.65 PPM TOC
TPPS3AB EB-31 FLUORENE 25.00000 1.09 PPM TOC
TPPS3AB EB-31 MERCURY 0.63000 1.54 PPM DRY
TPPS3AB EB-31 PCBS 27.00000 2.25 PPM TOC
TPPS3AB EB-31 2NOCTP 1300.00000 22.41 PPM TOC
TPPS3AB EB-31 6CLBUTAD 18.00000 4.62 PPM TOC
TPPS3AB EB-31 BAA 310.00000 2.82 PPM TOC
TPPS3AB EB-31 BAP 610.00000 6.16 PPM TOC
TPPS3AB EB-31 BUTBNZ_PHT 140.00000 28.57 PPM TOC
TPPS3AB EB-31 CHRYSENE 450.00000 4.09 PPM TOC
TPPS3AB EB-31 DEP 130.00000 2.13 PPM TOC
TPPS3AB EB-31 DINBP 1300.00000 5.91 PPM TOC
TPPS3AB EB-31 FLUORANTHN 740.00000 4.63 PPM TOC
TPPS3AB EB-31 FLUORENE 73.00000 3.17 PPM TOC
TPPS3AB EB-31 HPAH 3700.00000 3.85 PPM TOC
TPPS3AB EB-31 ICDP 160.00000 4.85 PPM TOC
TPPS3AB EB-31 LPAH 1200.00000 3.24 PPM TOC
TPPS3AB EB-31 NAPTHALENE 430.00000 4.34 PPM TOC
TPPS3AB EB-31 PCBS 640.00000 53.33 PPM TOC
TPPS3AB EB-31 PHENANTHRN 460.00000 4.60 PPM TOC
TPPS3AB EB-31 TBFLANTH 680.00000 2.96 PPM TOC
TPPS3AB EB-32 MERCURY 0.53000 1.29 PPM DRY
TPPS3AB EB-32 2NOCTP 170.00000 2.93 PPM TOC
TPPS3AB EB-32 PCBS 82.00000 6.83 PPM TOC
TPPS3AB EB-33 2BANTH 450.00000 13.64 PPM TOC
TPPS3AB EB-33 2NOCTP 290.00000 5.00 PPM TOC
TPPS3AB EB-33 BAP 1100.00000 11.11 PPM TOC
TPPS3AB EB-33 BGHIP 890.00000 28.71 PPM TOC
TPPS3AB EB-33 BUTBNZ_PHT 190.00000 38.78 PPM TOC
TPPS3AB EB-33 CHRYSENE 120.00000 1.09 PPM TOC
TPPS3AB EB-33 HPAH 5200.00000 5.42 PPM TOC
TPPS3AB EB-33 ICDP 320.00000 9.70 PPM TOC
TPPS3AB EB-33 MERCURY 0.98000 2.39 PPM DRY
TPPS3AB EB-33 PCBS 120.00000 10.00 PPM TOC
TPPS3AB EB-33 TBFLANTH 1900.00000 8.26 PPM TOC
TPPS3AB EB-33 2NOCTP 540.00000 9.31 PPM TOC
TPPS3AB EB-33 FLUORANTHN 280.00000 1.75 PPM TOC
TPPS3AB EB-33 MERCURY 1.00000 2.44 PPM DRY
TPPS3AB EB-33 PCBS 380.00000 31.67 PPM TOC
TPPS3AB EB-34 BAP 1500.00000 15.15 PPM TOC
TPPS3AB EB-34 FLUORANTHN 190.00000 1.19 PPM TOC
TPPS3AB EB-34 HPAH 4600.00000 4.79 PPM TOC
TPPS3AB EB-34 MERCURY 1.60000 3.90 PPM DRY
TPPS3AB EB-34 PCBS 140.00000 11.67 PPM TOC
TPPS3AB EB-34 TBFLANTH 2700.00000 11.74 PPM TOC
TPPS3AB EB-34 2NOCTP 250.00000 4.31 PPM TOC

TPPS3AB EB-34 6CLBUTAD 4.40000 1.13 PPM TOC
TPPS3AB EB-34 BAA 160.00000 1.45 PPM TOC
TPPS3AB EB-34 BAP 200.00000 2.02 PPM TOC
TPPS3AB EB-34 BGHIP 68.00000 2.19 PPM TOC
TPPS3AB EB-34 BUTBNZ_PHT 25.00000 5.10 PPM TOC
TPPS3AB EB-34 CHRYSENE 270.00000 2.45 PPM TOC
TPPS3AB EB-34 FLUORANTHN 200.00000 1.25 PPM TOC
TPPS3AB EB-34 HPAH 1500.00000 1.56 PPM TOC
TPPS3AB EB-34 ICDP 68.00000 2.06 PPM TOC
TPPS3AB EB-34 PCBS 410.00000 34.17 PPM TOC
TPPS3AB EB-34 PHENANTHRN 140.00000 1.40 PPM TOC
TPPS3AB EB-35 2NOCTP 1200.00000 20.69 PPM TOC
TPPS3AB EB-35 ANTHRACENE 510.00000 2.32 PPM TOC
TPPS3AB EB-35 BAA 1200.00000 10.91 PPM TOC
TPPS3AB EB-35 CHRYSENE 1300.00000 11.82 PPM TOC
TPPS3AB EB-35 DINBP 280.00000 1.27 PPM TOC
TPPS3AB EB-35 FLUORANTHN 700.00000 4.38 PPM TOC
TPPS3AB EB-35 FLUORENE 350.00000 15.22 PPM TOC
TPPS3AB EB-35 HPAH 4000.00000 4.17 PPM TOC
TPPS3AB EB-35 LEAD 670.00000 1.49 PPM DRY
TPPS3AB EB-35 LPAH 1400.00000 3.78 PPM TOC
TPPS3AB EB-35 MERCURY 1.60000 3.90 PPM DRY
TPPS3AB EB-35 PCBS 510.00000 42.50 PPM TOC
TPPS3AB EB-35 PHENANTHRN 560.00000 5.60 PPM TOC
TPPS3AB EB-35 2BANTH 240.00000 7.27 PPM TOC
TPPS3AB EB-35 2NOCTP 8600.00000 148.28 PPM TOC
TPPS3AB EB-35 ANTHRACENE 370.00000 1.68 PPM TOC
TPPS3AB EB-35 BAA 710.00000 6.45 PPM TOC
TPPS3AB EB-35 BAP 1300.00000 13.13 PPM TOC
TPPS3AB EB-35 BGHIP 1200.00000 38.71 PPM TOC
TPPS3AB EB-35 BUTBNZ_PHT 410.00000 83.67 PPM TOC
TPPS3AB EB-35 CHRYSENE 1200.00000 10.91 PPM TOC
TPPS3AB EB-35 DINBP 670.00000 3.05 PPM TOC
TPPS3AB EB-35 FLUORANTHN 1300.00000 8.13 PPM TOC
TPPS3AB EB-35 FLUORENE 27.00000 1.17 PPM TOC
TPPS3AB EB-35 HPAH 11000.00000 11.46 PPM TOC
TPPS3AB EB-35 ICDP 1000.00000 30.30 PPM TOC
TPPS3AB EB-35 LPAH 980.00000 2.65 PPM TOC
TPPS3AB EB-35 MERCURY 1.30000 3.17 PPM DRY
TPPS3AB EB-35 NNP 63.00000 5.73 PPM TOC
TPPS3AB EB-35 PCBS 220.00000 18.33 PPM TOC
TPPS3AB EB-35 PHENANTHRN 590.00000 5.90 PPM TOC
TPPS3AB EB-35 PYRENE 1400.00000 1.40 PPM TOC
TPPS3AB EB-35 TBFLANTH 2500.00000 10.87 PPM TOC
TPPS3AB EB-36 2NOCTP 4600.00000 79.31 PPM TOC
TPPS3AB EB-36 ACENAPTYLE 670.00000 10.15 PPM TOC
TPPS3AB EB-36 BAP 150.00000 1.52 PPM TOC
TPPS3AB EB-36 BUTBNZ_PHT 56.00000 11.43 PPM TOC
TPPS3AB EB-36 CHRYSENE 270.00000 2.45 PPM TOC
TPPS3AB EB-36 HPAH 1200.00000 1.25 PPM TOC
TPPS3AB EB-36 LPAH 700.00000 1.89 PPM TOC
TPPS3AB EB-36 MERCURY 0.77000 1.88 PPM DRY
TPPS3AB EB-36 PCBS 660.00000 55.00 PPM TOC
TPPS3AB EB-36 TBFLANTH 410.00000 1.78 PPM TOC
TPPS3AB EB-36 BUTBNZ_PHT 11.00000 2.24 PPM TOC
TPPS3AB EB-36 DINBP 660.00000 3.00 PPM TOC
TPPS3AB EB-36 ICDP 50.00000 1.52 PPM TOC
TPPS3AB EB-36 PCBS 79.00000 6.58 PPM TOC
TPPS3AB EB-37 2BANTH 65.00000 1.97 PPM TOC
TPPS3AB EB-37 2NOCTP 73.00000 1.26 PPM TOC
TPPS3AB EB-37 BAP 160.00000 1.62 PPM TOC
TPPS3AB EB-37 BGHIP 130.00000 4.19 PPM TOC
TPPS3AB EB-37 CHRYSENE 170.00000 1.55 PPM TOC
TPPS3AB EB-37 FLUORENE 38.00000 1.65 PPM TOC
TPPS3AB EB-37 MERCURY 0.72000 1.76 PPM DRY
TPPS3AB EB-37 PCBS 70.00000 5.83 PPM TOC
TPPS3AB EB-37 TBFLANTH 290.00000 1.26 PPM TOC
TPPS3AB EB-37 2NOCTP 2700.00000 46.55 PPM TOC
TPPS3AB EB-37 ANTHRACENE 250.00000 1.14 PPM TOC
TPPS3AB EB-37 BAA 1100.00000 10.00 PPM TOC
TPPS3AB EB-37 BAP 590.00000 5.96 PPM TOC
TPPS3AB EB-37 BUTBNZ_PHT 36.00000 7.35 PPM TOC
TPPS3AB EB-37 CHRYSENE 1600.00000 14.55 PPM TOC
TPPS3AB EB-37 FLUORANTHN 2200.00000 13.75 PPM TOC
TPPS3AB EB-37 HPAH 8400.00000 8.75 PPM TOC
TPPS3AB EB-37 LPAH 1100.00000 2.97 PPM TOC
TPPS3AB EB-37 MERCURY 3.60000 8.78 PPM DRY

TPPS3AB EB-37 NNP 38.00000 3.45 PPM TOC
TPPS3AB EB-37 PCBS 230.00000 19.17 PPM TOC
TPPS3AB EB-37 PHENANTHRN 760.00000 7.60 PPM TOC
TPPS3AB EB-37 PYRENE 2200.00000 2.20 PPM TOC
TPPS3AB EB-37 TBFLANTH 830.00000 3.61 PPM TOC
TPPS3AB EB-38 2BANTH 36.00000 1.09 PPM TOC
TPPS3AB EB-38 2NOCTP 130.00000 2.24 PPM TOC
TPPS3AB EB-38 BGHIP 62.00000 2.00 PPM TOC
TPPS3AB EB-38 CHRYSENE 120.00000 1.09 PPM TOC
TPPS3AB EB-38 MERCURY 0.62000 1.51 PPM DRY
TPPS3AB EB-38 PCBS 56.00000 4.67 PPM TOC
TPPS3AB EB-38 TBFLANTH 270.00000 1.17 PPM TOC
TPPS3AB EB-38 2NOCTP 350.00000 6.03 PPM TOC
TPPS3AB EB-38 BUTBNZ_PHT 68.00000 13.88 PPM TOC
TPPS3AB EB-38 CHRYSENE 150.00000 1.36 PPM TOC
TPPS3AB EB-38 MERCURY 0.72000 1.76 PPM DRY
TPPS3AB EB-38 PCBS 26.00000 2.17 PPM TOC
TPPS3AB EB-38 PHENANTHRN 250.00000 2.50 PPM TOC
TPPS3AB EB-39 2NOCTP 740.00000 12.76 PPM TOC
TPPS3AB EB-39 ACENAPTHEN 87.00000 5.44 PPM TOC
TPPS3AB EB-39 BAP 160.00000 1.62 PPM TOC
TPPS3AB EB-39 FLUORANTHN 380.00000 2.38 PPM TOC
TPPS3AB EB-39 FLUORENE 77.00000 3.35 PPM TOC
TPPS3AB EB-39 HPAH 1600.00000 1.67 PPM TOC
TPPS3AB EB-39 LPAH 530.00000 1.43 PPM TOC
TPPS3AB EB-39 MERCURY 0.65000 1.59 PPM DRY
TPPS3AB EB-39 PCBS 100.00000 8.33 PPM TOC
TPPS3AB EB-39 PHENANTHRN 180.00000 1.80 PPM TOC
TPPS3AB EB-39 TBFLANTH 360.00000 1.57 PPM TOC
TPPS3AB EB-39 6CLBUTAD 4.30000 1.10 PPM TOC
TPPS3AB EB-39 BAA 600.00000 5.45 PPM TOC
TPPS3AB EB-39 BAP 1000.00000 10.10 PPM TOC
TPPS3AB EB-39 BGHIP 1900.00000 61.29 PPM TOC
TPPS3AB EB-39 CHRYSENE 990.00000 9.00 PPM TOC
TPPS3AB EB-39 FLUORANTHN 1000.00000 6.25 PPM TOC
TPPS3AB EB-39 HPAH 11000.00000 11.46 PPM TOC
TPPS3AB EB-39 ICDP 1500.00000 45.45 PPM TOC
TPPS3AB EB-39 MERCURY 0.61000 1.49 PPM DRY
TPPS3AB EB-39 NAPTHALENE 360.00000 3.64 PPM TOC
TPPS3AB EB-39 PCBS 330.00000 27.50 PPM TOC
TPPS3AB EB-39 PYRENE 1500.00000 1.50 PPM TOC
TPPS3AB EB-39 TBFLANTH 2500.00000 10.87 PPM TOC
TPPS3AB EP-19 MERCURY 0.47000 1.15 PPM DRY
TPPS3AB WP-01 ACENAPTHEN 33.00000 2.06 PPM TOC
TPPS3AB WP-01 CHRYSENE 170.00000 1.55 PPM TOC
TPPS3AB WP-01 FLUORENE 28.00000 1.22 PPM TOC
TPPS3AB WP-01 PCBS 21.00000 1.75 PPM TOC
TPPS3AB WP-01 TBFLANTH 240.00000 1.04 PPM TOC
TPPS3AB WP-01 2NOCTP 120.00000 2.07 PPM TOC
TPPS3AB WP-01 BUTBNZ_PHT 7.90000 1.61 PPM TOC
TPPS3AB WP-02 ACENAPTHEN 18.00000 1.13 PPM TOC
TPPS3AB WP-02 BAP 130.00000 1.31 PPM TOC
TPPS3AB WP-02 CHRYSENE 150.00000 1.36 PPM TOC
TPPS3AB WP-02 FLUORANTHN 200.00000 1.25 PPM TOC
TPPS3AB WP-02 FLUORENE 41.00000 1.78 PPM TOC
TPPS3AB WP-02 HPAH 1300.00000 1.35 PPM TOC
TPPS3AB WP-02 MERCURY 0.58000 1.41 PPM DRY
TPPS3AB WP-02 PHENANTHRN 130.00000 1.30 PPM TOC
TPPS3AB WP-02 TBFLANTH 330.00000 1.43 PPM TOC
TPPS3AB WP-02 2BANTH 64.00000 1.94 PPM TOC
TPPS3AB WP-02 BAA 640.00000 5.82 PPM TOC
TPPS3AB WP-02 BAP 1300.00000 13.13 PPM TOC
TPPS3AB WP-02 BGHIP 460.00000 14.84 PPM TOC
TPPS3AB WP-02 CHRYSENE 760.00000 6.91 PPM TOC
TPPS3AB WP-02 FLUORANTHN 1000.00000 6.25 PPM TOC
TPPS3AB WP-02 FLUORENE 29.00000 1.26 PPM TOC
TPPS3AB WP-02 HPAH 7600.00000 7.92 PPM TOC
TPPS3AB WP-02 ICDP 370.00000 11.21 PPM TOC
TPPS3AB WP-02 LPAH 670.00000 1.81 PPM TOC
TPPS3AB WP-02 PCBS 55.00000 4.58 PPM TOC
TPPS3AB WP-02 PHENANTHRN 430.00000 4.30 PPM TOC
TPPS3AB WP-02 PYRENE 1400.00000 1.40 PPM TOC
TPPS3AB WP-02 TBFLANTH 1500.00000 6.52 PPM TOC
TPPS3AB WP-03 2NOCTP 240.00000 4.14 PPM TOC
TPPS3AB WP-03 BUTBNZ_PHT 6.70000 1.37 PPM TOC
TPPS3AB WP-03 DINBP 240.00000 1.09 PPM TOC
TPPS3AB WP-03 PCBS 14.00000 1.17 PPM TOC

TPPS3AB WP-04 2NOCTP 130.00000 2.24 PPM TOC
TPPS3AB WP-04 6CLBUTAD 6.90000 1.77 PPM TOC
TPPS3AB WP-04 BAA 170.00000 1.55 PPM TOC
TPPS3AB WP-04 BAP 110.00000 1.11 PPM TOC
TPPS3AB WP-04 BGHIP 94.00000 3.03 PPM TOC
TPPS3AB WP-04 CHRYSENE 330.00000 3.00 PPM TOC
TPPS3AB WP-04 FLUORANTHN 380.00000 2.38 PPM TOC
TPPS3AB WP-04 HPAH 1900.00000 1.98 PPM TOC
TPPS3AB WP-04 ICDP 120.00000 3.64 PPM TOC
TPPS3AB WP-04 PCBS 43.00000 3.58 PPM TOC
TPPS3AB WP-04 PHENANTHRN 160.00000 1.60 PPM TOC
TPPS3AB WP-05 2NOCTP 150.00000 2.59 PPM TOC
TPPS3AB WP-05 NNP 160.00000 14.55 PPM TOC
TPPS3AB WP-05 2NOCTP 160.00000 2.76 PPM TOC
TPPS3AB WP-05 BAA 130.00000 1.18 PPM TOC
TPPS3AB WP-05 BAP 220.00000 2.22 PPM TOC
TPPS3AB WP-05 BGHIP 95.00000 3.06 PPM TOC
TPPS3AB WP-05 CHRYSENE 150.00000 1.36 PPM TOC
TPPS3AB WP-05 DINBP 950.00000 4.32 PPM TOC
TPPS3AB WP-05 FLUORANTHN 270.00000 1.69 PPM TOC
TPPS3AB WP-05 HPAH 1500.00000 1.56 PPM TOC
TPPS3AB WP-05 ICDP 95.00000 2.88 PPM TOC
TPPS3AB WP-05 PHENANTHRN 200.00000 2.00 PPM TOC
TPPS3AB WP-06 2NOCTP 83.00000 1.43 PPM TOC
TPPS3AB WP-06 2NOCTP 91.00000 1.57 PPM TOC
TPPS3AB WP-06 BGHIP 100.00000 3.23 PPM TOC
TPPS3AB WP-06 CHRYSENE 190.00000 1.73 PPM TOC
TPPS3AB WP-06 FLUORANTHN 270.00000 1.69 PPM TOC
TPPS3AB WP-06 HPAH 1400.00000 1.46 PPM TOC
TPPS3AB WP-06 ICDP 110.00000 3.33 PPM TOC
TPPS3AB WP-06 PCBS 25.00000 2.08 PPM TOC
TPPS3AB WP-06 PHENANTHRN 120.00000 1.20 PPM TOC
TPPS3AB WP-07 2BANTH 430.00000 13.03 PPM TOC
TPPS3AB WP-07 2NOCTP 270.00000 4.66 PPM TOC
TPPS3AB WP-07 BAA 150.00000 1.36 PPM TOC
TPPS3AB WP-07 BAP 1000.00000 10.10 PPM TOC
TPPS3AB WP-07 BGHIP 880.00000 28.39 PPM TOC
TPPS3AB WP-07 CHRYSENE 810.00000 7.36 PPM TOC
TPPS3AB WP-07 FLUORANTHN 350.00000 2.19 PPM TOC
TPPS3AB WP-07 HPAH 6000.00000 6.25 PPM TOC
TPPS3AB WP-07 PCBS 84.00000 7.00 PPM TOC
TPPS3AB WP-07 PHENANTHRN 220.00000 2.20 PPM TOC
TPPS3AB WP-07 TBFLANTH 1900.00000 8.26 PPM TOC
TPPS3AB WP-07 2NOCTP 190.00000 3.28 PPM TOC
TPPS3AB WP-07 BAA 650.00000 5.91 PPM TOC
TPPS3AB WP-07 BAP 600.00000 6.06 PPM TOC
TPPS3AB WP-07 BGHIP 950.00000 30.65 PPM TOC
TPPS3AB WP-07 CHRYSENE 850.00000 7.73 PPM TOC
TPPS3AB WP-07 DINBP 600.00000 2.73 PPM TOC
TPPS3AB WP-07 FLUORANTHN 650.00000 4.06 PPM TOC
TPPS3AB WP-07 HPAH 6300.00000 6.56 PPM TOC
TPPS3AB WP-07 ICDP 900.00000 27.27 PPM TOC
TPPS3AB WP-07 PCBS 48.00000 4.00 PPM TOC
TPPS3AB WP-07 PHENANTHRN 150.00000 1.50 PPM TOC
TPPS3AB WP-07 PYRENE 1100.00000 1.10 PPM TOC
TPPS3AB WP-07 TBFLANTH 650.00000 2.83 PPM TOC
TPPS3AB WP-08 BGHIP 150.00000 4.84 PPM TOC
TPPS3AB WP-08 ICDP 78.00000 2.36 PPM TOC
TPPS3AB WP-08 PCBS 35.00000 1.25 PPM TOC
TPPS3AB WP-08 TBFLANTH 340.00000 1.48 PPM TOC
TPPS3AB WP-08 2NOCTP 430.00000 7.41 PPM TOC
TPPS3AB WP-08 6CLBUTAD 8.30000 2.13 PPM TOC
TPPS3AB WP-08 BAA 160.00000 1.45 PPM TOC
TPPS3AB WP-08 BAP 180.00000 1.82 PPM TOC
TPPS3AB WP-08 BUTBNZ_PHT 43.00000 8.78 PPM TOC
TPPS3AB WP-08 CHRYSENE 190.00000 1.73 PPM TOC
TPPS3AB WP-08 DEP 78.00000 1.28 PPM TOC
TPPS3AB WP-08 DINBP 3400.00000 15.45 PPM TOC
TPPS3AB WP-08 FLUORANTHN 210.00000 1.31 PPM TOC
TPPS3AB WP-08 FLUORENE 75.00000 3.26 PPM TOC
TPPS3AB WP-08 HPAH 1300.00000 1.35 PPM TOC
TPPS3AB WP-08 MERCURY 0.47000 1.15 PPM DRY
TPPS3AB WP-08 PCBS 270.00000 22.50 PPM TOC
TPPS3AB WP-09 BAP 120.00000 1.21 PPM TOC
TPPS3AB WP-09 CHRYSENE 150.00000 1.36 PPM TOC
TPPS3AB WP-09 PCBS 52.00000 4.33 PPM TOC
TPPS3AB WP-09 2NOCTP 120.00000 2.07 PPM TOC

TPPS3AB WP-09 BAP 240.00000 2.42 PPM TOC
TPPS3AB WP-09 CHRYSENE 130.00000 1.18 PPM TOC
TPPS3AB WP-09 FLUORANTHN 210.00000 1.31 PPM TOC
TPPS3AB WP-09 HPAH 1100.00000 1.15 PPM TOC
TPPS3AB WP-09 PCBS 65.00000 5.42 PPM TOC
TPPS3AB WP-10 2NOCTP 610.00000 10.52 PPM TOC
TPPS3AB WP-10 BAA 300.00000 2.73 PPM TOC
TPPS3AB WP-10 BGHIP 82.00000 2.65 PPM TOC
TPPS3AB WP-10 CHRYSENE 1100.00000 10.00 PPM TOC
TPPS3AB WP-10 FLUORANTHN 320.00000 2.00 PPM TOC
TPPS3AB WP-10 HPAH 2800.00000 2.92 PPM TOC
TPPS3AB WP-10 ICDP 95.00000 2.88 PPM TOC
TPPS3AB WP-10 PCBS 14.00000 1.17 PPM TOC
TPPS3AB WP-10 PHENANTHRN 110.00000 1.10 PPM TOC
TPPS3AB WP-10 TBFLANTH 340.00000 1.48 PPM TOC
TPPS3AB WP-10 2BANTH 89.00000 2.70 PPM TOC
TPPS3AB WP-10 2NOCTP 4500.00000 77.59 PPM TOC
TPPS3AB WP-10 BAA 430.00000 3.91 PPM TOC
TPPS3AB WP-10 BAP 1000.00000 10.10 PPM TOC
TPPS3AB WP-10 BGHIP 1200.00000 38.71 PPM TOC
TPPS3AB WP-10 BUTBNZ_PHT 29.00000 5.92 PPM TOC
TPPS3AB WP-10 CHRYSENE 480.00000 4.36 PPM TOC
TPPS3AB WP-10 FLUORANTHN 860.00000 5.38 PPM TOC
TPPS3AB WP-10 FLUORENE 79.00000 3.43 PPM TOC
TPPS3AB WP-10 HPAH 6800.00000 7.08 PPM TOC
TPPS3AB WP-10 ICDP 650.00000 19.70 PPM TOC
TPPS3AB WP-10 LPAH 780.00000 2.11 PPM TOC
TPPS3AB WP-10 PCBS 51.00000 4.25 PPM TOC
TPPS3AB WP-10 PHENANTHRN 480.00000 4.80 PPM TOC
TPPS3AB WP-10 TBFLANTH 1100.00000 4.78 PPM TOC
TPPS3AB WP-11 2NOCTP 240.00000 4.14 PPM TOC
TPPS3AB WP-11 ACENAPTHEN 220.00000 13.75 PPM TOC
TPPS3AB WP-11 ACENAPTYLE 380.00000 5.76 PPM TOC
TPPS3AB WP-11 ANTHRACENE 1700.00000 7.73 PPM TOC
TPPS3AB WP-11 BAA 2500.00000 22.73 PPM TOC
TPPS3AB WP-11 BAP 3800.00000 38.38 PPM TOC
TPPS3AB WP-11 BGHIP 1800.00000 58.06 PPM TOC
TPPS3AB WP-11 CHRYSENE 5900.00000 53.64 PPM TOC
TPPS3AB WP-11 FLUORANTHN 12000.00000 75.00 PPM TOC
TPPS3AB WP-11 FLUORENE 800.00000 34.78 PPM TOC
TPPS3AB WP-11 HPAH 60000.00000 62.50 PPM TOC
TPPS3AB WP-11 ICDP 1500.00000 45.45 PPM TOC
TPPS3AB WP-11 LPAH 9200.00000 24.86 PPM TOC
TPPS3AB WP-11 NAPTHALENE 440.00000 4.44 PPM TOC
TPPS3AB WP-11 PCBS 180.00000 15.00 PPM TOC
TPPS3AB WP-11 PHENANTHRN 5600.00000 56.00 PPM TOC
TPPS3AB WP-11 PYRENE 10000.00000 10.00 PPM TOC
TPPS3AB WP-11 TBFLANTH 22000.00000 95.65 PPM TOC
TPPS3AB WP-11 2BANTH 1200.00000 36.36 PPM TOC
TPPS3AB WP-11 ACENAPTHEN 100.00000 6.25 PPM TOC
TPPS3AB WP-11 ACENAPTYLE 640.00000 9.70 PPM TOC
TPPS3AB WP-11 ANTHRACENE 1300.00000 5.91 PPM TOC
TPPS3AB WP-11 BAA 4500.00000 40.91 PPM TOC
TPPS3AB WP-11 BAP 6800.00000 68.69 PPM TOC
TPPS3AB WP-11 BGHIP 5400.00000 174.19 PPM TOC
TPPS3AB WP-11 CHRYSENE 6700.00000 60.91 PPM TOC
TPPS3AB WP-11 DINBP 260.00000 1.18 PPM TOC
TPPS3AB WP-11 FLUORANTHN 6300.00000 39.38 PPM TOC
TPPS3AB WP-11 FLUORENE 640.00000 27.83 PPM TOC
TPPS3AB WP-11 HPAH 51000.00000 53.13 PPM TOC
TPPS3AB WP-11 ICDP 5200.00000 157.58 PPM TOC
TPPS3AB WP-11 LPAH 6200.00000 16.76 PPM TOC
TPPS3AB WP-11 NAPTHALENE 330.00000 3.33 PPM TOC
TPPS3AB WP-11 PCBS 130.00000 10.83 PPM TOC
TPPS3AB WP-11 PHENANTHRN 3200.00000 32.00 PPM TOC
TPPS3AB WP-11 PYRENE 7300.00000 7.30 PPM TOC
TPPS3AB WP-11 TBFLANTH 8000.00000 34.78 PPM TOC
TPPS3AB WP-12 2NOCTP 650.00000 11.21 PPM TOC
TPPS3AB WP-12 BAP 200.00000 2.02 PPM TOC
TPPS3AB WP-12 TBFLANTH 360.00000 1.57 PPM TOC
TPPS3AB WP-12 BUTBNZ_PHT 44.00000 8.98 PPM TOC
TPPS3AB WP-12 PCBS 15.00000 1.25 PPM TOC
TPPS3AB WP-13 PCBS 53.00000 4.42 PPM TOC
TPPS3AB WP-13 2NOCTP 1000.00000 17.24 PPM TOC
TPPS3AB WP-13 BAP 190.00000 1.92 PPM TOC
TPPS3AB WP-13 BGHIP 50.00000 1.61 PPM TOC
TPPS3AB WP-13 CHRYSENE 140.00000 1.27 PPM TOC

TPPS3AB WP-13 DINBP 1700.00000 7.73 PPM TOC
TPPS3AB WP-13 HPAH 1100.00000 1.15 PPM TOC
TPPS3AB WP-13 ICDP 37.00000 1.12 PPM TOC
TPPS3AB WP-13 PCBS 33.00000 2.75 PPM TOC
TPPS3AB WP-13 TBFLANTH 280.00000 1.22 PPM TOC
TPPS3AB WP-14 2NOCTP 12000.00000 206.90 PPM TOC
TPPS3AB WP-14 BUTBNZ_PHT 44.00000 8.98 PPM TOC
TPPS3AB WP-14 FLUORANTHN 400.00000 2.50 PPM TOC
TPPS3AB WP-14 FLUORENE 81.00000 3.52 PPM TOC
TPPS3AB WP-14 MERCURY 0.88000 2.15 PPM DRY
TPPS3AB WP-14 PCBS 25.00000 2.08 PPM TOC
TPPS3AB WP-15 2NOCTP 82.00000 1.41 PPM TOC
TPPS3AB WP-15 BAP 290.00000 2.93 PPM TOC
TPPS3AB WP-15 BGHIP 230.00000 7.42 PPM TOC
TPPS3AB WP-15 CHRYSENE 320.00000 2.91 PPM TOC
TPPS3AB WP-15 FLUORENE 55.00000 2.39 PPM TOC
TPPS3AB WP-15 HPAH 1800.00000 1.88 PPM TOC
TPPS3AB WP-15 ICDP 120.00000 3.64 PPM TOC
TPPS3AB WP-15 PCBS 19.00000 1.58 PPM TOC
TPPS3AB WP-15 TBFLANTH 520.00000 2.26 PPM TOC
TPPS3AB WP-15 2NOCTP 280.00000 4.83 PPM TOC
TPPS3AB WP-15 BGHIP 60.00000 1.94 PPM TOC
TPPS3AB WP-15 BUTBNZ_PHT 64.00000 13.06 PPM TOC
TPPS3AB WP-15 CHRYSENE 130.00000 1.18 PPM TOC
TPPS3AB WP-15 FLUORANTHN 190.00000 1.19 PPM TOC
TPPS3AB WP-15 HPAH 1200.00000 1.25 PPM TOC
TPPS3AB WP-15 ICDP 70.00000 2.12 PPM TOC
TPPS3AB WP-15 PCBS 49.00000 4.08 PPM TOC
TPPS3AB WP-15 PHENANTHRN 110.00000 1.10 PPM TOC
TPPS3AB WP-15 TBFLANTH 290.00000 1.26 PPM TOC
TPPS3AB WP-16 2NOCTP 100.00000 1.72 PPM TOC
TPPS3AB WP-16 PCBS 21.00000 1.75 PPM TOC
TPPS3AB WP-16 TBFLANTH 240.00000 1.04 PPM TOC
PSDDA1 EBB02 MERCURY 0.48000 1.17 PPM DRY
PSDDA1 EBB03 MERCURY 0.53000 1.29 PPM DRY
PSDDA1 EBP01 PCBS 82.00000 6.83 PPM TOC
PSDDA1 EBP04 MERCURY 0.74000 1.80 PPM DRY
PSDDA1 EBP05 2BANTH 41.00000 1.24 PPM TOC
PSDDA1 EBP05 BGHIP 80.00000 2.58 PPM TOC
PSDDA1 EBP05 ICDP 93.00000 2.82 PPM TOC
PSDDA1 EBP05 MERCURY 0.71000 1.73 PPM DRY
PSDDA1 EBP06 MERCURY 0.47000 1.15 PPM DRY
PSDDA1 EBP07 MERCURY 0.44000 1.07 PPM DRY
PSDDA1 EBP07 PCBS 25.00000 2.08 PPM TOC
PSDDA1 EBP08 MERCURY 0.64000 1.56 PPM DRY
PSDDA1 EBP08 PCBS 50.00000 4.17 PPM TOC
PSDDA1 EBP09 MERCURY 0.44000 1.07 PPM DRY
PSDDA1 EBP09 PCBS 20.00000 1.67 PPM TOC
PSDDA1 EBP10 MERCURY 0.47000 1.15 PPM DRY
PSDDA1 EBP10 PCBS 21.00000 1.75 PPM TOC
PSDDA1 EBS01 MERCURY 0.61000 1.49 PPM DRY
PSDDA1 EBS02 2BANTH 46.00000 1.39 PPM TOC
PSDDA1 EBS02 BAP 130.00000 1.31 PPM TOC
PSDDA1 EBS02 BGHIP 75.00000 2.42 PPM TOC
PSDDA1 EBS02 HPAH 1100.00000 1.15 PPM TOC
PSDDA1 EBS02 ICDP 95.00000 2.88 PPM TOC
PSDDA1 EBS02 MERCURY 7.30000 17.80 PPM DRY
PSDDA1 EBS02 PCBS 22.00000 1.83 PPM TOC
PSDDA1 EBS02 PHENANTHRN 130.00000 1.30 PPM TOC
PSDDA1 EBZ01 MERCURY 2.30000 5.61 PPM DRY
PSDDA1 EBZ01 PCBS 13.00000 1.08 PPM TOC
DUWAM84 U101 PHENOL 560.00000 1.33 PPB DRY
DUWAM84 U102 24-2MPHN 53.00000 1.83 PPB DRY
DUWAM84 U107 PHENOL 1200.00000 2.86 PPB DRY
DUWAM84 U113 ZINC 830.00000 2.02 PPM DRY
DUWAM84 U115 PHENOL 1600.00000 3.81 PPB DRY
DUWAM84 U115 ZINC 440.00000 1.07 PPM DRY
DUWAM84 U120 ACENAPTHEN 31.00000 1.94 PPM TOC
DUWAM84 U120 ZINC 690.00000 1.68 PPM DRY
DUWAM84 U121 12-2CLBNZ 3.00000 1.30 PPM TOC
DUWAM84 U121 ARSENIC 84.00000 1.47 PPM DRY
DUWAM84 U121 ICDP 46.00000 1.39 PPM TOC
DUWAM84 U121 MERCURY 0.65000 1.59 PPM DRY
DUWAM84 U121 PCBS 23.00000 1.92 PPM TOC
DUWAM84 U121 ZINC 660.00000 1.61 PPM DRY
DUWAM84 U122 ARSENIC 71.00000 1.25 PPM DRY
DUWAM84 U122 MERCURY 0.71000 1.73 PPM DRY

TPPS3AB WP-13 DINBP 1700.00000 7.73 PPM TOC
TPPS3AB WP-13 HPAH 1100.00000 1.15 PPM TOC
TPPS3AB WP-13 ICDP 37.00000 1.12 PPM TOC
TPPS3AB WP-13 PCBS 33.00000 2.75 PPM TOC
TPPS3AB WP-13 TBFLANTH 280.00000 1.22 PPM TOC
TPPS3AB WP-14 2NOCTP 12000.00000 206.90 PPM TOC
TPPS3AB WP-14 BUTBNZ_PHT 44.00000 8.98 PPM TOC
TPPS3AB WP-14 FLUORANTHN 400.00000 2.50 PPM TOC
TPPS3AB WP-14 FLUORENE 81.00000 3.52 PPM TOC
TPPS3AB WP-14 MERCURY 0.88000 2.15 PPM DRY
TPPS3AB WP-14 PCBS 25.00000 2.08 PPM TOC
TPPS3AB WP-15 2NOCTP 82.00000 1.41 PPM TOC
TPPS3AB WP-15 BAP 290.00000 2.93 PPM TOC
TPPS3AB WP-15 BGHIP 230.00000 7.42 PPM TOC
TPPS3AB WP-15 CHRYSENE 320.00000 2.91 PPM TOC
TPPS3AB WP-15 FLUORENE 55.00000 2.39 PPM TOC
TPPS3AB WP-15 HPAH 1800.00000 1.88 PPM TOC
TPPS3AB WP-15 ICDP 120.00000 3.64 PPM TOC
TPPS3AB WP-15 PCBS 19.00000 1.58 PPM TOC
TPPS3AB WP-15 TBFLANTH 520.00000 2.26 PPM TOC
TPPS3AB WP-15 2NOCTP 280.00000 4.83 PPM TOC
TPPS3AB WP-15 BGHIP 60.00000 1.94 PPM TOC
TPPS3AB WP-15 BUTBNZ_PHT 64.00000 13.06 PPM TOC
TPPS3AB WP-15 CHRYSENE 130.00000 1.18 PPM TOC
TPPS3AB WP-15 FLUORANTHN 190.00000 1.19 PPM TOC
TPPS3AB WP-15 HPAH 1200.00000 1.25 PPM TOC
TPPS3AB WP-15 ICDP 70.00000 2.12 PPM TOC
TPPS3AB WP-15 PCBS 49.00000 4.08 PPM TOC
TPPS3AB WP-15 PHENANTHRN 110.00000 1.10 PPM TOC
TPPS3AB WP-15 TBFLANTH 290.00000 1.26 PPM TOC
TPPS3AB WP-16 2NOCTP 100.00000 1.72 PPM TOC
TPPS3AB WP-16 PCBS 21.00000 1.75 PPM TOC
TPPS3AB WP-16 TBFLANTH 240.00000 1.04 PPM TOC
PSDDA1 EBB02 MERCURY 0.48000 1.17 PPM DRY
PSDDA1 EBB03 MERCURY 0.53000 1.29 PPM DRY
PSDDA1 EBP01 PCBS 82.00000 6.83 PPM TOC
PSDDA1 EBP04 MERCURY 0.74000 1.80 PPM DRY
PSDDA1 EBP05 2BANTH 41.00000 1.24 PPM TOC
PSDDA1 EBP05 BGHIP 80.00000 2.58 PPM TOC
PSDDA1 EBP05 ICDP 93.00000 2.82 PPM TOC
PSDDA1 EBP05 MERCURY 0.71000 1.73 PPM DRY
PSDDA1 EBP06 MERCURY 0.47000 1.15 PPM DRY
PSDDA1 EBP07 MERCURY 0.44000 1.07 PPM DRY
PSDDA1 EBP07 PCBS 25.00000 2.08 PPM TOC
PSDDA1 EBP08 MERCURY 0.64000 1.56 PPM DRY
PSDDA1 EBP08 PCBS 50.00000 4.17 PPM TOC
PSDDA1 EBP09 MERCURY 0.44000 1.07 PPM DRY
PSDDA1 EBP09 PCBS 20.00000 1.67 PPM TOC
PSDDA1 EBP10 MERCURY 0.47000 1.15 PPM DRY
PSDDA1 EBP10 PCBS 21.00000 1.75 PPM TOC
PSDDA1 EBS01 MERCURY 0.61000 1.49 PPM DRY
PSDDA1 EBS02 2BANTH 46.00000 1.39 PPM TOC
PSDDA1 EBS02 BAP 130.00000 1.31 PPM TOC
PSDDA1 EBS02 BGHIP 75.00000 2.42 PPM TOC
PSDDA1 EBS02 HPAH 1100.00000 1.15 PPM TOC
PSDDA1 EBS02 ICDP 95.00000 2.88 PPM TOC
PSDDA1 EBS02 MERCURY 7.30000 17.80 PPM DRY
PSDDA1 EBS02 PCBS 22.00000 1.83 PPM TOC
PSDDA1 EBS02 PHENANTHRN 130.00000 1.30 PPM TOC
PSDDA1 EBZ01 MERCURY 2.30000 5.61 PPM DRY
PSDDA1 EBZ01 PCBS 13.00000 1.08 PPM TOC
DUWAM84 U101 PHENOL 560.00000 1.33 PPB DRY
DUWAM84 U102 24-2MPHN 53.00000 1.83 PPB DRY
DUWAM84 U107 PHENOL 1200.00000 2.86 PPB DRY
DUWAM84 U113 ZINC 830.00000 2.02 PPM DRY
DUWAM84 U115 PHENOL 1600.00000 3.81 PPB DRY
DUWAM84 U115 ZINC 440.00000 1.07 PPM DRY
DUWAM84 U120 ACENAPTHEN 31.00000 1.94 PPM TOC
DUWAM84 U120 ZINC 690.00000 1.68 PPM DRY
DUWAM84 U121 12-2CLBNZ 3.00000 1.30 PPM TOC
DUWAM84 U121 ARSENIC 84.00000 1.47 PPM DRY
DUWAM84 U121 ICDP 46.00000 1.39 PPM TOC
DUWAM84 U121 MERCURY 0.65000 1.59 PPM DRY
DUWAM84 U121 PCBS 23.00000 1.92 PPM TOC
DUWAM84 U121 ZINC 660.00000 1.61 PPM DRY
DUWAM84 U122 ARSENIC 71.00000 1.25 PPM DRY
DUWAM84 U122 MERCURY 0.71000 1.73 PPM DRY

DUWAM84 U123 ZINC 840.00000 2.05 PPM DRY
DUWAM84 U124 PHENOL 850.00000 2.02 PPB DRY
DUWAM84 U125 PHENOL 480.00000 1.14 PPB DRY
DUWAM84 U127 MERCURY 0.56000 1.37 PPM DRY
DUWAM84 U128 ZINC 590.00000 1.44 PPM DRY
DUWAM84 U131 ZINC 620.00000 1.51 PPM DRY
DUWAM84 U133 ARSENIC 78.00000 1.37 PPM DRY
DUWAM84 U133 PCBS 20.00000 1.67 PPM TOC
DUWAM84 U133 PHENOL 2200.00000 5.24 PPB DRY
DUWAM84 U133 ZINC 570.00000 1.39 PPM DRY
DUWAM84 U134 MERCURY 0.79000 1.93 PPM DRY
DUWAM84 U134 PCBS 16.00000 1.33 PPM TOC
DUWAM84 U134 ZINC 420.00000 1.02 PPM DRY
DUWAM84 U135 PCBS 24.00000 2.00 PPM TOC
DUWAM84 U136 24-2MPHN 560.00000 19.31 PPB DRY
DUWAM84 U136 PHENOL 580.00000 1.38 PPB DRY
DUWAM84 U137 ACENAPTHEN 300.00000 18.75 PPM TOC
DUWAM84 U137 FLUORENE 260.00000 11.30 PPM TOC
DUWAM84 U137 MERCURY 0.57000 1.39 PPM DRY
DUWAM84 U137 PHENANTHRN 250.00000 2.50 PPM TOC
DUWAM85 LSAT01 MERCURY 0.48000 1.17 PPM DRY
DUWAM85 LSBQ01 MERCURY 0.46000 1.12 PPM DRY
DUWAM85 LSCL01 MERCURY 0.50000 1.22 PPM DRY
DUWAM85 LSCT02 MERCURY 0.53000 1.29 PPM DRY
EPAPS88 14 MERCURY 1.10000 2.68 PPM DRY
EPAPS88 14 PCBS 31.00000 2.58 PPM TOC
EPAPS88 2 BGHIP 47.00000 1.52 PPM TOC
EPAPS88 2 ICDP 45.00000 1.36 PPM TOC
EPAPS88 2 MERCURY 1.10000 2.68 PPM DRY
EPAPS88 2 PCBS 19.00000 1.58 PPM TOC
EPAPS88 5 5CLPHN 370.00000 1.03 PPB DRY
EPAPS88 5 B2ETHXPHTH 97.00000 2.06 PPM TOC
EPAPS88 5 BAA 140.00000 1.27 PPM TOC
EPAPS88 5 BAP 190.00000 1.92 PPM TOC
EPAPS88 5 BGHIP 90.00000 2.90 PPM TOC
EPAPS88 5 CHRYSENE 200.00000 1.82 PPM TOC
EPAPS88 5 COPPER 640.00000 1.64 PPM DRY
EPAPS88 5 FLUORANTHN 280.00000 1.75 PPM TOC
EPAPS88 5 HPAH 1900.00000 1.98 PPM TOC
EPAPS88 5 ICDP 100.00000 3.03 PPM TOC
EPAPS88 5 MERCURY 2.60000 6.34 PPM DRY
EPAPS88 5 PCBS 63.00000 5.25 PPM TOC
EPAPS88 5 PHENANTHRN 180.00000 1.80 PPM TOC
EPAPS88 5 TBFLANTH 370.00000 1.61 PPM TOC
EPAPS88 5 ZINC 800.00000 1.95 PPM DRY
EPAPS88 7 2BANTH 36.00000 1.09 PPM TOC
EPAPS88 7 5CLPHN 890.00000 2.47 PPB DRY
EPAPS88 7 ACENAPTHEN 25.00000 1.56 PPM TOC
EPAPS88 7 ARSENIC 92.00000 1.61 PPM DRY
EPAPS88 7 B2ETHXPHTH 120.00000 2.55 PPM TOC
EPAPS88 7 BAA 350.00000 3.18 PPM TOC
EPAPS88 7 BAP 410.00000 4.14 PPM TOC
EPAPS88 7 BGHIP 190.00000 6.13 PPM TOC
EPAPS88 7 BUTBNZ_PHT 16.00000 3.27 PPM TOC
EPAPS88 7 CHROMIUM 270.00000 1.04 PPM DRY
EPAPS88 7 CHRYSENE 580.00000 5.27 PPM TOC
EPAPS88 7 COPPER 720.00000 1.85 PPM DRY
EPAPS88 7 DIBNZFURAN 24.00000 1.60 PPM TOC
EPAPS88 7 FLUORANTHN 1200.00000 7.50 PPM TOC
EPAPS88 7 FLUORENE 64.00000 2.78 PPM TOC
EPAPS88 7 HPAH 5500.00000 5.73 PPM TOC
EPAPS88 7 ICDP 230.00000 6.97 PPM TOC
EPAPS88 7 LEAD 490.00000 1.09 PPM DRY
EPAPS88 7 LPAH 990.00000 2.68 PPM TOC
EPAPS88 7 MERCURY 6.60000 16.10 PPM DRY
EPAPS88 7 PCBS 99.00000 8.25 PPM TOC
EPAPS88 7 PHENANTHRN 760.00000 7.60 PPM TOC
EPAPS88 7 PYRENE 1600.00000 1.60 PPM TOC
EPAPS88 7 TBFLANTH 930.00000 4.04 PPM TOC
EPAPS88 7 ZINC 2400.00000 5.85 PPM DRY
EPA8283 12 ZINC 1200.00000 2.93 PPM DRY
EPA8283 12 ZINC 670.00000 1.63 PPM DRY
EPA8283 15 ARSENIC 100.00000 1.75 PPM DRY
EPA8283 15 ARSENIC 60.00000 1.05 PPM DRY
EPA8283 37 LEAD 970.00000 2.16 PPM DRY
EPA8283 37 PHENOL 500.00000 1.19 PPB DRY
EPA8283 39 5CLPHN 380.00000 1.06 PPB DRY

EPA8283 39 COPPER 1200.00000 3.08 PPM DRY
EPA8283 39 ZINC 580.00000 1.41 PPM DRY
EPA8283 4 ARSENIC 560.00000 9.82 PPM DRY
EPA8283 4 COPPER 2800.00000 7.18 PPM DRY
EPA8283 4 PHENOL 520.00000 1.24 PPB DRY
EPA8283 4 ZINC 3200.00000 7.80 PPM DRY
EPA8283 42 ARSENIC 1400.00000 24.56 PPM DRY
EPA8283 42 COPPER 1100.00000 2.82 PPM DRY
EPA8283 42 LEAD 2200.00000 4.89 PPM DRY
EPA8283 42 ZINC 4800.00000 11.71 PPM DRY
EPA8283 43 ZINC 610.00000 1.49 PPM DRY
EPA8283 44 ZINC 540.00000 1.32 PPM DRY
EPA8283 6A ZINC 430.00000 1.05 PPM DRY
GAMPONIA LTHB01 MERCURY 0.47000 1.15 PPM DRY
GAMPONIA LTHC03 24-2MPHN 600.00000 20.69 PPB DRY
GAMPONIA LTHC03 ARSENIC 180.00000 3.16 PPM DRY
GAMPONIA LTHC03 MERCURY 1.80000 4.39 PPM DRY
GAMPONIA LTHC03 ZINC 660.00000 1.61 PPM DRY
GAMPONIA LTHD03 24-2MPHN 290.00000 10.00 PPB DRY
GAMPONIA LTHD03 MERCURY 0.70000 1.71 PPM DRY
GAMPONIA LTHD04 ARSENIC 87.00000 1.53 PPM DRY
GAMPONIA LTHD04 MERCURY 1.00000 2.44 PPM DRY
GAMPONIA LTHE01 24-2MPHN 810.00000 27.93 PPB DRY
GAMPONIA LTHE01 ARSENIC 100.00000 1.75 PPM DRY
GAMPONIA LTHE01 COPPER 510.00000 1.31 PPM DRY
GAMPONIA LTHE01 MERCURY 1.90000 4.63 PPM DRY
GAMPONIA LTHE01 ZINC 790.00000 1.93 PPM DRY
GAMPONIA LTHE02 24-2MPHN 450.00000 15.52 PPB DRY
GAMPONIA LTHE02 MERCURY 0.53000 1.29 PPM DRY
GAMPONIA LTHE03 24-2MPHN 690.00000 23.79 PPB DRY
GAMPONIA LTHE03 5CLPHN 380.00000 1.06 PPB DRY
GAMPONIA LTHE03 ARSENIC 270.00000 4.74 PPM DRY
GAMPONIA LTHE03 COPPER 1700.00000 4.36 PPM DRY
GAMPONIA LTHE03 LEAD 630.00000 1.40 PPM DRY
GAMPONIA LTHE03 MERCURY 12.00000 29.27 PPM DRY
GAMPONIA LTHE03 ZINC 1800.00000 4.39 PPM DRY
GAMPONIA LTIB07 24-2MPHN 620.00000 21.38 PPB DRY
GAMPONIA LTIC05 MERCURY 0.73000 1.78 PPM DRY
GAMPONIA LTID04 24-2MPHN 630.00000 21.72 PPB DRY
GAMPONIA LTID04 ARSENIC 120.00000 2.11 PPM DRY
GAMPONIA LTID04 COPPER 860.00000 2.21 PPM DRY
GAMPONIA LTID04 LEAD 11000.00000 24.44 PPM DRY
GAMPONIA LTID04 MERCURY 0.78000 1.90 PPM DRY
GAMPONIA LTID04 ZINC 1600.00000 3.90 PPM DRY
GAMPONIA LTID05 ARSENIC 59.00000 1.04 PPM DRY
GAMPONIA LTID05 MERCURY 0.98000 2.39 PPM DRY
GAMPONIA LTJD05 24-2MPHN 380.00000 13.10 PPB DRY
GAMPONIA LTKD03 ARSENIC 61.00000 1.07 PPM DRY
GAMPONIA LTKD03 MERCURY 0.52000 1.27 PPM DRY
GAMPONIA LTKD04 ARSENIC 79.00000 1.39 PPM DRY
GAMPONIA LTKD04 MERCURY 0.79000 1.93 PPM DRY
MALINS 10015 CADMIUM 5.40000 1.06 PPM DRY
MALINS 10015 MERCURY 0.90000 2.20 PPM DRY
MALINS 10016 CADMIUM 5.70000 1.12 PPM DRY
MALINS 10016 MERCURY 1.40000 3.41 PPM DRY
MALINS 10030 ARSENIC 84.00000 1.47 PPM DRY
MALINS 10030 CADMIUM 11.00000 2.16 PPM DRY
MALINS 10030 LEAD 630.00000 1.40 PPM DRY
MALINS 10030 MERCURY 0.80000 1.95 PPM DRY
MALINS 10031 ARSENIC 70.00000 1.23 PPM DRY
MALINS 10031 CADMIUM 7.00000 1.37 PPM DRY
MALINS 10036 CADMIUM 8.30000 1.63 PPM DRY
MALINS 10039 ARSENIC 280.00000 4.91 PPM DRY
MALINS 10039 CADMIUM 18.00000 3.53 PPM DRY
MALINS 10040 CADMIUM 7.00000 1.37 PPM DRY
MALINS 10040 MERCURY 0.63000 1.54 PPM DRY
MALINS 10041 CADMIUM 6.50000 1.27 PPM DRY
MALINS 10041 MERCURY 1.10000 2.68 PPM DRY
MALINS 10042 CADMIUM 7.40000 1.45 PPM DRY
MALINS 10043 CADMIUM 6.50000 1.27 PPM DRY
MALINS 10043 MERCURY 0.42000 1.02 PPM DRY
MALINS 10044 CADMIUM 8.20000 1.61 PPM DRY
MALINS 10044 MERCURY 0.45000 1.10 PPM DRY
MALINS 10045 CADMIUM 7.30000 1.43 PPM DRY

APPENDIX B

Adjacent Station Pairs in Elliott Bay

APPENDIX B
Adjacent Station Pairs in Elliott Bay

The file listed below includes all stations in Elliott Bay that share a Thiessen polygon edge. The data were generated by constructing a TIN of all stations in ARC/INFO® and saving as a text file the names of the stations at the ends of every arc in the TIN.

LISTING B-1. SNTPDOS.FIL

The data columns in this file identify the data record (line) number, the arc identifier used by ARC/INFO®, the length of the arc connecting the stations (feet), and the survey and station identifiers of the two adjacent stations

Station Pairs for Elliott Bay

To: Dreas N.
From: Susan B.
Date: 4/11/91

$RECNO	EBARC2-ID	LENGTH	FROM-SURVEY	FROM-STN	TO-SURVEY	TO-STN
1	1	530.908	EPA8283	12A	EBCHEM	KG-02
2	3	342.968	EBCHEM	KG-01	EPA8283	12A
3	17	1,470.813	MALINS	10046	EBCHEM	SS-03
4	18	1,361.149	MALINS	10046	PSDDA1	EBB02
5	19	1,318.009	PSDDA1	EBB02	EBCHEM	SS-03
6	20	1,363.905	PSDDA1	EBB02	EBCHEM	SS-04
7	21	608.039	EBCHEM	SS-04	EBCHEM	SS-03
8	22	1,517.833	PSDDA1	EBB02	EBCHEM	SS-05
9	23	1,064.095	EBCHEM	SS-05	EBCHEM	SS-04
10	26	288.713	EBCHEM	SS-05	TPPS	S0090
11	27	611.858	TPPS	S0090	EBCHEM	SS-06
12	28	855.928	TPPS	S0090	MALINS	10015
13	29	1,223.299	MALINS	10015	EBCHEM	SS-06
14	30	1,380.030	MALINS	10015	EBCHEM	SS-07
15	31	409.287	EBCHEM	SS-07	EBCHEM	SS-06
16	36	577.429	EBCHEM	SS-08	EBCHEM	SS-09
17	41	11,948.900	TPPS3AB	WP-10	DUWAM85	KSJJ01
18	42	9,427.472	TPPS3AB	WP-10	TPPS3AB	WP-12
19	43	5,060.673	TPPS3AB	WP-12	DUWAM85	KSJJ01
20	44	4,518.760	TPPS3AB	WP-10	TPPS3AB	WP-01
21	45	6,513.979	TPPS3AB	WP-01	TPPS3AB	WP-12
22	46	3,503.785	TPPS3AB	WP-01	TPPS3AB	WP-13
23	47	6,798.161	TPPS3AB	WP-13	TPPS3AB	WP-12
24	48	1,401.763	TPPS3AB	WP-01	TPPS3AB	WP-02
25	49	3,845.362	TPPS3AB	WP-02	TPPS3AB	WP-13
26	50	1,690.693	TPPS3AB	WP-02	TPPS3AB	WP-04
27	51	3,867.650	TPPS3AB	WP-04	TPPS3AB	WP-13
28	52	3,155.627	TPPS3AB	WP-04	TPPS3AB	WP-14
29	53	1,734.877	TPPS3AB	WP-14	TPPS3AB	WP-13
30	58	11,823.510	TPPS3AB	WP-16	DUWAM85	LSCL01
31	59	11,261.230	DUWAM85	LSCL01	DUWAM85	LSJK01
32	60	5,095.803	DUWAM85	LSCL01	DUWAM85	LSFN01
33	61	7,429.177	DUWAM85	LSFN01	DUWAM85	LSJK01
34	62	5,607.292	DUWAM85	LSFN01	DUWAM85	LSIN01

35	63	3,832.012	DUWAM85	LSIN01	DUWAM85	LSJK01
36	64	922.272	DUWAM85	LSIN01	DUWAM84	U104
37	65	3,510.022	DUWAM84	U104	DUWAM85	LSJK01
38	66	2,951.375	DUWAM84	U104	ALKI	AP-06
39	67	4,600.493	ALKI	AP-06	DUWAM85	LSJK01
40	68	4,458.541	ALKI	AP-06	DUWAM85	LSML01
41	69	6,034.896	DUWAM85	LSML01	DUWAM85	LSJK01
42	70	1,652.612	ALKI	AP-06	ALKI	AP-05
43	71	5,067.902	ALKI	AP-05	DUWAM85	LSML01
44	72	2,909.490	ALKI	AP-05	DUWAM85	LSMQ01
45	73	5,625.205	DUWAM85	LSMQ01	DUWAM85	LSML01
46	77	896.782	EBCHEM	KG-03	EPA8283	11
47	78	627.338	EBCHEM	KG-03	EBCHEM	KG-02
48	79	405.299	EBCHEM	KG-02	EPA8283	11
49	80	342.968	EPA8283	12A	EPA8283	11
50	81	1,621.255	EBCHEM	KG-03	EBCHEM	KG-05
51	83	122.387	EBCHEM	KG-05	EBCHEM	KG-04
52	84	530.956	EBCHEM	KG-05	EPA8283	10
53	85	511.704	EPA8283	10	EBCHEM	KG-04
54	86	914.534	EPA8283	10	EBCHEM	KG-08
55	88	511.314	EBCHEM	KG-08	TPPS	0149
56	91	489.416	TPPS	0149	EBCHEM	KG-10
57	92	1,349.604	EBCHEM	KG-10	EBCHEM	EW-01
58	93	1,042.175	EBCHEM	KG-10	EBCHEM	KG-11
59	96	506.639	EPA8283	35	EBCHEM	EW-01
60	97	341.073	EPA8283	35	EBCHEM	EW-02
61	98	304.021	EPA8283	35	EPA8283	3
62	99	292.448	EPA8283	3	EBCHEM	EW-02
63	100	607.977	EPA8283	3	EBCHEM	EW-03
64	101	760.569	EBCHEM	EW-03	EBCHEM	EW-02
65	103	880.153	EBCHEM	EW-03	TPPS	A062
66	105	304.021	TPPS	A062	TPPS	B062
67	107	101.340	TPPS	B062	TPPS	C062
68	108	627.091	TPPS	C062	EBCHEM	EW-06
69	111	810.657	EBCHEM	EW-09	EBCHEM	EW-11
70	114	511.208	EBCHEM	EW-11	EPA8283	34A
71	116	667.011	EPA8283	34A	EBCHEM	EW-13
72	118	1,166.208	EBCHEM	EW-13	EBCHEM	EW-14
73	120	584.669	EBCHEM	EW-14	EPA8283	1A
74	121	292.332	EPA8283	1A	EBCHEM	EW-15
75	124	1,123.079	EBCHEM	SS-01	MALINS	10046
76	125	1,804.943	EBCHEM	SS-01	DUWAM84	U125
77	126	1,385.757	DUWAM84	U125	MALINS	10046
78	127	734.011	DUWAM84	U125	PSDDA1	EBP06
79	128	1,256.138	PSDDA1	EBP06	MALINS	10046
80	129	798.248	PSDDA1	EBP06	PSDDA1	EBB02
81	130	1,711.517	PSDDA1	EBP06	PSDDA1	EBP05
82	131	1,612.426	PSDDA1	EBP05	PSDDA1	EBB02
83	132	959.512	PSDDA1	EBP05	MALINS	10015
84	133	1,133.429	MALINS	10015	PSDDA1	EBB02
85	134	980.707	MALINS	10015	EBCHEM	SS-05
86	135	1,925.440	PSDDA1	EBP05	TPPS	S0065
87	136	1,855.907	TPPS	S0065	MALINS	10015
88	137	908.342	TPPS	S0065	EBCHEM	SS-07
89	138	427.876	TPPS	S0065	EBCHEM	SS-08
90	139	1,625.644	TPPS	S0065	PSDDA1	EBP04
91	140	1,704.545	PSDDA1	EBP04	EBCHEM	SS-08
92	141	1,712.630	PSDDA1	EBP04	EBCHEM	SS-09
93	142	1,968.734	PSDDA1	EBP04	TPPS	C061
94	143	1,461.150	TPPS	C061	EBCHEM	SS-09
95	144	458.337	TPPS	C061	EBCHEM	SS-10
96	145	1,193.101	EBCHEM	SS-10	EBCHEM	SS-09
97	151	798.077	TPPS	S0031	EBCHEM	NS-02
98	153	915.983	EBCHEM	NS-02	EBCHEM	NS-03
99	155	1,305.622	EBCHEM	NS-03	EBCHEM	NS-05
100	157	681.748	EBCHEM	NS-05	EBCHEM	NS-04
101	158	2,139.296	EBCHEM	NS-04	EBCHEM	NS-06
102	159	1,032.491	EBCHEM	NS-04	EBCHEM	NS-07
103	160	2,155.382	EBCHEM	NS-07	EBCHEM	NS-06
104	161	2,353.286	EBCHEM	NS-07	EBCHEM	NS-08
105	165	1,771.004	TPPS3AB	WP-11	TPPS3AB	WP-10
106	166	3,640.911	TPPS3AB	WP-11	TPPS3AB	WP-02
107	167	4,280.554	TPPS3AB	WP-02	TPPS3AB	WP-10
108	168	2,384.788	TPPS3AB	WP-11	TPPS3AB	WP-03
109	169	2,428.356	TPPS3AB	WP-03	TPPS3AB	WP-02
110	170	2,193.007	TPPS3AB	WP-03	TPPS3AB	WP-04
111	171	2,170.800	TPPS3AB	WP-03	TPPS3AB	WP-05

112	172	1,615.727	TPPS3AB	WP-05	TPPS3AB	WP-04
113	173	2,747.021	TPPS3AB	WP-05	TPPS3AB	WP-15
114	174	3,667.660	TPPS3AB	WP-15	TPPS3AB	WP-04
115	175	3,908.886	TPPS3AB	WP-15	TPPS3AB	WP-14
116	176	4,492.282	TPPS3AB	WP-15	TPPS3AB	WP-16
117	177	2,132.310	TPPS3AB	WP-15	TPPS3AB	WP-07
118	178	5,024.634	TPPS3AB	WP-07	TPPS3AB	WP-16
119	179	4,492.468	TPPS3AB	WP-07	TPPS3AB	WP-09
120	180	4,109.252	TPPS3AB	WP-09	TPPS3AB	WP-16
121	181	5,542.630	TPPS3AB	WP-09	TPPS	S0054
122	182	7,672.750	TPPS	S0054	TPPS3AB	WP-16
123	183	6,587.407	TPPS	S0054	DUWAM85	LSCL01
124	184	2,331.699	TPPS	S0054	EIGHTBAY	EL-12
125	185	4,488.069	EIGHTBAY	EL-12	DUWAM85	LSCL01
126	186	3,870.082	EIGHTBAY	EL-12	DUWAM84	U107
127	187	3,426.408	DUWAM84	U107	DUWAM85	LSCL01
128	188	4,560.715	DUWAM84	U107	DUWAM85	LSFN01
129	189	3,327.191	DUWAM84	U107	DUWAM85	LSEP01
130	190	2,441.933	DUWAM85	LSEP01	DUWAM85	LSFN01
131	191	405.308	DUWAM85	LSEP01	DUWAM84	U108
132	192	2,249.364	DUWAM84	U108	DUWAM85	LSFN01
133	193	2,850.569	DUWAM84	U108	DUWAM85	LSGP01
134	194	2,623.545	DUWAM85	LSGP01	DUWAM85	LSFN01
135	195	3,829.534	DUWAM85	LSGP01	DUWAM85	LSIN01
136	196	2,536.991	DUWAM85	LSGP01	DUWAM85	LSHP01
137	197	1,714.422	DUWAM85	LSHP01	DUWAM85	LSIN01
138	198	2,466.527	DUWAM85	LSHP01	DUWAM85	LSJP03
139	199	1,590.504	DUWAM85	LSJP03	DUWAM85	LSIN01
140	200	1,105.466	DUWAM85	LSJP03	DUWAM84	U104
141	201	2,643.174	DUWAM85	LSJP03	ALKI	AP-06
142	202	2,866.073	DUWAM85	LSJP03	TPPS	A160
143	203	2,704.945	TPPS	A160	ALKI	AP-06
144	204	1,732.717	TPPS	A160	ALKI	AP-05
145	205	611.822	TPPS	A160	TPPS	B160
146	206	1,729.467	TPPS	B160	ALKI	AP-05
147	207	1,049.758	TPPS	B160	ALKI	AP-04
148	208	1,338.027	ALKI	AP-04	ALKI	AP-05
149	209	2,331.616	ALKI	AP-04	DUWAM85	LSMQ01
150	210	521.109	ALKI	AP-04	TPPS	S0035
151	211	2,197.506	TPPS	S0035	DUWAM85	LSMQ01
152	212	1,553.200	TPPS	S0035	ALKI	AP-02
153	218	1,807.851	EBCHEM	KG-06	EBCHEM	KG-03
154	219	557.922	EBCHEM	KG-06	EBCHEM	KG-05
155	220	367.067	EBCHEM	KG-06	EPA8283	10
156	221	760.569	EBCHEM	KG-06	EBCHEM	KG-07
157	222	628.324	EBCHEM	KG-07	EPA8283	10
158	223	652.706	EBCHEM	KG-07	EBCHEM	KG-08
159	224	546.856	EBCHEM	KG-07	MALINS	10031
160	225	205.681	MALINS	10031	EBCHEM	KG-08
161	226	405.361	MALINS	10031	EPA8283	9B
162	227	454.551	EPA8283	9B	EBCHEM	KG-08
163	228	292.443	EPA8283	9B	TPPS	0149
164	229	122.315	EPA8283	9B	DUWAM84	U133
165	230	205.806	DUWAM84	U133	TPPS	0149
166	231	411.069	DUWAM84	U133	EBCHEM	KG-10
167	233	698.078	EPA8283	9C	EBCHEM	KG-10
168	234	68.519	EPA8283	9C	EBCHEM	KG-09
169	235	734.156	EBCHEM	KG-09	EBCHEM	KG-10
170	236	1,152.294	EBCHEM	KG-09	EBCHEM	KG-11
171	239	274.325	EBCHEM	WW-02	EBCHEM	WW-01
172	240	818.948	EBCHEM	WW-01	EBCHEM	KG-11
173	245	697.952	EBCHEM	EW-04	EBCHEM	EW-03
174	246	715.018	EBCHEM	EW-04	TPPS	A062
175	247	530.884	EBCHEM	EW-04	EBCHEM	EW-05
176	248	398.255	EBCHEM	EW-05	TPPS	A062
177	249	357.517	EBCHEM	EW-05	TPPS	B062
178	250	398.290	EBCHEM	EW-05	TPPS	C062
179	251	709.317	EBCHEM	EW-05	EBCHEM	EW-08
180	252	611.777	EBCHEM	EW-08	TPPS	C062
181	253	530.931	EBCHEM	EW-08	EBCHEM	EW-09
182	254	405.361	EBCHEM	EW-08	EPA8283	2
183	255	342.843	EPA8283	2	EBCHEM	EW-09
184	256	880.158	EPA8283	2	EBCHEM	EW-11
185	257	1,188.090	EPA8283	2	EBCHEM	EW-12
186	258	813.018	EBCHEM	EW-12	EBCHEM	EW-11
187	259	423.665	EBCHEM	EW-12	EBCHEM	EW-10
188	260	530.751	EBCHEM	EW-10	EBCHEM	EW-11

189	261	292.324	EBCHEM	EW-10	EPA8283	34A
190	262	101.338	EBCHEM	EW-10	EPA8283	34B
191	263	274.325	EPA8283	34B	EPA8283	34A
192	264	607.980	EPA8283	34B	EBCHEM	EW-13
193	265	274.201	EPA8283	34B	EPA8283	34C
194	266	666.942	EPA8283	34C	EBCHEM	EW-13
195	269	652.625	EBCHEM	NH-01	EBCHEM	NH-11
196	272	1,216.019	TPPS	S0064	EBCHEM	EW-13
197	273	357.497	TPPS	S0064	EBCHEM	EW-14
198	274	101.278	TPPS	S0064	EPA8283	1
199	275	398.222	EPA8283	1	EBCHEM	EW-14
200	276	101.340	EPA8283	1	EBCHEM	EW-16
201	277	458.160	EBCHEM	EW-16	EBCHEM	EW-14
202	279	405.361	EBCHEM	EW-16	DUWAM84	U124
203	281	746.637	DUWAM84	U124	EBCHEM	SS-01
204	282	917.013	DUWAM84	U124	PSDDA1	EBP07
205	283	1,374.745	PSDDA1	EBP07	EBCHEM	SS-01
206	284	1,425.267	PSDDA1	EBP07	DUWAM84	U125
207	285	1,881.074	PSDDA1	EBP07	TPPS	0150
208	286	1,852.858	TPPS	0150	DUWAM84	U125
209	287	1,563.775	TPPS	0150	PSDDA1	EBS05
210	288	916.221	PSDDA1	EBS05	DUWAM84	U125
211	289	1,096.676	PSDDA1	EBS05	PSDDA1	EBP06
212	290	1,711.492	PSDDA1	EBS05	PSDDA1	EBP05
213	291	1,069.696	PSDDA1	EBS05	PSDDA1	EBS04
214	292	1,078.666	PSDDA1	EBS04	PSDDA1	EBP05
215	293	1,824.001	PSDDA1	EBS04	PSDDA1	EBP04
216	294	1,507.502	PSDDA1	EBP04	PSDDA1	EBP05
217	295	1,085.093	PSDDA1	EBS04	PSDDA1	EBS01
218	296	1,629.698	PSDDA1	EBS01	PSDDA1	EBP04
219	297	1,459.453	PSDDA1	EBS01	PSDDA1	EBS03
220	298	1,306.050	PSDDA1	EBS03	PSDDA1	EBP04
221	299	1,114.684	PSDDA1	EBS03	PSDDA1	EBP03
222	300	1,781.568	PSDDA1	EBP03	PSDDA1	EBP04
223	301	1,138.729	PSDDA1	EBP03	TPPS	C061
224	302	1,246.482	PSDDA1	EBP03	MALINS	10040
225	303	798.131	MALINS	10040	TPPS	C061
226	304	68.519	MALINS	10040	TPPS	B061
227	305	746.445	TPPS	B061	TPPS	C061
228	306	479.632	TPPS	B061	EBCHEM	SS-11
229	307	511.270	EBCHEM	SS-11	TPPS	C061
230	308	567.874	EBCHEM	SS-11	EBCHEM	SS-10
231	313	303.959	TPPS	1603	EBCHEM	NS-01
232	314	68.518	TPPS	1603	TPPS3AB	EB-35
233	315	311.628	TPPS3AB	EB-35	EBCHEM	NS-01
234	316	520.727	TPPS3AB	EB-35	TPPS3AB	EB-33
235	317	557.425	TPPS3AB	EB-33	EBCHEM	NS-01
236	318	409.253	TPPS3AB	EB-33	TPPS	S0032
237	320	524.913	TPPS	S0032	TPPS	S0031
238	321	333.444	TPPS	S0032	MALINS	10041
239	322	810.726	MALINS	10041	TPPS	S0031
240	323	1,454.552	MALINS	10041	EBCHEM	NS-02
241	324	489.280	MALINS	10041	TPPS3AB	EB-34
242	325	1,756.365	TPPS3AB	EB-34	EBCHEM	NS-02
243	326	1,874.759	TPPS3AB	EB-34	TPPS3AB	EB-30
244	327	2,525.714	TPPS3AB	EB-30	EBCHEM	NS-02
245	328	2,346.712	TPPS3AB	EB-30	MALINS	10042
246	329	1,270.090	MALINS	10042	EBCHEM	NS-02
247	330	626.744	MALINS	10042	EBCHEM	NS-03
248	331	1,152.063	MALINS	10042	EBCHEM	NS-05
249	332	1,781.347	MALINS	10042	DUWAM84	U127
250	333	2,353.281	DUWAM84	U127	EBCHEM	NS-05
251	334	2,663.406	DUWAM84	U127	EBCHEM	NS-07
252	335	1,604.731	EBCHEM	NS-07	EBCHEM	NS-05
253	336	4,447.386	DUWAM84	U127	TPPS	S0088
254	337	3,634.839	TPPS	S0088	EBCHEM	NS-07
255	338	4,359.787	TPPS	S0088	EBCHEM	NS-08
256	339	2,909.002	TPPS	S0088	EBCHEM	MG-01
257	341	292.146	EBCHEM	MG-01	TPPS	S0030
258	345	3,178.213	EBCHEM	MG-03	EBCHEM	MG-04
259	349	427.815	MALINS	10023	TPPS3AB	WP-11
260	350	2,048.201	MALINS	10023	TPPS3AB	WP-03
261	352	3,552.656	TPPS3AB	WP-06	TPPS3AB	WP-03
262	353	2,818.884	TPPS3AB	WP-06	TPPS3AB	WP-05
263	354	1,783.165	TPPS3AB	WP-06	TPPS3AB	WP-07
264	355	2,027.834	TPPS3AB	WP-07	TPPS3AB	WP-05
265	356	3,512.808	TPPS3AB	WP-06	TPPS3AB	WP-08

266	357	4,319.353	TPPS3AB	WP-08	TPPS3AB	WP-07
267	358	1,248.361	TPPS3AB	WP-08	TPPS3AB	WP-09
268	359	4,644.710	TPPS3AB	WP-08	DUWAM85	KSYP01
269	360	4,413.681	DUWAM85	KSYP01	TPPS3AB	WP-09
270	361	1,883.656	DUWAM85	KSYP01	TPPS	S0054
271	362	1,233.213	DUWAM85	KSYP01	EIGHTBAY	EL-09
272	363	1,233.071	EIGHTBAY	EL-09	TPPS	S0054
273	364	1,477.038	EIGHTBAY	EL-09	EIGHTBAY	EL-10
274	365	1,873.387	EIGHTBAY	EL-10	TPPS	S0054
275	366	2,106.871	EIGHTBAY	EL-10	EIGHTBAY	EL-12
276	367	1,307.182	EIGHTBAY	EL-10	TPPS	S0059
277	368	2,126.322	TPPS	S0059	EIGHTBAY	EL-12
278	369	611.620	TPPS	S0059	DUWAM85	LSBQ01
279	370	2,499.614	DUWAM85	LSBQ01	EIGHTBAY	EL-12
280	371	2,431.975	DUWAM85	LSBQ01	DUWAM85	LSCQ03
281	372	3,759.619	DUWAM85	LSCQ03	EIGHTBAY	EL-12
282	373	1,761.929	DUWAM85	LSCQ03	DUWAM84	U107
283	374	1,816.530	DUWAM85	LSCQ03	TPPS	0128
284	375	3,016.948	TPPS	0128	DUWAM84	U107
285	376	3,594.995	TPPS	0128	DUWAM85	LSEP01
286	377	1,973.595	TPPS	0128	DUWAM85	LSDS02
287	378	2,936.537	DUWAM85	LSDS02	DUWAM85	LSEP01
288	379	1,123.057	DUWAM85	LSDS02	DUWAM84	U110
289	380	2,537.933	DUWAM84	U110	DUWAM85	LSEP01
290	381	2,586.031	DUWAM84	U110	DUWAM84	U108
291	382	2,250.447	DUWAM84	U110	DUWAM85	LSFQ03
292	383	1,972.805	DUWAM85	LSFQ03	DUWAM84	U108
293	384	2,172.351	DUWAM85	LSFQ03	DUWAM85	LSGP01
294	385	1,712.757	DUWAM85	LSFQ03	DUWAM85	LSGQ01
295	386	685.453	DUWAM85	LSGQ01	DUWAM85	LSGP01
296	387	2,591.989	DUWAM85	LSGQ01	DUWAM85	LSHP01
297	388	2,889.808	DUWAM85	LSGQ01	DUWAM85	LSHQ01
298	389	1,138.203	DUWAM85	LSHQ01	DUWAM85	LSHP01
299	390	2,608.383	DUWAM85	LSHQ01	DUWAM85	LSJP03
300	391	2,230.358	DUWAM85	LSHQ01	DUWAM85	LSJQ02
301	392	1,580.316	DUWAM85	LSJQ02	DUWAM85	LSJP03
302	393	2,055.420	DUWAM85	LSJQ02	TPPS	A160
303	394	897.097	DUWAM85	LSJQ02	ALKI	AP-07
304	395	2,001.918	ALKI	AP-07	TPPS	A160
305	397	584.826	ALKI	AP-01	TPPS	A160
306	398	367.059	ALKI	AP-01	TPPS	B160
307	399	847.512	ALKI	AP-01	ALKI	AP-02
308	400	1,033.571	ALKI	AP-02	TPPS	B160
309	401	1,233.266	TPPS	S0035	TPPS	B160
310	409	213.968	GAMPONIA	LTKD03	EBCHEM	WW-06
311	410	244.702	GAMPONIA	LTKD03	TPPS	S0036
312	411	411.116	TPPS	S0036	EBCHEM	WW-06
313	412	274.327	TPPS	S0036	EBCHEM	WW-08
314	413	530.920	EBCHEM	WW-08	EBCHEM	WW-06
315	414	611.762	EBCHEM	WW-08	EBCHEM	WW-05
316	415	693.269	EBCHEM	WW-05	EBCHEM	WW-06
317	420	836.338	EBCHEM	KG-09	EBCHEM	KG-07
318	421	511.605	EBCHEM	KG-09	MALINS	10031
319	422	458.294	EPA8283	9C	MALINS	10031
320	423	357.638	EPA8283	9C	EPA8283	9B
321	424	568.186	EBCHEM	WW-05	EBCHEM	WW-03
322	425	333.514	EBCHEM	WW-03	EBCHEM	WW-02
323	426	511.544	EBCHEM	WW-03	EBCHEM	WW-01
324	427	524.851	EBCHEM	WW-03	EBCHEM	WW-04
325	432	712.618	EBCHEM	WW-11	EBCHEM	WW-12
326	436	698.007	EBCHEM	EW-07	EBCHEM	EW-05
327	437	357.380	EBCHEM	EW-07	EBCHEM	EW-08
328	438	611.696	EBCHEM	EW-07	EPA8283	2
329	442	607.983	EBCHEM	WW-14	EBCHEM	WW-18
330	446	288.769	EBCHEM	NH-02	GAMPONIA	LTHE02
331	448	511.386	GAMPONIA	LTHE02	EBCHEM	NH-01
332	450	244.680	EPA8283	34C	EBCHEM	EW-12
333	451	292.448	EPA8283	34C	EBCHEM	EW-10
334	452	1,033.996	GAMPONIA	LTHE02	PSDDA1	EBP08
335	453	940.097	PSDDA1	EBP08	EBCHEM	NH-01
336	454	1,048.073	PSDDA1	EBP08	EBCHEM	NH-11
337	455	1,534.137	PSDDA1	EBP08	PSDDA1	EBP07
338	456	1,049.773	PSDDA1	EBP07	EBCHEM	NH-11
339	457	1,254.077	DUWAM84	U124	EBCHEM	NH-11
340	458	1,115.374	EBCHEM	EW-16	EBCHEM	NH-11
341	460	1,756.389	PSDDA1	EBP08	TPPS	0150
342	461	1,349.419	PSDDA1	EBP08	DUWAM84	U122

343	462	896.576	DUWAM84	U122	TPPS	0150
344	463	524.882	DUWAM84	U122	PSDDA1	EBS02
345	464	714.760	PSDDA1	EBS02	TPPS	0150
346	465	1,622.784	PSDDA1	EBS02	PSDDA1	EBZ01
347	466	1,606.560	PSDDA1	EBZ01	TPPS	0150
348	467	1,875.452	PSDDA1	EBZ01	PSDDA1	EBS05
349	468	1,666.377	PSDDA1	EBZ01	PSDDA1	EBS04
350	469	1,333.885	PSDDA1	EBZ01	PSDDA1	EBS01
351	470	1,835.531	PSDDA1	EBZ01	DUWAM84	U123
352	471	968.506	DUWAM84	U123	PSDDA1	EBS01
353	472	908.960	DUWAM84	U123	PSDDA1	EBS03
354	473	1,385.210	DUWAM84	U123	PSDDA1	EBS09
355	474	1,270.419	PSDDA1	EBS09	PSDDA1	EBS03
356	475	1,476.034	PSDDA1	EBS09	PSDDA1	EBP03
357	476	1,944.735	PSDDA1	EBS09	PSDDA1	EBB03
358	477	1,874.888	PSDDA1	EBB03	PSDDA1	EBP03
359	478	1,494.971	PSDDA1	EBB03	TPPS	A061
360	479	1,521.540	TPPS	A061	PSDDA1	EBP03
361	480	458.062	TPPS	A061	MALINS	10040
362	483	623.270	TPPS	A061	EBCHEM	SS-12
363	484	1,314.008	TPPS	A061	TPPS3AB	EB-39
364	485	1,027.785	TPPS3AB	EB-39	EBCHEM	SS-12
365	486	405.302	TPPS3AB	EB-39	TPPS3AB	EB-38
366	487	1,104.732	TPPS3AB	EB-38	EBCHEM	SS-12
367	488	366.995	TPPS3AB	EB-38	TPPS	A060
368	489	1,085.882	TPPS	A060	EBCHEM	SS-12
369	490	122.315	TPPS	A060	TPPS	1603
370	491	101.278	TPPS	A060	TPPS3AB	EB-35
371	492	479.633	TPPS	A060	TPPS3AB	EB-36
372	493	490.196	TPPS3AB	EB-36	TPPS3AB	EB-35
373	494	202.618	TPPS3AB	EB-36	TPPS	1406
374	495	490.237	TPPS	1406	TPPS3AB	EB-35
375	496	101.340	TPPS	1406	TPPS3AB	EB-33
376	497	423.312	TPPS	1406	MALINS	10041
377	498	410.989	MALINS	10041	TPPS3AB	EB-33
378	499	511.210	TPPS3AB	EB-36	MALINS	10041
379	500	692.626	TPPS3AB	EB-36	TPPS3AB	EB-34
380	501	714.503	TPPS3AB	EB-36	TPPS	1512
381	502	101.340	TPPS	1512	TPPS3AB	EB-34
382	503	1,861.039	TPPS	1512	TPPS3AB	EB-30
383	504	511.314	TPPS	1512	TPPS	C060
384	505	1,807.205	TPPS	C060	TPPS3AB	EB-30
385	506	1,525.499	TPPS	C060	TPPS3AB	EB-31
386	507	880.077	TPPS3AB	EB-31	TPPS3AB	EB-30
387	508	746.513	TPPS3AB	EB-31	PSDDA1	EBT11
388	509	1,333.273	PSDDA1	EBT11	TPPS3AB	EB-30
389	510	2,567.171	PSDDA1	EBT11	DUWAM84	U127
390	511	1,516.164	DUWAM84	U127	TPPS3AB	EB-30
391	512	2,107.194	PSDDA1	EBT11	TPPS	S0015
392	513	3,838.452	TPPS	S0015	DUWAM84	U127
393	514	4,920.034	TPPS	S0015	TPPS	S0089
394	515	4,550.477	TPPS	S0089	DUWAM84	U127
395	516	1,844.473	TPPS	S0089	TPPS	S0088
396	517	2,050.471	TPPS	S0089	EIGHTBAY	EL-23
397	518	2,616.740	EIGHTBAY	EL-23	TPPS	S0088
398	519	2,393.762	EIGHTBAY	EL-23	EIGHTBAY	EL-24
399	520	1,419.055	EIGHTBAY	EL-24	TPPS	S0088
400	521	1,825.291	EIGHTBAY	EL-24	EBCHEM	MG-01
401	522	915.970	EIGHTBAY	EL-24	TPPS	S0087
402	523	1,363.372	TPPS	S0087	EBCHEM	MG-01
403	524	1,361.114	TPPS	S0087	TPPS	S0030
404	525	1,420.288	TPPS	S0087	MALINS	10014
405	526	423.241	MALINS	10014	TPPS	S0030
406	528	1,041.204	MALINS	10014	EBCHEM	MG-02
407	529	1,308.797	EBCHEM	MG-02	EBCHEM	MG-03
408	530	846.635	EBCHEM	MG-02	SED19003	32
409	531	641.754	SED19003	32	EBCHEM	MG-03
410	532	1,317.101	SED19003	32	TPPS	S0086
411	533	1,168.422	TPPS	S0086	EBCHEM	MG-03
412	534	2,001.570	TPPS	S0086	TPPS	S0085
413	535	2,757.945	TPPS	S0085	EBCHEM	MG-03
414	536	912.021	TPPS	S0085	EBCHEM	MG-04
415	537	3,237.645	TPPS	S0085	DUWAM85	KSYP01
416	538	3,850.470	DUWAM85	KSYP01	EBCHEM	MG-04
417	539	4,227.064	TPPS3AB	WP-08	EBCHEM	MG-04
418	540	6,835.465	TPPS3AB	WP-06	EBCHEM	MG-04
419	541	2,648.890	TPPS	S0085	TPPS	S0060

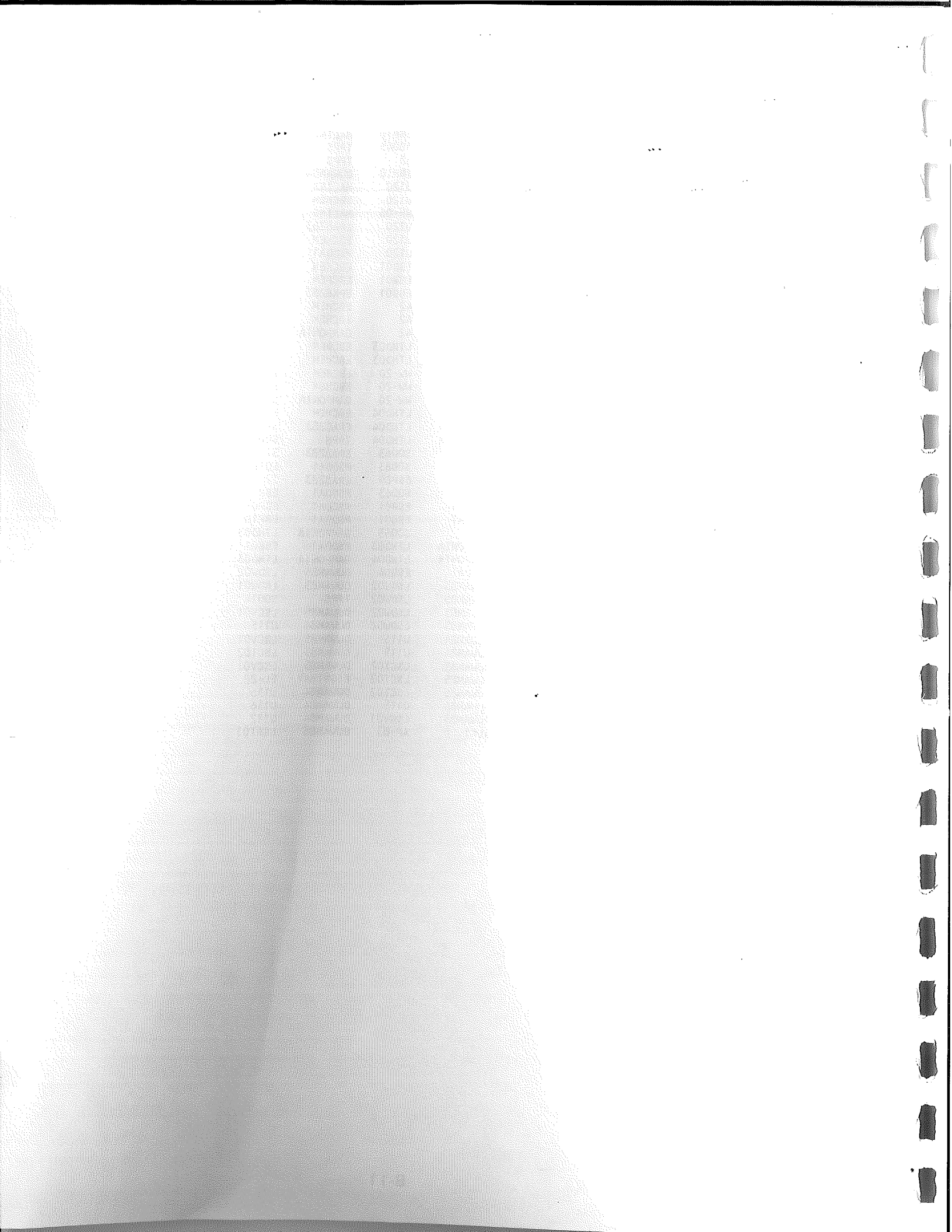
420	542	2,963.294	TPPS	S0060	DUWAM85	KSYP01
421	543	2,719.309	TPPS	S0060	EIGHTBAY	EL-09
422	544	2,969.509	TPPS	S0060	EIGHTBAY	EL-10
423	545	2,238.807	TPPS	S0060	DUWAM84	U134
424	546	2,077.631	DUWAM84	U134	EIGHTBAY	EL-10
425	547	366.987	DUWAM84	U134	EIGHTBAY	EL-17
426	548	1,947.116	EIGHTBAY	EL-17	EIGHTBAY	EL-10
427	549	1,499.055	EIGHTBAY	EL-17	TPPS	S0059
428	550	1,516.104	EIGHTBAY	EL-17	DUWAM85	LSBQ01
429	551	896.444	EIGHTBAY	EL-17	EIGHTBAY	EL-20
430	552	1,627.149	EIGHTBAY	EL-20	DUWAM85	LSBQ01
431	553	2,640.277	EIGHTBAY	EL-20	TPPS	S0011
432	554	2,099.417	TPPS	S0011	DUWAM85	LSBQ01
433	555	681.756	TPPS	S0011	DUWAM85	LSCQ03
434	556	1,712.663	TPPS	S0011	TPPS	0128
435	557	2,384.203	TPPS	S0011	TPPS	S0056
436	558	2,363.250	TPPS	S0056	TPPS	0128
437	559	819.926	TPPS	S0056	DUWAM85	LSCS01
438	560	2,157.041	DUWAM85	LSCS01	TPPS	0128
439	561	2,280.317	DUWAM85	LSCS01	DUWAM84	U113
440	562	1,649.839	DUWAM84	U113	TPPS	0128
441	563	978.646	DUWAM84	U113	DUWAM85	LSDS02
442	564	2,813.698	DUWAM84	U113	DUWAM85	LSET01
443	565	2,612.404	DUWAM85	LSET01	DUWAM85	LSDS02
444	566	2,297.888	DUWAM85	LSET01	DUWAM84	U110
445	567	623.256	DUWAM85	LSET01	DUWAM84	U111
446	568	2,354.057	DUWAM84	U111	DUWAM84	U110
447	569	1,479.747	DUWAM84	U111	DUWAM85	LSFS01
448	570	2,151.240	DUWAM85	LSFS01	DUWAM84	U110
449	571	409.390	DUWAM85	LSFS01	DUWAM84	U128
450	572	2,332.326	DUWAM84	U128	DUWAM84	U110
451	573	1,875.484	DUWAM84	U128	DUWAM85	LSFQ03
452	574	1,785.068	DUWAM84	U128	DUWAM84	U106
453	575	411.077	DUWAM84	U106	DUWAM85	LSFQ03
454	576	1,443.620	DUWAM84	U106	DUWAM85	LSGQ01
455	577	1,639.912	DUWAM84	U106	DUWAM85	LSGR01
456	578	1,894.788	DUWAM85	LSGR01	DUWAM85	LSGQ01
457	579	213.930	DUWAM85	LSGR01	DUWAM84	U129
458	580	2,013.490	DUWAM84	U129	DUWAM85	LSGQ01
459	581	2,617.202	DUWAM84	U129	DUWAM85	LSHQ01
460	582	628.146	DUWAM84	U129	DUWAM85	LSGS02
461	583	2,598.686	DUWAM85	LSGS02	DUWAM85	LSHQ01
462	584	2,281.416	DUWAM85	LSGS02	DUWAM85	LSIR04
463	585	1,072.441	DUWAM85	LSIR04	DUWAM85	LSHQ01
464	586	1,361.226	DUWAM85	LSIR04	TPPS	C160
465	587	1,760.377	TPPS	C160	DUWAM85	LSHQ01
466	588	866.291	TPPS	C160	DUWAM85	LSJQ02
467	589	760.449	TPPS	C160	ALKI	AP-07
468	590	2,366.892	TPPS	C160	DUWAM85	LSHS01
469	591	2,817.945	DUWAM85	LSHS01	ALKI	AP-07
470	592	2,654.071	DUWAM85	LSHS01	EBCHEM	AB-04
471	593	2,323.652	DUWAM85	LSHS01	DUWAM84	U109
472	594	2,605.775	DUWAM84	U109	EBCHEM	AB-04
473	595	1,397.553	DUWAM84	U109	DUWAM85	LSHU02
474	596	1,829.103	DUWAM85	LSHU02	EBCHEM	AB-04
475	597	2,727.754	DUWAM85	LSHU02	EBCHEM	AB-03
476	605	798.402	EBCHEM	NH-09	DUWAM84	U117
477	607	746.755	DUWAM84	U117	GAMPONIA	LTIB07
478	608	627.109	DUWAM84	U117	EBCHEM	NH-08
479	609	202.681	EBCHEM	NH-08	GAMPONIA	LTIB07
480	610	342.846	EBCHEM	NH-08	EBCHEM	NH-07
481	614	427.876	EBCHEM	WW-15	GAMPONIA	LTIC05
482	616	607.983	GAMPONIA	LTIC05	EBCHEM	WW-13
483	619	1,345.584	EBCHEM	WW-13	EPA8283	7
484	621	101.340	EPA8283	7	GAMPONIA	LTKD04
485	623	101.278	GAMPONIA	LTKD04	TPPS	S0036
486	624	292.448	GAMPONIA	LTKD04	EBCHEM	WW-08
487	625	292.443	GAMPONIA	LTKD04	GAMPONIA	LTJD05
488	626	202.681	GAMPONIA	LTJD05	EBCHEM	WW-08
489	628	750.088	EBCHEM	WW-04	EBCHEM	WW-08
490	629	398.229	EBCHEM	WW-04	EBCHEM	WW-05
491	630	822.171	GAMPONIA	LTJD05	EBCHEM	WW-11
492	631	274.325	GAMPONIA	LTJD05	EPA8283	7
493	632	909.137	EPA8283	7	EBCHEM	WW-11
494	633	852.627	EBCHEM	WW-13	EBCHEM	WW-11
495	634	411.489	EBCHEM	WW-13	MALINS	10028
496	635	576.146	MALINS	10028	EBCHEM	WW-11

497	636	68.519	MALINS	10028	EBCHEM	WW-10
498	637	546.849	EBCHEM	WW-10	EBCHEM	WW-11
499	638	341.037	EBCHEM	WW-10	EBCHEM	WW-12
500	639	411.055	EBCHEM	WW-10	MALINS	10030
501	640	288.758	MALINS	10030	EBCHEM	WW-12
502	641	213.931	MALINS	10030	GAMPONIA	LTID04
503	642	427.913	GAMPONIA	LTID04	EBCHEM	WW-12
504	643	333.498	GAMPONIA	LTID04	EBCHEM	WW-14
505	645	427.876	GAMPONIA	LTID04	EBCHEM	WW-16
506	646	292.332	EBCHEM	WW-16	EBCHEM	WW-14
507	647	576.134	EBCHEM	WW-16	EBCHEM	WW-18
508	648	568.117	EBCHEM	WW-16	EBCHEM	WW-17
509	649	780.934	EBCHEM	WW-17	EBCHEM	WW-18
510	650	1,086.225	EBCHEM	WW-17	EBCHEM	WW-19
511	651	511.295	EBCHEM	WW-19	EBCHEM	WW-18
512	655	423.652	EPA8283	4	EPA8283	37
513	656	340.984	EPA8283	37	EBCHEM	NH-02
514	657	479.882	EPA8283	37	GAMPONIA	LTHE02
515	658	914.528	EPA8283	37	MALINS	10016
516	659	1,064.149	MALINS	10016	GAMPONIA	LTHE02
517	660	357.397	MALINS	10016	PSDDA1	EBP08
518	661	1,242.299	MALINS	10016	DUWAM84	U122
519	662	1,274.047	MALINS	10016	PSDDA1	EBS06
520	663	68.519	PSDDA1	EBS06	DUWAM84	U122
521	664	511.270	PSDDA1	EBS06	PSDDA1	EBS02
522	665	1,397.495	PSDDA1	EBS06	PSDDA1	EBS07
523	666	1,233.842	PSDDA1	EBS07	PSDDA1	EBS02
524	667	1,996.635	PSDDA1	EBS07	PSDDA1	EBZ01
525	668	1,459.488	PSDDA1	EBS07	PSDDA1	EBS08
526	669	1,521.450	PSDDA1	EBS08	PSDDA1	EBZ01
527	670	2,408.944	PSDDA1	EBS08	DUWAM84	U123
528	671	2,973.729	PSDDA1	EBS08	PSDDA1	EBP12
529	672	2,567.127	PSDDA1	EBP12	DUWAM84	U123
530	673	1,693.970	PSDDA1	EBP12	PSDDA1	EBS09
531	674	1,188.063	PSDDA1	EBP12	PSDDA1	EBP01
532	675	1,422.985	PSDDA1	EBP01	PSDDA1	EBS09
533	676	288.726	PSDDA1	EBP01	PSDDA1	EBP02
534	677	1,374.185	PSDDA1	EBP02	PSDDA1	EBS09
535	678	1,262.944	PSDDA1	EBP02	PSDDA1	EBB03
536	679	458.384	PSDDA1	EBP02	PSDDA1	EBT07
537	680	1,419.245	PSDDA1	EBT07	PSDDA1	EBB03
538	681	1,030.497	PSDDA1	EBT07	TPPS3AB	EB-32
539	682	1,647.724	TPPS3AB	EB-32	PSDDA1	EBB03
540	683	1,274.827	TPPS3AB	EB-32	TPPS	C060
541	684	1,262.904	TPPS	C060	PSDDA1	EBB03
542	685	490.237	TPPS	C060	TPPS3AB	EB-37
543	686	952.273	TPPS3AB	EB-37	PSDDA1	EBB03
544	687	557.425	TPPS3AB	EB-37	TPPS3AB	EB-39
545	688	1,049.713	TPPS3AB	EB-39	PSDDA1	EBB03
546	689	652.497	TPPS3AB	EB-37	TPPS	B060
547	690	427.838	TPPS	B060	TPPS3AB	EB-39
548	691	137.039	TPPS	B060	TPPS3AB	EB-38
549	692	333.514	TPPS	B060	TPPS3AB	EB-36
550	693	409.382	TPPS3AB	EB-36	TPPS3AB	EB-38
551	694	828.472	TPPS	B060	TPPS	1512
552	695	733.958	TPPS3AB	EB-37	TPPS	1512
553	696	681.710	TPPS3AB	EB-32	TPPS3AB	EB-31
554	697	749.649	TPPS3AB	EB-32	PSDDA1	EBT10
555	698	722.452	PSDDA1	EBT10	TPPS3AB	EB-31
556	699	458.413	PSDDA1	EBT10	PSDDA1	EBT11
557	700	819.880	PSDDA1	EBT10	PSDDA1	EBT04
558	701	912.006	PSDDA1	EBT04	PSDDA1	EBT11
559	702	411.116	PSDDA1	EBT04	PSDDA1	EBT05
560	703	1,000.384	PSDDA1	EBT05	PSDDA1	EBT11
561	704	1,298.468	PSDDA1	EBT05	TPPS	S0015
562	705	1,807.810	PSDDA1	EBT05	DUWAM84	U119
563	706	1,484.906	DUWAM84	U119	TPPS	S0015
564	707	4,116.948	DUWAM84	U119	DUWAM85	LSDW01
565	708	3,748.512	DUWAM85	LSDW01	TPPS	S0015
566	709	1,886.028	DUWAM85	LSDW01	TPPS	S0014
567	710	3,917.829	TPPS	S0014	TPPS	S0015
568	711	2,945.833	TPPS	S0014	TPPS	S0089
569	712	980.575	TPPS	S0014	DUWAM85	LSCV01
570	713	2,973.614	DUWAM85	LSCV01	TPPS	S0089
571	714	3,345.255	DUWAM85	LSCV01	EIGHTBAY	EL-23
572	715	3,075.482	DUWAM85	LSCV01	EIGHTBAY	EL-22
573	716	2,053.965	EIGHTBAY	EL-22	EIGHTBAY	EL-23

574	717	2,638.205	EIGHTBAY	EL-22	DUWAM85	LSAT01
575	718	2,160.808	DUWAM85	LSAT01	EIGHTBAY	EL-23
576	719	2,554.008	DUWAM85	LSAT01	TPPS	S0087
577	720	2,766.720	TPPS	S0087	EIGHTBAY	EL-23
578	721	3,422.923	DUWAM85	LSAT01	EBCHEM	MG-02
579	722	2,093.516	EBCHEM	MG-02	TPPS	S0087
580	723	3,456.263	DUWAM85	LSAT01	SED19003	32
581	724	2,156.767	DUWAM85	LSAT01	DUWAM84	U135
582	725	3,032.040	DUWAM84	U135	SED19003	32
583	726	2,546.080	DUWAM84	U135	TPPS	S0086
584	727	1,213.427	DUWAM84	U135	TPPS	S0060
585	728	1,804.341	TPPS	S0060	TPPS	S0086
586	729	1,308.381	DUWAM84	U135	DUWAM84	U134
587	730	2,067.949	DUWAM84	U135	ALKI	AP-03
588	731	1,426.004	ALKI	AP-03	DUWAM84	U134
589	732	760.418	ALKI	AP-03	EIGHTBAY	EL-20
590	733	1,069.697	EIGHTBAY	EL-20	DUWAM84	U134
591	734	2,099.477	ALKI	AP-03	TPPS	S0056
592	735	2,324.110	TPPS	S0056	EIGHTBAY	EL-20
593	736	2,366.271	ALKI	AP-03	EIGHTBAY	EL-22
594	737	980.546	EIGHTBAY	EL-22	TPPS	S0056
595	738	1,064.117	EIGHTBAY	EL-22	DUWAM85	LSCS01
596	739	1,869.783	EIGHTBAY	EL-22	DUWAM84	U116
597	740	1,323.661	DUWAM84	U116	DUWAM85	LSCS01
598	741	819.862	DUWAM84	U116	DUWAM84	U130
599	742	1,711.428	DUWAM84	U130	DUWAM85	LSCS01
600	743	1,194.304	DUWAM84	U130	DUWAM84	U113
601	744	2,989.384	DUWAM84	U130	DUWAM85	LSET01
602	745	753.846	DUWAM84	U130	DUWAM84	U115
603	746	2,945.818	DUWAM84	U115	DUWAM85	LSET01
604	747	3,262.653	DUWAM84	U115	PSDDA1	EBB04
605	748	2,297.793	PSDDA1	EBB04	DUWAM85	LSET01
606	749	836.368	PSDDA1	EBB04	DUWAM84	U114
607	750	2,095.697	DUWAM84	U114	DUWAM85	LSET01
608	751	101.340	DUWAM84	U114	DUWAM85	LSFV01
609	752	2,117.701	DUWAM85	LSFV01	DUWAM85	LSET01
610	753	2,195.658	DUWAM85	LSFV01	DUWAM84	U111
611	754	1,734.717	DUWAM85	LSFV01	DUWAM84	U112
612	755	2,189.948	DUWAM84	U112	DUWAM84	U111
613	756	697.992	DUWAM84	U112	DUWAM85	LSGU02
614	757	2,459.793	DUWAM85	LSGU02	DUWAM84	U111
615	758	2,689.662	DUWAM85	LSGU02	DUWAM85	LSFS01
616	759	818.739	DUWAM85	LSGU02	TPPS	S0061
617	760	2,598.502	TPPS	S0061	DUWAM85	LSFS01
618	761	1,105.265	TPPS	S0061	DUWAM85	LSGT01
619	762	2,376.222	DUWAM85	LSGT01	DUWAM85	LSFS01
620	763	2,215.820	DUWAM85	LSGT01	DUWAM84	U128
621	764	1,521.713	DUWAM85	LSGT01	DUWAM85	LSGS02
622	765	2,167.352	DUWAM85	LSGS02	DUWAM84	U128
623	766	818.791	DUWAM85	LSGS02	DUWAM85	LSGR01
624	767	1,797.576	DUWAM85	LSGR01	DUWAM84	U128
625	768	2,164.482	DUWAM85	LSGT01	DUWAM85	LSHS01
626	769	1,657.131	DUWAM85	LSHS01	DUWAM85	LSGS02
627	770	1,270.893	DUWAM85	LSHS01	DUWAM85	LSIR04
628	771	274.205	DUWAM85	LSGT01	DUWAM84	U109
629	772	856.091	TPPS	S0061	DUWAM84	U109
630	773	1,064.166	TPPS	S0061	DUWAM85	LSHU02
631	774	1,519.941	DUWAM85	LSGU02	DUWAM85	LSHU02
632	775	1,072.235	DUWAM85	LSGU02	DUWAM85	LSGV01
633	776	2,093.846	DUWAM85	LSGV01	DUWAM85	LSHU02
634	777	1,182.826	DUWAM85	LSGV01	EBCHEM	AB-03
635	778	1,926.502	DUWAM85	LSGV01	DUWAM85	LSFV01
636	779	2,459.749	DUWAM85	LSFV01	EBCHEM	AB-03
637	780	934.915	DUWAM85	LSFV01	PSDDA1	EBB04
638	781	3,209.127	PSDDA1	EBB04	EBCHEM	AB-03
639	782	1,516.329	PSDDA1	EBB04	DUWAM85	LSDW01
640	783	4,154.635	DUWAM85	LSDW01	EBCHEM	AB-03
641	784	5,507.302	DUWAM85	LSDW01	DUWAM84	U118
642	785	4,636.188	DUWAM84	U118	EBCHEM	AB-03
643	786	2,459.793	DUWAM84	U118	EBCHEM	AB-02
644	787	738.527	DUWAM84	U118	TPPS	S0062
645	788	2,021.093	TPPS	S0062	EBCHEM	AB-02
646	789	2,313.085	TPPS	S0062	EBCHEM	AB-01
647	790	1,154.950	EBCHEM	AB-01	EBCHEM	AB-02
648	791	304.024	EBCHEM	AB-01	EBCHEM	NH-10
649	792	398.215	EBCHEM	AB-01	SED19003	33
650	793	357.485	SED19003	33	EBCHEM	NH-10

651	794	666.980	SED19003	33	EBCHEM	NH-09
652	795	1,105.314	SED19003	33	MALINS	10045
653	796	780.904	MALINS	10045	EBCHEM	NH-09
654	797	405.302	MALINS	10045	TPPS	S0034
655	798	780.902	TPPS	S0034	EBCHEM	NH-09
656	799	333.442	TPPS	S0034	DUWAM84	U117
657	800	734.093	TPPS	S0034	EBCHEM	NH-08
658	801	965.256	TPPS	S0034	EBCHEM	NH-06
659	802	746.701	EBCHEM	NH-06	EBCHEM	NH-08
660	803	546.798	EBCHEM	NH-06	EBCHEM	NH-07
661	804	357.364	EBCHEM	NH-06	EPA8283	43
662	806	342.845	EPA8283	43	EBCHEM	NH-05
663	810	333.498	EBCHEM	WW-17	EBCHEM	WW-15
664	811	617.047	EBCHEM	WW-16	EBCHEM	WW-15
665	812	628.192	EBCHEM	WW-16	GAMPONIA	LTIC05
666	813	411.055	EBCHEM	WW-16	GAMPONIA	LTID05
667	814	411.364	GAMPONIA	LTID05	GAMPONIA	LTIC05
668	815	244.760	GAMPONIA	LTID05	MALINS	10030
669	816	584.804	MALINS	10030	GAMPONIA	LTIC05
670	817	682.073	MALINS	10030	EBCHEM	WW-13
671	818	427.847	MALINS	10030	MALINS	10028
672	819	205.683	GAMPONIA	LTID05	GAMPONIA	LTID04
673	820	685.566	EBCHEM	NH-05	EBCHEM	NH-04
674	821	1,069.756	EBCHEM	NH-04	EBCHEM	WW-17
675	822	1,028.411	EBCHEM	NH-04	EBCHEM	WW-09
676	823	1,223.436	EBCHEM	WW-09	EBCHEM	WW-17
677	824	333.457	EBCHEM	WW-09	EBCHEM	WW-19
678	827	423.652	EBCHEM	NH-03	EPA8283	4
679	828	311.567	EBCHEM	NH-03	EPA8283	39
680	829	398.255	EPA8283	39	EPA8283	4
681	830	577.495	EPA8283	39	DUWAM84	U121
682	831	611.810	DUWAM84	U121	EPA8283	4
683	832	611.762	DUWAM84	U121	EPA8283	37
684	833	489.403	DUWAM84	U121	MALINS	10016
685	834	1,208.209	DUWAM84	U121	PSDDA1	EBP09
686	835	1,374.878	PSDDA1	EBP09	MALINS	10016
687	836	1,263.148	PSDDA1	EBP09	PSDDA1	EBS06
688	837	1,615.885	PSDDA1	EBP09	PSDDA1	EBS07
689	838	1,930.857	PSDDA1	EBP09	PSDDA1	EBP10
690	839	1,105.224	PSDDA1	EBP10	PSDDA1	EBS07
691	840	798.329	PSDDA1	EBP10	MALINS	10043
692	841	423.554	MALINS	10043	PSDDA1	EBS07
693	842	1,319.142	MALINS	10043	PSDDA1	EBS08
694	843	1,714.080	MALINS	10043	PSDDA1	EBP11
695	844	1,165.200	PSDDA1	EBP11	PSDDA1	EBS08
696	845	2,736.016	PSDDA1	EBP11	PSDDA1	EBP12
697	846	1,493.198	PSDDA1	EBP11	MALINS	10044
698	847	2,042.084	MALINS	10044	PSDDA1	EBP12
699	848	1,880.036	MALINS	10044	DUWAM84	U119
700	849	2,349.939	DUWAM84	U119	PSDDA1	EBP12
701	850	2,167.913	DUWAM84	U119	PSDDA1	EBT03
702	851	1,590.331	PSDDA1	EBT03	PSDDA1	EBP12
703	852	423.570	PSDDA1	EBT03	PSDDA1	EBT02
704	853	1,307.174	PSDDA1	EBT02	PSDDA1	EBP12
705	854	423.449	PSDDA1	EBT02	PSDDA1	EBT01
706	855	1,116.732	PSDDA1	EBT01	PSDDA1	EBP12
707	856	479.633	PSDDA1	EBT01	PSDDA1	EBP01
708	857	489.331	PSDDA1	EBT01	PSDDA1	EBT07
709	858	454.443	PSDDA1	EBT07	PSDDA1	EBP01
710	859	623.245	PSDDA1	EBT01	PSDDA1	EBT08
711	860	458.384	PSDDA1	EBT08	PSDDA1	EBT07
712	861	712.694	PSDDA1	EBT08	TPPS3AB	EB-32
713	862	398.109	PSDDA1	EBT08	PSDDA1	EBT09
714	863	576.072	PSDDA1	EBT09	TPPS3AB	EB-32
715	864	458.413	PSDDA1	EBT09	PSDDA1	EBT10
716	865	697.907	PSDDA1	EBT09	PSDDA1	EBT03
717	866	813.555	PSDDA1	EBT03	PSDDA1	EBT10
718	867	490.252	PSDDA1	EBT03	PSDDA1	EBT04
719	868	1,971.833	DUWAM84	U119	PSDDA1	EBT04
720	869	712.632	PSDDA1	EBT09	PSDDA1	EBT02
721	870	576.017	PSDDA1	EBT08	PSDDA1	EBT02
722	871	2,093.657	MALINS	10044	DUWAM84	U118
723	872	3,369.173	DUWAM84	U118	DUWAM84	U119
724	873	2,124.932	PSDDA1	EBP11	DUWAM84	U118
725	874	2,359.064	PSDDA1	EBP11	TPPS	S0062
726	875	1,886.019	PSDDA1	EBP11	PSDDA1	EBP10
727	876	2,202.890	PSDDA1	EBP10	TPPS	S0062

728	877	3,002.316	PSDDA1	EBP10	MALINS	10045
729	878	2,935.830	MALINS	10045	TPPS	S0062
730	879	2,447.356	SED19003	33	TPPS	S0062
731	880	2,844.719	PSDDA1	EBP10	DUWAM84	U120
732	881	1,250.671	DUWAM84	U120	MALINS	10045
733	882	409.440	DUWAM84	U120	EBCHEM	NH-06
734	883	1,085.403	EBCHEM	NH-06	MALINS	10045
735	884	213.930	DUWAM84	U120	EPA8283	43
736	885	458.495	DUWAM84	U120	EBCHEM	NH-05
737	886	1,493.297	DUWAM84	U120	PSDDA1	EBB01
738	887	1,395.932	PSDDA1	EBB01	EBCHEM	NH-05
739	888	1,215.965	PSDDA1	EBB01	EBCHEM	NH-04
740	889	974.257	PSDDA1	EBB01	EPA8283	42
741	890	458.168	EPA8283	42	EBCHEM	NH-04
742	891	749.975	EPA8283	42	EBCHEM	WW-09
743	892	341.037	EPA8283	42	GAMPONIA	LTHD03
744	893	652.572	GAMPONIA	LTHD03	EBCHEM	WW-09
745	894	137.037	GAMPONIA	LTHD03	EBCHEM	WW-20
746	895	576.146	EBCHEM	WW-20	EBCHEM	WW-09
747	896	584.747	EBCHEM	WW-20	EBCHEM	NH-03
748	897	333.442	EBCHEM	WW-20	GAMPONIA	LTHD04
749	898	423.658	GAMPONIA	LTHD04	EBCHEM	NH-03
750	899	520.904	GAMPONIA	LTHD04	EPA8283	39
751	900	489.401	GAMPONIA	LTHD04	TPPS	S0063
752	901	780.867	TPPS	S0063	EPA8283	39
753	902	712.618	TPPS	S0063	PSDDA1	EBP09
754	903	1,140.913	PSDDA1	EBP09	EPA8283	39
755	904	616.922	TPPS	S0063	PSDDA1	EBB01
756	905	986.391	PSDDA1	EBB01	PSDDA1	EBP09
757	906	2,030.042	PSDDA1	EBB01	PSDDA1	EBP10
758	907	709.320	TPPS	S0063	GAMPONIA	LTHD03
759	908	940.146	GAMPONIA	LTHD03	PSDDA1	EBB01
760	909	409.354	GAMPONIA	LTHD04	GAMPONIA	LTHD03
761	910	1,904.592	PSDDA1	EBB04	DUWAM85	LSDW02
762	911	856.275	DUWAM85	LSDW02	DUWAM85	LSDW01
763	912	1,114.696	DUWAM85	LSDW02	TPPS	S0014
764	913	1,629.731	DUWAM85	LSDW02	DUWAM85	LSCV01
765	914	2,699.097	DUWAM85	LSDW02	DUWAM84	U115
766	915	1,753.483	DUWAM84	U115	DUWAM85	LSCV01
767	916	607.992	DUWAM84	U115	DUWAM85	LSCT02
768	917	1,644.602	DUWAM85	LSCT02	DUWAM85	LSCV01
769	918	2,067.631	DUWAM85	LSCT02	EIGHTBAY	EL-22
770	919	357.336	DUWAM85	LSCT02	DUWAM84	U116
771	920	787.716	DUWAM84	U115	DUWAM84	U116
772	921	749.770	DUWAM85	LSGV01	DUWAM84	U112
773	922	1,592.084	ALKI	AP-03	DUWAM85	LSAT01



APPENDIX C

Computer Program to Calculate Similarity Indices

APPENDIX C
Computer Program to Calculate Similarity Indices

The program listed below was used to calculate values of the six similarity indices that were evaluated.

LISTING C-1. SIMILARI.MOD

```
MODULE Similarity;
(*================================================================

FILE:           SIMILARI.MOD
PROGRAM:    Similarity
PURPOSE:    Calculate measures of similarity between adjacent stations
            based on exceedances of P-2 sediment quality standards.

NOTES:          Originally created for PTI Contract No. C704-14-06.
            Meant to be used one time only.
            This program reads data from two free-format text files,
            each containing a single table of data with no missing entries.
            The files, and their contents, are:
            EBOVRP2.TXT
                Headers: none
                Columns: SURVEY STATION CHEM CONCENTRATION EXCEEDANCE FACTOR UNITS MEAS.BASIS
            SNTPDOS.FIL
                Headers: last line begins with "$"
                Columns: RECORD.NO ARC.NO ARC.LENGTH SURVEY1 STATION1 SURVEY2 STATION2

LIMITATIONS:    1) Input file names are coded into the program.
            2) This program was written for the JPI TopSpeed Modula-2
               compiler.

AUTHOR:         Dreas Nielsen, PTI Environmental Services

HISTORY:    Date            Remarks
            ------          ---------
            4/22/91         Created.  RDN

================================================================*)


(*=========================  Imports  =========================*)


(* JPI Modules *)
IMPORT IO;
IMPORT FIO;
IMPORT Str;
IMPORT Storage;
IMPORT Lib;

(* RDN Modules *)
IMPORT Links;


(*======================  Declarations  ======================*)

(*----------------------------------------------------------------
          Data structure notes
Every station is identified by a combination of a survey name and
a station name, each 8 characters long.  At each station there may
be many chemicals that exceed P-2; each chemical has a name of no
```

```
more than 10 characters, and at each station, has a real-valued
exceedance factor.  This information is represented by a linked list
of stations; a dynamically allocated array of chemical exceedance
factors is attached to each station.  The exceedances at each station
may be ranked, and the list may be sorted by ranks or proportional
ranks.
-------------------------------------------------------------*)

CONST
    SurvLen      = 8;
    StnLen       = 8;
    ChemLen      = 10;

    (*==== Error Code Declarations ====*)
    (*==== Error code 0 indicates no error        *)
    (*==== File and device I/O Errors:      1-100          *)
    FileNotFound      = 1;
    (*==== Network Errors:       101-150          *)
    (*==== Memory Management Errors:  151-200         *)
    (*==== Process Errors:       201-250          *)
    (*==== Math Errors:                251-300         *)
    (*==== Miscellaneous Operating System Errors: 301-500   *)
    (*==== Application Program Errors:      501-1000        *)
    UnexpectedEOF     = 501;
    UnrecognizedStn   = 502;


TYPE

    SurvName     = ARRAY[0..SurvLen-1] OF CHAR;
    StnName      = ARRAY[0..StnLen-1] OF CHAR;
    ChemName     = ARRAY[0..ChemLen-1] OF CHAR;

    SortMeth     = ( ExcFact, Rank, PropRank, Name );
    ExcRec       = RECORD
                     Chem    : ChemName;
                     ExcFact      : REAL;
                     Rank    : CARDINAL;
                     PropRank     : REAL;
                   END;
    ExcArray     = ARRAY[0..65000 DIV SIZE(ExcRec)] OF ExcRec;
    ExcListPtr   = POINTER TO ExcArray;

    PtrStnRec    = POINTER TO StnRec;
    StnRec       = RECORD
                     Next    : PtrStnRec;
                     Prev    : PtrStnRec;
                     Survey : SurvName;
                     Stn          : StnName;
                     Excs    : ExcListPtr;
                     ArraySize    : CARDINAL;     (* Max. # possible in array *)
                     ArrayElems   : CARDINAL;     (* Current # in array *)
                     SortedBy     : SortMeth;
                     Ranked : BOOLEAN;
                   END;
    StnRoot      = RECORD
                     Next    : PtrStnRec;
                     Prev    : PtrStnRec;
                   END;

    ErrorNum     = CARDINAL;
    WarnResp     = ( Retry, Continue, Abort );

VAR
    StnData      : StnRoot;


(*=======================  Procedures  ========================*)

(*-------------------------------------------------------------
    Cleanup
Perform whatever cleanup procedures are necessary before exiting.
-------------------------------------------------------------*)
PROCEDURE Cleanup();
BEGIN
END Cleanup;
(*================*)
```

```
(*-----------------------------------------------------------
     ErrorExpln
Return a textual explanation of an error.
-----------------------------------------------------------*)
PROCEDURE ErrorExpln( ErrorType : ErrorNum; VAR ErrMsg : ARRAY OF CHAR );
BEGIN
CASE ErrorType OF
    FileNotFound      : Str.Copy( ErrMsg, "File not found" );
    | UnexpectedEOF   : Str.Copy( ErrMsg, "Unexpected end of file");
    | UnrecognizedStn       : Str.Copy( ErrMsg, "Unrecognized station");
    ELSE          Str.Copy( ErrMsg, "" );
END;
END ErrorExpln;
(*================*)

(*-----------------------------------------------------------
     WriteErrMsg
Prints the error message.
-----------------------------------------------------------*)
PROCEDURE WriteErrMsg( ErrorType : ErrorNum );
VAR
    ErrStr       : ARRAY[0..40] OF CHAR;
BEGIN
ErrorExpln( ErrorType, ErrStr );
IF Str.Length(ErrStr) > 0 THEN FIO.WrStr(FIO.ErrorOutput, ErrStr) END;
END WriteErrMsg;
(*================*)

(*-----------------------------------------------------------
     Fatal
General routine for processing a fatal error.  This routine may print
a message or take other action, then calls 'Cleanup()' and exits the
program--it never returns.
-----------------------------------------------------------*)
PROCEDURE Fatal( ErrorType: ErrorNum; FatalMsg : ARRAY OF CHAR );
BEGIN
FIO.WrLn(FIO.ErrorOutput);
FIO.WrStr(FIO.ErrorOutput, "FATAL ERROR (SIMILAR): ");
WriteErrMsg(ErrorType);
IF Str.Length(FatalMsg) > 0 THEN
    FIO.WrStr(FIO.ErrorOutput, ": ");
    FIO.WrStr(FIO.ErrorOutput, FatalMsg);
    FIO.WrLn(FIO.ErrorOutput);
END;
Cleanup();
HALT;
END Fatal;
(*================*)

(*-----------------------------------------------------------
     WriteReal
Writes a real value to standard output in ordinary notation, with
3 decimal digits.
-----------------------------------------------------------*)
PROCEDURE WriteReal( R : REAL );
VAR
    OutputStr    : ARRAY[0..20] OF CHAR;
    RetVal       : BOOLEAN;
BEGIN
Str.FixRealToStr( LONGREAL(R), 3, OutputStr, RetVal );
IO.WrStr(OutputStr);
END WriteReal;
(*================*)

(*-----------------------------------------------------------
     FindStn
Locates the station record corresponding to the survey and station
name passed.  If not found, this function returns FALSE.
-----------------------------------------------------------*)
PROCEDURE FindStn( Surv : SurvName; Stn : StnName; VAR StnPtr : PtrStnRec ) : BOOLEAN;
VAR
    SrchName     : ARRAY [0..SurvLen+StnLen-1] OF CHAR;
    CurrName     : ARRAY [0..SurvLen+StnLen-1] OF CHAR;
BEGIN
Str.Concat( SrchName, Surv, Stn );
StnPtr := StnData.Next;
LOOP
```

APPENDIX C
Computer Program to Calculate Similarity Indices

The program listed below was used to calculate values of the six similarity indices that were evaluated.

LISTING C-1. SIMILARI.MOD

```
MODULE Similarity;
(*================================================================

FILE:           SIMILARI.MOD
PROGRAM:    Similarity
PURPOSE:    Calculate measures of similarity between adjacent stations
            based on exceedances of P-2 sediment quality standards.

NOTES:          Originally created for PTI Contract No. C704-14-06.
            Meant to be used one time only.
            This program reads data from two free-format text files,
            each containing a single table of data with no missing entries.
            The files, and their contents, are:
            EBOVRP2.TXT
                Headers: none
                Columns: SURVEY STATION CHEM CONCENTRATION EXCEEDANCE FACTOR UNITS MEAS.BASIS
            SNTPDOS.FIL
                Headers: last line begins with "$"
                Columns: RECORD.NO ARC.NO ARC.LENGTH SURVEY1 STATION1 SURVEY2 STATION2

LIMITATIONS:    1) Input file names are coded into the program.
            2) This program was written for the JPI TopSpeed Modula-2
               compiler.

AUTHOR:         Dreas Nielsen, PTI Environmental Services

HISTORY:    Date            Remarks
            ------          ---------
            4/22/91         Created.  RDN

================================================================*)


(*=========================  Imports  =========================*)


(* JPI Modules *)
IMPORT IO;
IMPORT FIO;
IMPORT Str;
IMPORT Storage;
IMPORT Lib;

(* RDN Modules *)
IMPORT Links;


(*======================  Declarations  ======================*)

(*----------------------------------------------------------------
          Data structure notes
Every station is identified by a combination of a survey name and
a station name, each 8 characters long.  At each station there may
be many chemicals that exceed P-2; each chemical has a name of no
```

```
more than 10 characters, and at each station, has a real-valued
exceedance factor.  This information is represented by a linked list
of stations; a dynamically allocated array of chemical exceedance
factors is attached to each station.  The exceedances at each station
may be ranked, and the list may be sorted by ranks or proportional
ranks.
-------------------------------------------------------------*)

CONST
    SurvLen      = 8;
    StnLen       = 8;
    ChemLen      = 10;

    (*==== Error Code Declarations ====*)
    (*==== Error code 0 indicates no error        *)
    (*==== File and device I/O Errors:      1-100          *)
    FileNotFound      = 1;
    (*==== Network Errors:       101-150          *)
    (*==== Memory Management Errors:  151-200         *)
    (*==== Process Errors:       201-250          *)
    (*==== Math Errors:                251-300         *)
    (*==== Miscellaneous Operating System Errors: 301-500   *)
    (*==== Application Program Errors:      501-1000        *)
    UnexpectedEOF     = 501;
    UnrecognizedStn   = 502;


TYPE

    SurvName     = ARRAY[0..SurvLen-1] OF CHAR;
    StnName      = ARRAY[0..StnLen-1] OF CHAR;
    ChemName     = ARRAY[0..ChemLen-1] OF CHAR;

    SortMeth     = ( ExcFact, Rank, PropRank, Name );
    ExcRec       = RECORD
                     Chem    : ChemName;
                     ExcFact      : REAL;
                     Rank    : CARDINAL;
                     PropRank     : REAL;
                   END;
    ExcArray     = ARRAY[0..65000 DIV SIZE(ExcRec)] OF ExcRec;
    ExcListPtr   = POINTER TO ExcArray;

    PtrStnRec    = POINTER TO StnRec;
    StnRec       = RECORD
                     Next    : PtrStnRec;
                     Prev    : PtrStnRec;
                     Survey : SurvName;
                     Stn          : StnName;
                     Excs    : ExcListPtr;
                     ArraySize    : CARDINAL;     (* Max. # possible in array *)
                     ArrayElems   : CARDINAL;     (* Current # in array *)
                     SortedBy     : SortMeth;
                     Ranked : BOOLEAN;
                   END;
    StnRoot      = RECORD
                     Next    : PtrStnRec;
                     Prev    : PtrStnRec;
                   END;

    ErrorNum     = CARDINAL;
    WarnResp     = ( Retry, Continue, Abort );

VAR
    StnData      : StnRoot;


(*=======================  Procedures  ========================*)

(*-------------------------------------------------------------
    Cleanup
Perform whatever cleanup procedures are necessary before exiting.
-------------------------------------------------------------*)
PROCEDURE Cleanup();
BEGIN
END Cleanup;
(*================*)
```

```
(*-----------------------------------------------------------
     ErrorExpln
Return a textual explanation of an error.
-----------------------------------------------------------*)
PROCEDURE ErrorExpln( ErrorType : ErrorNum; VAR ErrMsg : ARRAY OF CHAR );
BEGIN
CASE ErrorType OF
    FileNotFound      : Str.Copy( ErrMsg, "File not found" );
    | UnexpectedEOF   : Str.Copy( ErrMsg, "Unexpected end of file");
    | UnrecognizedStn       : Str.Copy( ErrMsg, "Unrecognized station");
    ELSE          Str.Copy( ErrMsg, "" );
END;
END ErrorExpln;
(*================*)

(*-----------------------------------------------------------
     WriteErrMsg
Prints the error message.
-----------------------------------------------------------*)
PROCEDURE WriteErrMsg( ErrorType : ErrorNum );
VAR
    ErrStr       : ARRAY[0..40] OF CHAR;
BEGIN
ErrorExpln( ErrorType, ErrStr );
IF Str.Length(ErrStr) > 0 THEN FIO.WrStr(FIO.ErrorOutput, ErrStr) END;
END WriteErrMsg;
(*================*)

(*-----------------------------------------------------------
     Fatal
General routine for processing a fatal error.  This routine may print
a message or take other action, then calls 'Cleanup()' and exits the
program--it never returns.
-----------------------------------------------------------*)
PROCEDURE Fatal( ErrorType: ErrorNum; FatalMsg : ARRAY OF CHAR );
BEGIN
FIO.WrLn(FIO.ErrorOutput);
FIO.WrStr(FIO.ErrorOutput, "FATAL ERROR (SIMILAR): ");
WriteErrMsg(ErrorType);
IF Str.Length(FatalMsg) > 0 THEN
    FIO.WrStr(FIO.ErrorOutput, ": ");
    FIO.WrStr(FIO.ErrorOutput, FatalMsg);
    FIO.WrLn(FIO.ErrorOutput);
END;
Cleanup();
HALT;
END Fatal;
(*================*)

(*-----------------------------------------------------------
     WriteReal
Writes a real value to standard output in ordinary notation, with
3 decimal digits.
-----------------------------------------------------------*)
PROCEDURE WriteReal( R : REAL );
VAR
    OutputStr    : ARRAY[0..20] OF CHAR;
    RetVal       : BOOLEAN;
BEGIN
Str.FixRealToStr( LONGREAL(R), 3, OutputStr, RetVal );
IO.WrStr(OutputStr);
END WriteReal;
(*================*)

(*-----------------------------------------------------------
     FindStn
Locates the station record corresponding to the survey and station
name passed.  If not found, this function returns FALSE.
-----------------------------------------------------------*)
PROCEDURE FindStn( Surv : SurvName; Stn : StnName; VAR StnPtr : PtrStnRec ) : BOOLEAN;
VAR
    SrchName     : ARRAY [0..SurvLen+StnLen-1] OF CHAR;
    CurrName     : ARRAY [0..SurvLen+StnLen-1] OF CHAR;
BEGIN
Str.Concat( SrchName, Surv, Stn );
StnPtr := StnData.Next;
LOOP
```

```
    IF StnPtr = ADR(StnData) THEN EXIT END;
    Str.Concat(CurrName, StnPtr^.Survey, StnPtr^.Stn);
    IF Str.Compare( SrchName, CurrName ) = 0 THEN EXIT END;
    StnPtr := StnPtr^.Next;
END;
IF StnPtr = ADR(StnData) THEN
    RETURN FALSE;
ELSE
    RETURN TRUE
END;
END FindStn;
(*================*)

(*-------------------------------------------------------------
     SaveData
Stores an exceedance value for a chemical at a station.  This routine
presumes that the stations are ordered by name and that the exceedances
at a station are ordered by chemical name.
-------------------------------------------------------------*)
PROCEDURE SaveData( Surv: SurvName; Stn: StnName; Chem: ChemName;
       ExcFact: REAL );
CONST
    Grainsize   = 5; (* amount by which to increment array of chems *)
VAR
    StnPtr      : PtrStnRec;
    NewStn      : PtrStnRec;
    SrchStn     : ARRAY[0..SurvLen+StnLen-1] OF CHAR;
    CurrStn     : ARRAY[0..SurvLen+StnLen-1] OF CHAR;
    ChemNo      : CARDINAL;
    MoveCtr     : CARDINAL;
    NewChemArray: ExcListPtr;
BEGIN
StnPtr := StnData.Next;
Str.Concat(SrchStn, Surv, Stn);
LOOP
    IF StnPtr = ADR(StnData) THEN EXIT END;
    Str.Concat(CurrStn, StnPtr^.Survey, StnPtr^.Stn);
    IF Str.Compare( SrchStn, CurrStn ) <= 0 THEN EXIT END;
    StnPtr := StnPtr^.Next;
END;
IF (StnPtr = ADR(StnData)) OR (Str.Compare( SrchStn, CurrStn ) <> 0) THEN
    Storage.ALLOCATE( NewStn, SIZE(StnRec));
    Str.Copy(NewStn^.Survey, Surv);
    Str.Copy(NewStn^.Stn, Stn);
    Storage.ALLOCATE(NewStn^.Excs, Grainsize * SIZE(ExcRec));
    NewStn^.ArraySize := Grainsize;
    NewStn^.ArrayElems := 0;
    NewStn^.SortedBy := Name;
    NewStn^.Ranked := FALSE;
    Links.DInsertBefore(NewStn, StnPtr);
    StnPtr := NewStn;       (* in preparation for next step *)
END;
(* Now save (or replace) the chemical exceedance factor. *)
(* Presume that this will be a new, not repeat, chemical. *)
IF StnPtr^.ArrayElems+1 > StnPtr^.ArraySize THEN
    Storage.ALLOCATE(NewChemArray, (StnPtr^.ArraySize+Grainsize) * SIZE(ExcRec));
    FOR ChemNo := 0 TO StnPtr^.ArrayElems DO
     NewChemArray^[ChemNo] := StnPtr^.Excs^[ChemNo]
    END;
    Storage.DEALLOCATE(StnPtr^.Excs, StnPtr^.ArraySize * SIZE(ExcRec));
    StnPtr^.Excs := NewChemArray;
    StnPtr^.ArraySize := StnPtr^.ArraySize + Grainsize;
END;
(* Now save new chemical exceedance factor *)
ChemNo := 0;
WHILE (ChemNo < StnPtr^.ArrayElems) AND (Str.Compare(Chem, StnPtr^.Excs^[ChemNo].Chem) < 0)
DO
    INC(ChemNo)
END;
IF ChemNo = StnPtr^.ArrayElems THEN
    Str.Copy(StnPtr^.Excs^[StnPtr^.ArrayElems].Chem, Chem);
    StnPtr^.Excs^[StnPtr^.ArrayElems].ExcFact := ExcFact;
    INC(StnPtr^.ArrayElems);
ELSE
    IF Str.Compare(Chem, StnPtr^.Excs^[ChemNo].Chem) = 0 THEN
     IF ExcFact > StnPtr^.Excs^[ChemNo].ExcFact THEN
         StnPtr^.Excs^[ChemNo].ExcFact := ExcFact
```

```
    END;
    ELSE
      FOR MoveCtr := StnPtr^.ArrayElems-1 TO ChemNo BY -1 DO
          StnPtr^.Excs^[MoveCtr+1] := StnPtr^.Excs^[MoveCtr]
      END;
      Str.Copy(StnPtr^.Excs^[ChemNo].Chem, Chem);
      StnPtr^.Excs^[ChemNo].ExcFact := ExcFact;
      INC(StnPtr^.ArrayElems);
    END;
END;
END SaveData;
(*================*)

(*---------------------------------------------------------------
     ReadExceedances
Reads all station data from a file, storing it in the data structures
pointed to by the global variable 'StnData'.  All of these structures
should be uninitialized (non-existent) upon entry.
---------------------------------------------------------------*)
PROCEDURE ReadExceedances();
CONST
    DefaultInput      = "EBOVRP2.TXT";
VAR
    InpFile      : FIO.File;
    Surv    : SurvName;
    Stn          : StnName;
    Chem    : ChemName;
    ExcFact      : REAL;
    JunkStr      : ARRAY[0..60] OF CHAR;
BEGIN
FIO.IOcheck := FALSE;
InpFile := FIO.OpenRead(DefaultInput);
IF InpFile = MAX(CARDINAL) THEN Fatal( FileNotFound, DefaultInput ) END;
WHILE FIO.OK AND (NOT FIO.EOF) DO
    FIO.RdItem(InpFile, Surv);
    FIO.RdItem(InpFile, Stn);
    FIO.RdItem(InpFile, Chem);
    FIO.RdItem(InpFile, JunkStr);      (* concentration *)
    ExcFact := FIO.RdReal(InpFile);
    FIO.RdStr(InpFile, JunkStr);       (* units & meas. basis *)
    IF FIO.OK THEN
      SaveData(Surv, Stn, Chem, ExcFact )
    END;
END;
FIO.Close(InpFile);
END ReadExceedances;
(*================*)

(*---------------------------------------------------------------
     DispExceedances
Dumps all station data to the console.
---------------------------------------------------------------*)
PROCEDURE DispExceedances();
VAR
    StnPtr       : PtrStnRec;
    ChemNo       : CARDINAL;
BEGIN
StnPtr := StnData.Next;
WHILE StnPtr <> ADR(StnData) DO
    IO.WrStr(StnPtr^.Survey);  IO.WrStr(" ");  IO.WrStr(StnPtr^.Stn);
    IO.WrLn();
    FOR ChemNo := 0 TO StnPtr^.ArrayElems-1 DO
      IO.WrStr("    ");
      IO.WrStr(StnPtr^.Excs^[ChemNo].Chem);
      WriteReal(StnPtr^.Excs^[ChemNo].ExcFact);
      IO.WrLn();
    END;
    StnPtr := StnPtr^.Next;
END;
END DispExceedances;
(*================*)

(*****************************************************************
                  SORTING ROUTINES
---------------------------------------------------------------*)

MODULE Sort;
```

```
IMPORT     PtrStnRec, ExcRec, ExcListPtr, ExcFact;
IMPORT     Lib;

EXPORT     ByExcFact;

VAR
    CurrStnPtr   : PtrStnRec;
    Exceedance   : ExcListPtr;


(*-------------------------------------------------------------
     SwapExc
Swaps two exceedance factor observances for the current station.
Note that the indexes range from 1..CurrStnPtr^.ArrayElems.
-------------------------------------------------------------*)
PROCEDURE SwapExc( Ix1, Ix2 : CARDINAL );
VAR
    TempExc      : ExcRec;
BEGIN
TempExc := Exceedance^[Ix1-1];
Exceedance^[Ix1-1] := Exceedance^[Ix2-1];
Exceedance^[Ix2-1] := TempExc;
END SwapExc;
(*================*)

(*-------------------------------------------------------------
     CompExc
Compares two exceedance factors, returning TRUE if the element with
the first index is lower than the element with the second index.
Note that the indexes range from 1..CurrStnPtr^.ArrayElems.
-------------------------------------------------------------*)
PROCEDURE CompExc( Ix1, Ix2 : CARDINAL ) : BOOLEAN;
BEGIN
IF Exceedance^[Ix1-1].ExcFact < Exceedance^[Ix2-1].ExcFact THEN RETURN TRUE;
ELSE RETURN FALSE END;
END CompExc;
(*================*)

(*-------------------------------------------------------------
     ByExcFact
Sorts the data for a station by the exceedance factor.
-------------------------------------------------------------*)
PROCEDURE ByExcFact( Stn : PtrStnRec );
BEGIN
CurrStnPtr := Stn;
Exceedance := Stn^.Excs;
IF CurrStnPtr^.SortedBy = ExcFact THEN RETURN END;
Lib.QSort( CurrStnPtr^.ArrayElems, CompExc, SwapExc );
CurrStnPtr^.SortedBy := ExcFact;
CurrStnPtr^.Ranked := FALSE;
END ByExcFact;
(*================*)

END Sort;

(*****************************************************************)

(*-------------------------------------------------------------
     SetRanks
Establishes the ranks and proportional ranks for a station, regardless
of the current sorting method.
-------------------------------------------------------------*)
PROCEDURE SetRanks( CurrStn : PtrStnRec );
VAR
    ExcCtr       : CARDINAL;
BEGIN
IF CurrStn^.Ranked THEN RETURN END;
FOR ExcCtr := 0 TO CurrStn^.ArrayElems-1 DO
    CurrStn^.Excs^[ExcCtr].Rank := ExcCtr + 1;
    CurrStn^.Excs^[ExcCtr].PropRank := REAL(ExcCtr + 1) / REAL(CurrStn^.ArrayElems);
END;
CurrStn^.Ranked := TRUE;
END SetRanks;
(*================*)

(*-------------------------------------------------------------
     NumChems
```

```
Computes the number of chemicals common to both stations and the
number of uniqe chemicals at either station.
-------------------------------------------------------------*)
PROCEDURE NumChems( Stn1, Stn2 : PtrStnRec; VAR Common, Total : CARDINAL );
VAR
    ExcCtr1      : CARDINAL;
    ExcCtr2      : CARDINAL;
BEGIN
(* First, find the number of common chemicals.  This is done by scanning
   the list of chemicals for one station, and searching the other station's
   list of chemicals for matches. *)
Common := 0;
FOR ExcCtr1 := 0 TO Stn1^.ArrayElems-1 DO
    ExcCtr2 := 0;
    LOOP
     IF ExcCtr2 = Stn2^.ArrayElems THEN EXIT END;
     IF Str.Compare(Stn1^.Excs^[ExcCtr1].Chem, Stn2^.Excs^[ExcCtr2].Chem )
      = 0 THEN
         INC(Common);
         EXIT
     END;
     INC(ExcCtr2);
    END;
END;
(* Second, find the number of total chemicals.  This is done by adding to the
   number of chemicals at one station all the chemicals at the second station
   that can't be matched in the first station's list. *)
Total := Stn2^.ArrayElems;
FOR ExcCtr1 := 0 TO Stn1^.ArrayElems-1 DO
    ExcCtr2 := 0;
    LOOP
     IF ExcCtr2 = Stn2^.ArrayElems THEN EXIT END;
     IF Str.Compare(Stn1^.Excs^[ExcCtr1].Chem, Stn2^.Excs^[ExcCtr2].Chem )
      = 0 THEN EXIT END;
     INC(ExcCtr2);
    END;
    IF ExcCtr2 = Stn2^.ArrayElems THEN INC(Total) END;
END;
END NumChems;
(*================*)

(*-------------------------------------------------------------
     RealRPD
Returns the RPD of two REAL numbers.
-------------------------------------------------------------*)
PROCEDURE RealRPD( N1, N2 : REAL ) : REAL;
BEGIN
RETURN ABS(N1 - N2) / ((N1 + N2) / 2.0);
END RealRPD;
(*================*)

(*-------------------------------------------------------------
     SumRankRPD
Returns the sum of [1.0 - Relative Percent Difference (RPD)] between
the scaled ranks for all chemicals in common between two stations.
-------------------------------------------------------------*)
PROCEDURE SumRankRPD( Stn1, Stn2 : PtrStnRec ) : REAL;
VAR
    ExcCtr1      : CARDINAL;
    ExcCtr2      : CARDINAL;
    Result       : REAL;
BEGIN
Result := 0.0;
FOR ExcCtr1 := 0 TO Stn1^.ArrayElems-1 DO
    ExcCtr2 := 0;
    LOOP
     IF ExcCtr2 = Stn2^.ArrayElems THEN EXIT END;
     IF Str.Compare(Stn1^.Excs^[ExcCtr1].Chem, Stn2^.Excs^[ExcCtr2].Chem )
      = 0 THEN
         Result := Result + (1.0 - RealRPD(Stn1^.Excs^[ExcCtr1].PropRank,
          Stn2^.Excs^[ExcCtr2].PropRank));
         EXIT
     END;
     INC(ExcCtr2);
    END;
END;
RETURN Result;
```

```
END SumRankRPD;
(*================*)

(*-------------------------------------------------------------
     SumExcRPD
Returns the sum of [1.0 - Relative Percent Difference (RPD)] between
the exceedance factors for all chemicals in common between two stations.
-------------------------------------------------------------*)
PROCEDURE SumExcRPD( Stn1, Stn2 : PtrStnRec ) : REAL;
VAR
    ExcCtr1      : CARDINAL;
    ExcCtr2      : CARDINAL;
    Result       : REAL;
BEGIN
Result := 0.0;
FOR ExcCtr1 := 0 TO Stn1^.ArrayElems-1 DO
    ExcCtr2 := 0;
    LOOP
     IF ExcCtr2 = Stn2^.ArrayElems THEN EXIT END;
     IF Str.Compare(Stn1^.Excs^[ExcCtr1].Chem, Stn2^.Excs^[ExcCtr2].Chem )
      = 0 THEN
         Result := Result + (1.0 - RealRPD(Stn1^.Excs^[ExcCtr1].ExcFact,
          Stn2^.Excs^[ExcCtr2].ExcFact));
         EXIT
     END;
     INC(ExcCtr2);
    END;
END;
RETURN Result;
END SumExcRPD;
(*================*)


(*-------------------------------------------------------------
     Wilcoxon
Calculates the Wilcoxon rank sum for two stations, returning the
Wilcoxon test statistic (Ts) and the number of samples.
-------------------------------------------------------------*)
PROCEDURE Wilcoxon( Stn1, Stn2 : PtrStnRec; VAR Ts : REAL; VAR Samps : CARDINAL);
TYPE
    PtrScore     = POINTER TO ScoreRec;
    ScoreRec     = RECORD
                Next    : PtrScore;
                Prev    : PtrScore;
                Score   : REAL;
                Rank    : REAL;
                PosObs  : CARDINAL;
                NegObs  : CARDINAL;
               END;
VAR
    ExcCtr1      : CARDINAL;
    ExcCtr2      : CARDINAL;
    ScoreRoot    : ScoreRec;
    SumPos       : REAL;
    SumNeg       : REAL;
    (*****************)

    (*---------------
    The following procedures maintain an ordered linked list of scores,
    with associated ranks, that is used to calculate Ts.
    ---------------*)
    PROCEDURE SaveScore( NewScore : REAL );
    VAR
     ScorePtr    : PtrScore;
     NewRec           : PtrScore;
    BEGIN
    ScorePtr := ScoreRoot.Next;
    LOOP
     IF ScorePtr = ADR(ScoreRoot) THEN EXIT END;
     IF ABS(ScorePtr^.Score) >= ABS(NewScore) THEN EXIT END;
     ScorePtr := ScorePtr^.Next;
    END;
    IF (ScorePtr <> ADR(ScoreRoot)) AND (ABS(ScorePtr^.Score) = ABS(NewScore)) THEN
     IF NewScore < 0.0 THEN
         INC(ScorePtr^.NegObs);
     ELSE
         INC(ScorePtr^.PosObs)
```

```
    END;
    ELSE
      Storage.ALLOCATE( NewRec, SIZE(ScoreRec) );
      NewRec^.Score := ABS(NewScore);
      IF NewScore < 0.0 THEN
          NewRec^.NegObs := 1;  NewRec^.PosObs := 0;
      ELSE
          NewRec^.PosObs := 1;  NewRec^.NegObs := 0;
      END;
      Links.DInsertBefore( NewRec, ScorePtr );
    END;
    END SaveScore;
    (*================*)
    PROCEDURE SetRanks();
    VAR
      ScorePtr   : PtrScore;
      CurrRank   : CARDINAL;
    BEGIN
    CurrRank := 1;
    ScorePtr := ScoreRoot.Next;
    WHILE ScorePtr <> ADR(ScoreRoot) DO
      ScorePtr^.Rank := REAL(CurrRank) + REAL(1 + ScorePtr^.PosObs + ScorePtr^.NegObs)/2.0;
      INC(CurrRank, ScorePtr^.PosObs + ScorePtr^.NegObs);
      ScorePtr := ScorePtr^.Next
    END;
    END SetRanks;
    (*================*)
    PROCEDURE SumRanks( VAR Pos, Neg : REAL );
    VAR
      ScorePtr   : PtrScore;
    BEGIN
    Pos := 0.0;
    Neg := 0.0;
    ScorePtr := ScoreRoot.Next;
    WHILE ScorePtr <> ADR(ScoreRoot) DO
      Pos := Pos + (ScorePtr^.Rank * REAL(ScorePtr^.PosObs));
      Neg := Neg + (ScorePtr^.Rank * REAL(ScorePtr^.NegObs));
      ScorePtr := ScorePtr^.Next
    END;
    END SumRanks;
    (*================*)
    PROCEDURE DelScores();
    VAR
      ScorePtr   : PtrScore;
    BEGIN
    WHILE ScoreRoot.Next <> ADR(ScoreRoot) DO
      ScorePtr := Links.DUnlink(ScoreRoot.Next);
      Storage.DEALLOCATE( ScorePtr, SIZE(ScoreRec) );
    END;
    END DelScores;
    (******************)

BEGIN                          (* main of Wilcoxon() *)
ScoreRoot.Next := ADR(ScoreRoot);
ScoreRoot.Prev := ADR(ScoreRoot);
Samps := 0;
Ts := 0.0;
FOR ExcCtr1 := 0 TO Stn1^.ArrayElems-1 DO
    ExcCtr2 := 0;
    LOOP
      IF ExcCtr2 = Stn2^.ArrayElems THEN EXIT END;
      IF Str.Compare(Stn1^.Excs^[ExcCtr1].Chem, Stn2^.Excs^[ExcCtr2].Chem )
       = 0 THEN
          INC(Samps);
          SaveScore(Stn1^.Excs^[ExcCtr1].ExcFact - Stn2^.Excs^[ExcCtr2].ExcFact );
          EXIT
      END;
      INC(ExcCtr2);
    END;
END;
IF Samps = 0 THEN RETURN END;
SetRanks();
SumRanks( SumPos, SumNeg );
IF SumPos < SumNeg THEN
    Ts := SumPos;
ELSE
    Ts := SumNeg
```

```
END;
DelScores();
END Wilcoxon;
(*================*)

(*-----------------------------------------------------------------
     X2Stat
This procedure calculates the X2 statistic, which is distributed
as Chi-square.  It reports only the sample statistic for two
stations, not the number of classes (chemicals in common) or the
degrees of freedom.  The number of classes is expected to be
independently known, and the degrees of freedom are equal to this
number (the number of deviations is 2N [where N is the number of
chemicals] and the expected value for each chemical is calculated
from the two station values, thereby losing a degree of freedom
for each pair of deviations.  No additional degrees of freedom are
lost because the chemicals are independent (the expected value for
one chemical is not affected by the values of other chemicals).
-----------------------------------------------------------------*)
PROCEDURE X2Stat( Stn1, Stn2 : PtrStnRec ) : REAL;
VAR
    ExcCtr1     : CARDINAL;
    ExcCtr2     : CARDINAL;
    ExpectedVal : REAL;
    Result      : REAL;

    (******************)
    PROCEDURE Sqr( R1 : REAL ) : REAL;
    BEGIN
    RETURN R1 * R1;
    END Sqr;
    (******************)

BEGIN
Result := 0.0;
FOR ExcCtr1 := 0 TO Stn1^.ArrayElems-1 DO
    ExcCtr2 := 0;
    LOOP
     IF ExcCtr2 = Stn2^.ArrayElems THEN EXIT END;
     IF Str.Compare(Stn1^.Excs^[ExcCtr1].Chem, Stn2^.Excs^[ExcCtr2].Chem )
      = 0 THEN
         ExpectedVal := (Stn1^.Excs^[ExcCtr1].ExcFact + Stn2^.Excs^[ExcCtr2].ExcFact) / 2.0;
         Result  := Result + 2.0 * ( Sqr(Stn1^.Excs^[ExcCtr1].ExcFact  -  ExpectedVal) /
ExpectedVal );
         EXIT
     END;
     INC(ExcCtr2);
    END;
END;
RETURN Result;
END X2Stat;
(*================*)

(*-----------------------------------------------------------------
     CalcAllSimi
Calculates all similarity measures for the given pair of stations
and emits them to the console.
-----------------------------------------------------------------*)
PROCEDURE CalcAllSimi( ArcID : ARRAY OF CHAR; Surv1 : SurvName; Stn1 : StnName;
                Surv2 : SurvName; Stn2 : StnName );
VAR
    Station1    : PtrStnRec;
    Station2    : PtrStnRec;
    Common      : CARDINAL;
    Total  : CARDINAL;
    SimiMeas    : REAL;
    Samples     : CARDINAL;
BEGIN
IF NOT FindStn( Surv1, Stn1, Station1 ) THEN RETURN END;
IF NOT FindStn( Surv2, Stn2, Station2 ) THEN RETURN END;
(*----*)
NumChems( Station1, Station2, Common, Total );
IF Common = 0 THEN RETURN END;   (* There might conceivably be a similarity  *)
                    (* measure that has a non-zero value when   *)
                    (* two stations have no chemicals in common,*)
                    (* but none of those used here are such.    *)
(*----*)
```

```
IO.WrStr(ArcID);
(*---- First similarity measure ----*)
IO.WrStr("  ");
WriteReal( REAL(Common) / REAL(Total) );
(*----*)
Sort.ByExcFact( Station1 );
Sort.ByExcFact( Station2 );
SetRanks( Station1 );
SetRanks( Station2 );
SimiMeas := SumRankRPD( Station1, Station2 );
(*---- Second similarity measure ----*)
IO.WrStr("  ");
WriteReal( SimiMeas / REAL(Common) );
(*---- Third similarity measure ----*)
IO.WrStr("  ");
WriteReal( SimiMeas / REAL(Total) );
(*---- Fourth similarity measure ----*)
IO.WrStr("  ");
WriteReal( SumExcRPD( Station1, Station2 ) / REAL(Common) );
(*---- Fifth similarity measure ----*)
Wilcoxon( Station1, Station2, SimiMeas, Samples );
IO.WrStr("  ");
IF Samples < 6 THEN
    IO.WrStr("NC");   (* 6 or more samples needed for significance *)
ELSE
    WriteReal( SimiMeas );
    IO.WrStr("(");
    IO.WrCard( Samples, 5 );
    IO.WrStr(")");
END;
(*---- Sixth similarity measure ----*)
IO.WrStr("  ");
SimiMeas := X2Stat( Station1, Station2 );
WriteReal( SimiMeas );
IO.WrStr("(");
IO.WrCard( Common, 5 );
IO.WrStr(")");
(*----*)
IO.WrLn();
END CalcAllSimi;
(*================*)


(*-----------------------------------------------------------------
     ProcessPairs
Reads data lines from SNTPDOS.FIL (skipping headers), extracts the
station pairs from them, and has similarity measures calculated
for each pair.
-----------------------------------------------------------------*)
PROCEDURE ProcessPairs();
CONST
    DefaultInput      = "SNTPDOS.FIL";
VAR
    InpFile     : FIO.File;
    LineBuf     : ARRAY[0..90] OF CHAR;
    ArcNo  : ARRAY[0..10] OF CHAR;
    Surv1  : SurvName;
    Stn1   : StnName;
    Surv2  : SurvName;
    Stn2   : StnName;
BEGIN
FIO.IOcheck := FALSE;
InpFile := FIO.OpenRead(DefaultInput);
IF InpFile = MAX(CARDINAL) THEN Fatal( FileNotFound, DefaultInput ) END;
(*---- Read and discard header lines; last header line starts with "$". ----*)
LOOP
    FIO.RdStr( InpFile, LineBuf );
    IF (NOT FIO.OK) OR (FIO.EOF) THEN Fatal(UnexpectedEOF, DefaultInput) END;
    IF LineBuf[0] = '$' THEN EXIT END
END;
WHILE FIO.OK AND (NOT FIO.EOF) DO
    FIO.RdItem(InpFile, LineBuf);     (* Record no. *)
    FIO.RdItem(InpFile, ArcNo);
    FIO.RdItem(InpFile, LineBuf);     (* Arc length *)
    FIO.RdItem(InpFile, Surv1);
    FIO.RdItem(InpFile, Stn1);
    FIO.RdItem(InpFile, Surv2);
```

```
    FIO.RdItem(InpFile, Stn2);
    IF FIO.OK THEN
     CalcAllSimi( ArcNo, Surv1, Stn1, Surv2, Stn2 )
    END;
END;
FIO.Close(InpFile);
END ProcessPairs;
(*================*)


(*=========================  Main  =========================*)

BEGIN

StnData.Next := ADR(StnData);
StnData.Prev := ADR(StnData);

FIO.WrStr(FIO.ErrorOutput, "Reading exceedances...");
ReadExceedances();
FIO.WrStr(FIO.ErrorOutput, "done.");
FIO.WrLn(FIO.ErrorOutput);

(* For debugging only *)
(* DispExceedances(); *)

FIO.WrStr(FIO.ErrorOutput, "Processing station pairs...");
ProcessPairs();
FIO.WrStr(FIO.ErrorOutput, "done.");
FIO.WrLn(FIO.ErrorOutput);

Cleanup();

END Similarity.
```