ISSUES IN DIGITAL CARTOGRAPHIC DATA STANDARDS

Report #7


Harold Moellering, Editor

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National Committee for Digital Cartographic Data Standards
Numerical Cartography Laboratory
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The Committee operates under the auspices of the American Congress on Surveying and Mapping. This work of the Committee is being funded in part by U.S. Geological Survey Grant #14-08-0001-G-1108. Production assistance has been provided by the Ohio State University Research Foundation (RF Project #717470).
This report is the seventh in the series which describes the work of the National Committee for Digital Cartographic Data Standards. It contains five papers that describe the evaluation and testing of the Interim Proposed Standard that has taken place between April, 1985 and March, 1986. The first paper by Moellering describes the background information concerning this evaluation and testing. The second paper by the same author discusses the evaluation and testing of the cartographic objects along with several updates of those objects. The third paper edited by Timothy Nyerges describes the testing of the data exchange portion of the standard. This is perhaps the most complicated facet of the work. The paper also provides a description of the exchange modules as they are defined as of March, 1986. These exchange modules are the heart of the data exchange standard. If any reader desires a full length description of these exchange modules which will be ready in May of 1986, please send a request to Professor Moellering at Columbus headquarters and a copy will be sent to you. The fifth paper by Nicholas Chrisman describes the testing of the data quality portion of the standard. This section is perhaps the least changed of the four sections of the standard. The fifth paper edited by Robert Rugg and Warren Schmidt sets forth the testing of the cartographic features and provides a current listing of them as of March, 1986.

The Committee would like to recognize the cooperation and participation of the Standards Working Group of the Federal Interagency Coordinating Committee on Digital Cartography, Mr. Gale TeSelle, Chairman. This Group has provided many constructive comments and suggestions during the last two years. This Group is also developing and testing the Federal Geographic Data Format which is one of the three data exchange implementations.

It should be noted that this material is still in the process of being fully developed and polished by the Committee. However, the Committee strongly felt that the professional community should remain informed of the continuing work of the Committee so that informed comments can be sent back to the Committee while the work is still in progress. Comment forms are provided in the back of the report if you desire to respond to this report. It should also be noted that because this material is still being polished by the Committee, this updated material has not yet been officially voted on by the Steering Committee. That will take place again in August of 1986. However, the Committee is interested in hearing your comments on the work contained herein. Your comments would be most effective if they were returned to Columbus headquarters prior to June 20, 1986, so they can be properly distributed for comment. However, comments can be sent to the Committee at any time. Please send your comments to the Committee at the following address:

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Harold Moellering
Series Editor
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1.0 INTRODUCING THE EVALUATION AND TESTING OF THE INTERIM PROPOSED STANDARD

by

Harold Moellering

The National Committee for Digital Cartographic Data Standards was founded in 1982 to develop standards that would facilitate the use and exchange of digital cartographic data bases. The Committee operates under the auspices of the American Congress on Surveying and Mapping, the umbrella organization for the American Cartographic Association which is the premier cartographic society in the United States. The original mandate for this work in cartographic standards began with a memorandum of understanding between the National Bureau of Standards and the U.S. Geological Survey to develop earth science information standards. Subsequently, the mandate came from the Geological Survey to the Committee to develop digital cartographic data standards that will ultimately be proposed as Federal Information Processing Standards (FIPS). For a more detailed discussion of the situation, please refer to Section 1.0 of the supporting documentation of Report No. 6 (Moellering, 1985, pp. 45-48).

To date, the Committee has completed the first three cycles of work; the first defining the issues involved, the second examining the alternatives, and the third of developing the Interim Proposed Standard. For a review of this work, please review Committee Reports No. 3, No. 4, and No. 6 (Moellering, 1983, 1984, 1985). This report discusses the work of the first year of the fourth cycle, that of evaluating and empirically field testing the Interim Proposed Standard. The findings and results from this work are being shared with the cartographic profession at this time in an effort to keep everyone informed on the progress in developing these standards, and to provide an opportunity for members of the profession to comment on this body of work. The second year of cycle four will include the reformulation and polishing of the current standard that will be presented as the Proposed Standard in January of 1987.

1.1 EVALUATION AND FIELD TESTING OF THE STANDARDS

The first year of cycle four has involved the evaluation and empirical field testing of the Interim Proposed Standard. The year began in April, 1985 and during the Spring of that year each major section of the standard, cartographic objects, data exchange, data set quality, and cartographic features were evaluated by the Committee and by the Working Groups as a result of written comments pertaining to Report No. 6, comments made at the public hearings held at the Spring ACSM meeting held in March, 1985 in Washington, D.C., as a result of Committee discussion at the Spring meetings, and as a result of internal evaluations and discussions. During the Summer of 1985 the Working Groups conducted internal tests on their parts of the standard which included elements of the entire Committee. In the case of cartographic objects, the evaluations were conducted by elements of the Committee, Working Group I and some external evaluators. The primary goal for these tests and evaluations were twofold: first for the Working Groups to get the first results from field testing, and second for the Working Groups to use
these internal tests as a method of finalizing the testing procedures being developed for the external and Federal tests planned for the Fall.

During the Spring of 1985 and at the March meetings, public calls were made for expressions of interest to participate in the field tests to be conducted later in the year. It had earlier been determined by the Committee that a set of field tests had to be conducted outside of the Committee with the segments of the profession who would later be using the standards. All told, 26 non-Federal organizations expressed interest in participating in such tests. At the same time the FICCDC was asked to identify Federal agencies interested in participating in such tests in the Federal sector. During the late Spring and early Summer, the private sector testing candidates were sent further information providing more details of the testing methods and requirements. Estimated requirements of donated personnel, time and other resources that were necessary to carry out the tests were also provided. Discussion with the candidate testing participants continued into the Summer as effective matches of personnel, time and capabilities were further explored. In late July, a list was drawn up by the Executive Committee of the testing candidates to be invited to the Fall Committee meeting in Indianapolis to be interviewed by the Working Groups and by the Committee in general. All told, 10 testing candidates from the state and private sector and seven from the Federal sector were invited to the meetings in Indianapolis. From the interviews at Indianapolis and discussions with one or two groups who could not attend, a list of testing participants was drawn up by the Committee. Nine independent tests were being conducted by groups in the state and private sectors, and ten tests were scheduled to be conducted by agencies in the Federal sector, while a few informal tests were conducted as continuing Working Group tests or by the members of a Working Group. However, all official tests were conducted by groups external to the Committee itself, although it should be noted that in some cases some of the Federal agency personnel conducting tests did include individuals who were also members of the Committee.

The following groups participated in tests with the following Working Groups:

WORKING GROUP I - DATA ORGANIZATION

External tests
DuPage County Map Department
Geographic Technology, Inc.
City of Boston Assessing Department

Federal tests
National Ocean Service
Defense Mapping Agency
National Bureau of Standards
U.S. Geological Survey
Federal Emergency Management Agency
WORKING GROUP II - DATA SET QUALITY

External tests
Boise Cascade Corp.
BellSouth Services

Federal tests
Soil Conservation Service

WORKING GROUP III - CARTOGRAPHIC FEATURES

External tests
BellSouth Services
University of Minnesota Dept. of Geography
Perkin-Elmer Corporation
Synectics Corporation

Federal tests
Tennessee Valley Authority
Defense Mapping Agency
National Ocean Service
Federal Emergency Management Agency

It should be noted that the cartographic objects were field tested as part of the Working Group I tests and evaluated as described in Section 2 of this report. In all cases, these tests were conducted with the cooperation and consultation of the Standards Working Group of the Federal Interagency Coordinating Committee on Digital Cartography.

The time frame for these external and Federal field tests was from October, 1985 to February, 1986. During that time, the bulk of the field testing outside of the Committee was conducted. During February and early March, the results of these tests were compiled and sent to the Working Group members for evaluation. At the recent Spring, 1986 meeting of ACSM in Washington, D.C., the Committee met to discuss the results of the field tests and assess the implications for the standard. At that meeting was also scheduled a public session to present the findings of the field tests, and to provide members of the profession an opportunity to ask questions and to discuss the situation in more detail. In an effort to keep the corresponding members of the Committee informed as to its work, this Report No. 7 has been prepared and distributed. The report contains the results of the field tests and evaluations, discussion of written comments received by the Committee since Report No. 6 was issued, and sections of the standard that have been significantly updated and/or expanded for the corresponding members to study and comment on it. The reader is invited to evaluate this report and to send written comments to the Committee on the forms provided in the back of this report.

1.2 ORGANIZATION AND STRUCTURE OF THIS REPORT

This report contains six major sections. The first is the introduction and the last is a set of comment forms which are to be filled out and returned to
The Committee for internal evaluation and circulation. Section 2 contains the discussion on cartographic objects. These objects are defined for 0-, 1- and 2-dimensions and serve the needs for geometry only, geometry and topology, and topology only. Section 3 contains the discussion and evaluation by Working Group I on Data Organization. Most of their attention is focused on testing the cartographic exchange modules defined after Report No. 6 was issued, and on evaluating the methods of implementing such an exchange. Section 4 presents the results of the field tests of the efforts of Working Group II on Data Set Quality. This section of the standard has the fewest changes and updates in it. Section 5 discusses the efforts by Working Group III on Cartographic Features. This section is now much more fully fleshed out from Report No. 6, and it presents a large number of the finished feature definitions.

At this point it is very important to state that all of the material presented here that relates to updates, modifications and extensions of the standard are still in a draft stage and are currently being worked on and polished up by the Committee. Therefore, this report represents work in progress and not a final polished standard. This modified material has not yet been voted on by the Steering Committee. The material, in this state, is being shared with the cartographic community because it is strongly felt that all corresponding members should have the benefit of being informed about the testing phase of the work so that they can provide informed comments on this segment of the work by the Committee in a timely fashion so that those comments can be integrated into the thinking and evaluations of the Committee. It has now been a year since the Interim Proposed Standard was issued and the Committee has made considerable progress since that time. It is therefore the intent of the Committee to provide an additional opportunity for members of the cartographic profession to return comments and discussion of this work as it progresses.

1.3 LIST OF COMMENTS

The following is a list of the individuals who returned written comments to the Committee from the time that Report No. 6 was issued in January, 1985 to the Spring ACSM meetings in March, 1986. This list is being provided as a matter of record and specific comments will not be identified individually in the discussion contained in the following sections of the report. These comments were received external to the Committee meetings and any individual listed who happens to be a member of the Committee was providing such comments as a member of his/her organization or as an individual. Comments internal to the Committee are not listed here.

General

1. Dr. Gerald L. Greenberg, NCIC-W- U.S.G.S., National Mapping Division

2. Mr. Peter Scheffer, TVA, Div. Land & Economic Resources, Special Project Unit
Objects

1. Ms. Carolyn C. Weiss, Statistics Canada, Geocartographics Subdivision
3. Mr. Daniel Neumann, National Ocean Service
4. Mr. J. E. Gearhart, National Ocean Service
5. Mr. Richard Schiro, National Ocean Service
6. Dr. Richard A. Williams, Goodyear Aerospace Corp.
7. Mr. Gale W. TeSelle, Director, Cartography & Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service
8. Mr. Matthew McGranaghan, Geography Department, SUNY - Buffalo
9. Mr. Richard Nicholson, Synercom Corp.
10. Mr. Robert W. Marx, Chief, Geography Division, Bureau of the Census
11. Mr. Denis White, Lab for Computer Graphics and Spatial Analysis, Harvard University
12. Mr. Jan W. van Roessel, Technique Development Section, Technicolor Government Services, Inc.
13. Prof. Mark Monmonier, Dept. of Geography, Syracuse University
14. Mr. Wallace Crisco, Bureau of Land Management

Working Group I

1. Dr. Kenneth J. Dueker, Acting Dean, School of Urban & Public Affairs, Portland State University
2. Mr. Lawrence W. Fritz, National Charting Research & Development Laboratory, NOAA/NOS
3. Mr. Erich Frey, Marine Chart Branch, NOAA/NOS
4. Mr. Daniel Neumann, NOAA/NOS
6. Mr. Gale W. TeSelle, Director, Cartography and Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service

8. Mr. Dennis R. Boston, Alabama Power Company

Working Group II

1. Mr. Erich Frey, Marine Chart Branch, NOAA/NOS
2. Mr. Daniel Neumann, NOAA/NOS
4. Mr. Gale W. TeSelle, Director, Cartography & Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service

Working Group III

1. Mr. Lawrence W. Fritz, National Charting Research & Development Laboratory, NOAA/NOS
2. Dr. Robert D. Thomson, Dept. of Geography, Frostburg State College
3. Ms. Carolyn C. Weiss, Statistics Canada, Geocartographics Subdivision
4. Mr. Erich Frey, Marine Chart Branch, NOAA/NOS
5. Mr. Daniel Neumann, NOAA/NOS
7. Mr. Gale W. TeSelle, Director, Cartography and Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service
8. Dr. Richard A. Williams, Goodyear Aerospace Corp.

1.4 MEMBERSHIP OF THE COMMITTEE

The Committee is made up of a Steering Committee, three Working Groups and an Executive Committee. The Steering Committee is the primary organizational structure for the effort and its members are the ones who created the working groups in 1982 and defined the scope of their activities. The Steering Committee is also the group that formally votes on the standards according to the American National Standards Institute rules being followed. The Executive Committee is composed of the Chairs and Vice Chairs of the Working Groups and the Committee itself. This group leads the work of the Committee on a day to
day basis. The Working Groups focus on specific aspects of the standards problem and are composed of experts knowledgeable about those specific aspects of the problem.

The members of the Steering Committee are as follows:

Harold Moellering, Ohio State University, Chairman
Lawrence Fritz, National Ocean Service, Vice Chairman
Dennis Franklin, Defense Mapping Agency
Robert Marx, Bureau of the Census
Jerome Dobson, Oak Ridge National Laboratory
Dean Edson, E-Quad Associates
Jack Dangermond, Environmental Systems Research Institute
John Davis, Kansas Geological Survey
Paula Hagen, Computer Corporation of America
A. R. Boyle, University of Saskatchewan
Timothy Nyerges, University of Washington
Dean Merchant, Ohio State University
Hugh Calkins, SUNY Buffalo

Members of Working Group I, Data Organization are as follows:

Timothy Nyerges, University of Washington, Chairman
Bill Liles, Xerox Special Information Services, Vice Chairman
A. R. Boyle, University of Saskatchewan
Hugh Calkins, SUNY Buffalo
Fred Billingsley, Jet Propulsion Laboratory
Robin Fegeas, U.S. Geological Survey
David Pendleton, National Ocean Service
Clif McVay, Defense Mapping Agency
Jan van Roessel, EROS Data Center
Alfred Brooks, Information Interchange Inc.

Members of Working Group II, Data Set Quality are as follows:

Nicholas Chrisman, University of Wisconsin, Chairman
Charles Poeppelmeier, Defense Mapping Agency, Vice Chairman
Dean Merchant, Ohio State University
John Davis, Kansas Geological Survey
George Rosenfield, U.S. Geological Survey
George Johnson, National Ocean Survey
Wallace Crisco, Bureau of Land Management
Gunther Greulich, Survey Engineers of Boston
John Stout, Geological Consultant
David Meixner, Bureau of the Census
Frank Beck, U.S. Geological Survey
Members of Working Group III, Cartographic Features are as follows:

Warren Schmidt, Digital Mapping Unlimited, Chairman
Robert Rugg, Virginia Commonwealth University, Vice Chairman
Joel Morrison, U.S. Geological Survey
Walter Winn, National Ocean Service
Beth Driver, Technology Service Corporation
Frederick Tamm-Daniels, Tennessee Valley Authority
Mary Clawson, Naval Ocean R&D Activity
Billy Love, Defense Mapping Agency
Erich Frey, National Ocean Service
Mark Monmonier, Syracuse University

Note: Working Group IV on Terms and Definitions was inactivated and the members were directly assigned to the Working Groups with which they have been developing definitions. The work on cartographic objects has been conducted with the Committee as a whole because it has an impact on the work of each WG.

1.5 AMERICAN NATIONAL STANDARDS INSTITUTE PROCEDURES

The standards being developed by the Committee are planned to be ultimately proposed as Federal Information Processing Standards. However, during this formulation process, the Committee is following the ANSI procedures as they apply to the work of the Committee because these procedures are generally recognized as the most appropriate for an effort of this kind. As such, the Committee operates under the auspices of the American Congress on Surveying and Mapping with a mandate from the U.S. Geological Survey which originally came from the National Bureau of Standards to develop such standards. Therefore, the Committee is not an ANSI committee, but will follow ANSI Appendix A, "Model Procedures for an Accredited Standards Committee" as it applies to this effort (ANSI, 1982).

1.6 REFERENCES


2.0  EVALUATING AND TESTING THE INTERIM PROPOSED STANDARD
FOR DIGITAL CARTOGRAPHIC OBJECTS

by

Harold Moellering

Prior to reading this section on cartographic objects, the reader is invited
to review pages 19-27 in Report No. 4 on the alternatives (Moellering, 1984)
and pages 37-39 and 147 to 154 in Report No. 6 on the Interim Proposed
Standard (Moellering, 1985).

2.1  BACKGROUND

The definition and use of cartographic objects is fundamental to achieving the
ability to analyze and display cartographic data, and to exchange digital
cartographic data bases between machine systems. At the outset, one must
consider the relationships between a cartographic feature, cartographic entity
and a cartographic object as shown in Figure 2.1. The definitions used in the
standard recognize the cartographic feature as the covering term for what
exists both in the real world and in digital storage. The specific term

CARTOGRAPHIC FEATURE

\[ \text{Cartographic entity} \quad \text{Cartographic object} \]

\( \text{(real world)} \quad \text{(digital storage)} \)

Figure 2.1  Relationship Between Cartographic Feature, Entity and Object.

for those things that exist in the real world is the cartographic entity.
When that information is captured as a digital representation of an entity in
digital storage, then it is defined as a cartographic object. In order to
capture this information in an efficient digital manner, and in order to be
able to manipulate it conveniently, it is important that cartographic objects
be parsimoniously defined. Therefore, these 0-, 1-, and 2-dimensional objects
must have the following properties: they must serve the tasks of geometry and
topology in various combinations, they must be modular, they must work in both
planar and curved coordinate systems, and they must be extendible.

In modern digital cartography, there is a distinct need to define objects that
provide various capabilities and combinations of geometry and topology. For
example, most of the early work in the 1960's included straight geometric
drawings of map displays that were real maps and sometimes CRT images (virtual
map type 1). Creating objects out of points in a geometry only operation and
the files associated with them came to be called spaghetti files. There is
still a need for geometry only objects today, but in relative terms, the need for them is declining. Most modern cartographic systems use data structures that are based on principles of both geometry and topology, and therefore, one must define objects that are not only locational, but also contain topological characteristics such as connectivity and contiguity. Therefore, a full set of cartographic objects must be defined that contain both geometric and topological properties. More recently, work has been conducted that involves objects that are topology only, such as that by White and Griffin (1979). Since the evaluation of the alternatives by the Committee in 1984, subsequent hearings, consideration of written comments, and oral discussion, it has become clear that classes of objects must be explicitly provided that are geometry only, and geometry and topology, whereas the capability must be provided such that topology only objects can be created by truncating the coordinates from the objects that utilize geometry and topology. At this stage in the development of digital cartography, a separate explicit class of topology only objects is not warranted. Table 2.1 shows the updated vector oriented topology only objects and how they fall into the two explicitly defined classes, and the third implicit class of objects.

<table>
<thead>
<tr>
<th>Geometry and Topology</th>
<th>Geometry Only (truncated node)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometry</td>
<td>Topology</td>
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<tr>
<td>0-D</td>
<td></td>
</tr>
<tr>
<td>point</td>
<td>node</td>
</tr>
<tr>
<td>1-D</td>
<td>link</td>
</tr>
<tr>
<td>line segment</td>
<td>directed link</td>
</tr>
<tr>
<td>string</td>
<td>chain</td>
</tr>
<tr>
<td>arc</td>
<td>ring (link or chain)</td>
</tr>
<tr>
<td>ring (string or arc)</td>
<td>ring (link or chain) w/truncated nodes</td>
</tr>
<tr>
<td>2-D</td>
<td></td>
</tr>
<tr>
<td>simple polygon</td>
<td>simple polygon</td>
</tr>
<tr>
<td>(string or arc)</td>
<td>(link or chain)</td>
</tr>
<tr>
<td>complex polygon</td>
<td>complex polygon</td>
</tr>
<tr>
<td>(string or arc)</td>
<td>(link or chain)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.1 Intended Uses of Defined Cartographic Objects in Three Cartographic Settings.

A second major requirement is that the objects defined must be modular. There are several reasons for this requirement and all pertain to the needs of digital cartography. The first is that the lower dimensional objects are needed to define the higher dimensional objects. For example, various
combinations of points and nodes are used to define the linear objects, and they are then used to define the two dimensional objects. This process can only happen if the objects defined are truly modular. The second is that various primitive and simple objects are used to define compound and complex objects. For example, a polygonal tessellation (coverage) of soils is a compound object because it is made up of one fundamental kind of lower level object. A stream network is another example. A complex object is one that is made up of various combinations of lower level objects, and a county that contains roads, streams and other networks, areas of various land use, soils, planning zones and census areas, along with features such as buildings, water towers, etc., is such an example. As defined here, the county is a rather complex cartographic object. Another reason for the requirement for modularity of objects is that then things will more easily fit into various data structure modules such as chain modules, node modules, point modules, attribute modules, etc. A further reason is that if objects are modular, then it is possible to define a set of data exchange modules that can be used to transfer digital cartographic data from one system to another. By now it should be clear that modularity is a critical requirement for cartographic objects if modern data structures are to operate efficiently.

The third requirement is that the coordinates for the objects and the objects themselves must explicitly recognize that the entities that they represent can exist in both planar and curved coordinate systems. It is common for the designer of spatial data structures to assume that the coordinate system is planar, although the real world is not that simple. The underlying assumption is that the simple mathematical equations that operate in planar systems can be used. However, for a national standard, one must define the cartographic objects such that coordinate references such as latitude and longitude can be used on the sphere or ellipsoid. The objects here have been defined such that they are valid in both planar and curved coordinate systems.

The fourth requirement is that the set of cartographic objects be extendible, that is, could be expanded at a later date, if necessary. There are several areas where such a need could arise. It is possible in the future that further research could indicate that the raster related objects, pixel and grid cell, require expansion to incorporate more explicitly topological concepts. It turns out that the raster oriented objects are currently much less well developed in the literature than are the vector-based objects. Therefore, extension of the standard could be required in the future. Another possible candidate area is that of three dimensional objects. Currently, work is going on in that area, but to date no real consensus has emerged as to what those objects should be. One possibility is an object called a prism, but other objects would have to be invented. The concept behind the current standard is to systematize and harmonize the set of objects that have already been defined. The three dimensional objects are a task for the future. In all cases, it is very important that the current standard be clearly and concisely stated, as well as being tightly organized conceptually. If this is true, the current standard will work well now and serve as a foundation on which to build extensions in the future.
2.2 REVIEW OF COMMENTS RECEIVED SINCE REPORT NO. 6 WAS PUBLISHED

Since Report No. 6 on the Interim Proposed Standard was issued in January of 1985, a number of comments have been made relating to the cartographic objects as they were defined. Most questions have been raised in the public sessions organized by the Committee to present this material and provide opportunities for questions and discussion. At the public sessions the overwhelming majority of the questions relate to clarification on what is meant by a concept or definition. A much smaller fraction of questions and comments relate to suggested changes of definitions or perhaps objects. At the outset one should point out that an important typographical error occurred on page 37 of the first printing of Report No. 6. These reports were distributed from January to April 1985. The error concerns the optionality of the coordinates for points and nodes. The current standard is that coordinates are optional for nodes. Obviously, coordinates are required for the point, or it could not exist as an object. The reason that coordinates are optional for the node is so that they can be truncated, if necessary, to produce a purely topological object. Later printings sent out after April, 1985 have been corrected to state the definitions of the point and node correctly.

During the period since Report No. 6 was issued, 14 written comments were received at Columbus headquarters and circulated to various elements of the Committee. In general, the written comments fall into two broad classes: one being suggested updates to the definitions of the objects, and the other is the need to handle holes in polygons in a direct topological manner. In terms of polishing the definitions, a number of detailed suggestions were given. These suggestions were circulated in the Committee and were used in combination with the testing and evaluation results to improve the definitions. Improvements were suggested for definitions of the pixel, grid cell, polygon, arc, node, and a number of other objects. A summary of these improvements is given in Section 2.3.

The second set of comments dealt with the way in which holes are handled for polygons. The definitions in the Interim Proposed Standard does not provide a direct approach as part of the object definitions, but offers the user the flexibility to construct a solution in the data structure. A number of written comments pointed out the need for such a capability to be directly incorporated into the object definitions. It was pointed out that while many systems handle holes in polygons now, in the future most systems will have such a capability. Therefore, it is essential that the objects be defined such that this capability is explicitly recognized without complicating life for those who do not use such a capability. One or two correspondents even provided suggestions of how this might be accomplished. As a result of the testing and evaluation work, the notion of a ring has been added to the linear objects. A ring can serve as an outer boundary of a polygon or as a boundary of a hole in a polygon. Therefore, a polygon is formed from one outer ring and zero or more inner rings that define holes. This approach adds the capability to deal with holes directly without incurring any real added complexity. Please read the next section for more discussion.
2.3 EVALUATION AND TESTING

Table 2.2 shows the sources of evaluation and testing of the cartographic objects. The upper six methods resulted in written or verbal comments that

1) evaluation by written comment from Report #6
2) evaluation by comments from Spring 1985 and 1986 meetings
3) evaluation by individual Committee members
4) evaluation by comments from external evaluators
5) evaluation by Committee in Spring and Fall meetings
6) evaluation by comments from Federal Committee
7) testing in WG I exchange modules.

Table 2.2 Evaluation and Testing Methods Conducted on the Cartographic Objects

were integrated into the evaluation of the cartographic objects and the concepts that underlie them. Many suggestions were provided for polishing up and improving the definitions. One important suggested change was the addition of an improved approach to deal with holes in polygons.

The explicit testing involved an approach very different from the other evaluations. The objects were tested by Working Group I as part of their data exchange field testing. The basic units of data exchange for cartographic data are the objects, and in order to accomplish such an exchange several additional components are required. First, a set of exchange modules must be defined. The initial set of exchange modules was defined directly from the cartographic objects. A later revision of the exchange modules was devised to consolidate the objects by dimensional class, excluding arc, pixel and grid cell. Of the three proposed implementations, the ISO 8211 implementation was used for testing here. GDIL is intended primarily for raster data and FGEF was still under development by the Federal Committee. A further description of the data exchange testing is provided in Section 3.

The results of the evaluation from all sources and the field tests by Working Group I produced a number of changes and improvements to the wording of the definitions. The most significant change is the inclusion of the ring as a linear object, 2.4.2.7. A number of comments received during the evaluation phase of the work indicated rather strongly that a direct approach had to be provided to topologically handle holes in polygons. The result is the development of the object called the ring. A ring is a linear object that can form the outer boundary of a polygon or a hole in a polygon. It is the linear boundary and not the area inside the boundary. The linear trace that forms the ring is separate from the area contained by the ring. The ring can be created from string(s), links, chain(s) or arc(s). A polygon (2.4.3.1) is then formed from one or more rings, the first being the outer polygon boundary and any other rings being interior holes. It should be noted that a ring that defines a hole in a polygon could also define the object that fills that hole, an island in the middle of a lake, for example. This approach then provides the capability for processing polygons simply if no holes are present, or rather elegantly if holes are to be processed topologically. This approach recommended by the reviewers follows the principles advocated by White (1979), by Corbett (1979, 1985) and by Wilson (1985).
A second addition to the definitions is to distinguish between a pixel and a grid cell. It turns out that there has been concern for some time that the cellular information coming from a scanner and cells on the ground are not necessarily identical because rectification has taken place, and it is also possible that the pixels may have been agglomerated. Therefore, it has become clear that two separate raster objects are necessary, one oriented to the scanning instruments and the other oriented towards surfaces, usually the ground. It is possible that in some cases the pixel and the grid cell could be identical, but that situation would be an exceptional case because they are usually different due to coordinate rectification. The definitions have been adjusted accordingly.

A third major change is the addition of the Special Implementation Objects 2.4.4, requested by the Standards Working Group of the Federal Committee. It turns out that these objects are necessary to implement the Federal Geographic Exchange Format. The Federal Group felt that they should be clearly defined so that there would be no misunderstanding when those objects were discussed in the FGEG section. Actually, these objects are special applications of the general objects defined in the main definitions. For example, feature point, label point and area point do not change the general definition of a point, but rather indicate a special use of the point as a punctiform object. Similarly, the area chain, complete chain, and network chain are variations on the general chain with the difference being whether the nodes or right/left identifiers are actually used in the implementation. Since these special objects are very important to the Federal FGEF implementation, they have been added as a separate section.

Many other minor modifications have been made to the wording of the definitions to improve the clarity of the meaning. It is also hoped that these improvements will facilitate a better understanding of the objects, what they mean, and how they are to be used. All of the objects are listed below along with any improvements that have been made to the definitions.

0-dimensional objects
- point - no real change (typographical error fixed)
- node - improved wording; coordinates optional

1-dimensional objects
- line - added as a generic definition
- line segment - no real change
- link - no real change
- directed link - no real change
- string - improved wording
- chain - improved wording; reference to identifiers added
- arc - much improved wording
- ring - a newly added definition discussed above
2-dimensional objects
area - generic definition added
polygon - rewritten to reflect the addition of rings
simple polygon - new definition to reflect the addition of ring
complex polygon - new definition to reflect the addition of ring
pixel - improved definition
grid cell - new definition to complement the pixel

Special implementation object
Feature point, label point, area point, area chain, complete chain,
network chain - new definitions added to support the FGEF implementation.

Together, these changes represent a significant improvement to the definitions of these cartographic objects. They are now more concisely and clearly defined in terms of wording and intended use. The current definitions are listed in the following subsection and have drawings included with them to facilitate understanding them.

2.4 DEFINITION OF CARTOGRAPHIC OBJECTS

NATIONAL COMMITTEE FOR DIGITAL CARTOGRAPHIC DATA STANDARDS
A PROPOSED STANDARD FOR CARTOGRAPHIC OBJECTS
Draft March 18, 1986
Including Federal Special Implementation Objects, January 1986

The cartographic objects specified in the following sections represent the basic objects required for digital cartographic processing which can be used to construct higher level objects that represent a more complex realization of the real world. The following definitions have been specified such that they are valid in planar, Euclidean geometry as well as simple curved surfaces such as the sphere or ellipsoid.

2.4.1 DEFINITION OF 0-DIMENSIONAL CARTOGRAPHIC OBJECTS

2.4.1.1 point - A 0-dimensional object that specifies geometric location. A set of coordinates specifies the location.

2.4.1.2 node - A 0-dimensional object that is a topological junction and may specify geometric location. An optional set of coordinates specifies the location.
2.4.2 DEFINITION OF 1-DIMENSIONAL CARTOGRAPHIC OBJECTS

2.4.2.0 line - A 1-dimensional object.

2.4.2.1 line segment - A 1-dimensional object that is a direct line between two points.

2.4.2.2 link - A 1-dimensional object that is a direct connection between two nodes. Alias: edge.

2.4.2.3 directed link - A link between two nodes with one direction specified.

2.4.2.4 string - A sequence of line segments.

2.4.2.5 chain - A directed sequence of nonintersecting line segments with nodes at each end. Reference to left and right identifiers are optional.
2.4.2.6  arc - A locus of points that forms a curve that is defined by a mathematical function.

2.4.2.7  ring - A sequence of nonintersecting chains, strings, links, or arcs with closure. (It represents a closed boundary, but not the area inside the closed boundary.) Alias: polygon boundary.

2.4.2.7.1  1) ring created from string(s).

2.4.2.7.2  2) ring created from links.

2.4.2.7.3  3) ring created from chain(s).

2.4.2.7.4  4) ring created from arc(s).
2.4.3 DEFINITION OF 2-DIMENSIONAL CARTOGRAPHIC OBJECTS

2.4.3.0 area - The interior of a continuous two dimensional object.

2.4.3.1 polygon - An area having one outer ring and zero or more nonintersecting inner rings.

2.4.3.1.1 1) simple polygon - A polygon without inner rings.

2.4.3.1.2 2) complex polygon - A polygon with one or more inner rings.

2.4.3.2 pixel - A 2-dimensional picture element which is the smallest nondivisible element of an image.

2.4.3.3 grid cell - A 2-dimensional object that represents an element of a regular or nearly regular tessellation of a surface.
2.4.4 SPECIAL IMPLEMENTATION OBJECTS

2.4.4.1 feature point - A point used principally for identifying the location of cartographic point feature, such as towers, buoys, gauging station, etc.

2.4.4.2 label point - A point used principally for displaying map and chart text (feature names) to assist in feature identification.

2.4.4.3 area point - A point within an area carrying attribute information about that area.

2.4.4.4 area chain - A chain with left and right identifiers but without node identifiers.

2.4.4.5 complete chain - A chain that has node identifiers and left and right identifiers.

2.4.4.6 network chain - A chain that has node pointers but without left and right identifiers.
2.5 REFERENCES


3.0 TESTING THE INTERIM PROPOSED STANDARD FOR CARTOGRAPHIC DATA EXCHANGE  by Timothy Nyerges

3.1 Background

Members of Working Group I:

Timothy Nyerges (Chair)  University of Washington
William Liles (Vice Chair)  Xerox Corporation
Frederick Billingsley  Jet Propulsion Laboratory
A. Raymond Boyle  University of Saskatchewan
Alfred A. Brooks Jr.  Information Interchange, Inc.
Hugh Calkins  State University of N. Y., Buffalo
Robin Fageas  U. S. Geological Survey
Clif McVay  Defense Mapping Agency
Dave Pendleton  National Ocean Service
Jan van Roessel  Technicolor Government Services

Observers:
Donna Peuquet  Pennsylvania State University
James Upperman  National Bureau of Standards
Marvin White  Etak Corporation

During cycle four of the work by the National Committee for Digital Cartographic Data Standards (NCDCDS), Working Group I refined and tested the Interim Proposed Standard for Cartographic Data Exchange. This portion of the NCDCDS Report 7 presents a summary of:

- the Interim Proposed Standard as documented in Report 6,
- comments received from Report 6,
- revisions to the Interim Proposed Standard,
- results from testing,
- implications for further revisions,

During cycle two of committee work an assessment of alternatives for digital cartographic data exchange was undertaken. This resulted in a conclusion that none of the current strategies, hence formats or standards for graphical data exchange were suitable for acceptance as a cartographic data exchange standard. In particular, the two standards most closely evaluated were the GKS Graphics Metafile and IGES standards. The Metafile is not appropriate because it has a graphic symbolization orientation, whereas this committee’s concern is with point, line, area and feature data, but not the multitude of symbolization which can be associated with these features. In addition, the metafile approach does not consider spatial topology and spatial referencing system information. The IGES standard is not appropriate because of the lack of spatial referencing system information, data quality information, raster and grid cell representations. Both standards would require significant enhancements to be used for a general digital cartographic data exchange standard that meets the needs of diverse applications in the cartographic community.
3.2 Review of the Comments on the Report 6 Interim Proposed Standard

NCDCDS Report 6 distributed before and discussed in public forum in March, 1985 contains a proposal to utilize (the then draft proposed, and now accepted) American National Standards / International Standards Organization (ANSI/ISO) 8211 Specification for a Data Descriptive File as a flexible means to transfer digital cartographic data. (This standard is still under review as a Federal Information Processing Standard - FIPS.) The ANSI/ISO 8211 standard is a specification for a data transfer mechanism by which data sets can be encoded and decoded, but does not specify the actual cartographic data fields that should be transferred. The committee recognized that the interim proposed standard at that time had some serious shortcomings in terms of completeness.

Working Group I received written comments as a result of a public review of the Report 6 Interim Proposed Standard during the past year. The comments have been distilled into four primary themes listed below in the order of the volume of comments received:

- data field meaning
  The committee should define data meaning for points, lines and areas in a clear and simple fashion.

- data descriptive mechanism
  An internal data descriptive mechanism is a good idea, but may be too complex to be successful. An external, fixed format definition would be simpler.

- user community
  The committee should define the intended user community more clearly.

- conformance
  The committee should define when an organization is in conformance with the standard.

Many of the comments received are of diametrically opposing views on some issues. The use of an internal data descriptive mechanism versus defining fixed formats defined by external documentation is one such example. The committee has considered all comments, incorporating their substance into committee deliberations.

As a result of both committee direction and comments, the draft interim proposed standard has been altered significantly to reflect this input. Effort has focused in the past year on formulating the description of the cartographic data field meaning rather than specifying a mechanism by which any data can be encoded and decode to implement a transfer. This new direction resulted in the creation of a draft interim proposed standard which defined a set of exchange modules closely aligned with the definitions of cartographic objects as defined by NCDCDS Working Group IV. An exchange module is a logical grouping of data
subfields required to represent a cartographic object or other important grouping of information to support data exchange.

Table 1 shows the status of the exchange modules as they appeared in the draft standard that was discussed at the September, 1985 meetings. The exchange modules are grouped at a higher level of abstraction into exchange forms. The five exchange forms that appear in Table 1 are: Global Information, Data Quality, Cartographic Object, Relational, and Raster.

<table>
<thead>
<tr>
<th>Exchange Modules and Exchange Forms</th>
</tr>
</thead>
</table>

### GLOBAL INFORMATION
- Catalog
- Identification
- Security
- Spatial Reference
- Coverage
- Map Projection
- Control Points

### DATA QUALITY
- Lineage
- Positional Accuracy
- Attribute Accuracy
- Logical Consistency
- Completeness

### CARTOGRAPHIC OBJECTS
- Feature
- Point
- Node
- Line Segment
- Link
- Directed Link
- String
- Chain
- Arc
- String Based Polygon
- Link Based Polygon
- Chain Based Polygon
The Cartographic Object Form consists of exchange modules for point, line, area, and grid cell type representations that follow a logical data organization closely aligned with the "dictionary" definition of the objects. The Relational Form consists of relations that define point, line and area objects; hence the logical data organization is of a simpler form than in the Cartographic Object Form. The Raster Form consists of exchange modules used to represent imagery data.

The draft of the Interim Proposed Standard that appeared in Report 6 is now being called a "method for implementation" of the exchange modules. This is discussed in section 3.4.6.

3.3 Testing the Interim Proposed Standard

A public call for participation in testing the interim proposed standard went before the cartographic community in the Spring and Summer of 1985. The categories for participating in a test of the data exchange standard are: Federal and Non-federal. The Federal participants would be from the Federal Government Agencies. The Non-federal would be from academic and industry organizations, and state and local government agencies. The test categories were also subdivided into formal and informal tests. Participating in a formal test required that a report be submitted to the committee documenting all stages in the test. An informal test required no report, but the committee did ask to be kept informed as to the outcome of the tests.
3.3.1 Test Participants

Participants agreeing to take part in a Formal Federal test were:

- Defense Mapping Agency in the Dept. of Defense, both Aerospace Center and Hydrographic/Topographic Center
- National Ocean Service of NOAA in the Dept. of Commerce
- U. S. Geological Survey in the Dept. of Interior

Participants agreeing to take part in the Formal Non-Federal test were:

- Assessing Department of the City of Boston, Massachusetts
- Map Department of DuPage County, Illinois
- Geographic Technology Inc. from Bellingham, Washington

Informal Tests were undertaken by members of the committee at:

- Jet Propulsion Laboratory from Pasadena, California
- U. S. Geological Survey at EROS Data Center from Sioux Falls, South Dakota

3.3.2 Test Methodology

A testing methodology was devised as a guideline to help testers perform similar functions and document their experience accordingly. Two levels of tests were undertaken: level 1 and level 2. A level 1 test is essentially a "pencil and paper" test to determine the suitability of the exchange modules in different application environments. This test included the first three steps of the eight step methodology listed below. A level 2 test consisted of all eight steps of the test methodology as listed below, including an automated portion in addition to the "pencil and paper" test. The steps in the testing methodology are as follows:

1. Source data base examined in terms of exchange modules.
   - The source data base for an organization is to be examined as for the suitability of the exchange modules to transfer data from that source data base to another environment.

2. Manual mapping of source data base records, fields and subfields to target exchange module records, fields and subfields.
   - Subfields in the source data base are to be matched against subfields in the exchange modules. This mapping of source to target is to documented.

3. Compile a report documenting the mapping.
   - A report should contain the suitability of the exchange modules for use in the testers application environment. The report should contain the mapping of the source data subfields into the target data subfields.
4. Encode the source to target mapping in an implementation. The source to target mapping is to be encoded for inclusion in an automated test.

5. Load a data set into the exchange module/form using an export interface. A data set is loaded onto a transfer medium as per the encoding performed in the previous step.

6. Using the same data set, retrieve the data set from the encoded form back into the original fields using an import interface. The data should be retrieved back into the original file structure.

7. Transfer the data set to a foreign environment and retrieve the data set via an import interface. A data set is to be transferred to a foreign environment which has a different file structure.

8. Compile a report documenting the procedures and conclusions. A report should include all findings from each step of the test. Conclusions should be developed as an assessment of the completeness of the interim proposed standard.

3.3.3 Test Results

All participants in the Formal Federal test completed their portion of the level 2 test. The Cartographic Object Form from the September draft standard was used. The full report appears in Appendix A. An implementation of ISO 8211 data descriptive file specification was used to operationalize the test.

The general conclusions from the Formal Federal test are as follows:

- The similarity of converted files is misleading because the same subfields in certain exchanges modules had a different interpretation of data field meaning among the organizations.

- An interchange requires knowledge of the other organizations mapping from source data base subfields to target exchange module subfields.

- A data exchange involving several modules would be sufficiently complex as to require more than one DDF and input file or a complex interface to the originating data base."

- The Interim Proposed Standard at the time tested requires more detail to be useful in an exchange environment of non-communicating organizations.

- The next stable version of the interim proposed standard should be tested.
The City of Boston Assessing Department completed a report on a "pencil and paper" level 1 test. The Cartographic Object Form from a December, 1985 draft was used in the test. The full report appears in Appendix B.

The general conclusions from the test are as follows:

- Reviewing the Interim Proposed Standard in terms of the City of Boston Data Base took the greatest amount of time in the test.

- Approximately three and one-half days were needed to perform the manual encoding from source to target subfields.

- The point and line modules are the most appropriate for the City's use since the majority of data is land parcel based. These modules are satisfactory for transferring City data.

- The arc module looked like it could be useful for transferring data, but no attempt was made to encode data.

The other participants were not able to complete tests due to shifts in priorities. However, mostly positive feedback was given when the material in the draft standard was clarified. This indicated that further detail is needed in the text of the standard.

3.3.4 Revisions as a Result of Testing

The tests provided considerable insight into the shortcomings of the draft standard. The document requires greater detail in explanation of the data subfields so that the intent and meaning of the subfields is clear. All modules are being clarified and further detailed to provide the necessary explanations.

3.4 Current Status of the Interim Proposed Standard

The Interim Proposed Standard is being revised currently to ameliorate the shortcomings uncovered during the testing stage. A summary of some of these changes is presented here.

The document is being rewritten in a style as close as possible to the ANSI Style Manual.

Repetitive sections of the document are being reduced, and generic explanations with respect to subfields are being included to simplify the reading of the document.

Several exchange modules are being reviewed to bring them into closer coordination with the Federal Interagency Coordinating Committee on Digital Cartography (FICCDC) Standards Working Group. This includes all modules in the Global Information Grouping as well as all modules in the Cartographic Object Form.
3.4.1 Global Information Modules

The exchange modules in the Globals Information Grouping currently in the standard are listed in Table 2.

Table 2.
Globals Information

Bootstrap - for describing how the data transfer is implemented
Catalog - 3 modules for directory, cross reference, and domain
Identification - identify the data set
Security - security level of the data set
Spatial Reference - spatial address parameters and orientation
Coverage - geographic extent of the data set
Map Projection - describe the projection used
Registration Points - register the data set to the earth

3.4.2 Data Quality Modules

The Data Quality modules have been simplified to include a general comment field only.

3.4.3 Cartographic Object Form

Modules in the Cartographic Object Form have been revised to reduce the number of modules by eliminating the redundancy in the data representations. The object representations for the FICCDC Standards Working Group and the NCDCDS Working Group I have been coordinated to produce a similar set of representations. Those object representations are listed in Table 3.

**NOTICE**

Readers desiring a copy of the full description of the cartographic object modules should write Prof. Moellering at Columbus headquarters. A copy of the object form descriptions will be available in late May, 1986. Please write to Prof. Moellering at the address given in the front of this report.
<table>
<thead>
<tr>
<th>Module Type</th>
<th>Object Representation</th>
<th>Representation Code</th>
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<tbody>
<tr>
<td>Point-Node</td>
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<td>Feature Point</td>
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<td></td>
<td>Network Chain</td>
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<td></td>
<td>Polygon represented using spatial addresses</td>
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<td></td>
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<td>D</td>
</tr>
<tr>
<td></td>
<td>Ring represented using spatial addresses</td>
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<tr>
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<td>Arc</td>
<td>Z</td>
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<td>Grid-Definition</td>
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</tr>
<tr>
<td></td>
<td>Straight encoding with attributes</td>
<td>J</td>
</tr>
<tr>
<td></td>
<td>Run encoding with cell values</td>
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<td>Feature</td>
<td>Feature</td>
<td>F</td>
</tr>
<tr>
<td>Attribute</td>
<td>Same as object to which attribute pertains</td>
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</tr>
</tbody>
</table>
3.4.4 Relational Form

The description of the exchange modules in the Relational Form has been revised since the last draft to include a generic description of relations having the following content: typel/type2 and type/spatial_address. An additional schema exchange module has been added to the Form. These modules are listed in Table 4.

Table 4. Relational Form

Schema

**typel/type2**
- Feature/Element
- Polygon/Ring
- Polygon/Chain
- Polygon/Point
- Ring/Chain
- Ring/Point
- Chain/Point
- Node/Chain
- Node/Point
- Label/Point

**type/address**
- Polygon/Address
- Ring/Address
- Chain/Address
- Node/Address
- Point/Address

Chain-topology

Attribute-primary

Attribute-secondary
3.4.5 Raster Form

The Raster Form contains three modules:

- Raster Logical Structure
- Raster Ancillary Attribute
- Raster Image Data

3.4.6 Implementation of the Standard

The implementation of the cartographic data exchange standard can be done currently with three methods:

- ISO 8211 Data Descriptive File specification
- FICCDC delimiter specification
- NASA/JPL General Data Interchange Language

In the fall of 1985 the International Standards Organization adopted a method of encoding relational and hierarchical structured files call ISO 8211. This technique stores a data definition record as part of the information to be transferred with a file so that a receiving system can directly decode the file without resorting to external documentation. The Formal Federal test utilized an implementation of this specification to test transfer of exchange modules.

The Federal Interagency Coordinating Committee on Digital Cartography has proposed a method of delimiters for the encoding of subfields, fields and records of a data set. This will soon be tested to determine the feasibility of such an approach.

NASA has been funding a project at the Jet Propulsion Laboratory to define a means to encode and decode in a flexible manner real-time transfer, as well as archival transfer, of space image data. This effort has resulted in the specification of a general data interchange language operationalizing the transfer of data.

Each of the methods proposed for implementing the cartographic data exchange standard have their particular strong and weak points. Further testing will determine the advantages and disadvantages of each of the three methods.
Appendix A

Interim NCDCDS Testing Report

A. A. Brooks
J. V. Upperman

February 20, 1986
Abstract

The NCDCDS (Sept 1985 version) was tested by constructing mapping tables and corresponding software for three data files: NOS/SDDEF, DMA/SLF and USGS/DLG. The procedure revealed that several data items in each file were not mapped into the NCDCDS in a well defined and unequivocally interpretable manner. This stemmed from both the outright lack of some fields or subfields in the NCDCDS and imprecise specifications. Also, data which users might consider as equivalent for many purposes was mapped into different locations, making interchange difficult. It is apparent that users are not sufficiently constrained by the NCDCDS document.

It is not clear that all of these difficulties will be removed by the new document (based on the NBS meeting of January 8-10, 1986). The solution may lie only in a smaller number of more robust interchange forms which will constrain users in the use of one form for similar data albeit some subfields would be null.

Comments on the NCDCDS Interfaces

The goals of producing the best possible interfaces by knowledgeable users and, at the same time, evaluating how the standard will be interpreted by de novo users are mutually incompatible. Therefore, in order to make the testing of the NCDCDS and ISO 8211 as indicative as possible of its future viability in the hands of de novo users, the implementation and critique were done separately under the following guidelines:

1. When possible, the mappings as received from the source agencies were used without consultation. The implementor made as few changes as possible without contravening the NCDCDS proposed standard in its current form. Where consultation was necessary, it has been documented, in order to indicate where and how the de novo user might be misled by the standard.

2. The critique, on the other hand, has been constructed after consultation and used the best insight of all participants.

These guidelines assign all the misunderstandings and mistakes of the individual participants to the standard, to be
documented and corrected, if necessary. During the testing period, 9-15-86 thru 1-15-86, the NCDCDS proposed standard underwent numerous changes which were not completed before the end of the test period. Therefore, it was decided that the test should be concluded against the September 1985 draft. The changes to the standard either retained or expanded the conceptual capabilities of the NCDCDS proposed standard. It is not yet clear how the changes have affected the NCDCDS/ISO 8211 file structure or the specific implementations of the test.

The interfaces for the NOS/SDDEF, DMA/SLF and USGS/DLG standards to the NCDCDS, using ISO 8211 as the interchange vehicle, were programmed from the mapping information provided by the participating agencies. The tags, field names and labels were taken from the NCDCDS proposed standard with the following modifications:

1. The MODNAM subfield was dropped as there was no consensus about its contents and it seemed logically redundant to the field tag and field name.

2. The labels for the NCDCDS subfields that had no equivalent in the source standard were entered as null values with specified delimited subfields which were entered in the data records as null fields.

3. The NCDCDS field descriptions were truncated after the last subfield required by the source standard.

4. Fields, nonexistent in the NCDCDS yet essential to the acceptance of the source data, were defined. The details of these definitions are described under each interface.

5. The fixed format nature of the source data was preserved at the detail level and is reflected in the assigned ISO 8211 formats.

6. Since the NCDCDS does not specify a single specific latitude/longitude format, no attempt was made to convert the native formats at this time.

7. Since the NCDCDS does not specify a record and file structure, the implementor chose to use a single file structure. Logically, it is the most stringent test case and the test should be designed to reveal any problems. The sample files do not represent the structure of their parent files and it may be easier to produce an interchange file set from these files.

The adequacy of the NCDCDS proposed standard and ISO 8211 to
perform the interchange are discussed separately for each source file.

The USGS/DLG Interface

In evaluating this test, it should be remembered that the mapping was provided by Robin Fegeas, a WGl member, knowledgeable about the NCDCDS proposed standard. The mapping he provided predated the test period.

The DLG file has eighty byte physical records with logical records spanning physical records as necessary.

The DLG interface was reasonably straightforward. Approximately 1500 bytes of source information was held in memory while the CATOLOG, IDENTIFICATION, SPATIAL REFERENCE, MAP PROJECTION, PROJECTION PARAMETERS, TRANSFORMATION PARAMETERS and CONTROL POINTS fields were constructed and placed into the first DDF data record. The data records were processed one at a time retaining only the brief (20 byte) control information from each header record in memory. The data was placed in the NODE, LINE ID LIST, CHAINED BASED POLYGON, CHAIN ID LIST, CHAIN POINT LIST and ATTRIBUTE fields as required.

The following are comments on this procedure:

1. No NCDCDS equivalent existed for the DLG NUMBER OF ISLANDS and none was generated.

2. No NCDCDS field for the DLG NODE-TO-LINE LINKAGE data existed and since this field was essential one was generated, LNID, formatted the same as CLST.

3. Four DLG fields (record 2: fields 2,3,4 and file accuracy records) were tentatively placed in the CATALOG/COMMENT field in an undifferentiated manner. This will require ad hoc processing on import. This can be avoided by defining CATALOG/COMMENT, not as a subfield, but as a tagged field. Since COMM is defined, it requires only approval of its use after CTLG.

4. One field was tentatively placed in IDENTIFICATION/BANNER.

5. The CATALOG field and to some extent the IDENTIFICATION field required several null fields. This is not considered a serious drawback.

The above items 1-4 should be considered as potentially serious in that other implementors, not in communication
with the exporter, might very well have assigned another location for this data. Certainly this is true for the LINE ID LIST field.

However, on the whole the mapping and implementation should be considered reasonably satisfactory for an interim standard. The test revealed only minor deficiencies in the NCDCDS proposed standard with respect to DLG.

The NOS/SDDEF Interface

The NOS/SDDEF file uses repetitive 80 byte records with a fixed format. The meaning of the data varies with field values and contiguous sets of records are logically related describing chains, splines, et cetera.

The documentation of the NOS/SDDEF (April 1, 1985) contains explicit details of the individual records but does not describe the interrecord structure implied by the data. The mapping instructions supplied much of this information but left some details in question. This was particularly true of ARCS, a topic about which NCDCDS is quite vague. Therefore, some additional discussion was necessary and is detailed in a letter (Al Brooks to Walt Winn dated 12/17/85; response dated 12/31/85). It exemplifies areas in which the NCDCDS proposed standard provides little guidance. A meeting between Al Brooks and Walt Winn was held on 1/7/86 to verify the mapping details.

After the meeting of 1/7/86, the interface software was completed with little trouble. The additional information retained in memory while forming the data fields was less than 80 bytes. Detail comments on this procedure are:

1. Several items from the UHL record (label) were placed in CTLG/COMMENT in an undifferentiated format. This is not desirable.

2. A new tag, ATTN, with subfields was defined to contain the added data about points, strings and arcs. There was no apparent location in the NCDCDS proposed standard for this information.

3. One field, CTLG, required 14 delimiters for null fields before reaching the COMMENT subfield where information was stored (see DLG comments). This is not serious but is not very elegant.

4. The question of where and how to place the spline information into ARCS raised fundamental questions about which the NCDCDS proposed standard does not provide much guidance.
Two methods suggest themselves:

a. Transmit the spline equation, its parameters and applicable range thus permitting the recipient to generate the intervening points.

b. Transmit the spline function and a set of points requiring the recipient to generate the spline parameters. This may be subject to computational precision problems. The spline function could be transmitted explicitly or by reference to an external document.

In any case, the NCDCDS proposed standard does not specify an approach but leaves it to the varying ingenuity of the exporting users. Only the NOS point data and spline type were transmitted pending NCDCDS clarification.

All in all, the NOS/SDDEF conversion was technically straightforward and successful in that the fundamental data mapped successfully into the NCDCDS proposed standard. The variances were easily accommodated in the NCDCDS proposed standard and the ISO 8211 structure. Again, other mappers and implementors could have made other assignments.

The DMA/SLF Interface

The DMA/SLF file contains a greater variety of data belonging in Glogals and Data Quality than does the NOS and USGS files. Notation and practice in these areas does not seem to be at all standardized and it is not surprising that more mismatches existed between SLF and NCDCDS than with the other test files. Further evidence is that two independent mappings had several inconsistencies. These were reconciled but left several questions about NCDCDS data assignments. In many cases the implementor was asked to improvise and did so. In other cases, multiple elemental SLF data items were placed into a single NCDCDS subfield. This gives rise to unresolved data items. In certain cases the implementor felt compelled to remedy this situation but could not always do so. A detailed itemization of problems follows:

1. The SLF file uses a blocked, spanned structure for logical records in 1980 byte physical blocks. The sample received did not contain spanning and blocking for the last two DSI groups. The DSI groups could be apportioned into the NCDCDS format without retaining more than 1980 bytes in main memory. The variable length DSI groups, DSRG and DSAG, can probably be processed with minor changes in the logic to accommodate control fields split across blocks. This group contained hexadecimal "00" as filler that was not specified
in the standard. These characters were replaced by "#" for printing purposes.

2. The following are notes on specific tags and fields:

a. IDEN - Relative few subfields used
b. SCUR - Retained the SLF fixed format in a single field
c. DLGC - Non NCDCDS tag for Date Source: questionable assignment
d. PROP - Scale was included as a parameter
e. DQLG - Multiple SLF fields were merged into both the STEP and SPEC subfields
f. DQPA - NCDCDS labels dropped as not appropriate
g. DQAA - NCDCDS labels changed as not appropriate
h. DSAG - Non NCDCDS tag for SLF DSAG group if present
i. CHN - Only the CHAINID subfield used; SLF assumes a different reconstruction process
j. ATTR - Dropped labels as inappropriate; field contains forty character blocks of SLF feature "header"
k. ELEM - Element type included with ELEMENID

The implementor received the impression that SLF was forced into the NCDCDS format in a not too satisfying manner with some data omitted. This was apparent from the differences in the original maps, the unanswered questions of the second map and the liberties allowed the implementor. It is clear that other implementors would make different assignments.

General Impressions and Comments

1. Any apparent similarity of the converted files based upon tags alone, or even subfield labels, is misleading. One must examine the subfield contents and meaning of the data to determine equivalence.

2. Interchange through the NCDCDS proposed standard, in its present (September 1985) state of specification, would require a knowledge of the source data file format and specifications. To be mapped into each other through the NCDCDS proposed standard, two files must be conceptually compatible with the NCDCDS format and with each other. Rather than using existing native interchange formats, the process should probably take place between the parent files.

3. The NCDCDS specifications were not precise enough to enable "mappers" to produce uniformly satisfactory "data maps" and this problem would be exacerbated if more than one implementation were involved or if test files of richer content had been used.

4. A large and complete interchange would very probably
require multiple interchange files which would best be produced by providing separate input files to the ISO 8211 implementation software and not by the single file approach used in the test. A greater flexibility for change will be attained by the multifile approach.

5. The NCDCDS proposed standard requires considerable enhancement before two noncommunicating implementations can exchange data. As it currently stands the receiving logic must be based at the tag/field level not at the file/record level. More detailed specifications for the meaning and use of the fields and subfields is required; more file and record specifications are required.

6. Testing of the September 1985 NCDCDS proposed standard has served its usefulness and the effort should be moved to the next "stable" version of the NCDCDS proposed standard as soon as it is made available.

**Potential for Interchange using the NCDCDS Proposed Standard**

The potential for interchange by noncommunicating parties can be judged from the data represented in "Attachment 1" that illustrates the usage of tagged fields and subfields. This does not ensure that the fields were used with the same meaning or detailed data format. The tag overlap varies from 5 to 40 percent. The recipient would certainly need to know the origin of the interchange file. Undoubtedly, a consensus on the use of the NCDCDS fields might improve matters. This may be attainable between noncommunicating users only by rigidly specifying a smaller set of more robust interchange forms thus constraining the user to place similar data into the same tagged field. In some cases, data forms would have globally null fields and a neutral terminology would need to be adopted. The data represented in "Attachment 2" illustrates the difficulty encountered when exporting a file to the NCDCDS format and then importing the same file back into its native format.
Attachment 1

NCDCDS (Sept. 1985) Tag usage table for NOS, DMA and USGS files

X = tag used; N/M = N out of M subfields in common;
? = private tag; # = varying meaning; * = repeating subfield,
additional field contents may have varying meaning

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<th>USGS</th>
<th>COMMENTS</th>
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<td>X 2/3</td>
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<td>X</td>
<td>X 1/3</td>
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Summary
Fields in Common

N/M//S
N out of M fields
S subfields

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<tr>
<th>NOS</th>
<th>DMA</th>
<th>USGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/23//2</td>
<td>9/23//15</td>
<td>2/18//3</td>
</tr>
</tbody>
</table>

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The Import Interfaces

The import interfaces (i.e., moving data from the ISO 8211 system back into their original file structures) have been constructed to evaluate the viability of the NCDCDS proposed standard to effect interchange between noncommunicating parties. This implies that the recipient has the following information:

1. The NCDCDS proposed standard and references
2. The ISO 8211 standard and references
3. The specifications of the target file (in this case, the original file)
4. The DDF data descriptive record

As it is easy to inadvertently make use of information not truly available to the user under the test guidelines, it is also useful to state specifically what information the target user does not have, namely:

1. The source file mapping table
2. Any privileged information of the export implementor

Under these conditions, foreign tags, fields and subfields as well as the nondocumented details of data structure within elementary ISO 8211 fields cannot be recovered from the interchange file. Or conversely, only those fields in the NCDCDS proposed standard which have readily apparent and unique equivalence in the source and target files will be recoverable with any certainty. Without the source mapping, any subjective decisions by the recipient will be cause for doubt about whether or not the sender made the same subjective decisions. Thus, not only must the NCDCDS proposed standard be sufficiently robust to accept a file, in the absence of the source mapping its specifications must leave the recipient no doubt as to the intent of the sender.

Under the above guidelines, the following comments apply to the tagged fields and subfields of the ISO 8211 files.

**NOS.NCDCDS.DDF**

1. CTLG/COMMENT - no target for DDF subfield
2. PNT/POINTID - no target for DDF subfield
   GEOQUAD - subfield not in NCDCDS
   X,Y - data format ambiguously defined in NCDCDS
3. ARCS/ARCID  - no target for DDF subfield
   ARCTYPE  - no target for DDF subfield
4. STRG/STRINGID - no target for DDF subfield
5. PLST/GEOQUAD  - subfield not in NCDCDS
   X,Y  - data format ambiguously defined in NCDCDS
6. ATTN  - tag not in NCDCDS

USGS.NCDCDS.DDF
1. CTLG/LAYER  - no target for DDF subfield
   MAP  - assignable in target file
   COMMENT  - no target for DDF subfield
2. IDEN  - assignable in target file
3. SREF  - assignable in target file
4. MPRJ  - assignable in target file
5. PROP  - assignable in target file
6. MTRG  - assignable in target file
7. CPNT  - assignable in target file
8. NODE  - assignable in target file
9. LNID  - tag not in NCDCDS
10. CPOL  - assignable in target file
11. CLST  - assignable in target file
12. CHN  - assignable in target file
13. PLST  - assignable in target file
14. ATTR  - no target for DDF subfield

DMA.NCDCDS.DDF
1. IDEN  - assignable in target file
2. SCUR  - not NCDCDS usage
3. DLGC  - tag not in NCDCDS
4. CVRG  - not NCDCDS usage, lat/long unresolved
5. SREF  - assignable in target file, -lat/long
6. MPRJ  - assignable in target file
7. PROP  - assignable in target file
8. CPNT  - assignable in target file
9. DQLG/DATEREV  - no apparent target
   PROAGENCY  - assignable in target file
   SPEC  - not NCDCDS usage, unresolved subfields
   STEP  - not NCDCDS usage, unresolved subfields
   DATESOURCE-  - not NCDCDS usage
10. DQPA  - not NCDCDS usage
11. DQAA  - not NCDCDS usage
12. DSAG  - tag not in NCDCDS
13. CHN  - assignable in target file
14. PLST  - assignable in target file
15. NODE  - assignable in target file
16. FEAT  - not NCDCDS usage
17. ATTR  - not NCDCDS usage
18. ELEM  - not NCDCDS usage
Appendix B

REPORT

to

The National Committee for
Cartographic Data
Standards

Joseph M. Distefano
City of Boston
Assessing Department

MARCH 1986
I. INTRODUCTION

The following test was undertaken for the National Committee for Cartographic Data Standards by the City of Boston Assessing Department.

The City of Boston is presently performing digital data base building through parcel line data capture. There are approximately 108,000 land parcels in the City within about 56 square miles.

The testing procedure as described in the National Committee's Testing Methodology memo (9/1/85) was followed. The test included a review of the Cartographic Object Form Exchange Modules and an evaluation of their appropriateness as transfer vehicles for Boston's graphic and related non-graphic attribute data. Since data capture is not complete in Boston, some assumptions were made as to what type and form data would be expected to be captured in the near future. Although all exchange modules were evaluated, only two (2) exchange modules were selected for manually encoding data from the Boston data base. The cartographic objects used for encoding were points (PNTS) and lines (LINE). These were chosen for two reasons. First, they were the most typical features captured as Boston builds its graphic data base. Second, points and lines represent the most probable data types that the City will be asked to share with others (i.e. municipal and regional utilities and State Agencies).

The "point" data chosen for encoding is the visual centroid of the land parcel. Simple text presently is placed at this point and attribute data including:

WARD
PRECINCT
BLOCK
STREET ADDRESS
The "lines" chosen for encoding are the parcel lines. While there are Arcs and Linestrings which also comprise these parcels, "lines" are by far the most dominant type. Attribute data including; WARD, PRECINCT, BLOCK, BRA MAP, TRACING NUMBER, RECORDED DIMENSION, have been associated with that graphic element.

II. ENVIRONMENT

The City of Boston operates an Intergraph System, composed of a dedicated VAX 11/751, two(2) monochromatic dual screen high performance work stations, one(1) color dual screen high performance work station, one(1) monochromatic and one(1) color, single screen work stations, three(3) V80 11" raster plotters, a 34" raster bed plotter and a 34" pen plotter. The software presently on the system includes;

Interactive Graphics Design System
Coordinate Geometry
World Mapping
Land Records Management
Drawing Management Services
Grid Data Utilities
3-D Graphics
Graphic Polygon Processing Utilities

Only minimal non graphic data are kept on the system. The non
graphic data were selected for storage and maintenance on the system on the basis of its commonality as a City-wide data identifier and its potential as a display parameter for probable thematic and analytical applications.

III. DATA ENCODING

The following testing methodology was used.

- Review the National Standards for Cartographic Object Form Exchange Modules

- Review internal methodologies of Cartographic and attribute data storage

- Select a subset of the Object Forms to encode

- Encode the subset of Objects and attribute data in accordance with the National Standards

- Review all the Cartographic Object Form Exchange Modules and evaluate:
  a) Suitability/appropriateness to Boston's data
  b) Sufficiency to transfer Boston's Data

Review of the National Standards was the most time consuming activity, while review if internal methods of data storage was the next most time consuming. This was most likely a function of the testers unfamiliarity with the nature of cartographic objects' data formatting as any other factor. It is estimated that from three to four person days were required to prepare for the first manual encoding. Actual encoding time for the sample data was negligible. The test was not structured to determine encoding times, however, it seems that programming resources needed to automate the encoding process would not be trivial.
It was found that both the point and the line Exchange Modules were appropriate as a data transfer medium for graphic and non graphic attribute data. The following Table A represents the results of evaluating the remaining Exchange Modules with regard to their being appropriate as data transfer mechanisms and/or whether the Exchange Module describes any cartographic object presently in the Boston data base.

IV. SUMMARY AND CONCLUSIONS

Generally the National Committee for Cartographic Data Standards, Object Exchange Modules provide an adequate format for encoding parcel lines and parcel centroids graphics and non graphics attribute data found in the City of Boston's data base.

It is, however, unclear as to how much resources are required to perform large scale automated data encoding. It is the opinion of this tester that those resources would not be trivial. The need to develop the capability of data transfer here in Boston is becoming increasingly evident. As of this date two(2) public utilities have requested sample Municipal graphic data in order to determine if it is feasible to use these data as a component of their data capture process. While one of these utilities is presently operating a system manufactured by the same vendor the other utility has not yet chosen a vendor. Other utilities and State agencies have initiated activity in purchasing automated mapping systems.

It is therefore quite probable that either the local utility and/or the State agencies will be faced with using various municipalities' data and will need to utilize a data transfer mechanism which will deal with the problems of compatibility of multiple digital cartographic data storage systems.
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<th>Sufficient to Transfer Data</th>
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ENCODTYPE S
OBJID
NUMATT 6
NUMCOORD 2

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</tr>
<tr>
<td>TRACING_NUM</td>
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</table>
Testing the Interim Proposed Standard for Digital Cartographic Data Quality

Report of the testing phase, Cycle 4
National Committee for Digital Cartographic Data Standards
Working Group II on Data Set Quality

prepared by N. Chrisman

Membership of Working Group II on Data Set Quality:

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4.0 Background Working Group II on Data Set Quality has the mission to develop standards for the quality components of digital cartographic data. Deliberations between 1982 and 1985 lead to the Interim Proposed Standard published in Report 6 of this series. For further information on the earlier activities, please refer to the previous reports. Over the past year, efforts have focused on testing the interim proposed standard. This report summarizes the results of the testing.

Quality standards can be defined in many ways. For a particular product, such as a large-scale topographic map or a cadastral survey, it is usual to set a performance standard - a fixed numerical threshold that all products must meet. In other cases, such as the approach applied to geodetic surveying until very recently, standards consist of specifications for the procedures that should lead to acceptable results. Both approaches are linked to specific products and identifiable uses. The mission of this committee is much broader. Digital cartographic data is a generic term for a broad range of products. Modern applications of digital cartographic data have also modified the expectations about end use. Producers can no longer predict the requirements of all the potential users.

The approach adopted by this Working Group is termed "truth-in-labelling". This approach places requirements on both the producer and the consumer. The producer must disclose all the information needed to evaluate the data, and the user must perform the evaluation of fitness for use relative to the particular application. For such a system to operate, a producer must have guidelines for the items which must be transmitted to permit evaluation. This Working Group intends to create a standard for use by producers to create a quality report. Report 6 contained an Interim Proposed Standard which will be refined into a Proposed Standard for potential adoption in 1987. From the results of testing available, the contents of the quality report specified in Report 6 will probably not be radically altered in the standard proposed. However, our testing was only performed from the producer's end. The Working Group is relying on the readers of this report to evaluate the quality reports included to determine if they communicate adequate information to evaluate fitness for use.
4.1 Response to comments  Since the publication of the Interim Proposed Standard, a number of comments have been offered in written form or at public hearings. A few of these were issues of clarity which will result in revised wording in the new draft of the standard. Most of the comments have dealt with terminology. The Working Group has examined these comments and has decided, in almost all cases, not to modify the terms proposed. One commentator urged the Working Group to adopt some of the approaches described in the literature on quality assurance and quality control (QA/QC). This literature formed a part of the examination of alternatives in Cycle 2, and is the origin of our fitness for use concept. Most of the QA/QC methods apply to circumstances in production flow where a consistent set of specifications and thresholds can be applied. By contrast, this Working Group is charged with the use of quality information in the exchange of data outside producing agencies. The interim proposed standard may increase the awareness of QA/QC inside producing agencies, but there is no intention to change internal procedures.

Another theme of comments concerns stringency. The Interim Proposed Standard can be read as a very detailed list of information to be transmitted. This might increase costs and difficulty. However, others found that the standard had been interpreted too liberally so that virtually any result complied with the standard. The difficult conclusion is that both comments are valid. The truth-in-labelling standard covers a broad range of information desired, and it also accepts an practical limits to complete realization. The proposed standard will frustrate those who want a specific list to apply to all products. No single list can cover the range of products in the committee's mandate. The Working Group considers that its approach combines sound theory and a practical implementation.

4.2 Results of testing  Over the past year, the Working Group has conducted three kinds of tests of the Interim Proposed Standard, external, Federal, and internal. This section will review the process used and the results obtained. Two quality reports produced in this process are provided in as an appendix to this section of the report.

Internal tests are largely an extension of the functioning of the Working Group. Members of the group were chosen for their interest and expertise in the topic, so it is not surprising to find some continued efforts. The main work used in this phase of the standards process was in the form of prototype quality reports. After a few draft papers circulated around the committee, N. Chrisman produced a quality report for a digital product from his current research project. The Working Group accepted the report as a prototype at its meeting at Indianapolis. This quality report is the second appendix to this chapter.

Federal tests were arranged in cooperation with the Federal Interagency Coordinating Committee for Digital Cartography. The Soil Conservation Service (SCS) volunteered to carry out not simply a quality report, but a comprehensive survey based on the concepts of the standard. SCS, in its national office of Cartography and Geographic Information Systems, maintains a catalogue of all the data bases containing soils data derived from SCS surveys. Much of this effort has been carried out at the regional, state, or county level. The national office developed a questionnaire to find out more about each digital data base. By the time of our meetings, SCS had been through a few drafts, and had received responses from the three states used as a trial run. SCS plans to refine this questionnaire, then plans to send it to all states. Because the draft nature of this document, it is not included in this report. The questionnaire demonstrates that the categories of the standard were useful for operating a data inventory, which is closely related to the intention of a quality report. A later version of the SCS questionnaire may be included as an appendix to the Proposed Standard as a guideline for the issues which must be addressed to complete a quality report.
External tests are intended to provide reaction particularly from the private sector. From a small number of volunteers, two groups were selected to test the quality standard. Two individuals from the Timberland Cartographics operation of Boise Cascade Corp. were commissioned to produce a quality report for a project they planned to take on. By the time the testing should have been complete, these two had left Boise Cascade. No test report was obtained. This result should not reflect upon the standard; volunteer efforts depend on personal circumstances which can not always be perfectly predictable. The other test involved a digital land base developed for Bell South Services by Donohue Intelligraphics and subcontractor Aero-Metric Engineering. Earlier in the year, these contractors had delivered a land base for telephone utility management. Together, these three groups produced a quality report retrospectively. The product is presented as an appendix to this chapter. The Working Group believes that the Bell South product represents minimal compliance with the Interim Proposed Standard. To complete the process, readers should evaluate this quality report and determine if it communicates the basic information to allow a judgement on fitness for use.

The adoption of this standard will depend, in part, on the difficulty of compliance. Over the process of designing the standard, the Working Group has had to consider cost of implementation along with technical needs. The Bell South test provides some evidence that the standard will not create large dislocations. Because it was retrospective, the test shows that Donohue and Aero-Metric Engineering were able to assemble the information for the quality report from their existing archives. Thus, the information for this quality report did not add to the cost of constructing the land base. Writing the quality report did have a cost, but it amounted to a few person-days. Donohue reports that many customers require some form of quality information to be delivered. If the quality report becomes accepted as a standard, the uniform organization may simplify this task.

Another interesting result of the external test is that there was some form of information to enter into each section of the quality report. Even though the product was produced for a primarily graphic purpose, the kinds of checks usually associated with analytical applications had been applied to at least some part of the data.
QUALITY REPORT FOR
WILMINGTON-EAST DISTRICT
BELL SOUTH DIGITAL LAND BASE

February 14, 1986

Jim Ferree, Staff Manager
BellSouth Services
14G56 Southern Bell Center
675 W. Peachtree Street
Atlanta, GA 30375
(404) 529-0274

in cooperation with

Larry Keenan, Project Manager
Donohue Intelligraphics
4738 North 40th Street
Sheboygan, WI 53081
(414) 458-8711

and

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Aero-Metric Engineering Co., Inc.
4708 North 40th Street
Sheboygan, WI 53081
(414) 457-3631

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INTRODUCTION

This report summarizes the quality which can be expected from the digital land base of the Southern Bell Wilmington District, East section in the version delivered by BellSouth to Southern Bell. Appendix A indicates the area covered by the Wilmington-East District, an area of 1487.6 square miles in southeast North Carolina. The digital land base covers portions of four counties (Brunswick, Columbus, New Hanover, and Pender) and portions of 32 quadrangles (see Appendix B).

As suggested in the National Committee for Digital Cartographic Data Standards (NCDCDS) Interim Proposed Standard (IPS), a quality report is intended to communicate information about a digital product. Any users must evaluate the results to determine whether the data is suitable for a particular use.

This report consists of five parts: Lineage, Positional Accuracy, Attribute Accuracy, Logical Consistency, and Completeness (the components required by IPS).
LINEAGE

This section describes the history of the Wilmington-East
digital land base from the original source materials to the
final digital product. This description does not cover all
aspects of production, but tries to cover any information with
potential impact on quality.

A project design was jointly established by Donohue
Intelligraphics and Aero-Metric Engineering. The main criteria
was for a flexible digital land base that would meet an accuracy
of plus or minus 50' while allowing for a timely and cost
effective approach. The format selected was one that had
previously been successfully completed and verified as having
the ability to meet the project requirements.

The basic land base development process involves enlarging and
rectifying quad sheets and aerial photography, constructing a
composite of the quads and photography, digitizing, and editing.
This process is described in detail below.

An East/West flight pattern was designed to allow for three
flight lines per quadrangle. Each line covered approximately
1/3 of the quadrangle. This format allowed for a reasonable
enlargement factor from the aerial negative to the final mylar
rectified photo base. Each quadrangle flight line was further
sub-divided into three panels to allow for a convenient working
size image. Appendix B lists the quadrangles used for
compilation of the land base.

The aerial photography was flown in February - April 1984 at
elevations of approximately 10000-13000'. The camera (Zeiss
Jena LMK 15/2323, Serial Number 244665A) produced 9x9" negatives
using a 153 mm lens (6'). The scale of photography, therefore,
is approximately 1:24000. The calibration report for the camera
is indicated in Appendix C. The type film used was Kodak XX and
Kodak Panatomic. Additional specifications relating to the
aerial photography are listed in Appendix D. The original
photographic negatives are stored at Aerometric Engineering.

The 7.5 minute (1:24000) quads are divided into nine panels and
enlarged to 1"=400' (1:4800). This enlargement is produced on a
mylar base, utilizing a Brown precision copy camera at
Aerometric Engineering, Inc. in Sheboygan, Wisconsin. Tick
marks were scribed into the original negative made of the quad
to correspond with the UTM grid indicated on the quad.

The photographs were ratio rectified by Aero-Metric Engineering
to remove the effects of tilt and a set of positive enlargements
were made at a scale of 1"=400' (1:4800).
For three portions of the Wilmington-East district (areas covered by the Mooretown, Castle Hayne, and Wrightsville Beach 7.5 minute quadrangles), the USGS quad maps were not available. The process for preparing these areas for digitization involved the use of orthophotos, prepared by Aero-Metric Engineering.

Unless otherwise indicated, all remaining processes were performed at Donohue Intelligraphics in Sheboygan, Wisconsin.

The reconciliation of land features on the enlarged mylar were done by overlaying the quad mylar on top of the enlarged photographic positive. Corrections to streets, railroads and water features were added to the mylar overlay with a color coordinated system. Accuracy was maintained by local orientation of the two images.

Street names were numbered on the SAG (Street Address Guide) maps using a Street Name Index, supplied by Southern Bell. Numbers that represented street names were transferred from the SAG maps onto the mylar enlargement. The Street Name Index, that contains the corresponding street names and numbers, was then loaded into the Intergraph system for later loading into the digital graphics file.

Blind digitizing was performed on Calcomp digitizing tables using Donohue Intelligraphics software. The tables surface measures 30"x40" and has a .001" resolution. The corrected mylar enlargements were placed arbitrarily on the table and a "3D Conformal Coordinate Transformation", by Wolfe, was used to align the coordinate system to agree with the tick marks on the mylar acetates.

Appendix E lists the features digitized. Rights-of-way, however, were not digitized, but were generated by expanding the digitized centerline. Right-of-way lines, therefore, are not true rights-of-way but only an expanded centerline. ROW lines are represented as 72' width for primary roads, 48' for secondary roads, and 36' for 3rd class roads, as symbolized on the quad. Interpretation of road classification for the aerial photography updates attempted to follow the above USGS road classification scheme. The digitizer would enter the width of the ROW prior to digitizing the centerline of that ROW.

The centerlines of ROW's were "tagged" with the street name number through the use of a cursor data point input. Once transferred to the Intergraph System, the numeric street name numbers were replaced with the actual street names. The street names were then interactively edited to their proper orientation with their respective streets.

Once captured at the digitizing station, the digital features are stored as ASCII text files. These files were then transferred to the Intergraph system by a program written by
Donohue Intelligraphics. This transfer program expands centerlines to proper ROW widths, replaces numeric street name numbers with the actual street names, and assigns the line weights, line symbology, color, text height, and element type indicated in Appendix E to each facet.

After the digitized files have been transferred to the Intergraph, 1"=400' check plots were produced. These plots were then checked against the 400 scale mylar quad enlargements and known errors corrected.

Additional features were then added to each digital facet file. Wire center and exchange boundaries were created by copying to the appropriate levels those already digitized features which visually correspond to the wire center and exchange boundaries in the Southern Bell SAG maps. Digitizing of new lines may be performed in order to make boundary lines visually continuous. Other boundaries, such as municipal, county, parks, etc., were created in the same fashion. Additional annotations (eg. water names, railroad names, county names, park names, etc.) were also added to the facet file at this time.

A 5000 meter grid was generated to encompass a given wire center. Each facet file was then merged into the 5000 meter grid system until the entire grid system was filled. Edgematching of facets were completed as each facet was merged into the 5000 meter grid system and street names were checked to assure each street is labeled (i.e. named) at least once per 5000 meter grid.

After a wire center was merged together, 400 scale check plots were again produced. The plots were reviewed against the appropriate source documents and corrected for content, continuance (i.e. edge matching), and clarity.

A final quality review occurred by producing 1000 scale check plots. These plots were given a review primarily for text appearance and boundaries. Once the wire center was considered complete, a magnetic tape was created by Donohue Intelligraphics and sent to BellSouth.

Appendix F charts the major steps, which have been described above, in the production of the Wilmington-East digital land base.
POSITIONAL ACCURACY

Positional accuracy of the digital product was estimated to be +/- 50'. This was based on calculations for the enlarged 7.5 minute USGS quads and added digitizing error. This estimate was also based on the past experience of Donohue Intelligraphics and Aero-Metric Engineering.

Testing of this estimate was performed by Donohue Intelligraphics and involved the overlaying of 1"=400" paper check plots on top of each enlarged mylar positive. Digitized centerlines which fell outside the width of the quad representation of the roads were investigated against the aerial photography and corrected when necessary.

ATTRIBUTE ACCURACY

The only attributes contained in the digital land base are feature names (eg. streets, water, counties, wire centers, etc.). Testing the accuracy of these attributes was performed by Donohue Intelligraphics and involved manual edits using source documents (eg. Street Name Index, SAG maps, USGS maps, and county maps).

LOGICAL CONSISTENCY

The Wilmington-East district, essentially created on and for Intergraph systems, is not a topological land base. Except for wire center and exchange boundaries, no features were checked for logical consistency. Since the specifications for wire center and exchange areas required they form closed polygons, these boundaries received added attention during the editing processes and were visually checked for closure. The logical consistency of the wire center and exchange boundaries were checked in subsequent processing of this product and the error rate was estimated to be no more than 5%.
The completeness of most features and attributes were checked through the editing processes described previously. Street names, however, received special attention.

The source materials used for street naming were the SAG maps, Street Name Indexes, USGS maps, and county maps. An alphabetic listing of street names was prepared from the Street Name Indexes and a number assigned to each street. Each street name found on the SAG map was located in the alphabetic listing, highlighted on the listing, and the street name number coded to the SAG map. If the street name is not found in the listing, it is researched against other materials, a name assigned, and the name added to the listing (if required). At the end of this coding process, any uncoded streets on the SAG map or non-highlighted street names on the listing are researched and reconciled if possible. Any remaining unnamed streets were named NNA (no name available).
# APPENDIX B

## WILMINGTON-EAST QUADRANGLES

<table>
<thead>
<tr>
<th>USGS Quad</th>
<th>Scale</th>
<th>Date Last Revised</th>
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<tbody>
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<td>Bolton (15)</td>
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<td>1954</td>
</tr>
<tr>
<td>Juniper Creek</td>
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<td>1942</td>
</tr>
<tr>
<td>White Lake</td>
<td>1:62500</td>
<td>1954</td>
</tr>
<tr>
<td>Honey Island</td>
<td>1:24000</td>
<td>1943</td>
</tr>
<tr>
<td>Atkinson</td>
<td>1:62500</td>
<td>1955</td>
</tr>
<tr>
<td>Acme</td>
<td>1:62500</td>
<td>1954</td>
</tr>
<tr>
<td>Lewis Swamp</td>
<td>1:24000</td>
<td>1943</td>
</tr>
<tr>
<td>Lockwoods Folly</td>
<td>1:24000</td>
<td>1943</td>
</tr>
<tr>
<td>Currie</td>
<td>1:24000</td>
<td>1983</td>
</tr>
<tr>
<td>Leland</td>
<td>1:24000</td>
<td>1984</td>
</tr>
<tr>
<td>Winnabow</td>
<td>1:24000</td>
<td>1943</td>
</tr>
<tr>
<td>Funston</td>
<td>1:24000</td>
<td>1943</td>
</tr>
<tr>
<td>Southport</td>
<td>1:24000</td>
<td>1981</td>
</tr>
<tr>
<td>Wallace East</td>
<td>1:24000</td>
<td>1981</td>
</tr>
<tr>
<td>Burgaw</td>
<td>1:24000</td>
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</tr>
<tr>
<td>Rocky Point</td>
<td>1:24000</td>
<td>1970</td>
</tr>
<tr>
<td>Castle Hayne</td>
<td>1:24000</td>
<td>1980</td>
</tr>
<tr>
<td>Wilmington</td>
<td>1:24000</td>
<td>1979</td>
</tr>
<tr>
<td>Carolina Beach</td>
<td>1:24000</td>
<td>1970</td>
</tr>
<tr>
<td>Kure Beach</td>
<td>1:24000</td>
<td>1970</td>
</tr>
<tr>
<td>Cate Fear</td>
<td>1:24000</td>
<td>1970</td>
</tr>
<tr>
<td>Pin Hook</td>
<td>1:24000</td>
<td>1981</td>
</tr>
<tr>
<td>Stag Park</td>
<td>1:24000</td>
<td>1981</td>
</tr>
<tr>
<td>Mooretown</td>
<td>1:24000</td>
<td>1975</td>
</tr>
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<td>Scotts Hill</td>
<td>1:24000</td>
<td>1970</td>
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</tr>
<tr>
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<td>1981</td>
</tr>
<tr>
<td>Maple Hill SW</td>
<td>1:24000</td>
<td>1981</td>
</tr>
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<td>Topsail</td>
<td>1:24000</td>
<td>1970</td>
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<td>1970</td>
</tr>
<tr>
<td>Folkstone</td>
<td>1:24000</td>
<td>1981</td>
</tr>
<tr>
<td>Holly Ridge</td>
<td>1:24000</td>
<td>1970</td>
</tr>
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</table>

T/T/EQ1
Camera type: Zeiss Jena LMK 15/2323  
Lens type: Zeiss Jena Lamegon PI/C  
Nominal focal length: 153 mm  
Camera serial no.: 244665A  
Lens serial no.: 7381334C  
Maximum aperture: f/4.5  
Test aperture: f/4.5

Submitted by: Aero-Metric Engineering, Inc.  
Sheboygan, Wisconsin 53081


These measurements were made on Kodak Micro-flat glass plates, 0.25 inch thick, with spectroscopic emulsion type V-F Panchromatic, developed in D-19 at 68° F for 3 minutes with continuous agitation. These photographic plates were exposed on a multicollimator camera calibrator using a white light source rated at approximately 5200K.

I. Calibrated Focal Length: 151.585 mm

This measurement is considered accurate within 0.005 mm

<table>
<thead>
<tr>
<th>Field angle</th>
<th>Δc</th>
<th>Dc for azimuth angle</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>um</td>
<td>0° A-C</td>
</tr>
<tr>
<td>degrees</td>
<td>um</td>
<td>um</td>
</tr>
<tr>
<td>7.5</td>
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</tr>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
</tr>
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<td>-3</td>
<td>-3</td>
</tr>
<tr>
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<td>-5</td>
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</tr>
<tr>
<td>40</td>
<td>7</td>
<td>8</td>
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</tbody>
</table>

The radial distortion is measured for each of four radii of the focal plane separated by 90° in azimuth. To minimize plotting error due to distortion, a full least-squares solution is used to determine the calibrated focal length. Δc is the average distortion for a given field angle. Values of distortion Dc based on the calibrated focal length referred to the calibrated principal point (point of symmetry) are listed for azimuths 0°, 90°, 180° and 270°. The radial distortion is given in micrometers and indicates the radial displacement away from the center of the field. These measurements are considered accurate within 5 μm.
III. Resolving Power in cycles/mm

Area-weighted average resolution: 86.8

<table>
<thead>
<tr>
<th>Field angle:</th>
<th>0°</th>
<th>7.5°</th>
<th>15°</th>
<th>22.5°</th>
<th>30°</th>
<th>35°</th>
<th>40°</th>
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<tr>
<td>Tangential lines</td>
<td>95</td>
<td>80</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>67</td>
<td>57</td>
</tr>
</tbody>
</table>

The resolving power is obtained by photographing a series of test bars and examining the resultant image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable confidence. The series of patterns has spatial frequencies from 5 to 268 cycles/mm in a geometric series having a ratio of the 4th root of 2. Radial lines are parallel to a radius from the center of the field, and tangential lines are perpendicular to a radius.

IV. Filter Parallelism

The two surfaces of the 500 No. 50759A, the 550 No. 50779A, and the 350 No. 50738A filters accompanying this camera are within 10 seconds of being parallel. The 500 filter was used for the calibration.

V. Shutter Calibration

(Not applicable)

VI. Magazine Platen

The platens mounted in LMK-K 24/120 film magazines No. 266458A and No. 266471A do not depart from a true plane by more than 13 um (0.0005 in).

These film magazines are equipped with identification markers that will register "266458" for magazine No. 266458A, and "266471" for magazine No. 266471A in the film edge for each exposure.
VII. Principal Point and Fiducial Coordinates

Positions of all points are referenced to the principal point of autocollimation (PPA) as origin. The diagram indicates the orientation of the reference points when the camera is viewed from the back, or a contact positive with the emulsion up. The direction-of-flight fiducial marker or data strip is to the left.

<table>
<thead>
<tr>
<th>X coordinate</th>
<th>Y coordinate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.008 mm</td>
<td>-0.007 mm</td>
</tr>
<tr>
<td>0.007</td>
<td>-0.004</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.018</td>
<td>0.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fiducial Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2</td>
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<tr>
<td></td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)
1-2: 311.132 mm  3-4: 311.133 mm
Lines joining these markers intersect at an angle of 89° 59' 48"

Midside fiducials
5-6: 220.013 mm  7-8: 220.025 mm
Lines joining these markers intersect at an angle of 90° 00' 10"

Corner fiducials (perimeter)
1-3: 220.014 mm  2-3: 220.001 mm
1-4: 219.994 mm  2-4: 220.007 mm

The method of measuring these distances is considered accurate within 0.005 mm
IX. Stereomodel Flatness

Magazine No.: 266458A
Platen ID: 266458

Base/Height ratio: 0.6
Maximum angle of field tested: 40°

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereomodels based on comparator measurements on contact glass (Kodak Micro-flat) diapositives made from Kodak 2405 film exposures. These measurements are considered accurate within 5 μm.

X. Resolving Power in cycles/mm

Area-weighted average resolution: 48.3

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Film: Type 2405
IX. Stereomodel Flatness

Magazine No.: 266471A  
Platen ID: 266471  
Base/Height ratio: 0.6  
Maximum angle of field tested: 40°

![Diagram](image)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereomodels based on comparator measurements on contact glass (Kodak Micro-flat) diapositives made from Kodak 2405 film exposures. These measurements are considered accurate within 5 μm.

X. Resolving Power in cycles/mm

Area-weighted average resolution: 48.3  
Film: Type 2405

<table>
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<tr>
<th>Field angle</th>
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<th>15°</th>
<th>22.5°</th>
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</tbody>
</table>

Eberhard G. Schirmacher  
Acting Chief, Optical Science Section  
National Mapping Division
III. Specifications

A. Aerial Photography

1. Cameras

a. Calibrated precision aerial cameras that can take serial photographs compatible with precision stereoscopic mapping instruments are required to be used.

b. Negative image shall be 9" x 9" (23cm x 23 cm)

c. Focal length

(1) Camera of nominal 6-inch focal length

(a) focal length 153mm ± 3.0mm
   (Planigom, Pleogon, Aviogon, or equivalent)
(b) usable angular field at least 90
(c) minimum resolution no less than 15 lines/mm
(d) distortion in usable angular field not to exceed 0.015mm tangential and 0.030mm radial

(2) Cameras with focal lengths different from above to be approved by TBF.

d. Color - In the event color photography is used it must meet these specifications. Precision aerial cameras used for color and infrared photography shall be equipped with fully color-corrected lenses (ZEISS, RMK-4, WILD UNIVERSAL AVIOGON, or equivalent).
e. Calibration - In order for the camera to be accepted, the bidder must supply a current status report prepared by an approved testing organization on each camera used. Current certification by UNITED STATES GEOLOGICAL SURVEY will be acceptable evidence of each camera's suitability for taking photographs.

B. Aerial Film

1. Type - shall be dimensionally stable polyester base such as du Pont 'Cronar', Eastman Kodak 'ESTAR', or equivalent.

2. Negatives - shall be clear and sharp in detail and uniform in range of density. They shall be free from clouds, and cloud shadows, smoke, foliage, haze, light streaks, snow, static marks, excessive shadows, tears, scratches, and other blemishes which would interfere with their intended purpose.

3. Scale - Film shall not depict more than 5% of the specified scale.

4. Numbering - No spool shall contain film from more than one project or one camera. All exposures on a spool must bear the same roll number.

5. Labels - The container, spool, and each roll of film must become the property of TBF. Each container shall be neatly lettered by the contractor with the required data.

C. Flight Lines and Height

1. Maps - Vendor shall supply an adequate map of the project area depicting flight lines; flight attitude of each line (above sea level) and flight height (above mean ground elevation); spacing between lines; and focal length of camera(s). TBF shall maintain the right to approve all flight lines prior to the flight.

2. Height - Departures from the specification of C-1 above shall not exceed 2% low or 5% high for all specified flight heights.
3. TBF shall at its option inspect the negatives in order to ascertain approximate flight height.

D. Crabbing and Tilt

1. Any photograph crabbed in excess of 10% as measured from the line of flight, or relative crab in excess of 10% between any two successive exposures is not acceptable.

2. Tilt shall not exceed 4 degrees, nor average more than 2 degrees in any 10 mile section of a flight line. Relative tilt exceeding 6 degrees between any two successive exposures may be cause for rejection of that portion of the flight lines.

E. Overlap

1. Minimum overlap end to end on each adjoining photography shall be 60%, ±3%

2. Minimum overlap side to side on each adjoining photography shall be 30%, ±3%

3. Overlap shall be judged on the usable portion of the field of the lens used.

F. Time of Photography

Photography shall be undertaken only when the lighting and weather conditions are such that acceptable negatives can be produced (see Section II.B.2). Photography shall be flown when the sun angle is greater than 30 degrees.
APPENDIX E

LAND BASE FEATURES AND ATTRIBUTES

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APPENDIX F

WILMINGTON-EAST PROJECT APPROACH
PROJECT APPROACH FOR BELL SOUTH

CADD MAPPING (50% ACCURACY)
Quality Report for 
Dane County Soil Survey 
digital files

Report prepared 3 September 1985 
by N. Chrisman Dane County Land Records Project, UW- Madison 
in cooperation with US Soil Conservation Service Wisconsin Office

This report summarizes the quality which can be expected from the digital records of the Dane County, Wisconsin soil survey in the version delivered by the Dane County Land Records Project (DCLRP) to the US Soil Conservation Service (SCS) National Cartographic Office in 1985. Dane County, Wisconsin occupies 1200 square miles in south central Wisconsin. The soil survey consists of 181 sheets reproduced at 1:15840, while the products delivered in digital form consist of parts of 34 quadrangles in the 7.5 minute series.

As suggested in the NCDCDS Interim Proposed Standard (IPS), a quality report is intended to communicate information about a digital product. Any users must evaluate the results to determine whether the data is suitable for a particular use.

This report consists of five parts: lineage, positional accuracy, attribute accuracy, logical consistency and completeness (the components required by IPS).
**Lineage**

This section relates the history of the Dane County soil survey from the original materials to the final digital product. This account does not cover all aspects, but tries to cover any information with potential impact on quality.

Immediately inside the cover of the printed soil survey, a box contains this information:

Major fieldwork for this soil survey was completed in the period 1966-1971. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1972.

The actual history of the work is more complex, and it becomes rather difficult to assign a single date to the product.

The compilation of soils maps proceeds in two phases, from advance field sheets to the printed report. The advance field sheets were compiled on air photographs taken between June and August 1962. The field sheets show a range of dates from 1968-1972. A second flight with dates from August to October 1974 produced the photos for the printed report. The soil maps were compiled on the 1974 base using the field sheets and corrections. The printed report contains the legend "Issued January 1978". The Dane County Land Records Project took the final maps and converted them to digital form in the period 1983-1985.

No specific information is available about the 1962 photography. Since the field sheet data was recompiled, this may not be important.

The 1974 photography was flown at elevations of about 1300-1500'. The camera (serial number UAg 477) took 9X9" negatives with a 152.38 mm lens (6"). Originals of these photos are stored in the ASCS Aerial Photography Field Office in Salt Lake City, Utah. Diapositive copies were made for the DCLRP and are available from the SCS State Office. The correspondence of negatives to soil sheets is shown on Map 2.

The photographs were rectified to remove the effects of tilt, and a set of positive prints were made at publication scale (1:15840). The process was performed at the Lincoln, Nebraska regional office (now combined with the Fort Worth, Texas national facility). The DCLRP has not been able to determine the methods used to orient and scale the photos. However, by checks performed in transferring the soils data into known coordinates, the photos appear reasonably planimetric (although relief displacement is not corrected - see below). According to current SCS National Office guidelines, the soil maps are not sufficiently accurate to merit entry into the national digital data base. (see National Cartographic Manual, draft of 9/7/82; NHQ/CRS Issue Paper "digitizing detailed soil surveys from..."
accurate base maps versus inaccurate base maps" rev. 9/7/82) A
direct test of this assumption is covered in the section on
positional accuracy.

The soils boundaries were penciled onto enlargements of the
1974 photos (2.5 X to the publication scale of 1:15840).
Presumably, the advance field sheets were used as a compilation
source along with new field work. Some boundaries based on slope
were determined with pocket stereo viewers, using adjacent
photos.

A major process in soil mapping relates to the attribute
system - the soil classification. In the advance field sheet
stage, a three part numeric code was placed on the maps. The
three parts have a correspondence to the three parts of the
alphabetic code shown on the final maps: the four digit soil
class became a two letter code, the numeric percent slope became
the classes A .. E, and the eroded code of 2 or blank was
retained. In the field process, the soil scientist could
classify a particular area as a specific soil. In the office
process, this soil could be reclassified into a cognate soil for
a number of reasons, such as not having enough of the soil class
in the county, or to enforce consistency between interpreters.
There are also national directives to consolidate classification
systems so that the effective date of 1972 is crucial to
understand the type of soil classification used.

From the pencil product on the photobase, the published soil
map was developed. A fresh mylar was pin registered, and the
pencil lines were redrafted with a liquid ink drafting pen. In
most cases, the pen width was about .01" (.25 mm), although there
are variations in line quality. Although the map finisher
primarily transfered the pencil lines, there were also
cartographic rules applied to eliminate narrow areas or to
simplify detail around roads and other features.

For the Dane County survey, the soil labels were applied
with stickup lettering on a separate pin-registered mylar.
Non-soil linear features, such as roads and drainage, were
applied to the same overlay as the soils boundaries. (This
separation has a bearing on the digital scanning process.)

A number of checks were built into the finishing process.
Each sheet was "matched" with adjacent ones. Even though the
photobases could be different due to different image centers, the
soil lines were made to agree. Classifications across the sheet
edges were also examined ( further information on the reliability
of this process appears below under logical consistency).

Another check performed during map finishing consists of
"coloring" the soil polygons to ensure that labels are consistent
(no lines are missing) and that no unnecessary lines were left
in. Considering the geometric complexity of some of the sheets
(the driftless area leads to convoluted slope-based polygons),
this process was tedious and errors did persist to be detected in later stages (see logical consistency).

The map finisher also includes PLSS section corners and state plane coordinate tick marks. The printed maps have a printed caution nearly hidden in the binding of the volume: Coordinate grid ticks and land division corners, if shown, are approximately positioned. This caution is well-founded, and considered below under positional accuracy.

The published maps were printed from the mylar originals, but the printed maps have no direct relation to the digital product.

The DCLRP has undertaken two major soil digitizing efforts. The first, a manual one, digitized 66 soils sheets (out of 181) between June 1983 and January 1984. The second, based on an inexpensive scanner, is still under development, but its product will complete the county during 1986. This quality report is limited to the manually digitized products.

Digitizing began with direct positive copies of the soil map originals produced by a contact process at Master Blueprint in Madison, Wisconsin. The copies were made of the line work overlay and the label overlay, so that the line digitizing and point label digitizing were performed from the same product. In a few cases, the label layer original had been lost, so the printed map had to be used in those cases. The positional accuracy of the labels is not crucial to this process. The chemical residues of the copying process (perhaps due to incomplete fixation or washing) were sufficient to affect the electrical resistance on the digitizer surface and degrade accuracy. When washed in cold water, the problem abated.

Tick marks were placed on the mylar copies to bracket the image area. The tick marks were intended to form a rectangle 15" X 9", although hand placement could create errors of a few hundredths of an inch.

Digitizing was performed at two sites: UW Land Information and Computer Graphics Facility (LICGF), and Wisconsin Dept. of Natural Resources (WDNR) Bureau of Information Management. LICGF used a TALOS 660 backlight table connected to an ORION microprocessor. The ORION had a 512 X 512 pixel plasma screen and 8" floppy disk drives. (see Chrisman and Sullivan, 1983 for procedures used). The mylar sheet was placed arbitrarily on the table (intentionally at a diagonal to avoid a known bug in the digitizer firmware). Firmware in the TALOS (SMART 3.0) was used to rotate and translate the coordinate system to agree with the tick marks. The lower left was forced to (0,0) and the lower right was used to align the X axis. The upper right point was read to confirm a reading sufficiently close to (15,9). (Note that the manual location of the tick marks did not require
positional accuracy because the inch scaling of the device was unaltered). The TALOS floating point calculations seem to be accurate within the accuracy of the digitizer.

The manufacturer’s specification of the device quotes a "repeatability" of .01 inch for this device. This figure could be interpreted as plus or minus .05 inch, which is the result obtained in some tests performed on this equipment by Mills (1982).

FORTRAN programs on the ORION controlled the process and wrote the results to the 8" disks. One program was used to capture the linework in unstructured form (as "spaghetti") and another for the label points. The plasma screen (8.5" X 8.5" with resolution of 512 X 512) provided almost the same line width as the original when the screen window covered one half of the soils sheet. The plasma screen also permitted selective erasure of lines if they were deleted. Graphic feedback allow some gross errors to be detected, but the screen was not registered to the map to detect the fidelity of linefollowing.

When the TALOS operated in point mode, the ORION could handle the data stream. (The problem was partially that the IO ports on the ORION could only operate at 2400 baud, and also that the FORTRAN code was not very fast on the obsolete 8 bit processor.) From tests of point mode line following, the operator was usually too stingy in recording the curvature of the soils boundaries. The SCS guidelines call for digitizing to recreate the graphic product within one linewidth, so line following mode was required. The TALOS controller was set to use distance sampling with a tolerance of .03 inch. This figure is a compromise between graphic fidelity and the communications between the TALOS and ORION. Even at this tolerance, the TALOS could get ahead of the ORION when the operator moved the cursor too fast. As there was no bell on the ORION to alert the operator, and as the operator was probably not looking at the screen, data was occasionally lost. The result was flat sections where curvature was missing. Where the flat sections detracted from the product at the checkplot stage, they were fixed in the final edit.

Once captured on the ORION, the lines were stored as binary reals (4 bytes). Each line was filtered by the Douglas-Peucker algorithm with a tolerance (half-band) of .005 inch. This reduced file size by about 50%. The data was converted to ASCII strings with coordinates sent under FORTRAN format F10.4 to send to a Digital VAX 11/780.

The second digitizing product was the set of labels. On a background of the linework (for graphic orientation), the operator digitized each soil unit label on the map. The operator entered the alphabetic identifier on the keyboard. The file was stored in ASCII and transmitted to the VAX.
The WDNR process performed essentially the same functions with somewhat different equipment. WDNR had a Bendix digitizer connected to a Data General minicomputer with a Tektronix 4014 for graphic feedback. Registration was limited to recording the coordinates of the tickmarks in the Bendix table coordinates. Software on the VAX converted this into the same system as the LICGF process.

The software on the Data General (GEdit, written by WDNR) provided a more flexible editing environment than the ORION. In addition, the operator could snap objects closed or trim off overshoots. These capabilities shortened the editing time, but did not affect the quality of the product. The Data General was able to keep up with the Bendix, so that fewer lines had to be fixed in the final inspection against the check plot.

Once transmitted to the VAX, the files were converted into ODYSSEY format with coordinates stored as 32 bit reals (this should have little impact as yet, since each sheet had its own origin). The ODYSSEY PENELLOPE program (see Morehouse and Broekhuysen, 1982) was used to convert the spaghetti into a chain file. This processor detects all intersections and labels all polygons. A tolerance of .03 inch (or .02 inch for some of the DNR products) was needed to capture all of the intended intersections. This tolerance ensures that no smaller feature can occur in the file, and that no point comes within the tolerance of another. By this process, duplicate versions of a line, if within the tolerance, will be automatically removed. The numerical nature of the intersection processor has been discussed by Dougenik (1980) and by Chrisman (1983). The tolerance does not act as a traditional "filter" because it does not round off coordinate values; all coordinate positions were in the input file or come from calculated intersections. The intersection calculation is done in a local origin system with one of the points as (0,0) to ensure that precision is not lost.

The PENELLOPE process produces an error report detailing the following kinds of errors: "dangling chain" caused by either undershoot, overshoot or lines missing, polygons with no labels or two conflicting labels caused by missing labels or lines or by extraneous lines. Each file was corrected using the HOMER editor until the error report had nothing further to report. Coordinates are copied through these processes without modification, in general. Missing lines were digitized on the TALOS using the process above, and shipped to the VAX. However, the correction of undershoots, for example, requires new coordinates. In some cases, a coordinate value was extracted from the feature that the undershoot should have touched, and in other cases a screen crosshair was used at large magnification. A final stage of editing for unlabelled polygons usually involved the PROTEUS processor aggregation function.

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Once the file was topologically clean, a check plot was generated on mylar at the original scale. SCS examined each check plot and noted corrections required for geometric fidelity. In some cases, whole files were rejected for gross errors that can be attributed to hardware problems such as the chemical residues noted above or to personnel problems such as lack of training. After the corrections were made the file was archived as a true copy of the original survey.

The goal of the project was to make the soil survey compatible with local land records and other mapping bases, particularly the USGS topographic quadrangles. One part of the project examined the need for analytical removal of relief distortion using the USGS Digital Elevation Matrices (DEM) as a base. This report concerns the less complex approach using photoidentifiable points.

To control the conversion of the inch-space measurements on the soil sheet into a system of geodetically referencable coordinates, the ticks and section corner marks shown on the soil product were inadequate. The common procedure in such cases is to detect "well-defined" points, such as road intersections on both the soils map and on another planimetric base such as the USGS topographic quadrangles. The drawback of this approach is that cartographic generalization of roads and other features may degrade the accuracy of the fit. Also, the density of "well-defined" points may not be sufficient for a rigorous transformation, particularly in the rural areas where the soil map coverage is of the greatest interest.

In large portions of the United States, there is a uniformly spaced network of points used to define the Public Land Survey System. These section corners and quarter section corners formed the basis for the control of the Dane County products. Coordinates for the section corners were obtained by methods varying from direct observation with a Macrometer geopositioning receiver through traditional ground survey to manual digitizing from USGS topographic quadrangles (see quality report for USGS PLSS layer). This heterogeneous collection of coordinates is expected to improve over time, due to land surveying activities so that the quality of the control for the soil survey could also be improved.

The photobase for the soil survey is hardly detailed enough to permit the identification of survey monuments, even if they had been panelled. Instead, the position of the section corner was estimated by using the remonumentation record for each section corner and quarter section corner. This record includes a sketch showing the location of the marker with respect to street pavement, fences, etc. Control was only taken for points identified with reasonable certainty. The number of control points for each soil sheet varied from the maximum of 32 down to 6 when lakes removed large portions of the study area. For full sheets (not involving large amounts of water), the number of
control points ran between 15 and 25 in areas where coordinates existed for quarter section corners. In areas using the USGS PLSS, which was only reliable for section corners, the maximum was 12 and the typical values fell around 8. The exact numbers of control points are shown in the appended tables (Map?).

Using the control information, a transformation was calculated using a least squares fit to an affine (software written by Cliff Petersohn under the direction of Alan Vonderohe). All calculations were carried out in 64 bit double precision. The fit for each sheet was examined and often a few outliers were discarded. The resulting fits run between 20 and 40 feet of positional error (see figures appended). These values are small, considering the line width of the soil product.

Once the separate sheets were placed into a common coordinate system (either State Plane or UTM with a local offset), the adjacent sheets could be merged into a sheetless data base. At first this process was performed by the WHIRLPOOL polygon overlay processor (similar code to PENELOPE discussed above). No matter how well the sheets fit the control, this approach had problems resolving overlaps and gaps between the adjacent sheets. Much manual editing was required to clean up the slivers and overlaps. A new program (written by Kate Beard under the direction of N. Chrisman) was developed to "zip" these sheets together (see separate documentation).

The Dane County soil survey data is either delivered in state plane, UTM or geodetic coordinates (latitude, longitude). In all situations there is a local offset to preserve precision. Products in the quad sheet format were created by cutting a rectangle out of the file when stored in geodetic coordinates. This ensures that the sheet borders conform mathematically to the expectation. All conversions between state plane, UTM and geodetic coordinates are performed using software distributed by the National Geodetic Survey. This software contains disclaimer that it might not work, but these were ignored after samples proved sufficiently accurate. All calculations are carried out in 64 bit double precision, which is rather a bit of overkill for most of the coordinates processed.
Positional Accuracy

The positional accuracy of the soil survey can be estimated from two considerations: the base and the interpretations. The base accuracy was estimated by the transformation process described in the lineage report. This does not constitute a test of the digital product, in the sense that the information obtained was used to remove systematic errors. The positional error at control points for each sheet is appended.

Positional accuracy of soil interpretations cannot be determined using the existing standards for positional accuracy tests, because very few points are "well defined". An attempt to test the accuracy of the soils maps was performed as a part of the Dane County Land Records Project (described in greater detail in the DCLRP final report). First, a set of likely areas to test (about 20) were selected. Third order control was established along nearby roads using inertial autosurveyor equipment and personnel loaned by the Bureau of Land Management. These surveys were tied to second order monuments set with Macrometer surveys. Then a field crew of one SCS area supervisor (T. Hoffman) and N. Chrisman constructed the soil map in the field. The soil scientist was told of the general nature of the soil map product for the area, but he did not reconstruct that map. Auger holes were drilled, usually upslope and downslope until the location of the transition could be approximated. A wood lathe was placed in the ground and an uncertainty (ranging from 10 to 50 feet) was estimated. After three full days in the field, only four sites were staked. Surveying crews located the lathes relative to the third order control using theodolite and electronic distance meters and using stadia observations as a cross check. The positional errors of the field data fall well within the tolerances specified by the soil scientist.

The results of the study are presented on the maps attached by overplotting the field survey data and the digital soils record. Some of the errors detected are of an attribute identification nature, and reported in the next section. No standard procedure is established to report the positional accuracy of complex curves of this nature when there are uncertainties about all positions. Furthermore, some of the differences are due to cartographic limits at the scale of 1:15840.
Attribute Accuracy

The only testing performed was described above under positional accuracy. Due to the differences of soil naming procedures, the test was not carried out to the level of the specific soil series. The soil scientist would give the important distinguishing characteristic (drainage, slope, mineral/organic ...) and check back to determine if the soil map depicted the same distinction. Of the twenty soil mapping units tested, there were two problems of identification, where the unit was somewhat misclassified. In one case the underlying material (4 feet deep) was lake clay, not a beach deposit. This difference would not alter most surface interpretations of the soil, however. In the other case, the whole polygon belongs in a transition zone and it would be very hard to classify properly. Again, the classification assigned in the map would be approximately correct for many applications. In addition, in the one test of the slope classification, the determination of the higher slopes was marginal when the site was examined on the ground. There may be a bias towards land falling in the lower portions of a given slope class, not the middle. To determine this with more accuracy a more comprehensive test is required, perhaps in comparison to the USGS DEM data.

Logical Consistency

The PENELOPE process and the sheet matching process provided substantial checking of logical consistency. The result is topologically clean as established in the guidelines to the NCDCDS IPS. Some of the errors detected in the PENELOPE process were latent errors from the compilation process, in spite of substantial effort by SCS to color maps by hand. The total count of errors for the first 66 sheets is shown on the map appended. All such errors were removed in the editing process, often with recourse to the manuscript or the advance field sheets. A further, partial check of logical consistency (attribute accuracy ?) occurs along sheet borders when matched. In most cases, the classifications are identical and the sheet border can vanish. However, some classifications differ and the sheet border has to be retained. Some of these differences are simply a matter of slope category or could be a difference related to scale effects (small polygons on the sheet border are not shown whereas they might have appeared as a continuation of an adjacent polygon if the sheet boundary had been elsewhere). There is usually one problem per sheet match, on average. This could be indicative of attribute errors elsewhere on the sheet, or it could be edge specific. Without further tests, the situation cannot be clarified.
Completeness

The soil maps exhaustively partition the county, all area is assigned to one and only one soil mapping unit. This relation is ensured by the method used to check logical consistency and to match sheet boundaries.

The soil classification has limitations due to mapping rules related to the scale of 1:15840 used for compilation. The line width was approximately 26 feet on the ground, and features were not allowed to become much narrower than 50-80 feet. This rule was not fixed and was not enforced rigidly. Also, the rules tended to generalize areas smaller than an acre or so. Whatever rules were in use are specified in SCS procedures.

The soil attributes were checked against a master list of permitted codes and all unknown codes were corrected.
5.0 TESTING THE INTERIM PROPOSED STANDARD FOR CARTOGRAPHIC FEATURES

Edited by
Robert Rugg and Warren Schmidt

5.1 BACKGROUND

The Working Group III - Cartographic Features (WGP III) of the National Committee for Digital Cartographic Data Standards (NCDCDS) began in 1982. Its original charge was to investigate the issues, recommend alternatives, and prepare an interim standard. These tasks were completed in the Spring of 1985. Since then the WGP has continued to work on feature definitions, sought to create a mechanism for maintenance, responded to comments on the Interim Proposed Standard (IPS), and tested that IPS. This report will summarize the comments received on the IPS, detail the testing methods and results, and give the revised IPS. It should be noted that work is continuing on the IPS definitions and those shown are not the final version.

Before going to the comments, I would like to list the members and observers of the WGP whose dedication has made this all possible.

Members:

Mary Clawson, Naval Oceanographic Research & Development Activity
Beth Driver, Technology Service Corporation
Erich Frey, National Ocean Service
Benny Klock, Defense Mapping Agency
Mark Monmonier, Syracuse University
Joel Morrison, U.S. Geological Survey
Robert Rugg, Vice Chairman, Virginia Commonwealth University
Warren Schmidt, Chairman, Digital Mapping Unlimited
Fred Tamm-Daniels, Tennessee Valley Authority
Walt Winn, National Ocean Service

Observers:

Meredith Burrill, DMA Retired
David Douglas, University of Ottawa
William Hess, Central Intelligence Agency
Roger Payne, U.S. Geological Survey

Special Assistance:

Billy Love, Defense Mapping Agency
5.2 SUMMARY OF COMMENTS ON THE INTERIM PROPOSED STANDARD

The eight comments received on the Cartographic Features portion of the Interim Proposed Standard represented a wide spectrum of cartographic data users. In general, they were favorable and all were constructive. A summary of the responses follows:

- The majority favored the proposed approach.
- Two commented on the codes: one saying they needed more exploration and the other cautioning on adopting any system that would restrict exchange.
- Two letters agreed with the need for a national body to rule on additions and changes.
- One respondent could find no terms related to mining and minerals processing features. These are being added.
- One person thought too few features were defined and the remainder were referred to as included terms.
- Another felt that one more comprehensive features list was unneeded.
- Suggestions were offered clarifying the attribute value and feature class definitions in one response. The same wording had appeared in earlier versions but was eliminated later.
- One comment proposed that features be tied with 0, 1, and 2-dimensional objects and that each feature have a unique identifier. This was not adopted because our features are scale-independent and not tied to any single application.

5.3 TEST OF THE INTERIM PROPOSED STANDARD

5.3.1 Background

The test of the Interim Proposed Standard for feature definitions sought to determine the general validity of the model developed by Working Group III and the specific application of the model to topographic map and nautical chart features. Three broad questions were posed by the Working Group as the basis for the test. How complete is the set of definitions? Are the definitions understandable and specific enough to assure consistency of interpretation in a variety of operational settings? How easy or difficult to use is the proposed scheme? These questions were addressed in a test of the September 1985 version of the proposed definitions (see Appendix II). The test was administered in four Federal agencies and four external organizations during the period November 1985 through February 1986.
To meet the objectives of the test, three sections were devised. Section 1, the "consistency test," involved the identification and coding of 51 selected features on the Port Royal, Virginia quadrangle of the USGS 7.5 minute series topographic map. Section 2, the "completeness test," involved identification and coding of selected features shown in the legends for nautical charts and topographic maps. The sources used for the completeness test were Section G -- Ports and Harbors -- of NOAA/DMA Chart No. 1, Nautical Chart Symbols and Abbreviations, November 1984 edition, and page 11 -- Blue Plate -- of USGS Standards for 1:24,000 and 1:25,000 Scale Quadrangle Maps, part 6, December 1981 edition. Section 3 on "ease of use" consisted of a series of open-ended questions. The test instructions appear as Appendix 1.

Each participating organization was asked to select three testers. All organizations participated. The number of tests returned by each organization is shown in Table 1.

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<th>Organization</th>
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5.3.2 Consistency

The results of the consistency test were measured in terms of the percentage of testers who coded the same map features the same way. For the 51 features identified on the Port Royal Quadrangle, an average "consistency score" of 85% was achieved. This result did not vary significantly between names features (such as Rappahannock River) versus unnamed features (such as fence rows or marshes). There were significant differences in consistency scores among the specific features themselves, however. (See Table 2.) The first feature, for example, was named "Skinker's Neck." The Interim Proposed Standard definition refers "neck" to a coastal feature "isthmus," whereas the feature shown on the map is the land area within a meander of the river. While 45% of the testers coded Skinker's...
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**Table 2**
FEATURES CONSISTENCY TEST

Consistency Scores by Test Item

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<td>20</td>
<td>PLA</td>
<td>85.000</td>
</tr>
<tr>
<td>39</td>
<td>19</td>
<td>SHL</td>
<td>42.105</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
<td>INL</td>
<td>94.444</td>
</tr>
<tr>
<td>41</td>
<td>18</td>
<td>BEA</td>
<td>100.000</td>
</tr>
<tr>
<td>42</td>
<td>18</td>
<td>BOU</td>
<td>44.444</td>
</tr>
<tr>
<td>43</td>
<td>19</td>
<td>CEM</td>
<td>89.474</td>
</tr>
<tr>
<td>44</td>
<td>18</td>
<td>CON</td>
<td>100.000</td>
</tr>
<tr>
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<td>19</td>
<td>STR</td>
<td>78.947</td>
</tr>
<tr>
<td>46</td>
<td>18</td>
<td>PLC</td>
<td>100.000</td>
</tr>
<tr>
<td>47</td>
<td>19</td>
<td>MIN</td>
<td>89.474</td>
</tr>
<tr>
<td>48</td>
<td>18</td>
<td>CEM</td>
<td>94.444</td>
</tr>
<tr>
<td>49</td>
<td>19</td>
<td>MIN</td>
<td>89.474</td>
</tr>
<tr>
<td>50</td>
<td>19</td>
<td>WET</td>
<td>36.842</td>
</tr>
<tr>
<td>51</td>
<td>19</td>
<td>WET</td>
<td>36.474</td>
</tr>
</tbody>
</table>

**Overall Results**

<table>
<thead>
<tr>
<th>named</th>
<th>84.5%</th>
<th>3.27%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=34)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>unnamed</th>
<th>87.1%</th>
<th>5.01%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=17)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>all items</th>
<th>85.4%</th>
<th>2.72%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=51)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Neck as an "isthmus," the remainder sought definitions that fit the feature itself rather than the name "neck." Although many such ambiguous terms had been identified in the Interim Proposed Standard, in this instance an extension of the proposed standard would be necessary to resolve the problem. Other problems occurred simply because of name placement on the map. The second feature, "Buckner's Reach," was a stream segment but the name was placed on a bluff next to the River. While 43% of the testers coded it as a watercourse and 10% as a stream, the remainder sought definitions corresponding to the land feature where the name was placed. Some problems occurred because of analytical distinctions made by the Working Group that may be unfamiliar to some testers: the distinction between a watercourse as a stream bed and the stream itself, or between a wetland that has vegetation and a tidal flat without vegetation, for example. Nevertheless, the results of the consistency test were surprisingly good, with over three-fifths of the test features consistently coded by 90% or more of the testers.

5.3.3 Completeness

In the "completeness test," testers were simply asked to give a standard feature code for each item appearing on the legends. Completeness was measured in terms of whether or not a standard code could be found for each item attempted. About 90% of the items were successfully coded to the standard. There was a difference between the results for Chart No. 1 and for the USGS legend as shown in Table 3.

<table>
<thead>
<tr>
<th>Source</th>
<th>Coded number</th>
<th>Coded %</th>
<th>Uncoded number</th>
<th>Uncoded %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOS/HTC Chart No. 1</td>
<td>898</td>
<td>85.04</td>
<td>158</td>
<td>14.96</td>
</tr>
<tr>
<td>USGS Legend</td>
<td>575</td>
<td>97.62</td>
<td>14</td>
<td>2.38</td>
</tr>
<tr>
<td>Both Sources</td>
<td>1,473</td>
<td>89.54</td>
<td>172</td>
<td>10.46</td>
</tr>
</tbody>
</table>

To some extent, the difference in coding success can be attributed to the familiarity of testers with the source material. For example, testers from Bell South originally asked to be excused from coding Chart No. 1 since their work entirely concerns topographic features. They participated fully in the test, however, and their results were 100% complete for the USGS legend while only 74% complete for Chart No. 1.

5.3.4 Ease of Use

Responses to the open-ended questions were mixed. Many testers found the testing process cumbersome. (See Table 4.) It took between 4 and 40 hours to complete the test. In large part, this problem may be explained by the form of test materials. In addition to the test instructions, map, and
Table 4
Responses to Selected Open-Ended Questions

Q. 3. In both Part 1 and Part 2, were you able to separate different features adequately with the attributes provided? Please describe any problems in this respect.
- yes, 5
- no, 10
- inadequate or incomplete attribute list, 7
- too many features grouped together, 2
- lack of values, 2
- no response, 1

Q. 4. Overall, would you say that the proposed standard and attribute scheme was easy to use, or difficult to use? Please comment.
- easy, 4
- somewhat easy, 4
- difficult, 8
- time consuming, 3
- confusing, 1
- flipping around too much, 6
- inadequate attribute list, 2

Q. 5. Are you satisfied that the results of such a coding scheme could provide a sound basis for exchanging digital cartographic data?
- yes, 6
- no, 4
- mixed, 4
- attribute coding difficult, 1
- no response, 2

Q. 7. Please indicate your professional training or background in the area of cartography and computer mapping.
- cartography, 12
- geography, 5
- undergraduate, 3
- graduate, 6
- professional training, 2
- 1-3 years experience, 3
- 3+ years experience, 7
- no experience, 1
- no response, 4
copies of Chart No. 1 and the USGS Legend, the test materials included four print-outs. One print-out contained definitions for 145 standard feature terms and over 1,100 "included terms." A second print-out contained definitions for 197 attributes. The third and fourth print-outs consisted of 3-character alphanumeric codes for each standard feature and attribute. To complete parts 1 and 2 of the test required leafing through the definitions print-outs, finding a suitable definition and appropriate attributes for each feature to be coded, then scanning the separate code print-outs in order to enter the proper code on the test form. This amount of effort would be greatly reduced in a production environment by providing an on-line system to speed up the search process, and eventually would be minimized as coders begin to memorize the standard definitions.

5.3.5 Conclusions

The quantitative results of the test were positive, leading Working Group III to adopt the following resolution on March 16, 1986:

"Working Group III accepts the test results as sufficient evidence of the viability of the proposed model."

While the results affirm the viability of the proposed model, they also indicate problems remaining to be addressed for the proposed standard. Among these are a need to refine current feature definitions to eliminate remaining ambiguities, a need to extend the basic set of definitions to include not just most, but all hydrographic and topographic features and their attributes, and a need to simplify the presentational form of the standard to promote greater ease of use.

5.4 REVISED INTERIM PROPOSED STANDARD

The purpose of feature classification is to describe entities as they occur in the world and not as they appear on a graphic representation. The lists of Features, Attributes and Attribute Values are not limited to any map series or scales.

5.4.1 Cartographic Feature Descriptive Model

Cartographic features shall be described by the following three categories: Feature, Attribute, and Attribute Value. These are defined as follows:

- Feature - a defined entity of interest that is not further subdivided.
- Attribute - a defined characteristic of a feature. The only mandatory attribute shall be location.
- Attribute Value - a specific quality or quantity assigned to an attribute.
Two additional categories, Feature Class and Attribute Class are provided as user options. These are defined as follows:

- Feature Class - a specified group of features (e.g., hydrographic, land use, transportation)
- Attribute Class - a specified group of attributes (e.g., those describing measure, serviceability, composition, or structure)

5.4.2 Cartographic Feature Definitions

A comprehensive list of feature and attribute definitions is being prepared. Appendix II describes and lists a sample of the feature definitions and attributes. Maintenance of the standard list of features and attributes will be provided by a national body which will rule on all additions and changes to the standard.

5.4.3 Cartographic Feature Codes

The assignment of codes for the features and attributes will be made upon completion and review of the definitions. These codes shall not impose a structure upon the features, but are intended only for retrieval and maintenance.
APPENDIX I

INSTRUCTIONS FOR TESTING STANDARD FEATURES AND ATTRIBUTES *

Working Group III - Cartographic Features
National Committee for Digital Cartographic Data Standards

October 1, 1985

Introduction

The test consists of three parts. Part 1 is a "consistency test." In this test, each participant will be given the same U.S.G.S. quadrangle (Port Royal, Virginia, 7.5 minute series), with 51 features to be coded. The results will show whether different coders arrive at the same codes for the same features. Part 2 is a "completeness test." In the completeness test, each participant will attempt to find standard codes for features contained in selected portions of the legends used for U.S.G.S. quadrangles and nautical charts. Part 3 is a participant evaluation. After completing the tests for consistency and completeness, each participant will record comments on various aspects of the proposed standard scheme. When the test has completed, please send the instructions, results and comments to:

Mr. Shih-Lung Shaw
Numerical Cartography Lab
158 Derby Hall
154 North Oval Mall
Columbus, OH 43210

* Instructions prepared by Oona Przygocki and Robert Rugg
PART 1 - CONSISTENCY TEST

Looking at your materials you will find:

a. one Test Map
b. one Interim Proposed Standard Feature Definitions list
c. one Interim Proposed Standard Attribute Definitions list
d. one list of feature abbreviations
e. one list of attribute abbreviations
f. four sheets marked Form A.

On the test map, each feature to be considered has been circled and given a number ranging from 1-51. This is the "item number." Each standard feature term has been given a 3 character abbreviation. This is the "feature code." Each standard attribute term has been given a 3 character abbreviation. This is called the "attribute code." The item number is located on the map. The features abbreviation list corresponds with the Interim Proposed Standard Feature Definitions list. The attribute abbreviation list corresponds with the Interim Proposed Standard Attribute Definitions list. The values for the attributes will be based on what you think is appropriate for the attribute chosen and specific to the feature on the test map. These values have no codes yet and thus will be listed in English.

The following instructions are written using Item Number 20 from the test map as an example.

1. Look at the map and identify the feature assigned item number 20. Write that item number on Form A under Item number.

Example: Item Number 20 on Test Map

   20. Rappahannock River
Instructions

2. Look on the Proposed Standard Features and Definitions list for the feature identified on the map. If that term appears on that list it will be either a standard term or an included term. If it is an included term it will refer you to the standard term.

Example: River
See Stream

If the feature is referred to more than one standard term, read the definitions for both standard terms referred to. Choose the standard term that best describes what is seen on the map.

3. Using the standard feature term chosen, look on the Features Abbreviations list for that term. Beside the Standard Term on the abbreviations list there will be a three character code which has been assigned to it.

Example: STR Stream

Write this code on Form A, under Feature Code, and beside the Item Number it refers to.

Example: Item Feature Attribute Value
Number Code Code
20 STR

4. In the Proposed Standard Feature Definitions list is a list of suggested attributes which may potentially apply to each feature. Look over this list to find one or more attributes that can be identified from the information shown on the test map. Please note that the list of suggested attributes is for your guidance only. Make a note of any attributes you wish to code that are not mentioned below the Standard Feature Definition. After selecting the attributes you wish to use, look at the Proposed Standard Attribute Definitions list. If a chosen attribute does not appear on the list, enter the attribute without a code on FORM A. If the attribute is listed, but refers you to another attribute, go to the attribute to which you are referred to find the standard attribute term.

Example: Natural
See: Artificially Improved/Manmade/Natural
Instructions

The standard attribute term is:
Artificially Improved/Manmade/Natural

Using this standard attribute term look on the Attributes Abbreviations list. The Standard Attribute term will appear with a 3 character code beside it. This is the Attribute Code.

Example: MAN      Artificially Improved/Manmade/Natural

Enter this 3 character code on Form A, under Attribute Code, beside the corresponding feature code. Enter the first attribute listed for a feature on the same line beside the feature it is describing.

Example: Item  Feature  Attribute  Values
Number  Code  Code
20      STR  MAN

If there is more than one Standard Attribute that is relevant, follow the same procedure to find the Attribute Codes and list these codes in the column under Attribute Code. The next Item Number will be listed on the line after the last attribute code for the previous feature.

Example: Item  Feature  Attribute  Value
Number  Code  Code
20      STR  MAN
      NAM  NAM
      SAL  SAL

21

5. Think of values for each attribute chosen that further describe the specific feature on the map. List these in English beside the corresponding attribute.

Example:

Item  Feature  Attribute  Values
Number  Code  Code
20      STR  MAN  Natural
      NAM  Rappahannock River
      SAL  Brackish

21

Continue this process in order for each item circled on the test map.
PART 2 - COMPLETENESS TEST

Portions of nautical chart and topographic map legend specifications have been chosen for the test of "completeness." Section G - Ports and Harbors - of Chart #1, 8th edition, November 1984, and page 11 of the Standards for 1:24,000 and 1:25,000 Scale Quadrangle Maps, December 1981, are the test legend sheets. Using the same procedure as in Part 1, complete FORM A for each numbered legend item on the test sheets.
Instructions

PART 3 - COMMENTS

Please respond to the questions on the following pages. Your comments will provide valuable information and assist greatly in making the changes necessary for the improvement of the standard.

1. In Part 1, which numbered features caused the greatest difficulties for coding? Were there any features on the map that could not be coded from the standard list?

2. In Part 2, which legend items caused the greatest difficulties for coding? Were there items that could not be coded from the standard list?

3. In both Part 1 and Part 2, were you able to separate different features adequately with the attributes provided? Please describe any problems in this respect.

4. Overall, would you say that the proposed standard and attribute scheme was easy to use, or difficult to use? Please comment.

5. Are you satisfied that the results of such a coding scheme could provide a sound basis for exchanging digital cartographic data?

6. Please record any additional comments you have on the testing procedure and the proposed scheme.

7. Please indicate your professional training or background in the area of cartography or computer mapping.
<table>
<thead>
<tr>
<th>ITEM NUMBER</th>
<th>FEATURE CODE</th>
<th>ATTRIBUTE CODE</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>FEATURE</td>
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<td>---------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ACCESSWAY</td>
<td>CABLEWAY SEE: ROAD</td>
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<td></td>
</tr>
<tr>
<td>AERIAL CABLEWAY LINES</td>
<td>CABLEWAY SEE: CABLEWAY * DEF: CABLEWAY LARGE DIAMETER, HEAVY STEEL OR FIBER ROPE STRUNG BETWEEN ELEVATED SUPPORTS AS PART OF A CONVEYOR SYSTEM</td>
<td></td>
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</tr>
<tr>
<td>AERODROME</td>
<td>AIRPORT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERODROME_ Beacon</td>
<td>AERODROME_BEACON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERODROME_CONTROLLER_ TOWER</td>
<td>AERODROME controL_TOWER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERONAUTICAL_RADIOBEACON</td>
<td>SEE: BEACON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERONAUTICAL_BEACON</td>
<td>SEE: BEACON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERONAUTICALLIGHT</td>
<td>SEE: BEACON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERONAUTICAL_NAVIGATIONAL_RADIO_STATION</td>
<td>SEE: STATION/ BUILDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRPORT</td>
<td>SEE: AERODROME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRTRAFFICCONTROL</td>
<td>SERVICE AREA CIVILIAN MILITARY MILITARY MILITARY TRANSPORTATION CARGO TRANSPORTATION PASSENGER TRANSPORTATION AUXILIARY AERODROME LANDING AREA SUPPLEMENTARY AERODROME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIRTRAFFICAREA</td>
<td>FLYING HEIGHT RUNWAY</td>
<td>MOTH RUNWAY RUNWAY RUNWAY SURFACE MATERIAL SIZE OF AIRCRAFT SERVED FLYING HEIGHT SERVICES AVAILABLE AIR TRAFFIC CONTROL SERVICE AREA CIVILIAN MILITARY MILITARY MILITARY MILITARY MILITARY TRANSPORTATION CARGO TRANSPORTATION PASSENGER TRANSPORTATION AUXILIARY AERODROME LANDING AREA SUPPLEMENTARY AERODROME</td>
<td></td>
</tr>
</tbody>
</table>
FEATURES

SEE: APPROACHWAY

AIRPORT_TRAFFIC_CONTROL_TOWER
SEE: TOWER

AIRSTRIPE
SEE: RUNWAY

ALLEY
SEE: ROAD

ALLUVIAL_FAN
SEE: DELTA

STANDARD FEATURE TERM 2: ALLUVIUM
DEFN: ALL UNCONSOLIDATED FRAGMENTAL MATERIAL LAID DOWN BY A STREAM
SOURCE: MODIFIED FROM MONKHOUSE, A DICTIONARY OF GEOGRAPHY
ATTRIB: LOCATION COMPOSITION SHAPE VOLUME

ALTERNATE_AERODROME
SEE: AIRPORT

ALTERNATING_LIGHT
SEE: BEACON

ALTITUDE_TINT
SEE: RELIEF

AMMUNITION_DUMP
SEE: MILITARY_INSTALLATION

AMPHITHEATER
SEE: OUTDOOR_THEATER

AMUSEMENT_PARK
SEE: PARK

ANABRANCH
SEE: STREAM
DEFN: AN OLD TERM, NOT MUCH USED, FOR A BRANCH OF A STREAM WHICH LEAVES A RIVER AND RE-ENTERS IT LOWER DOWN.
SOURCE: A DICTIONARY OF GEOGRAPHY, STAMP

ANCHOR_BUOY
SEE: BUOY

ANCHOR_LIGHT
SEE: BEACON

ANCHORAGE
SEE: HARBOR

ANCHORAGE_BUOY
SEE: BUOY

INCLUDED TERM 16
INCLUDED TERM 17
INCLUDED TERM 18
INCLUDED TERM 19
INCLUDED TERM 20
INCLUDED TERM 21
INCLUDED TERM 22
INCLUDED TERM 23
INCLUDED TERM 24
INCLUDED TERM 25
INCLUDED TERM 26
INCLUDED TERM 27
INCLUDED TERM 28
INCLUDED TERM 29
INCLUDED TERM 30
ANSE
SEE: INLET

STANDARD FEATURE TERM 3: ANTENNA
DEFN: A METALLIC APPARATUS FOR SENDING AND RECEIVING ELECTRO-MAGNETIC WAVES.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION TYPE_OF_SIGNAL HEIGHT NAME CONNECTED_FEATURE COMPOSITION MICROWAVE_TRANSMISSION MOUNTED MOVABLE STATIONARY RADIO_TRANSMISSION TELEVISION_TRANSMISSION USE_TYPE
INCLUD: DIRECTIONAL_ANTENNA ANTENNA_ARRAY LOOP_ANTENNA

ANTENNA_ARRAY
SEE: ANTENNA

APARTMENT
SEE: BUILDING

APPROACH_AREA
SEE: APPROACHWAY

APPROACH_LIGHTS
SEE: BEACON

APPROACH_PATH
SEE: APPROACHWAY

APPROACH_TO_HIGHWAY
SEE: ROAD

STANDARD FEATURE TERM 4: APPROACHWAY
DEFN: THE AIRSPACE THROUGH WHICH AIRCRAFT APPROACH OR LEAVE A LANDING AREA.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION AREA HEIGHT RESTRICTIONS NAME USER_TYPE RESTRICTIONS
INCLUD: AIRPORT_TRAFFIC_AREA APPROACH_PATH APPROACH_AREA

APPROXIMATE_CONTOUR
SEE: CONTOUR_LINE

APRON
SEE: PLAIN/REVETMENT

AQUEDUCT
SEE: WATERCOURSE/BRIDGE

ARCH
SEE: GAP

ARCHED_ICEBERG
SEE: ICEBERG

ARCHIPELAGO
SEE: SEA/ISLAND_CLUSTER

ARCHIPELAGO_APRON
SEE: PLAIN

ARCTIC_PACK
SEE: ICE_FIELD

ARENA
SEE: BUILDING

ARETE
SEE: RIDGE

ARM
SEE: INLET

ARMORY
SEE: MILITARY_INSTALLATION/BUILDING

ARMY_CAMP
SEE: MILITARY_INSTALLATION/CAMPGROUND

ARRROYD
SEE: WATERCOURSE
DEFN: THE COURSE OF AN INTERMITTENT STREAM, STEEP-CUT IN LOOSE EARTH; A COULEE; A STEEP-WALLED TRENCHLIKE VALLEY. SEE WASH.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1986

ART_GALLERY
SEE: BUILDING

ARTIFICIAL_HARBOR
SEE: HARBOR

ATHLETIC_CLUB
SEE: BUILDING

ATOLL
SEE: REEF/ISLAND

ATOLL_REEF
SEE: REEF

AUDITORIUM
SEE: BUILDING

AUTOMOBILE_PLANT
SEE: BUILDING

AUXILIARY_AERODROME
SEE: AIRPORT

AUXILIARY_CONTOUR
SEE: CONTOUR_LINE

AVENUE
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

SEE: ROAD

AWASH ROCK
SEE: ROCK

AWAWA
SEE: STREAM

BACK MARSH
SEE: WETLAND

BACKSWAMP
SEE: WETLAND

STANDARD FEATURE TERM 5: BACKWATER

DEFN: AN AREA OF CALM WATER UNAFFECTED BY THE CURRENT OF A STREAM
SOURCE: ADAPTED FROM STAMP AND MONKHOUSE
ATTRIB: LOCATION WIDTH DEPTH FORCE_OF_FLOW

BALD
SEE: CLEARING/MOUNT

BALL
SEE: BAR

BALL PARK
SEE: PARK/SPORTS_FIELD

BANDSTAND
SEE: OUTDOOR_THEATER

BANK
SEE: MOUNT/SHORE

BANK REEF
SEE: REEF

STANDARD FEATURE TERM 6: BAR

DEFN: A SUBMERGED OR EMERGED MOUND OR RIDGE OF SAND, GRAVEL, OR MUD BUILT ON THE SEA FLOOR IN SHALLOW WATER BY WAVES AND CURRENTS.
SOURCE: MODIFIED FROM GLOSSARY OF OCEANOGRAPHIC TERMS
ATTRIB: COMPOSITION LOCATION LENGTH SHAPE AREA WIDTH HEIGHT SHORE ORIENTATION ARTIFICIALLY IMPROVED/MANMADE/NATURAL
INCLUD: ALL SANDBAR MARSH_BAR LONGSHORE_BAR SHAD BAYMOUTH_BAR BARRIER_Beach TRANSVERSE_BAR SAND_BANK BAY_BAR OFFSHORE_BAR LONGSHORE_BAR BARRIER ISLAND BAY_BARRIER SHAD PATCHES BAY_HEAD_BAR CUSPATE_BAR TONGUE POINT HOOK SAND_HORN SAND_LOBE SPIT HOOKED_SPIT RECURVED_SPIT SAND_SPIT TOMBOLO CUSPATE_SPIT

BAR_BUOY
SEE: BUOY

BAR_PORT
SEE: PORT

BARE ROCK
### Features

| SEE:         | ROCK          |
| BARN:       | BUILDING      |
| BARRACKS:   | MILITARY_INSTALLATION/BUILDING |
| BARRAGE:    | DAM           |
| BARRANCA:   | WATERCOURSE   |

**STANDARD FEATURE TERM 7: BARRIER**

**DEFN:** A fence, wall, or other structure built to bar passage, to enclose an area, or to mark a boundary.

**SOURCE:** MODIFIED FROM AMERICAN HERITAGE DICTIONARY

**ATTRIB:** LOCATION LENGTH HEIGHT CONSTRUCTION_MATERIAL ARTIFICIALLY_IMPROVED/MANMADE/NATURAL

**INCLUD:** FENCE GUARD_RAIL GUIDE_RAIL HEDGE HEDGEROW WALL WINDBREAK SOUND_BARRIER

| SEE:         | BARRIER BASIN |
| BARRIER BEACH | BASIN        |
| BARRIER FLAT | WETLAND/FLAT |
| BARRIER ISLAND | BAR/ISLAND  |
| BARRIER LAGOON | LAGDON      |
| BARRIER REEF | REEF         |
| BASE_LINE | BEARING_LINE/BOUNDARY |

**STANDARD FEATURE TERM 8: BASIN**

**DEFN:** Any bowl-shaped depression in the surface of the land or ocean floor.

**SOURCE:** MODIFIED FROM AMERICAN HERITAGE DICTIONARY

**ATTRIB:** CIRCUMFERENCE LOCATION SHAPE DEPTH SLOPE_OF_SIDES NAME SIZE NATURAL/ARTIFICIALLY_IMPROVED/MANMADE NAME AREA AIR/LAND/WATER

**INCLUD:** BARRIER_BASIN SINK SINK KETTLE DEPRESSION CALDRON NON_TIDAL_BASIN TIDAL_BASIN WAVE_BASIN
FEATURES

BATTERY
SEE: MILITARY_INSTALLATION

BAY
SEE: INLET

BAY-HEAD_BAR
SEE: BAR

BAY_BAR
SEE: BAR

BAY_BARRIER
SEE: BAR

BAY_DELTA
SEE: DELTA

BAY_ICE
SEE: ICE_FIELD

BAYMOUTH_BAR
SEE: BAR

BAYOU
SEE: STREAM/LAKE

BEACH
DEFN: THE AREA EXTENDING FROM THE SHORELINE INLAND TO A MARKED CHANGE IN PHYSIOGRAPHIC FORM OR MATERIAL, OR TO THE LINE OF PERMANENT VEGETATION. THE GENTLY SLOPING SHORE WHICH IS WASHED BY WAVES OR TIDES, ESPECIALLY THE PARTS COVERED BY SAND OR PEBBLES.
SOURCE: NAVIGATION DICTIONARY. U.S. NAVAL OCEANOGRAPHIC OFFICE
INCLUD: LAGOON_Beach FORESHORE_FLATS RIVAGE BEACH_BERM

BEACH_BERM
SEE: BEACH

BEACH_CUSPS
SEE: RIDGE

BEACH_FACE
SEE: SHORE

BEACH_RIDGE
SEE: RIDGE

BEACH_Scarp
SEE: CLIFF

BEACON
DEFN: A FIXED SIGNAL, MARK OR LIGHT ERECTED FOR THE GUIDANCE OF MARINERS OR AIRPLANE PILOTS.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION SIGNAL_TYPE FIXED/FLASHING INTENSITY NAME WATCHED HEIGHT WIDTH SIGNAL_DIRECTION COLOR LIGHT_DISPLAY SIGNAL_INTENSITY
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCDCCS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

INCLUD: AERODROME_BEACON AERONAUTICAL_RADIOBEACON AERONAUTICAL_BEACON AIR_BEACON AIRPORT_BEACON CIRCULAR_BEACON CALIBRATION_RADIOBEACON CODBEACON CONTINUOUS_RADIOBEACON DAYBEACON DIRECTIONAL_BEACON FAN_MARKER_BEACON HOMING_BEACON IDENTIFICATION_BEACON LANDING_BEACON LANDMARK_BEACON LIGHTHOUSE LIGHTED_BEACON MARKER_RADIOBEACON MARKER_BEACON MARINE_RADIOBEACON OBSTRUCTION_BEACON OMNIDIRECTIONAL_BEACON PIKE_LIGHTHOUSE POST PERCH PILE_BEACON RACON RADAR_BEACON RADAR_RESPONDER_BEACON RADIOBEACON RESPONDER_BEACON ROTATING_BEACON ROTATING_LOOP_RADIOBEACON SEA_BEACON SPOTTER_BEACON WARNING_BEACON WARNING_RADIOBEACON OBSTRUCTION_MARKER WINTER_MARKER AERONAUTICAL_LIGHT ALTERNATING_LIGHT ANCHOR_LIGHT CHANNEL_LIGHT COLORED_LIGHT INTERMITTENT_LIGHT FIXED_AND_GROUP_FLASHING_LIGHT FLASHING_LIGHT HORIZON_LIGHTS LEADING_LIGHT INTERMITTANT_LIGHT LONG_FLASHING_LIGHT MAJOR_LIGHT MARINE_LIGHT MINOR_LIGHT NAVIGATION_LIGHT OBSTRUCTION_LIGHT OCCASIONAL_LIGHT OCCULTING_LIGHT PILE_DOLPHIN OCCULTING_QUICK_FLASHING_LIGHT QUICK_FLASHING_LIGHT RANGING_LIGHT REAR_LIGHT RED_SECTOR_RUNWAY_LIGHTS ROTATING_LIGHT SECTORED_LIGHT SHORT_FLASHING_LIGHT SHORT_LONG_FLASHING_LIGHT TAXI_CHANNEL_LIGHT TAXIWAY_LIGHTS THRESHOLD_LIGHT TIDAL_LIGHT UNATTENDED_LIGHT UNDULATING_LIGHT UNWATCHEO_LIGHT WARNING_LIGHT WATCHED_LIGHT WEAK_LIGHT WINTER_LIGHT RED_SECTOR_LIGHT APPROACH_LIGHTS FOG_SIGNAL MAJOR_FOG_SIGNAL MINOR_FOG_SIGNAL OCCASIONAL_FOG_SIGNAL BOUNDARY_LIGHTS

STANDARD FEATURE TERM: BEARING LINE
DEFN: A LINE EXTENDING IN THE DIRECTION OF A BEARING. THE MOST COMMON APPLICATION OF THE EXPRESSION IS TO A LINE OF POSITION
CONSTITUTING THE LOCUS OF ALL POINTS HAVING A COMMON BEARING OF A GIVEN REFERENCE MARK.
SOURCE: NAVIGATION DICTIONARY.
ATTRIB: LOCATION_NAME
INCLUD: CENTER_LINE OMNIBEARING_LINE COURSE_LINE COMPASS_DIRECTION COMPASS_DEVIATION COMPASS_VARIATION COMPASS_MAGNETIC_VARIATION LEADING_LINE CLEARING_LINE CLEARING_BEARING GRID_BEARING GRID_COURSE GRID_TRACK TRUE_BEARING BEARING_COMPASS BEARING_RHUMB_LINE LOXODROME RHUMB_LINE COURSE LOXODROMIC_CURVE GRID_LINE GRID_RHUMB_LINE GRID_PARALLEL GRID_MERIDIAN TRANSVERSE_RHUMB_LINE MERIDIAN_BASE_LINE PARALLEL_OF_LATITUDE

BEAVER_OAM
SEE: DAM

BECK
SEE: STREAM

BELL_BUOY
SEE: BUOY

BENCH
SEE: TERRACE

BENCH_MARK
SEE: CONTROL_POINT

BEND
SEE: WATERCOURSE
DEFN: A CURVE IN THE COURSE OF A STREAM AND (OR) THE LAND WITHIN THE CURVE; A CURVE IN A LINEAR BODY OF WATER (BOTTOM, LOOP, MEANDER)

BERY
SEE: MOUNT/ICEBERG

BICYCLE_PATH
SEE: ROAD

BICYCLE_TRAIL
SEE: ROAD
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<td>BOTANICAL_GARDEN</td>
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INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III. NCCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

STANDARD FEATURE TERM 12: BOUNDARY
DEFN: A LINE INDICATING THE LIMIT OR EXTENT OF AN AREA OR TERRITORY.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING.
ATTRIB: LOCATION LENGTH PHYSICAL NAME
INCLUD: TREE_LINE TIMBER_LINE HARBOR_LINE BOUNDARY_LINE BOUNDARY_LIGHTS TIDE_LIMIT TOWN/CITY_LIMITS INTERNATIONAL_BOUNDARY INTERPROVINCIAL_BOUNDARY CADASTRAL_BOUNDARY LIMITS COAST_GUARD_LINES HEDGE HEDGEROW FENCE
BOUNDARY_LINE
SEE: BOUNDARY
BOUNDARY_LIGHTS
SEE: BOUNDARY_BEACON
BOUNDARY_MONUMENT
SEE: CONTROL_POINT
BOUNDARY_SIGN
SEE: SIGN
BRAIDED_RIVER
SEE: STREAM
DEFN: A RIVER HAVING DIVISIONS WHICH ARE NUMEROUS AND INTERCONNECTED.
SOURCE: MODIFIED FROM THE CANADIAN COUNCIL ON SURVEYING AND MAPPING DRAFT REPORT, VOL 1, STANDARDS FOR THE CLASSIFICATION OF TOPOGRAPHIC FEATURES
BRAIDED_STREAM
SEE: STREAM
DEFN: A STREAM CHOKE WITH SAND BARS THAT DIVIDE IT INTO AN INTRICATE NETWORK OF INTERLACING CHANNELS.
SOURCE: "GLOSSARY OF TERMS"
BRAKE
SEE: WOODLAND
BRANCH
SEE: STREAM
DEFN: A CREEK OR BROOK, AS USED LOCALLY IN SOUTHERN STATES. ALSO USED TO DESIGNATE ONE OF THE BIFURCATIONS OF A STREAM, AS A FORK.
SOURCE: THE AMERICAN HERITAGE DICTIONARY
STANDARD FEATURE TERM 13: BREAKER
DEFN: A WAVE BREAKING INTO FOAM AS IT ADVANCES TOWARD THE SHORE.
SOURCE: A DICTIONARY OF GEOGRAPHY, MOORE
STANDARD FEATURE TERM 14: BREAKWATER
DEFN: A STRUCTURE BUILT TO BREAK THE FORCE OF WAVES SO AS TO PROTECT A BEACH, HARBOR, OR OTHER WATERFRONT FACILITY.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION ORIENTATION_TO_SHORE LENGTH CONSTRUCTION_MATERIAL WIDTH PROTRUDING/SUBMERGED PERMEABLE NAME
INCLUD: GROIN/GROYNE JETTY MOLE SEAWALL BOOM FLOATING_BREAKWATER WAVE_TRAP TRAINING_WALL BULKHEAD WEIR_JETTY WAVE_BASIN SEA_GATE
STANDARD FEATURE TERM 15: BRIDGE
DEFN: A STRUCTURE ERECTED OVER A DEPRESSION OR OBSTACLE TO CARRY TRAFFIC OR SOME FACILITY SUCH AS A PIPELINE.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME SPAN LENGTH CONSTRUCTION_MATERIAL WIDTH BEARING_CAPACITY MODE_TRANSPORTED FEATURE_SPANNED SUPPORT_TYPE SPAN_MOVEMENT ELEVATION COVERED/UNCOVERED CONNECTED_FEATURE MATERIAL_TRANSPORTED CLEARANCE LIGHTED CONDITION_OF_SURFACE_MATERIAL TOLL SPAN_MOVEMENT
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

INCLUD:
AQUEDUCT COVERED_BRIDGE BASCULE_BRIDGE DRAW_BRIDGE FOOTBRIDGE LIFT_BRIDGE OVERPASS PEDESTRIAN-BICYCLE_OVERPASS PONTOON_BRIDGE SUSPENSION_BRIDGE SWING_BRIDGE TRESTLE VIADUCT

BRIGALOW
SEE: WOOLAND

BRINE_WELL
SEE: WELL

BROOK
SEE: STREAM
DEFN: A SMALL STREAM OR RIVULET, COMMONLY SWIFTLY FLOWING IN RUGGED TERRAIN, OF LESS LENGTH AND VOLUME THAN A CREEK. ONE OF THE SMALLEST BRANCHES OF A DRAINAGE SYSTEM.
SOURCE: OHIO STATE PRELIMINARY LIST (GNIS, CANADIAN COUNCIL, AND THE AMERICAN HERITAGE DICTIONARY)

BUSH
SEE: WOOLAND

STANDARD FEATURE TERM 16: BUILDING
DEFN: ANY PERMANENT WALLED AND ROOFED CONSTRUCTION SUCH AS A HOUSE, FACTORY, ETC.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION AGE HEIGHT SIZE MICROWAVE_TRANSMISSION OWNER_TYPE RADIO_TRANSMISSION STORAGE TELEVISION_TRANSMISSION USE_TYPE USE_TYPE USER_TYPE
INCLUD: APARTMENT ARCADE ART GALLERY ATHLETIC_CLUB AUDITORIUM BARN BOATHOUSE TOURIST_CABIN CANNERY CATHEDRAL CEMENT_PLANT CHEMICAL_PLANT CHURCH CITY HALL CLINIC COLLEGE CONVENT COURTHOUSE CREATARIUM DEPOT DWELLING FACTORY FIRE_LOOKOUT_BUILDING FUNERAL_HOME GARAGE GREENHOUSE HANGAR HOSPITAL HOSTEL HOTEL HOUSE JAIL LIBRARY ONTOURIST LODGE MARINA MOPIL MONUMENT SHRINE ARMORY BARRACKS BUILDING CLEFILLATION PLANT REFINERY TREATMENT PLANT WINDMILL GRAIN ELEVATOR GRANARY PUMPING STATION COAST GUARD STATION FIRE STATION FIRE_STATION FIRE_STATION FIRE_STATION FILLING STATION POLICE STATION Radar_station RANGE STATION SIGNAL STATION AUTOMOBILE PLANT TELEVISION STATION TIDE STATION PRIMARY_TIDE STATION SECONDARY_TIDE STATION LIFE_SAVING STATION ROCKET STATION MARINE AUTOMATIC_METERLOGICAL STATION LIGHT STATION OFFSHORE LIGHT STATION OCEAN STATION RADIO STATION RADIOBEACON MONI TRANSMITTER STATION RADIO_DIRECTION_FINDER STATION AERONAUTICAL_NAVIGATION RADIO STATION ELECTRIC POWER GENERATING STATION ELECTRICAL SUBSTATION TRANSFORMER STATION

BULKHEAD
SEE: BREAKWATER/REVERTMENT EMBANKMENT

STANDARD FEATURE TERM 17: BUOY
DEFN: A FLOAT MOORED OR ANCHORED IN WATER AS AN AID TO NAVIGATION.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: SHAPE COLOR SOUND CHARACTERISTIC LIGHT CHARACTERISTIC RADIO SIGNAL CHARACTERISTIC COLOR_PATTERN NAME HEIGHT
WIDTH LIGHTED SIGNAL_INTENSITY SIGNAL TYPE LIGHT DISPLAY
INCLUD: BAR_BUOY BELL_BUOY CABLE_BUOY CAN BUOY CASK_BUOY ANCHOR BUOY BIFURCATION_BUOY ANCHOR_BUOY CHANNEL_MARKER CHECKED_BUOY CHANNEL_BUOY COMBINATION_BUOY CONICAL_BUOY DANGEROUS_BUOY DREDGING_BUOY FAIRWAY_BUOY FISH_NET_BUOY HORN_BUOY ICE_BUOY JUNCTION_BUOY KEG_BUOY LIGHTED_BUOY LIGHTED_SOUND_BUOY LIGHT_FLOAT LIGHTSHIP LIGHT_VESSEL MID_CHANNEL_BUOY MID_BUOY OBSTRUCTION_BUOY PARTY-COLORED_BUOY PILLAR_BUOY PILOT_LIGHTSHIP QUARANTINE_BUOY RADAR_BUOY RADIOBEACON_BUOY SEA_BUOY RIVER BUOY SPAR_BUOY SPECIAL_PURPOSE_BUOY SOIL_GROUND_BUOY STATION_BUOY SUPER_BUOY SWINGING BUOY TELEGRAPH BUOY THERMOBUOY TOPMARK_BUOY TRANSIENT_BUOY TRUMPET_BUOY TRUNK_BUOY TURNING_BUOY WARPING_BUOY WHISTLE_BUOY WINTER_BUOY WRECK_BUOY FLAME_FLOAT MISSISSIPPI_RIVER-TYPE_BUOY BEACON BUOY
FEATURES

BURN
SEE: CLEARING

BURNT_OVER_AREA
SEE: CLEARING

BUSH
SEE: WOODLAND

BUTTE
SEE: PLATEAU

CAATINGA
SEE: WOODLAND

CAELEB_BUDY
SEE: BUDDY

STANDARD FEATURE TERM 18: CABLEWAY
DEFN: A CONVEYOR SYSTEM IN WHICH CARRIER UNITS RUN ON WIRE CABLES STRUNG BETWEEN SUPPORTS.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION HEIGHT LENGTH OPERATING_SEASON MODE_TRANSPORTED NAME COMPOSITION COVERED PASSENGER_TRANSPORTATION
INCLUD: AERIAL_CABLEWAY' SKI_LIFT AERIAL_CABLEWAY_LINES

CADASTRAL_BOUNDARY
SEE: BOUNDARY

CADASTRAL_MONUMENT
SEE: CONTROL_POINT

CAIRN
SEE: CONTROL_POINT

CAISSON
SEE: GATE

CALDERA
SEE: CRATER

CALDRON
SEE: BASIN

CALIBRATION_RADIOBEACON
SEE: BEACON

CAMBER
SEE: HARBOR/BASIN

STANDARD FEATURE TERM 19: CAMPGROUND
DEFN: THE GROUND OR AREA ON WHICH TENTS, HUTS, ETC. ARE ERECTED FOR TEMPORARY SHELTER.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: LUMBER_CAMP ARMY_CAMP
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

CAN BUOY
SEE: BUOY

CANAL
SEE: WATERCOURSE
DEFN: A MANMADE OR ARTIFICIALLY IMPROVED WATERCOURSE CUT THROUGH A LAND AREA FOR SUCH USES AS NAVIGATION AND IRRIGATION.
SOURCE: MODIFIED FROM NATIONAL OCEAN SERVICE GLOSSARY, 1985

CANAL_PORT
SEE: PORT

CANNERY
SEE: BUILDING

CANYON
SEE: VALLEY

CANYON_DELTA
SEE: DELTA

STANDARD FEATURE TERM 20: CAPE
DEFN: A RELATIVELY EXTENSIVE LAND AREA JUTTING INTO A WATERBODY, WHICH PROMINENTLY MARKS A CHANGE IN OR INTERRUPTS NOTABLY THE COASTAL TREND OF THAT WATERBODY.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: NAME LOCATION SHAPE WIDTH LENGTH
INCLUDE: FORELAND PROMONTORY WINGED HEADLAND HEADLAND HEAD TONGUE POINT HOOK HEAD PEAK NECK PENINSULA

CARLINE
SEE: RAILWAY

CART TRACK
SEE: ROAD

CASCADE
SEE: WATERFALL

CASK BUOY
SEE: BUOY

CATAACT
SEE: RAPIDS

STANDARD FEATURE TERM 21: CATCH BASIN
DEFN: A TANK OR RESERVOIR DESIGNED TO RECEIVE RAINWATER; IT IS NOT TO BE CONFUSED WITH CATCHMENT
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING, DRAFT STANDARDS
ATTRIB: LOCATION COMPOSITION WIDTH DEPTH COVERED

STANDARD FEATURE TERM 22: CATCHMENT
DEFN: AN AREA DRAINED BY A SINGLE RIVER; A NATURAL DRAINAGE AREA WHICH MAY Coincide WITH A RIVER BASIN, IN WHICH THE DIVIDES Direct THE WATER FROM THE RAINFALL AND PERCOLATION INTO A RIVER. HOWEVER WHERE UNDERGROUND FLOW IS INVOLVED THE C. MAY BE LARGER OR SMALLER THAN THAT THAT MAY BE APPARENT FROM THE SURFACE RELIEF.
SOURCE: A DICTIONARY OF GEOGRAPHY, DONKHOUSE
ATTRIB: LOCATION AREA FLOOD_CONTROL
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<th>Definition</th>
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<tr>
<td>Cathedral</td>
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<td>Causeway</td>
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<td><strong>STANDARD FEATURE TERM 23: CAVE</strong></td>
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<tr>
<td>Cavern</td>
<td>Cave</td>
<td>Modified from Canadian Council on Surveying and Mapping</td>
<td>Area, Depth, Width, Chambers, Number, Name, Location, Air/Land/Water</td>
<td>Cavern, Grotto, Notch</td>
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<td>Cement_plant</td>
<td>Building</td>
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<td><strong>STANDARD FEATURE TERM 24: CEMETERY</strong></td>
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<tr>
<td>Cemetery</td>
<td>A place for burying the dead</td>
<td>American Heritage Dictionary</td>
<td>Location, Name</td>
<td>Graveyard</td>
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<td>GNIS Documentation, Appendix B</td>
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INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III. NCCCS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

SEE: BUOY

CHANNEL_LIGHT SEE: BEACON (INCLUDED TERM 181)

CHANNEL_Marker SEE: BUOY (INCLUDED TERM 182)

CHAPARRAL SEE: WOODLAND (INCLUDED TERM 183)

CHAPEIRAO SEE: PINNACLE (INCLUDED TERM 184)

CHART_DATUM SEE: SOUNDING (INCLUDED TERM 185)

CHARTED_DEPTH SEE: SOUNDING (INCLUDED TERM 186)

CHASM SEE: VALLEY (INCLUDED TERM 187)

CHECKERED_BUOY SEE: BUOY (INCLUDED TERM 188)

CHEMICAL_PLANT SEE: BUILDING (INCLUDED TERM 189)

CHIMNEY SEE: TOWER (INCLUDED TERM 190)

CHURCH SEE: BUILDING (INCLUDED TERM 191)

CINDER_CONE SEE: MOUNT (INCLUDED TERM 192)

CIRCULAR_BEACON SEE: BEACON (INCLUDED TERM 193)

STANDARD FEATURE TERM 25: CIRQUE
DEFINITION: A DEEP HOLLOW IN A MOUNTAIN SIDE WHICH HAS BEEN ERODED AND SHAPED BY THE MOVEMENT OF SNOW AND ICE. THE WALLS ARE STEEP ALL ROUND.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING

CITY SEE: PLACE (INCLUDED TERM 194)

CITY_HALL SEE: BUILDING (INCLUDED TERM 195)

CLEARED_AREA (INCLUDED TERM 196)
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

WORKING GROUP III, NCDCDS

PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

SEE: CLEARING

STANDARD FEATURE TERM 26: CLEARING

DEFN: AN OPEN AREA IN A FOREST.

SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING

ATTRIB: LOCATION ELEVATION AGE AREA NATURAL/ARTIFICIALLY.IMPROVED/MANMADE SPECIES.REMOVED PREDOMINANT_SPECIES NAME FIRE_LINE SPECIES WIDTH

INCLUD: CLEARED_AREA BALD_GLADE BURN_BURNT_OVER_AREA FIREBREAK FIRE_LINE LOGGED_AREA CUT_LINE

CLEARING_BEARING

SEE: BEARING_LINE

CLEARING_LINE

SEE: BEARING_LINE

STANDARD FEATURE TERM 27: CLIFF

DEFN: A HIGH, STEEP, OR OVERHANGING FACE OF ROCK.

SOURCE: AMERICAN HERITAGE DICTIONARY

ATTRIB: ELEVATION SLOPE COMPOSITION LOCATION NAME HEIGHT LENGTH

INCLUD: BLUFF CEJA CRAG ICE_CLIFF ESCARPMENT BEACH_SCARP PRECIPICE SCAW PALISADE SCARP SCAR MARINE_CLIFF

CLINIC

SEE: BUILDING

CLOSED_BAY

SEE: INLET

CLOSED_SEA

SEE: SEA

CLOVER_LEAF_INTERCHANGE

SEE: INTERSECTION

CO-RANGE_LINE

SEE: CONTOUR_LINE

STANDARD FEATURE TERM 28: COAST

DEFN: THE GENERAL REGION OF INDEFINITE WIDTH THAT EXTENDS FROM THE SEA INLAND TO THE FIRST MAJOR CHANGE IN TERRAIN FEATURES.

SOURCE: U.S. NAVAL OCEANOGRAPHIC OFFICE GLOSSARY OF OCEANOGRAPHIC TERMS

ATTRIB: NAME LOCATION

INCLUD: COASTAL_AREA SEA_COAST RIVAGE COASTAL_PLAIN

COAST_GUARD_STATION

SEE: STATION/BUILDING

COAST_GUARD_LINES

SEE: BOUNDARY

COASTAL_AREA

SEE: COAST

COASTAL_PLAIN

SEE: PLAIN/COAST
COASTLINE
  SEE: SHORELINE

CODE BEACON
  SEE: BEACON

COL
  SEE: GAP

COLLEGE
  SEE: BUILDING

COLOR_GRADIENT
  SEE: RELIEF

COLORED_LIGHT
  SEE: BEACON

COMBINATION_BUOY
  SEE: BUOY

COMMUNITY
  SEE: PLACE

COMPASS_BEARING
  SEE: BEARING_LINE

COMPASS_DEVIATION
  SEE: BEARING_LINE

COMPASS_DIRECTION
  SEE: BEARING_LINE

COMPASS_MAGNETIC_VARIATION
  SEE: BEARING_LINE

COMPASS_VARIATION
  SEE: BEARING_LINE

CONICAL_BUOY
  SEE: BUOY

CONIFEROUS_FOREST
  SEE: WOODLAND

CONSERVATION_AREA
  SEE: PARK

CONTINENTAL_GLACIER
  SEE: ICE_FIELD

CONTINENTAL_ICE
  SEE: ICE_FIELD

INCLUDED TERM 208
INCLUDED TERM 209
INCLUDED TERM 210
INCLUDED TERM 211
INCLUDED TERM 212
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INCLUDED TERM 222
INCLUDED TERM 223
INCLUDED TERM 224
INCLUDED TERM 225
FEATURES

CONTINUOUS_RADIOBEACON
SEE: BEACON

CONTOUR
SEE: CONTOUR_LINE

CONTOUR_INTERVAL
SEE: RELIEF

STANDARD FEATURE TERM 29: CONTOUR_LINE
DEFN: A LINE CONNECTING POINTS OF EQUAL ELEVATION OR EQUAL DEPTH.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY.
ATTRIB: NAME ABOVE/Below_SEA_LEVEL UNIT_OF_MEASUREMENT APPROXIMATE/EXACT_MEASUREMENT ELEVATION/DEPRESSION
INCLUD: DEPTH_CONTOUR FATHOM_CURVE FORM_LINE CONTOUR APPROXIMATE_CONTOUR AUXILIARY_CONTOUR DEPRESSION_CONTOUR
FORM_LINE_CONTOUR_(LAND) FORM_LINE_CONTOUR_(GLACIER, ICEFIELD, SNOWFIELD) INDEX_CONTOUR INTERMEDIATE_CONTOUR
DEPTH_CURVE ISOBATH CO-RANGE_LINE ISOHYPSE

STANDARD FEATURE TERM 30: CONTROL_POINT
DEFN: A SURVEYED POINT OF KNOWN ALTITUDE AND/OR LATITUDE AND LONGITUDE.
SOURCE: NEW DEFINITION
ATTRIB: LOCATION PHYSICAL CONSTRUCTION_MATERIAL ALTITUDE HORIZONTAL/VERTICLE ELEVATION
INCLUD: VERTICAL_CONTROL_POINT BENCH_MARK VERTICAL_CONTROL_MONUMENT HORIZONTAL_CONTROL_POINT HORIZONTAL_CONTROL_MONUMENT
PHOTOGRAFOMETRIC_Horizontal_CONTROL_POINT CONTROL_SURVEY_MONUMENT CADASTRAL_MONUMENT BOUNDARY_MONUMENT
SURVEY_MONUMENT MONUMENTED_CONTROL_POINT WAY_POINT STONE_MOUND_MONUMENT CAIRN

CONTROL_SURVEY_MONUMENT
SEE: CONTROL_POINT

CONTROL_TOWER
SEE: TOWER

CONTROLLED_ACCESS_ROAO
SEE: ROAD

CONTROLLED_AERODROME
SEE: AIRPORT

CONTROLLING_DEPTH
SEE: SOUNDING

CONVENT
SEE: BUILDING

COPSE
SEE: WOODLAND

CORAL_HEAD
SEE: PINNACLE

CORAL_REEF
SEE: REEF

CORDUROY_ROAD
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

SEE: ROAD
SEE: VALLEY/WATERCOURSE
SEE: BEARING_LINE
SEE: BUILDING
SEE: INLET
SEE: BRIDGE
SEE: CLIFF/Pinnacle

STANDARD FEATURE TERM 31: CRATER
SEE: BASIN
DEFN: CIRCULAR-SHAPED DEPRESSION AT THE SUMMIT OF A VOLCANIC CONE OR ON THE SURFACE OF THE LAND CAUSED BY THE IMPACT OF A METEORITE; A MANMADE DEPRESSION CAUSED BY AN EXPLOSION.
SOURCE: GNIS DOCUMENTATION, APPENDIX B, FEATURE CLASS DEFINITIONS
INCLUD: CALDERA

SEE: STREAM
DEFN: A STREAM OF LESS VOLUME THAN A RIVER BUT LARGER THAN A BROOK. A SMALL TIDAL CHANNEL THROUGH A COASTAL MARSH.
SOURCE: NAVIGATION DICTIONARY, U.S. OCEANOGRAPHIC OFFICE

SEE: BUILDING
SEE: RIDGE
SEE: VALLEY
SEE: MOORING

STANDARD FEATURE TERM 32: CROP LAND
DEFN: LAND THAT HAS BEEN PLOWED OR OTHERWISE CULTIVATED.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION CROP_GROWN GROWING_PATTERNS AREA GROWING_SEASON IRRIGATED NAME ACIDITY COMMERCIAL ELEVATION ENCLOSED FALLOW GRAZING LATITUDINAL_ZONE MINERAL_CONTENT PREDOMINANT_SPECIES TREE_COVER
INCLUD: FIELD CULTIVATED_FIELD CULTIVATED_AREA ORCHARD VINEYARD GARDEN MARKET_GARDEN TRUCK_FARM TRUCK_GARDEN PADDY_FIELD

SEE: SOUNDELING
## INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

**WORKING GROUP III, NCDCDS**

**PREPARED AT V.C.U. SEPTEMBER 6, 1985**

### FEATURES

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<td>CROSING_GATE</td>
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<td>CUESTA</td>
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<td>CUL_DE_SAC</td>
<td>ROAD/LEAD</td>
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<tr>
<td>CULTIVATED_FIELD</td>
<td>CROP_LAND (NEW) AN EXPANSE OF LAND THAT HAS BEEN PLOWED OR PREPARED FOR RAISING CROPS.</td>
<td>Source: National Ocean Service Glossary, 1985</td>
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<tr>
<td>CULTIVATED_AREA</td>
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<tr>
<td>CUSPATE_BAR</td>
<td>BAR</td>
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<td>CUSPATE_SPI</td>
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<td>CUT_LINE</td>
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<tr>
<td>CUT_OFF</td>
<td>WATERCOURSE</td>
<td>Source: American Heritage Dictionary</td>
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<tr>
<td>DALE</td>
<td>VALLEY</td>
<td></td>
</tr>
<tr>
<td>DAM</td>
<td>A BARRIER CONSTRUCTED ACROSS A WATERCOURSE TO CONTROL THE FLOW OR RAISE THE LEVEL OF WATER.</td>
<td>Source: American Heritage Dictionary</td>
</tr>
<tr>
<td>DAN_BUOY</td>
<td>BuoY</td>
<td></td>
</tr>
</tbody>
</table>

**STANDARD FEATURE TERM 33: DAM**

**DEFN:** A BARRIER CONSTRUCTED ACROSS A WATERCOURSE TO CONTROL THE FLOW OR RAISE THE LEVEL OF WATER.

**ATTRIB:** LOCATION NAME CONSTRUCTION MATERIAL DISCHARGE FLOOD CONTROL HYDROELECTRIC POWER IRRIGATION LIGHTED

**INCLUD:** BARRAGE WEIR BEAVER DAM

**STANDARD FEATURE TERM 34: DANGER AREA**

**DEFN:** A SPECIFIED AREA ABOVE, BELOW, OR WITHIN WHICH THERE MAY EXIST POTENTIAL DANGER.

**ATTRIB:** LOCATION AREA AIR LAND WATER AREA NAME
### Standard Feature Definitions

**Features**

- **Prohibited_Area**
- **Prohibited_Flying_Area**
- **Restricted_Area**
- **Restricted_Waters**

**Dangers**

- **Danger_BUOY** (See: BUOY)
- **Danger_SOUNDINGS** (See: SOUNDING)
- **Dangerous_Wreck** (See: WRECK)
- **Dangerous_Rock** (See: ROCK)
- **Daybeacon** (See: BEACON)
- **Dead_End_Street** (See: ROAD)
- **Deciduous_Forest** (See: WOODLAND)
- **Deep** (See: THROUGH)
- **Dell** (See: GULLY)
- **Dell** (See: VALLEY)

**Standard Feature Term 35: Delta**

**DEFN:** A tract of alluvium formed at the mouth of a river where the deposition of some of its load exceeds its rate of removal. Crossed by the divergent channels (distributaries) of the river.

**Source:** A Dictionary of Geography, Monkhouse

**Attributes:** Location, Width, Discharge, Navigable

**Includes:** Bay, Delta, Canyon, Delta Fan, Outwash Plain

<table>
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<tr>
<th>Standard Feature Term 35: Delta</th>
<th>DEFN: A tract of alluvium formed at the mouth of a river where the deposition of some of its load exceeds its rate of removal. Crossed by the divergent channels (distributaries) of the river.</th>
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<tr>
<td><strong>Source:</strong> A Dictionary of Geography, Monkhouse</td>
<td></td>
</tr>
<tr>
<td><strong>Attributes:</strong> Location, Width, Discharge, Navigable</td>
<td></td>
</tr>
<tr>
<td><strong>Includes:</strong> Bay, Delta, Canyon, Delta Fan, Outwash Plain</td>
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**Depression** (See: BASIN/VALLEY/HOLE)

**Depression Contour** (See: CONTOUR_LINE)

**Depth** (See: SOUNDING)
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<tr>
<td>DEPTH_CURVE</td>
<td>See: CONTOUR_LINE</td>
<td>(INCLUDED TERM 280)</td>
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<tr>
<td>STANDARD FEATURE TERM 36: DESERT</td>
<td>A REGION RENDERED BARREN OR PARTIALLY BARREN BY ENVIRONMENTAL EXTREMES, ESPECIALLY BY LOW RAINFALL.</td>
<td>AMERICAN HERITAGE DICTIONARY</td>
<td>NAME LOCATION LATITUDINAL_ZONE AREA</td>
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<tr>
<td>DIAMOND_INTERSECTION</td>
<td>See: INTERSECTION</td>
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<td>DIRECTIONAL_BEACON</td>
<td>See: BEACON</td>
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<td>DISPLAY_SIGN</td>
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<tr>
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<td>See: DUMPING_GROUND</td>
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<tr>
<td>DIVIDED_HIGHWAY</td>
<td>See: ROAD</td>
<td>(INCLUDED TERM 290)</td>
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<tr>
<td>STANDAFRED FEATURE TERM 37: DOCK</td>
<td>THE SLIP OR WATERWAY BETWEEN TWO PIERS, OR CUT INTO THE LAND FOR THE BERTHING OF SHIPS. ALSO CALLED SLIP.</td>
<td>NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE</td>
<td>SLIP FERRY_SITE_SLIP WETDOCK DRYDOCK DRY_DOCK GRAVING_DOCK FLOATING_DOCK</td>
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<td>DOCKYARD</td>
<td>See: SHIPYARD</td>
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FEATURES

DOLPHIN
SEE: MOORING

DOME
SEE: MOUNT

DOMINION LAND SURVEY
SEE: GRID

DOUBLE TRACK RAILWAY
SEE: RAILWAY

DOWN
SEE: RAILWAY

DOWNLAND
SEE: GRASSLAND

DOWNS
SEE: GRASSLAND

DRAIN
SEE: WATERCOURSE
DEFN: AN ARTIFICIAL WATERCOURSE FOR CARRYING OFF EXCESS WATER FROM LOW-LYING AREAS.
SOURCE: MODIFIED FROM OHIO STATE PRELIMINARY (INCLUDES GNIS, CANADIAN COUNCIL, AND AMERICAN HERITAGE DICTIONARY)

DRAW
SEE: WATERCOURSE
DEFN: A SMALL, NATURAL WATERCOURSE OR GULLY, GENERALLY SHALLOW OR MORE OPEN THAN A RAVINE; A TROUGHLIKE DEPRESSION LEADING UP FROM A VALLEY TO A GAP BETWEEN TWO HILLS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING DRAFT REPORT, VDL. 1, STANDARDS FOR THE CLASSIFICATION OF TOPOGRAPHIC FEATURES

DRAW BRIDGE
SEE: BRIDGE

DREDGING BUOY
SEE: BUOY

DRIFT
SEE: MORAINE

DRILL HALL
SEE: MILITARY_INSTALLATION/BUILDING

DRIVE IN THEATER
SEE: OUTDOOR_THEATER

DRIVEWAY
SEE: ROAD

DROWNED VALLEY
SEE: VALLEY
## Features

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<td>DRY Harbor</td>
<td>See: HARBOR</td>
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<tr>
<td>DRY DOCK</td>
<td>See: DOCK</td>
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<td>DUAL HIGHWAY</td>
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<tr>
<td>DUMP</td>
<td>See: DUMPING_GROUND</td>
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<tr>
<td>DUMP SITE</td>
<td>See: DUMPING_GROUND</td>
</tr>
</tbody>
</table>

### Standard Feature Term 38: DUMPING GROUND

**DEFN:** AREA DESIGNATED FOR DUMPING VARIOUS TYPES OF MATERIALS.

**SOURCE:** MODIFIED FROM NAUTICAL CHART MANUAL

**ATTRIB:** LOCATION AREA WASTE MATERIAL WATER DEPTH SALINITY NAME AIR/LAND/WATER MINERAL CONTENT

**INCLUDE:** SPOIL_GROUND SPOIL_AREA DISPOSAL_AREA DUMP_SITE SPOIL_BANKS DISPOSAL_BED DUMP LIQUID_WASTE_DISPOSAL_AREA TAILINGPILE TAILING_POND TAILING_DUMP SLAG HEAP

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<th>Feature</th>
<th>Description</th>
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<td>ECOLOGICAL AREA</td>
<td>See: PARK</td>
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<tr>
<td>EDDY</td>
<td>See: CURRENT</td>
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</tbody>
</table>

### ELECTRIC POWER GENERATING STATION

**DEFN:** AN INDUSTRIAL BUILDING USED TO PRODUCE ELECTRIC POWER.

**SOURCE:** CANADIAN COUNCIL ON SURVEYING AND MAPPING

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<tr>
<td>ELEVATED HIGHWAY</td>
<td>See: ROAD</td>
</tr>
</tbody>
</table>
STANDARD FEATURE TERM 39: EMBANKMENT
DEFN: A RAISED STRUCTURE OF EARTH, GROUND, ETC. USED TO HOLD BACK WATER OR OTHER FLUIDS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH HEIGHT CONSTRUCTION_MATERIAL WIDTH NATURAL ARTIFICIALLY_IMPROVED NAME
INCLUD: DYKE/DIKE LEVEE SEA_WALL BULKHEAD

END_MIDRAIN
SEE: RIDGE

ENTRANCE_LOCK
SEE: LOCK

ENTREPOT
SEE: PORT

EQUATORIAL_FOREST
SEE: WOODLAND

EQUATORIAL_RAIN_FOREST
SEE: WOODLAND

ESCARPMENT
SEE: CLIFF

ESKER
SEE: RIDGE

ESTUARY
SEE: INLET/MOUTH

EVERGLADE
SEE: WETLAND

EXCAVATION
SEE: MINE/HOLE

STANDARD FEATURE TERM 40: EXHIBITION GROUND
DEFN: A PUBLIC AREA CONTAINING BUILDINGS, PADDOCKS ETC. FOR THE DISPLAY OF LIVESTOCK, AGRICULTURAL PRODUCE, MACHINERY, ETC.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
INCLUD: FAIRGROUND

EXPRESSWAY
SEE: ROAD

FACTORY
SEE: BUILDING

FAIRGROUND
SEE: EXHIBITION_GROUND

FAIRWAY
SEE: WATERCOURSE/LANE
FEATURES

DEFN: THE MAIN TRAVELED PART OF A WATERWAY; A MARINE THOROUGHFARE.
SOURCE: NAVIGATION DICTIONARY

FAIRWAY_BUOY
SEE: BUOY

FALLS
SEE: WATERFALL

FAN
SEE: DELTA

FAN_DELTA
SEE: DELTA

FAN_MARKER_BEACON
SEE: BEACON

STANDARD FEATURE TERM 41: FARM
DEFN: (MODIFIED) A TRACT OF CROP LAND, AS WELL AS THE GROUP OF BUILDINGS WITH AND OFTEN SURROUNDING A FARMHOUSE, INCLUDING BARNS, SHEDS, AND OTHER OUTBUILDINGS.
SOURCE: AMERICAN HERITAGE DICTIONARY

FARM_LANE
SEE: ROAD

FATHOM_CURVE
SEE: CONTOUR_LINE

FEN
SEE: WETLAND

FENCE
SEE: BARRIER/BOUNDARY

FERRY
SEE: WHARF/PIER

FERRY/HOVERCRAFT/HYDROFOIL_TERMINAL/STATION
SEE: DOCK

FERRY_CROSSING
SEE: LANE

FERRY_SITE/SLIP
SEE: DOCK

FERRY_TERMINAL
SEE: PORT/DOCK

FIELD
SEE: CROP_LAND/GRASSLAND
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

WORKING GROUP III, NCDCCS

PREPARED AT V.C.U. SEPTEMBER 6, 1985

features

filling station
see: building/station

filtration plant
see: building

fire line
see: clearing

fire lookout tower
see: tower

fire lookout-building
see: building

fire road
see: road

fire station
see: building/station

fire tower
see: tower

firebreak
see: clearing

firth
see: inlet

defn: a long narrow inlet of the sea. fjord. (fiord)
source: the american heritage dictionary

standard feature term 42: fish hatchery

defn: a facility used for the spawning of fish which are subsequently used to stock lakes and streams.
source: canadian council on surveying and mapping
attrib: location name species capacity
includ: fishery

fish haven
see: fishing ground

standard feature term 43: fish ladder

defn: a facility consisting of a series of small pools each one slightly higher than the preceding, build around a dam to enable fish to make their way upstream.
source: canadian council on surveying and mapping
attrib: location length species_served season_used width name

fish net buoy
see: buoy

fish pound
see: fish trap

(included term 352)

(included term 353)

(included term 354)

(included term 355)

(included term 356)

(included term 357)

(included term 358)

(included term 359)

(included term 360)

(included term 361)

(included term 362)

(included term 363)

(included term 364)
### Standard Feature Term 44: Fish Trap

**DEFN:** A device used to catch fish.  
**SOURCE:** New Definition  
**ATTRIB:** Location Name Season Used Predominant Species Trapped Salinity Length Width  
**INCLUD:** Fish_Pound Fishing_Stakes Weir Tunny_Nets Stake_Net

**FISH_TRAP_AREA**
SEE: FISHING_GROUND

**FISHERY**
SEE: FISHING_GROUND/FISH_HATCHERY

### Standard Feature Term 45: Fishing Ground

**DEFN:** A water area in which fishing is frequently carried on.  
**SOURCE:** Modified from Navigation Dictionary  
**ATTRIB:** Location Predominant Species Seasonal Limits Area Salinity Artificially_Improved/Manmade/Natural Name  
**INCLUD:** Fishery Fish Trap Area Oyster_Bed Fish_Haven Fishing_Zone

**FISHING_STAKES**
SEE: FISH_TRAP

**FISHING_ZONE**
SEE: FISHING_GROUND

**FIXED_AND_FLASHING_LIGHT**
SEE: BEACON

**FIXED_AND_GROUP_FLASHING_LIGHT**
SEE: BEACON

**FIXED_LIGHT**
SEE: BEACON

### Fjord
SEE: Inlet  
**DEFN:** A long narrow arm of the sea, running up between high banks or cliffs, as on the coast of Norway. Often has relatively shallow sill across its entrance.  
**SOURCE:** National Ocean Service Glossary, 1985

**FLAG_TOWER**
SEE: TOWER

**FLAME_FLOAT**
SEE: BUOY

**FLASHING_LIGHT**
SEE: BEACON

### Standard Feature Term 46: Flat

**DEFN:** A level tract lying at a small depth below the surface of water, or alternately covered and left bare by the tide.  
**SOURCE:** Nautical Chart Manual, U.S. Dept. of Commerce, National Ocean Survey  
**INCLUD:** Tidal_Flat Barrier_Flat
FEATURES

FLOATING_BREAKWATER
SEE: BREAKWATER

FLOATING_DOCK
SEE: DOCK

FLOATING_MARSH
SEE: WETLAND

FLOEBERG
SEE: ICEBERG

STANDARD FEATURE TERM 47: FLOODPLAIN
DEFN: (MODIFIED) AN AREA ADJACENT TO A STREAM CHANNEL WHICH IS SUBJECT TO PERIODIC FLOODING.
SOURCE: A DICTIONARY OF BASIC GEOGRAPHY, SCHMIEDER, GRIFFIN, CHATHAM, NATOLI

FLOODGATE
SEE: GATE

FLUME
SEE: WATERCOURSE
DEFN: AN ARTIFICIAL STREAM CHANNEL CONSTRUCTED FOR INDUSTRIAL PURPOSES; TO PROVIDE POWER FOR WATER, TO FLOAT LOGS AND FOR WATER SUPPLY, USED IN PARTS OF U.S.A. FOR A NARROW RAVINE OR GORGE.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

FDG_SIGNAL
SEE: BEACON

FOOTBRIDGE
SEE: BRIDGE

FOOTHILL
SEE: MOUNT

FOOTPATH
SEE: ROAD

FORCES_BASE
SEE: MILITARY_INSTALLATION

FORD
SEE: WATERCOURSE
DEFN: THE SHALLOW PART OF A RIVER WHICH CAN BE EASILY Crossed
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

FOREDEEP
SEE: TROUGH

FORELAND
SEE: CAPE

FORESHORE
SEE: SHORE
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS  WORKING GROUP III. NDCDS  PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

FORESHORE_FLATS
SEE: BEACH

FOREST
SEE: WOODLAND

FOREST_RESERVE
SEE: PARK

FORK
SEE: STREAM
DEFN: ONE OF THE MAJOR BIFURCATIONS OF A STREAM. ALSO CALLED A BRANCH.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

FORM_LINE
SEE: CONTOUR_LINE

FORM_LINE_CONTOUR(LAND)
SEE: CONTOUR_LINE

FORM_LINE_CONTOUR(GLACIER, ICEFIELD, SNOWFIELD)
SEE: CONTOUR_LINE

FORT
SEE: MILITARY_INSTALLATION

FREeway
SEE: ROAD

FRINGING_REEF
SEE: REEF

STANDARD FEATURE TERM 48: FUMAROLE
DEFN: A HOLE IN THE EARTH'S CRUST FROM WHICH STEAM AND GASES ARE EMITTED UNDER PRESSURE
SOURCE: ADAPTED FROM MOORE, A DICTIONARY OF GEOGRAPHY
ATTRIB: LOCATION GAS_EMITTED_TYPE

FUNERAL_HOME
SEE: BUILDING

STANDARD FEATURE TERM 49: GAP
DEFN: LOW POINT OR OPENING BETWEEN HILLS OR MOUNTAINS OR IN A RIDGE OR MOUNTAIN RANGE.
SOURCE: GNIS DOCUMENTATION. APPENDIX B
ATTRIB: LOCATION ELEVATION SHAPE SLOPE WIDTH AREA
INCLUD: ARCH DEFILE NOTCH PASS SADDLE COL SILL CUT

GARAGE
SEE: BUILDING/VEHICLE_STORAGE

GARDEN
SEE: CROP_LAND

GARIGUE

(INCLUDED TERM 391)

(INCLUDED TERM 392)

(INCLUDED TERM 393)

(INCLUDED TERM 394)

(INCLUDED TERM 395)

(INCLUDED TERM 396)

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(INCLUDED TERM 400)

(INCLUDED TERM 401)

(INCLUDED TERM 402)

(INCLUDED TERM 403)

(INCLUDED TERM 404)
FEATURES

SEE: WOODLAND

GAS_FIELD
SEE: OIL_FIELD

GASOMETER
SEE: TANK

STANDARD FEATURE TERM 50: GATE
DEFN: A STRUCTURE THAT MAY BE SWUNG, DRAWN, OR LOWERED TO BLOCK AN ENTRANCE OR PASSAGEWAY.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION RELATED FEATURE NAME WIDTH LENGTH TOLL HEIGHT CONSTRUCTION MATERIAL TIDAL CONNECTED FEATURES
INCLUD: CROSSING_GATE CATTLE_GATE TOLL_GATE CAISSON TIDE_GATE FLOODGATE SLUICE SLUICE_GATE SEA_GATE

GEDISOTHERM
SEE: ISDGRAM

STANDARD FEATURE TERM 51: Geyser
DEFN: AN INTERMITTENT FOUNTAIN OF HOT WATER EJECTED WITH FORCE FROM A HOLE IN THE EARTH'S CRUST
SOURCE: ADAPTED FROM MONKHOUSE

GLACIAL_Drift
SEE: MORAINE

GLACIAL_GORGE
SEE: VALLEY

GLACIAL_STREAM
SEE: STREAM

GLACIAL_TROUGH
SEE: VALLEY

GLACIER
SEE: ICE_FIELD

GLACIER_BERG
SEE: ICEBERG

GLACIER_ICEBERG
SEE: ICEBERG

GLACIER_TONGUE
SEE: ICE_FIELD

GLADE
SEE: CLEARING/GRASSLAND

GLEN
SEE: VALLEY

GOE
SEE: VALLEY
STANDARD FEATURE TERM 52: GOLF COURSE
DEFN: AN AREA SET OUT FOR THE PLAYING OF GOLF.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
INCLUD: GOLF_DRIVING_RANGE

GOLF_DRIVING_RANGE
SEE: GOLF_COURSE

GORGE
SEE: VALLEY
ATTRIB: LOCATION DISCHARGE

GRABEN
SEE: VALLEY

GRADE_CROSSING
SEE: INTERSECTION

GRADE_INTERSECTION
SEE: INTERSECTION

GRADIENT_TINT
SEE: RELIEF

GRAIN_ELEVATOR
SEE: BUILDING/TOWER

GRANARY
SEE: BUILDING

STANDARD FEATURE TERM 53: GRASSLAND
DEFN: AN AREA OF GRASS OR GRASSLIKE VEGETATION.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION ANNUAL_PRECIPITATION ACIDITY AREA PREDOMINANT_SPECIES NAME
INCLUD: MEADOW PLAIN RANGE SAVANNA FIELD PRAIRIE PASTURE PAMPA HAY_MEADOW STEPPE VELD PUSZTA DOWNLAND DOWNS DOWN GLADE MOOR

GRATICULE
SEE: GRID

GRATICULE_TICK
SEE: GRID

GRAVEL_PIT
SEE: MINE/HOLE

GRAVEYARD
SEE: CEMETERY

GRAVING_DOCK
SEE: DOCK
GREENHOUSE
SEE: BUILDING

STANDARD FEATURE TERM 54: GRID
DEFN: TWO SETS OF PARALLEL LINES, INTERSECTING AT RIGHT ANGLES AND FORMING SQUARES, THAT ARE SUPERIMPOSED ON MAPS IN A CONSISTENT MANNER TO PERMIT IDENTIFICATION OF GROUND LOCATIONS AND THE COMPUTATION OF DIRECTION AND DISTANCE FROM ONE POINT TO ANOTHER.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION_NAME DISTANCE_BETWEEN_LINES ORIENTATION_OF_LINES
INCLUD: GRATICULE GRATICULE_TICK RANGE DOMINION_LAND_SURVEY LAND_SURVEY_SYSTEM TOWNSHIP

GRID_BEARING
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GRID_COURSE
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GRID_LINE
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GRID_MERIDIAN
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GRID_PARALLEL
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GRID_RHUMB_LINE
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GRID_TRACK
SEE: BEARING_LINE
INCLUD: BEARING_BEARING BOUNDARY

GROIN/GROYNE
SEE: BREAKWATER
INCLUD: BREAKWATER

GROTTO
SEE: CAVE
INCLUD: CAVE

GROVE
SEE: WOODLAND
INCLUD: WOODLAND

GUARD_RAIL
SEE: BARRIER
INCLUD: BARRIER

GUIDE_RAIL
SEE: BARRIER
INCLUD: BARRIER

GULCH
SEE: VALLEY/WATERCOURSE
INCLUD: VALLEY/WATERCOURSE

GULF
SEE: INLET
INCLUD: INLET
GULLY
SEE: VALLEY/WATERCOURSE
SOURCE: GNIS DOCUMENTATION, APPENDIX B, FEATURE CLASS DEFINITIONS
DEFN: A SMALL CHANNEL RECENTLY CUT BY RUNNING WATER; SMALLER THAN A GULCH OR RAVINE.
SOURCE: NAUTICAL CHART MANUAL, U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEAN SURVEY

GUT
SEE: WATERCOURSE
DEFN: A NARROW PASSAGE OR CONTRACTED STRAIT CONNECTING TWO BODIES OF WATER.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

GUTTER
SEE: WATERCOURSE

GUYOT
SEE: PLATEAU

HACHURED AREA
SEE: RELIEF

HACHURES
SEE: RELIEF

HALF-TIDE BASIN
SEE: LOCK

HAMLET
SEE: PLACE

HANGAR
SEE: BUILDING

STANDARD FEATURE TERM 55: HARBOR
DEFN: AN AREA OF WATER WHERE SHIPS, PLANES OR OTHER WATERCRAFT CAN ANCHOR OR DOCK. ALSO SPELLED HARBOUR.
SOURCE: MODIFIED FROM GEOPHYSIC NAMES INFORMATION SYSTEM APPENDIX B
ATTRIB: LOCATION TIDAL ARTIFICIALLY_IMPROVED/MANMADE/NATURAL NAME VEHICLE_TYPE DEPTH_OF_WATER AREA SALINITY
         FACILITIES_AVAILABLE MOORING_FACILITIES PRESENCE_OF_BREAKWATERS CONTROL_OVER_WATER_LEVEL SHELTERED/EXPOSED RESTRICTIONS LIGHTED VEHICLE_SIZE_SERVED BUOYED CARGO_TRANSPORTATION CHARTED_DEPTH
         COMMERCIAL_SHIPPING NAVIGABLE RESTRICTIONS LIGHTED VEHICLE_SIZE_SERVED
         INCLUD: DRY_HARBOR HARBOR_OF_REFUGE ARTIFICIAL HARBOR BOAT HARBOR INNER_HARBOR ISLAND_HARBOR NATURAL_HARBOR TIDAL_HARBOR HAVEN BOAT_BASIN DOCKYARD PORT CANAL_PORT SEAPORT ENTREPOT ANCHORAGE OPEN_BERTH PROHIBITED_ANCHORAGE TEMPORARY_ANCHORAGE QUARANTINE_ANCHORAGE OPEN_HARBOR OPEN_ROADSTEAD ROADSTEAD SEAPLANE_BASE STRANDING_HARBOR CAMBER

HARBOR LINE
SEE: BOUNDARY

HARBOR OF REFUGE
SEE: HARBOR

HAVEN
SEE: HARBOR
FEATURES

- HAY MEADOW
  SEE: GRASSLAND
  (INCLUDED TERM 459)

- HEAD
  SEE: CAPE
  (INCLUDED TERM 460)

- HEADLAND
  SEE: CAPE
  (INCLUDED TERM 461)

- STANDARD FEATURE TERM 56: HEADWATERS
  DEFN: THE UPPER PART OF A RIVER SYSTEM USED MORE COMMONLY IN THE PL. DENOTING THE UPPER BASIN AND SOURCE STREAMS OF A RIVER.
  SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

- HEATH
  SEE: WOODLAND/WETLAND
  (INCLUDED TERM 462)

- HEDGE
  SEE: BARRIER/BOUNDARY
  (INCLUDED TERM 463)

- HEDGEROW
  SEE: BARRIER/BOUNDARY
  (INCLUDED TERM 464)

- HELIPAD
  SEE: RUNWAY
  (INCLUDED TERM 465)

- HELIPORT
  SEE: RUNWAY
  (INCLUDED TERM 466)

- HIGHWAY
  SEE: ROAD
  (INCLUDED TERM 467)

- HIGHWAY_ROUTE_NUMBER
  SEE: SIGN
  (INCLUDED TERM 468)

- HILL
  SEE: MOUNT
  (INCLUDED TERM 469)

- HILL-SHADING
  SEE: RELIEF
  (INCLUDED TERM 470)

- HILL_SHADED_AREA
  SEE: RELIEF
  (INCLUDED TERM 471)

- HILLOCK
  SEE: MOUNT
  (INCLUDED TERM 472)

- HOCKEY_RINK
  SEE: OUTDOOR_THEATER
  (INCLUDED TERM 473)

- STANDARD FEATURE TERM 57: HOLE
  DEFN: AN ABRUPT HOLLOW IN THE GROUND OR OCEAN FLOOR.
  SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
  ATTRIB: LOCATION DIAMETER DEPTH
**FEATURES**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Included Term</th>
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</thead>
<tbody>
<tr>
<td>PIT Gravel Pit</td>
<td>474</td>
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<tr>
<td>Sand Pit</td>
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<tr>
<td>Borrow Pit</td>
<td></td>
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<tr>
<td>Excavation Quarry</td>
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<tr>
<td>Honeydew</td>
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<tr>
<td>See: Valley</td>
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<tr>
<td>Homing Beacon</td>
<td>475</td>
</tr>
<tr>
<td>See: Beacon</td>
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</tr>
<tr>
<td>Hook</td>
<td>476</td>
</tr>
<tr>
<td>See: Bar/Cape</td>
<td></td>
</tr>
<tr>
<td>Hooked Spit</td>
<td>477</td>
</tr>
<tr>
<td>See: Bar</td>
<td></td>
</tr>
<tr>
<td>Horizon Lights</td>
<td>478</td>
</tr>
<tr>
<td>See: Beacon</td>
<td></td>
</tr>
<tr>
<td>Horizontal Control Point</td>
<td>479</td>
</tr>
<tr>
<td>See: Control Point</td>
<td></td>
</tr>
<tr>
<td>Horizontal Control Monument</td>
<td>480</td>
</tr>
<tr>
<td>See: Control Point</td>
<td></td>
</tr>
<tr>
<td>Defn: (Modified) A survey marker for which the precise latitude and longitude are known.</td>
<td></td>
</tr>
<tr>
<td>Horn Buoy</td>
<td>481</td>
</tr>
<tr>
<td>See: Buoy</td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>482</td>
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<tr>
<td>See: Building</td>
<td></td>
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<tr>
<td>Hostel</td>
<td>483</td>
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<tr>
<td>See: Building</td>
<td></td>
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<tr>
<td>Hotel</td>
<td>484</td>
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<tr>
<td>See: Building</td>
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<tr>
<td>Hotspring</td>
<td>485</td>
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<tr>
<td>See: Spring</td>
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<tr>
<td>House</td>
<td>486</td>
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<tr>
<td>See: Building</td>
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<tr>
<td>Hulk</td>
<td>487</td>
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<td>See: Wreck</td>
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<tr>
<td>Hummock</td>
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<tr>
<td>See: Mount/Island</td>
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<tr>
<td>Hydro Tower</td>
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<tr>
<td>See: Tower</td>
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</tr>
<tr>
<td>Hypsometric Tint</td>
<td>490</td>
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<tr>
<td>See: Relief</td>
<td></td>
</tr>
</tbody>
</table>
ICE_BUOY
SEE: BUOY

ICE_CAP
SEE: ICE_FIELD

ICE_CLIFF
SEE: CLIFF

STANDARD FEATURE TERM 58: ICE FIELD

DEFN: LARGE AREA OF PERMANENT SEA OR LAND ICE.
SOURCE: MODIFIED FROM STAMP, DICTIONARY OF GEOGRAPHY
ATTRIB: NAME LOCATION
INCLUD: ICE_SHEET ICE_CAP GLACIER ROCK_GLACIER POLAR_IICE_PACK GLACIER_TONGUE ISLAND_IICE ARCTIC_PACK BAY_IICE CONTINENTAL_GLACIER

ICE_SHEET
SEE: ICE_FIELD

STANDARD FEATURE TERM 59: ICEBERG

DEFN: A LARGE MASS OF DETACHED LAND ICE IN THE SEA OR STRANDED IN SHALLOW WATER.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME
INCLUD: ARCHED_ICEBERG FLOEBERG GLACIER_BERG BARRIER_ICEBERG BERY GLACIER_ICEBERG

IDENTIFICATION_BEACON
SEE: BEACON

IMPROVED_CHANNEL
SEE: WATERCOURSE/LANE

INDEX_CONTOUR
SEE: CONTOUR_LINE

STANDARD FEATURE TERM 60: INDIAN RESERVATION

DEFN: AN AREA SET ASIDE FOR THE USE OF AN INDIAN BAND OR BANDS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
ATTRIB: LOCATION NAME

INLAND_SEA
SEE: LAKE

STANDARD FEATURE TERM 61: INLET

DEFN: AN OPENING OF THE SEA INTO THE LAND, OR OF A LAKE INTO ITS SHORES.
SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MONKHOOSE
ATTRIB: NAME LOCATION SIZE SHAPE WIDTH DEPTH SALINITY BUOYED COMMERCIAL_SHIPPING NAVIGABLE
INCLUD: ANSE ARM BAY BIGHT COVE ESTUARY FIRTH GULF CLOSED_BAY RIA RINCON FJORD

INNER_HARBOR
SEE: HARBOR

INNER_LEAD
SEE: HARBOR

(INCLUDED TERM 491)

(INCLUDED TERM 492)

(INCLUDED TERM 493)

(INCLUDED TERM 494)

(INCLUDED TERM 495)

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<table>
<thead>
<tr>
<th>Feature Term</th>
<th>Definition</th>
<th>Source</th>
<th>Attributes</th>
<th>Included Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERSECTION</td>
<td>The junction of roads or tracks.</td>
<td>NEW DEFINITION</td>
<td>LOCATION SHAPE GRADE SEPARATION CONNECTED FEATURES AREA FEATURE_PRESENT PASSENGER_TRANSPORTATION LIGHTED</td>
<td>CLOVER_LEAF_INTERCHANGE CROSSING DIAMOND_INTERSECTION GRADE_INTERSECTION GRADE CROSSING INTERCHANGE PEDESTRIAN CROSSING TRAFFIC_CIRCLE RAILROAD_CROSSING</td>
</tr>
<tr>
<td>ISANOMAL</td>
<td>A line connecting points having the same anomalies of temperature, pressure, etc.</td>
<td>NAVIGATION DICTIONARY</td>
<td>LOCATION PHENOMENON MEASURED VALUE_ATTACHED_TO_LINE</td>
<td>ISABNORMAL ISALLOBAR ISALLOTHERM</td>
</tr>
<tr>
<td>ISLAND</td>
<td>Area of dry or relatively dry land surrounded by water or low wetland.</td>
<td>GNIS DOCUMENTATION, APPENDIX B</td>
<td>LOCATION NAME AREA SHAPE COMPOSITION ELEVATION</td>
<td>CAY/KEY ISLET ATOLL STACK TOMBLO HUMMOCK BARRIER ISLAND</td>
</tr>
</tbody>
</table>
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

ISLAND_ARC
SEE: ISLAND_CLUSTER

STANDARD FEATURE TERM 65: ISLAND_CLUSTER
DEFN: A GROUP OF ISLANDS
SOURCE: NEW TERM NO EXISTING DEFINITION
INCLUD: ARCHIPELAGO ISLAND_ARC

ISLAND_HARBOR
SEE: HARBOR

ISLAND_ICE
SEE: ICE_FIELD

ISLET
SEE: ISLAND

ISOBAR
SEE: ISOGRAM

ISOBATH
SEE: CONTDUR_LINE

ISOBATHYTERM
SEE: ISOGRAM

ISOBRONT
SEE: ISOGRAM

ISOCHAISM
SEE: ISOGRAM

ISOCEHM
SEE: ISOGRAM

ISOCHRONE
SEE: ISOGRAM

ISOCLINAL
SEE: ISOGRAM

ISOCLINAL_LINE
SEE: ISOGRAM

ISOCLINIC_LINE
SEE: ISOGRAM

ISODEF
SEE: ISOGRAM

ISODYNAMIC_LINE
SEE: ISOGRAM

(INCLUDED TERM 512)

(INCLUDED TERM 513)

(INCLUDED TERM 514)

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(ININCLUDED TERM 524)

(ININCLUDED TERM 525)

(ININCLUDED TERM 526)

(ININCLUDED TERM 527)
ISOGEOTHERM
SEE: ISOGRAM

ISOGRADIENT
SEE: ISOGRAM

STANDARD FEATURE TERM 66: ISOGRAM
DEFN: THAT LINE, ON A CHART OR DIAGRAM, CONNECTING POINTS OF EQUAL VALUE OF SOME PHENOMENON.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION PHENOMENON MEASURED VALUE ATTACHED TO LINE
INCLUD: ISOBAR ISOBATHYTERM ISOBRONT ISOCHRONE ISOCHASM ISOCHROMI ISOCHEL ISOCLINAL ISOCLINICAL LINE ISOCLINAL LINE MAGNETIC PARALLEL ISODEF ISOHYET ISOISOMAGNETIC ISOISOMAGNETIC LINE ISOISONEPHE ISOISOPAG ESOREPTIC ISOPOR ISOISOPORIC LINE ISOPYCNIC ISOSTERE ISOISOTHERM ISOISOTHERMOBATH

ISOGRIV
SEE: ISOGRAM

ISOHALINE
SEE: ISOGRAM

ISOHALSINE
SEE: ISOGRAM

ISOHEL
SEE: ISOGRAM

ISOHYET
SEE: ISOGRAM

ISOHYPSE
SEE: CONTOUR LINE

ISOMAGNETIC
SEE: ISOGRAM

ISOMAGNETIC LINE
SEE: ISOGRAM

ISONEPHE
SEE: ISOGRAM

ISOPAG
SEE: ISOGRAM

ISOPECTIC
SEE: ISOGRAM
ISOPOR
SEE: ISOGRAM

ISOPOIC_LINE
SEE: ISOGRAM

ISOPYCNIC
SEE: ISOGRAM

ISOSTERE
SEE: ISOGRAM

ISOTAC
SEE: ISOGRAM

ISOTACH
SEE: ISOGRAM

ISDHERE
SEE: ISOGRAM

ISOTHERM
SEE: ISOGRAM

ISOTHERMOBATH
SEE: ISOGRAM

STANDARD FEATURE TERM 67: ISTHMUS
DEFN: NARROW SECTION OF LAND IN A BODY OF WATER CONNECTING TWO LARGER LAND AREAS.
SOURCE: GNIS DOCUMENTATION, APPENDIX B
ATTRIB: LOCATION COMPOSITION AREA WIDTH LENGTH NAME
INCLUD: NECK SUBMARINE_ISTHMUS
JAIL
SEE: BUILDING

JETTY
SEE: BREAKWATER/PIER

JUNCTION_BUOY
SEE: BUOY

JUNGLE
SEE: WOODLAND

JUNK_YARD
SEE: VEHICLE_STORAGE

KAME
SEE: MOUNT/RIDGE

KAME_TERRACE
SEE: TERRACE

(INCLUDED TERM 543)

(INCLUDED TERM 544)

(INCLUDED TERM 545)

(INCLUDED TERM 546)

(INCLUDED TERM 547)

(INCLUDED TERM 548)

(INCLUDED TERM 549)

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(INCLUDED TERM 557)

(INCLUDED TERM 558)
FEATURES

KILL
SEE: STREAM
DEFN: A CHANNEL, CREEK OR STREAM, AS THE KILLS BETWEEN STATEN ISLAND AND BERGEN NECK.
SOURCE: NAUTICAL CHART MANUAL, U.S. DEPT. OF COMMERCE, NATIONAL OCEAN SURVEY

KNOB
SEE: MOUNT

KNOLL
SEE: MOUNT

LAGOON
DEFN: A SHEET OF SALT WATER SEPARATED FROM THE OPEN SEA BY SAND OR SHINGLE BANKS... THE SHEET OF WATER BETWEEN AN OFFSHORE REEF ESP. OF CORAL AND MAINLAND. THE SHEET OF WATER WITHIN A RING OR HORSESHOE SHAPED ATOLL.
SOURCE: A DICTIONARY OF GEOGRAPHY, MDNKHOUSE
ATTRIB: LOCATION NAME AREA SALINITY BUOYED CHARTED DEPTH DEPTH NAVIGABLE
INCLUD: BARRIER_LAGOON LAGUNA

LAGOON BEACH
SEE: BEACH

LAGUANA
SEE: LAGOON

LAKE
DEFN: ANY STANDING BODY OF INLAND WATER.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME ACIDITY CHARTED DEPTH ENCLOSED RECREATIONAL SALINITY STORAGE TEMPERATURE WATER_SUPPLY ICE_PRESENCE OF
INCLUD: BAYOU PASTEUR LAKE PROGLACIAL LAKE SALT LAKE MORTLAKE OXBOW OPEN_WATER POOL INLAND_SEA MILLPOND POOL RESERVOIR POND SALINA SOUND

LANDING LANE
SEE: GRID

LANDING BEACON
SEE: BEACON

LANDING_FIELD
SEE: RUNWAY

LANDING AREA
SEE: AIRPORT/ Runway

LANDING
SEE: WHARF/ PIER

LANDING_SYSTEM
SEE: GRID

LANDING
SEE: GRID

LANDING
SEE: WHARF/ PIER

LANDING
SEE: AIRPORT/ RUNWAY

LANDING
SEE: BEACON

LANDING
SEE: RUNWAY

LANDING
SEE: GRID

LANDING
SEE: WHARF/ PIER

LANDING
SEE: AIRPORT/ RUNWAY

LANDING
SEE: BEACON

LANDING
SEE: RUNWAY

LANDING
SEE: GRID

LANDING
SEE: WHARF/ PIER

LANDING
SEE: AIRPORT/ RUNWAY

LANDING
SEE: BEACON

LANDING
SEE: RUNWAY

LANDING
SEE: GRID

LANDING
SEE: WHARF/ PIER

LANDING
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

SEE: RUNWAY/LANE

LANDING_STRIP
SEE: RUNWAY

LANDMARK_BEACON
SEE: BEACON

STANDARD FEATURE TERM 70: LANE
DEFN: A PRESCRIBED COURSE FOR SHIPS OR AIRCRAFT, OR A STRIP DELINEATED ON A STREET OR HIGHWAY TO ACCOMMODATE A SINGLE LINE OF AUTOMOBILES.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: WIDTH LENGTH CHARTED_DEPTH FEATURE_PRESENT LANES_NUMBER_OF_INCLUD: CHANNEL SHIPPING_LANE FAIRWAY WAY PASS SERVICE_LANE LANDING_LANE WATER_LANE FERRY_CROSSING IMPROVED_CHANNEL WATERWAY LEAD SEAWAY

LATERAL_MDRaine
SEE: RIDGE

STANDARD FEATURE TERM 71: LAUNCHING RAMP
DEFN: A TRANSPORTATION STRUCTURE USED FOR LAUNCHING BOATS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH WIDTH SIZE_BOAT_CAN_ACcommodate CONSTRUCTION_MATERIAL_NAME GRADIENT

LAVA_CONE
SEE: MOUNT

LAWN_BOWLING_GREEN
SEE: PARK

LAYER_TINTING
SEE: RELIEF

LAYER_TINT
SEE: RELIEF

STANDARD FEATURE TERM 72: LEAD
SEE: LANE
DEFN: A NAVIGABLE PASSAGE THROUGH ICE, BETWEEN ROCKS OR SHOALS, ETC. IT MAY BE COVERED BY THIN ICE. ONE NOT SO COVERED IS CALLED AN OPEN LEAD. ONE BETWEEN FLOATING ICE AND THE SHORE OR FAST ICE IS CALLED A SHORE LEAD OR SHORE CLEARING. A LEAD WITH ONLY ONE OUTLET IS CALLED A BLIND LEAD, POCKET, OR CUL-DE-SAC. ALSO CALLED A CHANNEL, LANE.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: SHORE BLIND/OPEN CARTED_DEPTH LEAD_TYPE_INCLUD: INNER_LEAD/CUL_DE_SAC

LEADING_LIGHT
SEE: BEACON

LEADING_LINE
SEE: BEARING_LINE

LEDGE
SEE: REEF
<table>
<thead>
<tr>
<th>Feature</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Levee</td>
<td>A place where equipment for saving life at sea is maintained. Source: Navigation Dictionary</td>
</tr>
<tr>
<td>Library</td>
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<tr>
<td>Lift Bridge</td>
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<td>Lifted Beacon</td>
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<td>Lifted Buoy</td>
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<tr>
<td>Lifted Sound Buoy</td>
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<tr>
<td>Lighthouse</td>
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<tr>
<td>Locality</td>
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**Standard Feature Term 73: Lock**

DEFN: An enclosure in a waterbody with gates at each end to raise or lower vessels as they pass from one level to another.

SOURCE: Modified from Canadian Council on Surveying and Mapping

ATTRIB: Location Tidal Vehicle Size Served Length Width Salinity Name Discharge Flood Control

INCLUD: Half-Tide Basin Entrance_Lock Tide_Lock
FEATURES

LODE
SEE: WATERCOURSE
(INCLUDED TERM 597)

LOGGED_AREA
SEE: CLEARING
(INCLUDED TERM 598)

LONG_FLASHING_LIGHT
SEE: BEACON
(INCLUDED TERM 599)

LONGSHORE_BAR
SEE: BAR
(INCLUDED TERM 600)

LOOKOUT_TOWER
SEE: TOWER
(INCLUDED TERM 601)

LOOP_ANTENNA
SEE: ANTENNA
(INCLUDED TERM 602)

LOXODROME
SEE: BEARING_LINE
(INCLUDED TERM 603)

LOXODROMIC_CURVE
SEE: BEARING_LINE
(INCLUDED TERM 604)

LUMBER_CAMP
SEE: CAMPGROUND
(INCLUDED TERM 605)

MAGNETIC_BEARING
SEE: BEARING_LINE
(INCLUDED TERM 606)

MAGNETIC_PARALLEL
SEE: ISOGRAM
(INCLUDED TERM 607)

MAINTENANCE ROAD
SEE: ROAD
(INCLUDED TERM 608)

MAJOR_FOG_SIGNAL
SEE: BEACON
(INCLUDED TERM 609)

MAJOR_LIGHT
SEE: BEACON
(INCLUDED TERM 610)

MALLEE_SCRUB
SEE: WOODLAND
(INCLUDED TERM 611)

MANGROVE_SWAMP
SEE: WETLAND/WOODLAND
(INCLUDED TERM 612)

MAQUIS
SEE: WOODLAND
(INCLUDED TERM 613)

MARGINAL_SEA
SEE: SEA
(INCLUDED TERM 614)
### INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

**FEATURES**

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<td>SEE: BUILDING</td>
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<tr>
<td>MARINE_AUTOMATIC_METEROLOGICAL_STATION</td>
<td>SEE: STATION</td>
<td>A MOORED, BOAT-TYPE AUTOMATIC WEATHER STATION CONSTRUCTED OF NONMAGNETIC MATERIALS. IT IS MOORED IN DEEP WATER.</td>
<td>MODIFIED FROM NAVIGATION DICTIONARY</td>
<td>(INCLUDED TERM 616)</td>
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<td>SEE: WETLAND</td>
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<td>MARSH_BAR</td>
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<tr>
<td>MEAN_SEA_LEVEL</td>
<td>SEE: SHORELINE</td>
<td>THE AVERAGE LEVEL OF THE SEA, AS CALCULATED FROM A LARGE NUMBER OF OBSERVATIONS TAKEN AT EQUAL INTERVALS OF TIME. IT IS THE STANDARD LEVEL FROM WHICH ALL HEIGHTS ARE CALCULATED.</td>
<td>MODIFIED FROM MOORE'S A DICTIONARY OF GEOGRAPHY</td>
<td>(INCLUDED TERM 628)</td>
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<tr>
<td>MEANDER</td>
<td>SEE: WATERCOURSE</td>
<td>A CURVED LOOP-LIKE BEND OR SINUOSITY IN THE COURSE OF A SLUGGISH STREAM OR RIVER.</td>
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<td>(INCLUDED TERM 629)</td>
</tr>
</tbody>
</table>
FEATURES

SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MONKHOUSE

MEMORIAL_PARK
SEE: PARK

MERIDIAN
SEE: BEARING_LINE

MESA
SEE: PLATEAU

MID_CHANNEL_BUOY
SEE: BUOY

MILE_POST
SEE: SIGN

MILEAGE_KILOMETER_POST
SEE: SIGN

MILITARY_BASE
SEE: MILITARY_INSTALLATION

MILITARY_BUNKER
SEE: MILITARY_INSTALLATION

STANDARD FEATURE TERM 74: MILITARY_INSTALLATION
DEFN: ALL FORMS OF BUILDINGS, EMPLACEMENTS OR INSTALLATIONS USED FOR THE TRAINING OF THE MILITARY.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: AMMUNITION_DUMP ARMY_CAMP BARRACKS MILITARY_BASE BATTERY MILITARY_BUNKER DRILL_HALL FORCES_BASE FORT MILITARY_RESERVE NAVAL_STATION POWDER_MAGAZINE

MILITARY_RESERVE
SEE: MILITARY_INSTALLATION

MILL
SEE: BUILDING

MILLPOND
SEE: LAKE

STANDARD FEATURE TERM 75: MINE
DEFN: AN EXCAVATION IN THE EARTH FOR THE PURPOSE OF EXTRACTING FREE METALS, COAL, SALT, OR OTHER MINERALS.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION DEPTH WIDTH SHAPE SUBSTANCE EXTRACTED AREA
INCLUD: STRIP_MINE PLACER_MINE OPEN_PIT_MINE GRAVEL_PIT PIT EXCAVATION QUARRY SAND_PIT BORROW_PIT

MINERAL_SPRING
SEE: SPRING

MINER_FOG_SIGNAL
SEE: BEACON
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS  WORKING GROUP III, NCDCDS  PREPARED AT V.C.U.  SEPTEMBER 6, 1985

FEATURES

MINOR_LIGHT
SEE: BEACON

MICROWAVE_TOWER
SEE: TOWER

MIRE
SEE: WETLAND

MISSISSIPPI_RIVER-TYPE_BUOY
SEE: BUOY

MOAT
SEE: VALLEY

MOLE
SEE: BREAKWATER

MONADNACK
SEE: MOUNT

MONASTERY
SEE: BUILDING

MONORAIL
SEE: RAILWAY

MONSOON_FOREST
SEE: WOODLAND

MONUMENT
SEE: BUILDING

MONUMENTED_CONTROL_POINT
SEE: CONTROL_POINT

MOOR
SEE: WOODLAND/WETLAND/GRASSLAND

STANDARD FEATURE TERM 76: MOORING
DEFN: THE PLACE WHERE A CRAFT MAY BE SECURED TO THE GROUND. WHARF, PIER OR QUAY.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION LENGTH WIDTH CONSTRUCTION_MATERIAL VEHICLE_TYPE_SERVED SURFACE_FEATURE_NAME
INCLUD: CRIB DOLPHIN PILE BOLLARD MOORING_MAST MOORING_BUOY TRUNK_BUOY

MOORING_BUOY
SEE: BUOY/MOORING

MOORING_MAST
SEE: MOORING

STANDARD FEATURE TERM 77: MORaine
DEFN: AN ACCUMULATION OF BOULDERS, STONES, OR OTHER DEBRIS CARRIED AND DEPOSITED BY A GLACIER.
FEATURES

SOURCE: AMERICAN HERITAGE DICTIONARY
INCLUD: TILL GLACIAL_DRIFT DELTA_MORAINE DRIFT

MORASS
SEE: WETLAND

MORTLAKE
SEE: LAKE

MOSQUE
SEE: BUILDING

MOTEL
SEE: BUILDING

MOTTE
SEE: WOODLAND

MOUND
SEE: MOUNT

STANDARD FEATURE TERM 78: MOUNT
DEFN: A MOUNTAIN OR HILL.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION
INCLUD: SUMMIT MOUNTAIN CINDER_CONE SAND_DUNE HUMMACK KNOLL PINGO RANGE MOUNTAIN_RANGE VOLCANO BALD SEAMOUNT SEAPEAK SHIELD_VOLCANO KNOB MOUND PEAK LAVA_CONE MONADNOCK SEAKNOLL DOME HILL HILLOCK DRUMLIN SEAMOUNT_CHAIN SEAMOUNT_GROUP SEAMOUNT_RANGE KAME BERY CERRITO CERRO FOOTHILL CUESTA RISE BANK

MOUNTAIN
SEE: MOUNT

MOUNTAIN_RANGE
SEE: MOUNT/RIDGE

STANDARD FEATURE TERM 79: MOUTH
DEFN: THE EXIT OR POINT OF DISCHARGE OF A STREAM INTO ANOTHER STREAM, LAKE OR SEA.
SOURCE: U.S. NAVAL OCEANOGRAPHIC OFFICE, NAVIGATION DICTIONARY
INCLUD: ESTUARY/OUTLET

MULGA
SEE: WOODLAND

MULGA_SCRUB
SEE: WOODLAND

MULTIPLE_TRACK_RAILWAY
SEE: RAILWAY

MUNICIPAL_PARK
SEE: PARK

MUNICIPALITY
FEATURES

SEE: PLACE

MUSEUM
SEE: BUILDING

MUSKEG
SEE: WETLAND

NARROWS
SEE: WATERCOURSE
DEFN: A CONSTRICTED SECTION OF A RIVER, A STRAIT, VALLEY OR PASS. THE N. IS A COMMON PLACE NAME;
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

NATIONAL PARK
SEE: PARK

NATURAL HARBOR
SEE: HARBOR

NAVAL STATION
SEE: MILITARY INSTALLATION

NAVIGATION LIGHT
SEE: BEACON

NECK
SEE: Isthmus/cape

NGVD DATUM
SEE: SHORELINE
DEFN: FIXED REFERENCE ADOPTED AS A STANDARD GEODETIC DATUM FOR HEIGHTS.

NON TIDAL BASIN
SEE: BASIN

NOTCH
SEE: GAP/CAVE

NULLAH
SEE: WATERCOURSE
DEFN: (INDIAN) THE BED OF A STREAM WHICH FLOWS ONLY OCCASIONALLY, FOLLOWING SPORADIC THOUGH INTENSIVE DOWNPOURS OF RAIN.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

NUN BUOY
SEE: BUOY

OBSEOUENT STREAM
SEE: STREAM

OBSERVATION TOWER
SEE: TOWER
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

OBSTRUCTION_BEACON
SEE: BEACON

OBSTRUCTION_MARKER
SEE: BEACON

OBSTRUCTION_LIGHT
SEE: BEACON

OBSTRUCTION_BUOY
SEE: BUOY

OCCASIONAL_LIGHT
SEE: BEACON

OCCASIONAL_FOG_SIGNAL
SEE: BEACON

OCCULTING_LIGHT
SEE: BEACON

OCCULTING_QUICK_FLASHING_LIGHT
SEE: BEACON

OCEAN
SEE: SEA

OCEAN_STATION
SEE: STATION
DEFN: THE ASSIGNED POSITION OF AN OCEAN STATION VESSEL IN A SPECIFICALLY LOCATED AREA OF OCEAN SURFACE, ROUGHLY SQUARE AND 200 NAUTICAL MILES ON A SIDE.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY

STANDARD FEATURE TERM 80: OFF-ROAD VEHICULAR AREA
DEFN: AN AREA USED FOR THE TESTING OF VEHICLES THAT ARE DESIGNED TO TRAVEL ACROSS THE TERRAIN.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

OFFICE
SEE: BUILDING

OFFSHORE_BAR
SEE: BAR

OFFSHORE_LIGHT_STATION
SEE: STATION/BUILDING

OFFSHORE_TOWER
SEE: STATION/BUILDING

STANDARD FEATURE TERM 81: OIL FIELD
DEFN: AN AREA WHERE PETROLEUM IS OR WAS REMOVED FROM THE EARTH.
SOURCE: GNIS DOCUMENTATION, APPENDIX B
FEATURES

ATTRIB: NAME LOCATION
INCLUD: GAS_FIELD

OIL_WELL
SEE: WELL

OMNIBEARING_LINE
SEE: BEARING_LINE

OMNIDIRECTIONAL_Beacon
SEE: BEACON

OPEN-PIT_MINE
SEE: MINE

OPEN_BERTH
SEE: HARBOR

OPEN_HARBOR
SEE: HARBOR

OPEN_ROADSTEAD
SEE: HARBOR

OPEN_SEA
SEE: SEA

OPEN_SOUND
SEE: SEA

OPEN_WATER
SEE: SEA/LAKE

ORCHARD
SEE: CROP_LAND

ORDNANCE_DATUM
SEE: SHORELINE

STANDARD FEATURE TERM 82: OUTDOOR THEATER
DEFN: AN OUTDOOR AREA CONSISTING OF A STAGE, AND AN AREA WHERE THE AUDIENCE CAN BE SEATED TO VIEW THE PERFORMANCE.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: AMPHITHEATER BANDSTAND DRIVE-IN_THEATER HOCKEY_RINK STADIUM

OUTLET
SEE: MOUTH

OUTPUT
SEE: PORT

OUTWASH
SEE: DELTA

(INCLUDED TERM 700)

(INCLUDED TERM 701)

(INCLUDED TERM 702)

(INCLUDED TERM 703)

(INCLUDED TERM 704)

(INCLUDED TERM 705)

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(INCLUDED TERM 711)

(INCLUDED TERM 712)

(INCLUDED TERM 713)

(INCLUDED TERM 714)
OUTWASHPLAIN
SEE: DELTA/plain

OVERFLOW_CHANNEL
SEE: WATERCOURSE
DEFN: A CHANNEL BY WHICH A LAKE HAS OVERFLOWED DURING A FORMER PERIOD OF HIGH WATER-LEVEL.
SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MONKHOUSE

OVERPASS
SEE: BRIDGE

OXBOW
SEE: LAKE

OYSTER_BED
SEE: FISHING_GROUND

PADDY_FIELD
SEE: CROP_LAND

PALISADE
SEE: CLIFF

PALSA_BOG
SEE: WETLAND

PAMPAS
SEE: GRASSLAND

PARALLEL_OF_LATITUDE
SEE: BEARING_LINE

PARISH
SEE: PLACE

STANDARD_FEATURE_TERM 83: PARK
DEFN: A PLACE OR AREA SET ASIDE FOR RECREATION OR PRESERVATION OF A CULTURAL OR NATURAL RESOURCE.
SOURCE: MODIFIED FROM GNIS DOCUMENTATION, APPENDIX B
ATTRIB: NAME LOCATION
INCLUD: AMUSEMENT_PARK BALL_PARK BIRD_SANCTUARY BOTANICAL_GARDEN CONSERVATION_AREA ECOLOGICAL_AREA FOREST_reserve
       LAWN_BOWLING_GREEN NATIONAL_PARK MEMORIAL_PARK MUNICIPAL_PARK REGIONAL_PARK PICNIC_SITE PLAYGROUND REST_AREA RESERVE RESERVATION SANCTUARY SQUARE TRAILER_PARK WAYSIDE_PARK ZOO

PARKING_AREA
SEE: VEHICLE_STORAGE

PARKING_GARAGE
SEE: VEHICLE_STORAGE

PARKING_LOT
SEE: VEHICLE_STORAGE
PARKWAY
SEE: ROAD

PARTI-COLORED_BUOY
SEE: BUOY

PASS
SEE: GAP/WATERCOURSE/LANE

PASSAGE
SEE: WATERCOURSE/LANE
DEFN: A NAVIGABLE CHANNEL, ESPECIALLY ONE THROUGH REEFS OR ISLANDS. SOMETIMES CALLED PASS.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

PASTEUR LAKE
SEE: LAKE

PASTURE
SEE: GRASSLAND

PATERNOSTER LAKE
SEE: LAKE

PATH
SEE: ROAD

PEAK
SEE: MOUNT/CAPE

PEAT BOG
SEE: WETLAND

PEAT CUTTING
SEE: WETLAND

PEDESTRIAN CROSSING
SEE: INTERSECTION

PEDESTRIAN-BICYCLE OVERPASS
SEE: BRIDGE

PEDESTRIAN_UNDERPASS
SEE: TUNNEL

STANDARD FEATURE TERM 84: PENINSULA
SEE: CAPE
DEFN: A BODY OF LAND JUTTING OUT INTO AND NEARLY SURROUNDED BY WATER.
SOURCE: MODIFIED FROM NAUTICAL CHART MANUAL
ATTRIB: NAME LOCATION

PENITENTIARY
SEE: BUILDING
### Standard Feature Term 85: Pier

**Defn:** A structure built out into the water, usually with its greatest dimension at right angles to the shore, forming a landing place or a place alongside which vessels can lie.

**Source:** Nautical Chart Manual

**Includ:** Landing Jetty, Boat Landing Jetty

### Standard Feature Term 86: Pilot Waters

**Defn:** Areas in which the services of a marine pilot are essential.

**Source:** Modified from Navigation Dictionary

**Attrib:** Name, Location

### Standard Feature Term 87: Pinnacle

**Defn:** A tall, slender, spire-shaped rock projecting from a level or more gently sloping surface.

**Source:** Modified from Nautical Chart Manual

**Attrib:** Height, Shape, Circumference, Name, Location, Composition

**Includ:** Pillar, Scar, Crag, Coral Head, Chaipirao, Precipice
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<td>See: UTILITY</td>
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<td>PIT</td>
<td>See: MINE/HOLE</td>
<td></td>
<td>(INCLUDED TERM 757)</td>
</tr>
<tr>
<td>PLACE (INCLUDED TERM 88): PLACE</td>
<td>An area with definite or indefinite boundaries</td>
<td>LOCATION NAME, POPULATION AREA, INCORPORATED/UNINCORPORATED</td>
<td>POPULATED_PLACE, CITY, BOROUGH, TOWNSHIP, VILLAGE, PARISH, HAMLET, LOCALITY, MUNICIPALITY, SETTLEMENT, COMMUNITY, URBAN_AREA, SEAPORT</td>
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<tr>
<td>PLACER_MINE</td>
<td>See: MINE</td>
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<td>(INCLUDED TERM 758)</td>
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<tr>
<td>PLAIN (INCLUDED TERM 89): PLAIN</td>
<td>A region of general uniform slope, comparatively level and of considerable extent</td>
<td>FLAT ARCHIPELAGO_APRON, COASTALPLAIN_APRON, APRON, DELTA, OUTWASHPLAIN</td>
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<td>PLANETARIUM</td>
<td>See: BUILDING</td>
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<td>PLANT</td>
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<tr>
<td>PLATEAU (INCLUDED TERM 90): PLATEAU</td>
<td>An elevated and comparatively level expanse of land</td>
<td>LOCATION NAME</td>
<td>TABLELAND, MESA, BUTTE, GUYOT, TABLEMOUNT, TABLEKNOLL, INTERMONTAINE_PLATEAU</td>
</tr>
<tr>
<td>PLAYGROUND</td>
<td>See: PARK</td>
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<tr>
<td>PLUNGE POOL</td>
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<td>PDCOSIN</td>
<td>See: CAPE/BAR</td>
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<tr>
<td>POLAR ICE_PACK</td>
<td>See: ICE_FIELD</td>
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<td>POLICE_STATION</td>
<td>See: BUILDING/STATION</td>
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<td>(INCLUDED TERM 765)</td>
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### FEATURES

**STANDARD FEATURE TERM 92: POLYNA**

**DEFN:** A water area enclosed by ice, generally fast. This water area remains constant and usually has an oblong shape. Sometimes limited on one side by the coast. Any enclosed water area in pack ice other than a lead, not large enough to be called open water. When frozen over, a polynya becomes an ice skylight from the point of view of the submariner. Also called big clearing, glade, ice clearing, pool, regional clearing.

**SOURCE:** NAVIGATION DICTIONARY

**POND**
SEE: LAKE

**PONTOON_BRIDGE**
SEE: BRIDGE
DEFN: (NEW) A floating bridge.

**POOL**
SEE: LAKE

**POPULATED_PLACE**
SEE: PLACE
DEFN: A place or area with clustered or scattered buildings and a permanent human population.
**SOURCE:** GNIS DOCUMENTATION, APPENDIX B

**STANDARD FEATURE TERM 93: PORT**

**DEFN:** A place provided with terminal and transfer facilities for loading and discharging cargo or passengers, usually located in a harbor.
**SOURCE:** NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
**ATTRIB:** LOCATION NAME, AREA, BUOYED, CHARTED, DEPTH, COMMERCIAL SHIPPING FACILITIES, AVAILABLE FEATURE, PRESENT, VEHICLE_SIZE, SERVED
**INCLUD:** CANAL_PORT, SEAPLANE_BASE, OUTPORT, SEAPORT

**POST**
SEE: BEACON

**POST_OFFICE**
SEE: BUILDING

**POWDER_MAGAZINE**
SEE: MILITARY_INSTALLATION

**POWER_LINE**
SEE: UTILITY

**PRAIRIE**
SEE: GRASSLAND

**PRECIPICE**
SEE: CLIFF/PINNACLE

**PRIMARY_TIDE_STATION**
SEE: STATION/BUILDING

**PRISON**
SEE: BUILDING
PRIVATE ROAD
SEE: ROAD

PROGLACIAL LAKE
SEE: LAKE

PROHIBITED_ANCHORAGE
SEE: HARBOR

PROHIBITED_AREA
SEE: DANGER_AREA

PROHIBITED_FLYING_AREA
SEE: DANGER_AREA

PROMONTORY
SEE: CAPE

PUMPING_STATION
SEE: BUILDING/STATION

PUP
SEE: STREAM

PUSZTA
SEE: GRASSLAND

PYLON
SEE: TOWER
DEFN: (NEW) A BRIDGE SUPPORT.

QUAGMIRE
SEE: WETLAND

QUAKING BOG
SEE: WETLAND

QUARANTINE_ANCHORAGE
SEE: HARBOR

QUARANTINE_BUOY
SEE: BUOY

QUARRY
SEE: MINE/HOLE

QUAY
SEE: WHARF

QUICK_FLASHING_LIGHT
SEE: BEACON

STANDARD FEATURE TERM 94: QUICKSAND
FEATURES

DEFN: A BED OF LOOSE SAND MIXED WITH WATER FORMING A SOFT, SHIFTING MASS THAT YIELDS EASILY TO PRESSURE AND TENDS TO SUCK DOWN ANY OBJECT RESTING ON ITS SURFACE.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION

RACE
SEE: WATERCOURSE/STREAM
DEFN: SWIFTLY FLOWING WATER IN A NARROW CHANNEL OR RIVER; ALSO THE CHANNEL ITSELF.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1985

STANDARD FEATURE TERM 95: RACETRACK
DEFN: A COURSE LAID OUT FOR RACING.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION
INCLUD: SPORTS_TRACK

RACON
SEE: BEACON

RADAR_BEACON
SEE: BEACON

RADAR_BUOY
SEE: BUOY

STANDARD FEATURE TERM 96: RADAR DOME
DEFN: A DOME SHAPED STRUCTURE USED TO PROTECT THE ANTENNA OF A RADAR INSTALLATION.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

STANDARD FEATURE TERM 97: RADAR REFLECTOR
DEFN: A DEVICE CAPABLE OF OR INTENDED FOR REFLECTING RADAR SIGNALS.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME

RADAR_RESPONDER_BEACON
SEE: BEACON

RADAR_STATION
SEE: BUILDING/STATION

RADIO_DIRECTION_FINDER_STATION
SEE: STATION/BUILDING

RADIO_MAST
SEE: TOWER

RADIOS_STATION
SEE: BUILDING/STATION
DEFN: A PLACE EQUIPPED WITH ONE OR MORE TRANSMITTERS OR RECEIVERS INCLUDING THE ACCESSORY EQUIPMENT NECESSARY FOR CARRYING ON A RADIOCOMMUNICATION SERVICE.
SOURCE: MODIFIED FROM NATIONAL OCEAN SERVICE GLOSSARY
<table>
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<tr>
<th>Feature Type</th>
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<tr>
<td><strong>Radio Tower</strong></td>
<td>See: Tower</td>
<td>-</td>
<td>(Included Term 804)</td>
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<tr>
<td><strong>Radio Beacon</strong></td>
<td>See: Beacon</td>
<td>-</td>
<td>(Included Term 805)</td>
</tr>
<tr>
<td><strong>Radio Beacon Buoy</strong></td>
<td>See: Buoy</td>
<td>-</td>
<td>(Included Term 806)</td>
</tr>
<tr>
<td><strong>Radio Beacon Monitor Station</strong></td>
<td>See: Station/Building</td>
<td>-</td>
<td>(Included Term 807)</td>
</tr>
<tr>
<td><strong>Railroad</strong></td>
<td>See: Railway</td>
<td>-</td>
<td>(Included Term 808)</td>
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<tr>
<td><strong>Railroad Crossing</strong></td>
<td>See: Intersection</td>
<td>-</td>
<td>(Included Term 809)</td>
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<tr>
<td><strong>Standard Feature Term 98; Railroad Gantry</strong></td>
<td>A bridgelike spanning frame supporting a group of railway signals over several tracks.</td>
<td>Location Name</td>
<td>Source: Modified from American Heritage Dictionary</td>
</tr>
<tr>
<td><strong>Railroad Passing</strong></td>
<td>See: Railway</td>
<td>Location Access Name, Rails, Number Of Elevation, Gradient, Track, Gauge, Length, Movable/Stationary, Main Track, Connected By Switches, Cargo Transportation, Passenger Transportation, Composition, Covered Feature, Present Span, Rail Direction Changes, Rail Connector Type, Rail Gauge, Adaptable, Slope, Traffic Lights, Presence Of Tree Lined</td>
<td>Source: Modified from American Heritage Dictionary</td>
</tr>
<tr>
<td><strong>Railroad Storage/Repair Building</strong></td>
<td>A building used to restore, repair, or store railroad equipment.</td>
<td>-</td>
<td>(Included Term 810)</td>
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<tr>
<td><strong>Standard Feature Term 99; Railway</strong></td>
<td>A permanent way having one or more rails which provides a track for cars.</td>
<td>Location Access Name, Rails, Number Of Elevation, Gradient, Track, Gauge, Length, Movable/Stationary, Main Track, Connected By Switches, Cargo Transportation, Passenger Transportation, Composition, Covered Feature, Present Span, Rail Direction Changes, Rail Connector Type, Rail Gauge, Adaptable, Slope, Traffic Lights, Presence Of Tree Lined</td>
<td>Source: Modified from Canadian Council On Surveying and Mapping</td>
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<tr>
<td><strong>Railway Tunnel</strong></td>
<td>See: Tunnel</td>
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<td>(Included Term 811)</td>
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<tr>
<td><strong>Standard Feature Term 100; Railway Yard</strong></td>
<td>An area provided with a system of tracks where railroad trains are made up and cars are switched, stored, or serviced.</td>
<td>-</td>
<td>Source: American Heritage Dictionary</td>
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INTERIM PROPOSED STANDARD FEATURE DEFINITIONS WORKING GROUP III, NCDCDS PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

SEE: WETLAND

RAMP
SEE: ROAD

RANGE
SEE: GRASSLAND/LANE/MOUNT/RIDGE

RANGER STATION
SEE: BUILDING/STATION

RANGING LIGHT
SEE: BEACON

RANGING_MARKER
SEE: BEACON

STANDARD FEATURE TERM 101: RAPIDS
DEFN: AN AREA OF BROKEN, FAST FLOWING WATER IN A STREAM, WHERE THE SLOPE OF THE BED INCREASES (BUT WITHOUT A PROMINENT BREAK OF SLOPE WHICH MIGHT RESULT IN A WATERFALL), OR WHERE A GENTLY DIPPING BAR OF HARDER ROCK OUTCROPS;...
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE
ATTRIB: LOCATION WIDTH FEATURE_PRESENT DISCHARGE
INCLUD: CATARACT

RAVINE
SEE: VALLEY/WATERCOURSE
DEFN: A DEEP NARROW CLEFT OR GORGE IN THE EARTH'S SURFACE, ESPECIALLY ONE WORN BY THE FLOW OF WATER.
SOURCE: ADAPTED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

RE-ENTRANT
SEE: VALLEY

REACH
SEE: WATERCOURSE/STREAM
DEFN: A SPECIFIC SECTION OF A RIVER. IN NAVIGATION, A STRAIGHT SECTION BETWEEN BENDS. IN A CANAL, A SECTION BETWEEN TWO LOCKS.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

REAR LIGHT
SEE: BEACON

RECURRED_SPIRIT
SEE: BAR

RED SECTOR
SEE: BEACON

RED SECTOR LIGHT
SEE: BEACON

STANDARD FEATURE TERM 102: REEF
DEFN: A RIDGE OF ROCKS, LYING NEAR THE SURFACE OF THE SEA, WHICH MAY BE VISIBLE AT LOW TIDE, BUT IS USUALLY COVERED BY WATER.
SOURCE: MOORE, A DICTIONARY OF GEOGRAPHY
**FEATURES**

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<td>DEFN:</td>
<td>(NEW)AN AREA SET ASIDE FOR THE PURPOSE OF RESTING OR CEASING ACTIVITIES SUCH AS TRAVELLING.</td>
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STANDARD FEATURE TERM 104: REVETMENT
DEFN: A facing of stone, concrete, wood etc., built to sustain an embankment.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH CONSTRUCTION_MATERIAL HEIGHT WIDTH NAME
INCLUD: RIPRAP MATTRESS RETAINING_WALL APRON BULKHEAD RIPRAP_MOUNDS
RHUMB_LINE
SEE: BEARING_LINE
RHUMB_LINE_COURSE
SEE: BEARING_LINE
RIA
SEE: INLET
DEFN: A long narrow inlet with gradually decreasing depth inward.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
STANDARD FEATURE TERM 105: RIDGE
DEFN: A long and narrow upland with steep sides.
SOURCE: MODIFIED FROM NAUTICAL CHART MANUAL
ATTRIB: LOCATION HEIGHT ELEVATION SLOPE COMPOSITION LENGTH WIDTH
INCLUD: SPUR ARETE ESKER SILL SAND DUNE CERRO LATERAL_MORAINE TERMINAL_MORAINE END_MORAINE CUESTA BEACH_CUSPS BEACH_RIDGE CREST RANGE MOUNTAIN_RANGE DRUMLIN SEAMOUNT_RANGE KAME
RIFT_VALLEY
SEE: VALLEY
RILL
SEE: STREAM
RINGON
SEE: INLET
RID
SEE: STREAM
RIPRAP
SEE: REVETMENT
RIPRAP_MOUNDS
SEE: REVETMENT
RISE
SEE: MOUNT
RIVAGE
SEE: SHORE/COAST/BECHEL
RIVER
SEE: STREAM
DEFN: A natural stream of water, of greater volume than a creek or rivulet, flowing in a more or less permanent bed or channel, between defined banks or walls, with a current which may either be continuous in one direction or affected by the ebb and flow of the tidal current.
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

RIVER_BED
SEE: WATERCOURSE
DEFN: THE WATERCOURSE COVERED OR ONCE COVERED BY WATER, BETWEEN THE BANKS OF A RIVER.
SOURCE: MODIFIED FROM HERITAGE DICTIONARY

RIVER_BUOY
SEE: BUOY

RIVULET
SEE: STREAM
DEFN: A SMALL BROOK OR STREAM; STREAMLET
SOURCE: THE AMERICAN HERITAGE DICTIONARY

STANDARD FEATURE TERM 106: ROAD
DEFN: AN OPEN WAY FOR THE PASSAGE OF VEHICLES, PERSONS, OR ANIMALS ON LAND.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

STANDARD FEATURE TERM 107: ROCK
DEFN: AN ISOLATED ROCKY FORMATION OR A SINGLE LARGE STONE, USUALLY ONE CONSTITUTING A DANGER TO NAVIGATION. IT MAY BE ALWAYS SUBMERGED, ALWAYS UNCOVERED, OR ALTERNATELY COVERED AND UNCOVERED BY THE TIDE.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY

HARBOR

ICE_FIELD

TERRACE

BUILDING/STATION

BEACON

BEACON
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<td>ROTATING_LIGHT</td>
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<td>SEE: BEACON</td>
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<td>ROUNDHOUSE</td>
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<td>SEE: BUILDING</td>
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<td>SEE: SIGN</td>
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<td>RUN</td>
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<td>RUNWAY_PREVENTER</td>
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<td>SEE: ROAD</td>
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<td>RUNITEL</td>
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<tr>
<td>SEE: STREAM/TROUGH</td>
<td>SMALL BROOK OR CHANNEL. A TROUGH, GENERALLY ABOUT PARALLEL TO THE SHORE, SEPARATED BY LOW RIDGES (ORDINARILY ON SANDY BOTTOM), EXPOSED AS A RULE WHEN THE TIDE EBBs ACROSS A COMPARATIVELY FLAT BOTTOM, AS A RULE SEVERAL ORDERS OF MAGNITUDE LARGER THAN RIPPLE MARKS (WHICH COMMONLY ARE PRESENT ON ITS SURFACE). [SOURCE: COASTAL LANDFORMS AND SURFACE FEATURES, SNEAD]</td>
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<td>STANDARD FEATURE TERM 108: RUNWAY</td>
<td>A STRAIGHT PATH USED FOR LANDING AND TAKE-OFF OF AIRCRAFT. [SOURCE: MODIFIED FROM NAVIGATION DICTIONARY]</td>
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<td>SEA_Beacon</td>
<td>BEACON</td>
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<tr>
<td>SEA_Buoy</td>
<td>BUOY</td>
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INTERIM PROPOSED STANDARD FEATURE DEFINITIONS
WORKING GROUP III, NCCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

SEA_COAST
SEE: COAST

SEA_GATE
SEE: BREAKWATER/GATE

SEA_WALL
SEE: EMBANKMENT

SEACHANNEL
SEE: VALLEY/WATERCOURSE

SEADROME
SEE: RUNWAY

SEAKNOLL
SEE: MOUNT

SEAMOUNT
SEE: MOUNT

SEAMOUNT_CHAIN
SEE: MOUNT

SEAMOUNT_GROUP
SEE: MOUNT

SEAMOUNT_RANGE
SEE: MOUNT/RIDGE

SEAPEAK
SEE: MOUNT

SEAPLANE_BASE
SEE: PORT

SEAPORT
SEE: PORT/PLACE

SEASHORE
SEE: SHORE

SEAWALL
SEE: BREAKWATER

SEAWAY
SEE: WATERCOURSE/LANE
DEFN: A SHIP CANAL; IN INLAND WATERWAY WHICH CAN TAKE SEA-GOING SHIPS; E.G. THE ST. LAWRENCE S.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SECONDARY_TIDE_STATION
SEE: STATION/BUILDING

(INCLUDED TERM 892)

(INCLUDED TERM 893)

(INCLUDED TERM 894)

(INCLUDED TERM 895)

(INCLUDED TERM 896)

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(INCLUDED TERM 907)

(INCLUDED TERM 908)
SECTORED_LIGHT
SEE: BEACON

SEEPE
SEE: SPRING

SERVICE_LANE
SEE: ROAD/LANE

SERVICE_STREET
SEE: ROAD

SETTLEMENT
SEE: PLACE

SEWAGE_TREATMENT_PLANT
SEE: BUILDING

SHADING
SEE: RELIEF

SHIELD_VOLCANO
SEE: MOUNT

SHINGLE
DEFN: A COLLECTION OF LOOSE PEBBLES ON THE SHORE OF THE SEA OR A LAKE
SOURCE: ADAPTED FROM MOORE, A DICTIONARY OF GEOGRAPHY

SHIP_CANAL
SEE: WATERCOURSE
DEFN: AN ARTIFICIAL WATERWAY LARGE ENOUGH TO ACCOMMODATE OCEAN-GOING VESSELS.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SHIPPING_LANE
SEE: LANE

SHIPYARD
DEFN: A YARD OR AREA WHERE SHIPS ARE BUILT OR REPAIRED.
SOURCE: AMERICAN HERITAGE DICTIONARY
INCLUD: DOCKYARD

SHOAL
SEE: BAR

SHOAL_PATCHES
SEE: BAR

SHOPPING_CENTER
SEE: BUILDING

SHORE
DEFN: THAT PART OF THE LAND IN IMMEDIATE CONTACT WITH A BODY OF WATER INCLUDING THE AREA BETWEEN HIGH AND LOW WATER LINES.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
FEATURES

ATTRIB: SLOPE LOCATION AREA COMPOSITION LENGTH WIDTH NAME
INCLUD: INSHORE STRAND FORESHORE BEACH_FACE RIVAGE SHOREFACE SEASHORE SHORELINE BANK

SHORE_REEF
SEE: REEF

SHOREFACE
SEE: SHORE

STANDARD FEATURE TERM 113: SHORELINE
DEFN: THE LINE OF CONTACT BETWEEN A BODY OF WATER AND THE LAND
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: MEAN_HIGH_WATER MEAN_SEA_LEVEL DATUM COASTLINE
INCLUD: SHORELINE MEAN_SEA_LEVEL ORDNANCE_DATUM COASTLINE NGVD_DATUM

SHORT_FLASHING_LIGHT
SEE: BEACON

SHORT_LONG_FLASHING_LIGHT
SEE: BEACON

SHRINE
SEE: BUILDING

SIDEWALK
SEE: ROAD

SIDING
SEE: RAILWAY

STANDARD FEATURE TERM 114: SIGN
DEFN: A ROADWAY ASSOCIATED FEATURE WHICH PROVIDES INFORMATION TO PEOPLE PASSING.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION INFORMATION_DISPLAYED COMPOSITION LIGHTED
INCLUD: DISPLAY_SIGN HIGHWAY_ROUTE_NUMBER MILE_POST MILEAGE/KILOMETER_POST ROUTE_MARKER TRAFFIC_SIGN SIGN_POST BILLBOARD

SIGN_POST
SEE: SIGN

SIGNAL_STATION
SEE: BUILDING/STATION

SILL
SEE: RIDGE/GAP

SILO
SEE: TOWER

SILVA
SEE: WOODLAND

SINGLE_TRACK_RAILWAY
SEE: RAILWAY
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**SEE:** RAILWAY

**SINK**
**SEE:** BASIN

**SINKHOLE**
**SEE:** BASIN

**STANDARD FEATURE TERM 115: SKI AREA**
**DEFN:** AN AREA USED FOR SKIING.
**SOURCE:** CANADIAN COUNCIL ON SURVEYING AND MAPPING
**ATTRIB:** LOCATION NAME

**SKI_LIFT**
**SEE:** CABLEWAY

**SLAG_HEAP**
**SEE:** DUMPING_GROUND

**SLASH**
**SEE:** WETLAND

**SLIP**
**SEE:** DOCK

**SLough**
**SEE:** WETLAND

**SLue**
**SEE:** WETLAND

**SLuice**
**SEE:** WATERCOURSE/GATE

**SLuice_Gate**
**SEE:** GATE

**SMOKE_STACK**
**SEE:** TOWER

**STANDARD FEATURE TERM 116: SNOWFIELD**
**DEFN:** A REGION OF PERMANENT SNOW IN MOUNTAINOUS AREAS OR HIGH LATITUDES.
**SOURCE:** MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING

**SOUND**
**SEE:** BUOY

**SOUND**
**SEE:** WATERCOURSE/LAKE/SOUND

**DEFN:** A RELATIVELY LONG ARM OF THE SEA OR OCEAN FORMING A CHANNEL BETWEEN AN ISLAND AND A MAINLAND OR CONNECTING TWO LARGER BODIES OF WATER, AS A SEA AND THE OCEAN, OR TWO PARTS OF THE SAME BODY BUT USUALLY WIDER AND MORE EXTENSIVE THAN A STRAIT. THE TERM HAS BEEN APPLIED TO MANY FEATURES WHICH DO NOT FIT THE ACCEPTED DEFINITION. MANY ARE VERY LARGE BODIES OF WATER, SUCH AS MISSISSIPPI SOUND AND PRINCE WILLIAM SOUND, OTHERS ARE MERE SALT WATER PONDS OR SMALL PASSAGES BETWEEN ISLANDS.
FEATURES

SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

SOUND_BARRIER
SEE: BARRIER (INCLUDED TERM 948)

SOUND_BUOY
SEE: BUOY (INCLUDED TERM 949)

STANDARD FEATURE TERM 117: SOUNDING
DEFN: MEASURED OR CHARTED DEPTH OF WATER, OR THE MEASUREMENT OF SUCH DEPTH.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION DEPTH NAME APPROXIMATE/EXACT MEASUREMENT NO_MEASUREMENT POSSIBLE
INCLUD: CROSS_LINES DANGER_SOUNDINGS CHART_DATUM CHARTED_DEPTH DEPTH CONTROLLING_DEPTH NO_BOTTOM_SOUNDING DOUBTFUL_SOUNDINGS
NO_BOTTOM_FOUND OUT_OF_POSITION LEAST_DEPTH_IN_NARROW_CHANNELS DREDGED_CHANNEL DREDGED_AREA SWEEP_CHANNEL DRYING (OR_UNCOVERING) HEIGHTS_ABOVE_CHART SOUNDING_DATUM SWEEP_AREA ECHO_SOUNDINGS UNSOUNDED_AREA SOUNDINGS_AT_WHICH_BOTTOM_HAS_NOT_BEEN_REACHED SOUNDING_DATUM (INCLUDED TERM 950)

SOUNDING_DATUM
SEE: SOUNDING (INCLUDED TERM 951)

SPAR_BUOY
SEE: BUOY (INCLUDED TERM 952)

SPECIAL_PURPOSE_BUOY
SEE: BUOY (INCLUDED TERM 953)

SPECIAL_TRACK_RAILWAY
SEE: RAILWAY (INCLUDED TERM 954)

SPILLWAY
SEE: WATERCOURSE
DEFN: A PASSAGE FOR SURPLUS WATER TO RUN OVER OR AROUND A DAM.
SOURCE: WEBSTERS NEW COLLEGIATE DICTIONARY

SPIT
SEE: BAR (INCLUDED TERM 955)

SPOIL_AREA
SEE: DUMPING_GROUND (INCLUDED TERM 956)

SPOIL_BANKS
SEE: DUMPING_GROUND (INCLUDED TERM 957)

SPOIL_GROUND_BUOY
SEE: BUOY (INCLUDED TERM 958)

SPOIL_GROUND
SEE: DUMPING_GROUND (INCLUDED TERM 959)

STANDARD FEATURE TERM 118: SPORTS FIELD
DEFN: A FIELD ON WHICH SPORTING ACTIVITIES ARE CARRIED OUT.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
FEATURES

INCLUDED: SPORTS_PLAYING_FIELD BALL_PARK

SPORTS_PLAYING_FIELD
SEE: SPORTS_FIELD

SPORTS_TRACK
SEE: RACETRACK

STANDARD FEATURE TERM 119: SPRING
DEFN: THE PLACE WHERE WATER ISSUES FROM THE GROUND NATURALLY.
SOURCE: MODIFIED FROM USGS
ATTRIB: LOCATION NAME FORCE OF FLOW INTERMITTENT/PERENNIAL TEMPERATURE RELATION_TO_WATER_SURFACE SALINITY
INCLUDED: SEEP MINERAL_SPRING HOTSPrING WATERING_PLACE

SPUR
SEE: RIDGE/RAILWAY/ROAD

SQUARE
SEE: PARK

STABLE
SEE: BUILDING

STACK
SEE: ISLAND

STADIUM
SEE: OUTDOOR_THEATER

STAKE_NET
SEE: FISH_TRAP

STAND
SEE: WOODLAND

STANDPIPE
SEE: TOWER

STANDARD FEATURE TERM 120: STATION
SEE: BUILDING
DEFN: THE PLACE, BUILDING OR ESTABLISHMENT FROM WHICH A SERVICE IS PROVIDED OR OPERATIONS ARE DIRECTED.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME FACILITIES_AVAILABLE LIGHTED USER_TYPE OWNER_TYPE RADIO_TRANSMISSION
INCLUDED: PUMPING_STATION FIRE_STATION FILLING_STATION POLICE_STATION RADAR_STATION RANGER_STATION SIGNAL_STATION TELEVISION_STATION TIDE_STATION PRIMARY_TIDE_STATION SECONDARY_TIDE_STATION LIFE_SAVING_STATION COAST_GUARD_STATION ROCKET_STATION MARINE_AUTOMATIC_METEROLOGICAL_STATION LIGHT_STATION OFFSHORE_STATION OFFSHORE_LIGHT_STATION OCEAN_STATION RADIO_STATION RADIOBEACON_MONITOR STATION TRANSMITTER_STATION RADIO_DIRECTION_FINDER_STATION AERONAUTICAL_NAVIGATION_RADIO_STATION ELECTRICAL_POWERGENERATING_STATION ELECTRICAL_SUBSTATION TRANSFORMER_STATION

STATION_BUOY
SEE: BUOY

INCLUDED TERM 960
INCLUDED TERM 961
INCLUDED TERM 962
INCLUDED TERM 963
INCLUDED TERM 964
INCLUDED TERM 965
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<td>STONE_MOUND_MONUMENT</td>
<td>CONTROL_POINT</td>
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<td>STORAGE_TANK</td>
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<td>STRAND</td>
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<td>STRANDING_HARBOR</td>
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<td>STRATH</td>
<td>VALLEY</td>
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**STANDARD FEATURE TERM 121: STREAM**

**DEFN:** A linear body of water flowing along a watercourse.

**SOURCE:** Modified from Ohio State Preliminary List.

**ATTRIB:** Location, Name, Ground Level, Relationship, Width, Depth, Volume, Length, Intermittent/Perennial, Salinity, Direction of Flow, Branch/Parent, Force of Flow, Tidal, Glacial, Hydraulic Radius, Form Ratio, Cross-Sectional Area, Wetted Perimeter, Acidity, Braided, Buoyed, Charted, Depth, Covered, Discharge, Drainage, Ice Presence of, Irrigation, Mineral Content, Navigable, Recreational, Lighted, Temperature.

**INCLUD:** Anabranch, Awawa, Bayou, Beck, Braided River, Braided Stream, Branch, Brook, Creek, Fork, Glacial Stream, Kill, Obsequent Stream, Pup, Rio, River, Run, Slough, Torrent, Rivulet, Runnel, Rill, Tributary, Race, Swale, Reach, Thoroughfare, Throughfare.

**STREAM_CHANNEL**

**DEFN:** The watercourse of a stream.

**SOURCE:** Modified from a Dictionary of Basic Geography, Schwieter, Griffin, Chatham, Natoli.

**SEE:** WATERCOURSE

**SEE:** ROAD

**SEE:** RAILWAY

**STRING_BOG**

**SEE:** WETLAND
FEATURES

STRIP_MINE (INCLUDED TERM 984)
SEE: MINE

SUBMARINE_ISTHMUS (INCLUDED TERM 985)
SEE: ISTHMUS

SUBMARINE_CABLE (INCLUDED TERM 986)
SEE: UTILITY

SUBMERGED_REEF (INCLUDED TERM 987)
SEE: REEF

SUBWAY (INCLUDED TERM 988)
SEE: RAILWAY/TUNNEL

SUMMIT (INCLUDED TERM 989)
SEE: MOUNT

SUNKEN_ROCK (INCLUDED TERM 990)
SEE: ROCK

SUNKEN_WRECK (INCLUDED TERM 991)
SEE: WRECK

SUPER_BUOY (INCLUDED TERM 992)
SEE: BUOY

SUPPLEMENTARY_AERODROME (INCLUDED TERM 993)
SEE: AIRPORT

SURVEY_MONUMENT (INCLUDED TERM 994)
SEE: CONTROL_POINT

SUSPENSION_BRIDGE (INCLUDED TERM 995)
SEE: BRIDGE

SWALE (INCLUDED TERM 996)
SEE: TROUGH
DEFN: A LONG NARROW DEPRESSION ON A BEACH, BROADLY PARALLEL TO THE COASTLINE, SEPARATING TWO RIDGES OF SHINGLE;
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SWAMP (INCLUDED TERM 997)
SEE: WETLAND

SWAMP_FOREST (INCLUDED TERM 998)
SEE: WETLAND

STANDARD FEATURE TERM 122: SWASH
DEFN: THE MASS OF BROKEN FOAMING WATER WHICH RUSHES BODILY UP A BEACH AS A WAVE BREAKS. SYN. WITH SEND.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SWING_BRIDGE (INCLUDED TERM 999)
SEE: BRIDGE
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<td>SWINGING_BUOY</td>
<td>SEE: BUOY</td>
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<td>SYNAGOGUE</td>
<td>SEE: BUILDING</td>
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<td>TABLEKNOB</td>
<td>SEE: PLATEAU</td>
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<tr>
<td>TABLELAND</td>
<td>SEE: PLATEAU</td>
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<tr>
<td>TABLE_MOUNT</td>
<td>SEE: PLATEAU</td>
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<td>TAIGA</td>
<td>SEE: WOODLAND</td>
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<tr>
<td>TAILING_DUMP</td>
<td>SEE: DUMPING_GROUND</td>
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<tr>
<td>TAILINGPILE</td>
<td>SEE: DUMPING_GROUND</td>
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<td>TAILING_POND</td>
<td>SEE: DUMPING_GROUND</td>
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<tr>
<td>TALUS</td>
<td>DEFIN: SLOPES OF BROKEN ROCK DEBRIS ON A MOUNTAINSIDE.</td>
<td>SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING</td>
<td>LOCATION NAME</td>
<td>1000, 1001</td>
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<tr>
<td>TANK</td>
<td>DEFIN: A STRUCTURE USED FOR THE STORAGE OF FLUIDS.</td>
<td>SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING</td>
<td>LOCATION NAME</td>
<td>1002, 1003</td>
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<tr>
<td>TAXI_CHANNEL</td>
<td>SEE: RUNWAY</td>
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<tr>
<td>TAXI_CHANNEL_LIGHT</td>
<td>SEE: BEACON</td>
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<td>TAXIWAY</td>
<td>SEE: RUNWAY</td>
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<tr>
<td>TAXIWAY_LIGHTS</td>
<td>SEE: BEACON</td>
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<tr>
<td>TELEGRAPH_BUOY</td>
<td>SEE: BUOY</td>
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TELEVISION_TOWER
SEE: TOWER

TELEVISION_STATION
SEE: BUILDING/STATION

TEMPLE
SEE: BUILDING

TEMPORARY_ANCHORAGE
SEE: HARBOR

STANDARD FEATURE TERM 125: TENNIS COURT
DEFN: A RECREATIONAL AREA USED FOR PLAYING TENNIS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

TERMINAL
SEE: BUILDING

TERMINAL_MORAINE
SEE: RIDGE

STANDARD FEATURE TERM 126: TERRACE
DEFN: A STEPLIKE FEATURE BETWEEN HIGHER AND LOWER GROUND: A RELATIVELY FLAT OR GENTLY INCLINED SHELF OF EARTH, BACKED AND
FRONTED BY STEEP SLOPES OR MAN-MADE RETAINING WALLS.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: BENCH MARINE_BENCH KAME_TERRACE ROCK_TERRACE RAISED_Beach FLAT

TEXAS_TOWER
SEE: TOWER

THEATER
SEE: BUILDING

THERMOBUOY
SEE: BUOY

THICKET
SEE: WOODLAND

THORN_FOREST
SEE: WOODLAND

THOROFARE
SEE: WATERCOURSE/STREAM/ROAD

THRESHOLD_LIGHT
SEE: BEACON

THROUGHFARE
SEE: WATERCOURSE/STREAM/ROAD

(INCLUDED TERM 1014)

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FEATURES

THRUWAY
SEE: ROAD

TIDAL_BASIN
SEE: BASIN

TIDAL_FLAT
SEE: FLAT

TIDAL_HARBOR
SEE: HARBOR

TIDAL_LIGHT
SEE: BEACON

TIDAL_MARSH
SEE: WETLAND

TIDAL_QUAY
SEE: WHARF

TIDE_GATE
SEE: GATE

TIDE_LIMIT
SEE: BOUNDARY

TIDE_LOCK
SEE: LUCK

TIDE_SIGNAL
SEE: BEACON

TIDE_STATION
SEE: STATION/BUILDING
DEFN: A PLACE AT WHICH TIDE OBSERVATIONS ARE MADE.
SOURCE: NAVIGATION DICTIONARY

TIDE_STATION
DEFN: A GROUP OF BUILDINGS INCLUDING A LIGHTHOUSE AND ADDITIONAL BUILDINGS HOUSING PERSONNEL, FOG SIGNAL, RADIOBEACON, AND ANY OTHER EQUIPMENT ASSOCIATED WITH THE LIGHTHOUSE.
SOURCE: NAVIGATION DICTIONARY

TIDEWAY
SEE: WATERCOURSE

TILL
SEE: MORaine

TIMBER_LINE
SEE: BOUNDARY

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STANDARD FEATURE TERM 127: TOWER

DEFN: A BUILDING OR STRUCTURE TYPICALLY MUCH HIGHER THAN ITS DIAMETER OR WIDTH.

SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING

ATTRIB: LOCATION HEIGHT DIAMETER NAME SURFACE FEATURE CONNECTED_FEATURE CONTROL_LIGHTED MOVABLE_STATIONARY RADIO_TRANSMISSION MICROWAVE_TRANSMISSION STORAGE SUPPORT_TYPE TELEVISION_TRANSMISSION USE_TYPE

INCLUD: CONTROL_TOWER AIRPORT_TRAFFIC_CONTROL_TOWER PYLON AERODROME_CONTROL_TOWER CHIMNEY FLAG_TOWER TEXAS_TOWER LOOKOUT_TOWER SMOKE_STACK OBSERVATION_TOWER RADIO_MAST RADIO_TOWER WATER_TOWER TELEVISION_TOWER MICROWAVE_TOWER TRANSMISSION_TOWER FIRE_LOOKOUT_TOWER FIRE_TOWER SILO ELECTRICAL_TOWER HYDRO_TOWER STANDPIPE GRAIN_ELEVATOR LIGHTHOUSE
<table>
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<tr>
<th>Feature</th>
<th>See:</th>
<th>Included Term(s)</th>
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<tbody>
<tr>
<td>Traffic Sign</td>
<td>Intersection</td>
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<td>Trail</td>
<td>Road</td>
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<td>Trailer Park</td>
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<td>Training Wall</td>
<td>Breakwater</td>
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<td>Tramway/Incline Railway</td>
<td>Railway</td>
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<td>Transformer Station</td>
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<td>Transmission Tower</td>
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<td>Transmission Line</td>
<td>Utility</td>
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<td>Transmitter Station</td>
<td>Station/Building</td>
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<td>Transo buoy</td>
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<td>Transponder Beacon</td>
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<td>Transverse Bar</td>
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<td>Transverse Rhumb Line</td>
<td>Bearing Line</td>
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<td>Tree Line</td>
<td>Boundary</td>
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<td>Trench</td>
<td>Valley/Trough</td>
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<td>Trestle</td>
<td>Bridge</td>
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<tr>
<td>Tributary</td>
<td>Stream</td>
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</tbody>
</table>
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS WORKING GROUP III, NCCS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

TROPICAL_RAIN_FOREST
SEE: WOODLAND

STANDARD FEATURE TERM 128: TROUGH
DEFN: A LONG DEPRESSION OF THE SEA FLOOR
SOURCE: ADAPTED FROM NAUTICAL CHART MANUAL
INCLUD: DEEP TRENCH FOREDEEP RUNNEL

TRUCK_FARM
SEE: CROP_LAND

TRUCK_GARDEN
SEE: CRDP_LAND

TRUE_BEARING
SEE: BEARING_LINE

TRUMPET_BUDY
SEE: BUOY

TRUNK_BUDY
SEE: BUOY/MOORING

TULELANDS
SEE: WETLAND

STANDARD FEATURE TERM 129: TUNDRA
DEFN: A TREELESS AREA POLEWARD OR UPWARD OF THE TREE LINE OF ARCTIC OR ALPINE REGIONS, HAVING A PERMANENTLY FROZEN SUBSOIL AND SUPPORTING LOW-GROWING VEGETATION SUCH AS LICHENS, MOSSES, AND STUNTED SHRUBS.
SOURCE: NEW DEFINITION
ATTRIB: LOCATION AREA ELEVATION PREDOMINANT_SPECIES NAME

STANDARD FEATURE TERM 130: TUNNEL
DEFN: AN UNDERGROUND OR UNDERWATER PASSAGE.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME MODE_TRANSPORTED CLEARANCE LENGTH WIDTH RESTRICTIONS DISTANCE_BELOW_SURFACE FEATURE_PASSED_UNDER CONNECTED_FEATURE PASSENGER_TRANSPORTATION PHYSICAL_CONDITION_OF_SURFACE_MATERIAL TOLL
INCLUD: CATTLE_UNDERPASS PEDESTRIAN_UNDERPASS RAILWAY_TUNNEL SUBWAY UNDERPASS

TUNNY_NETS
SEE: FISH_TRAP

STANDARD FEATURE TERM 131: TURNING BASIN
DEFN: A WATER AREA USED FOR TURNING VESSELS.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION WIDTH LENGTH DEPTH_OF_WATER SALINITY

TURNING_BUOY
SEE: BUOY

TURNPIKE
SEE: ROAD
STANDARD FEATURE TERM 132: TURNTABLE
DEFN: A CIRCULAR HORIZONTAL ROTATING PLATFORM EQUIPPED WITH A RAILWAY TRACK, USED FOR TURNING LOCOMOTIVES, AS IN A ROUNDHOUSE.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME DIAMETER TRACK GAUGE
UNATTENDED_LIGHT
SEE: BEACON
UNDEEPASS
SEE: TUNNEL
UNDEULATING_LIGHT
SEE: BEACON
UNDEIVERSITY
SEE: BUILDING
UNDEWATCHED_LIGHT
SEE: BEACON
UNDEBRAN_AREA
SEE: PLACE
UNDEILITOR
SEE: UTILITY

STANDARD FEATURE TERM 133: UTILITY
DEFN: A LINEAR DISTRIBUTION SYSTEM CONSISTING OF PIPELINES, HIGH TENSION WIRES, CABLES ETC., PROVIDING A PUBLIC SERVICE AND USUALLY SUBJECT TO GOVERNMENT REGULATIONS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: TRANSMISSION_LINE POWER_LINE SUBMARINE_CABLE UTILIDORE PIPELINE

STANDARD FEATURE TERM 134: VALLEY
DEFN: A LONG, NARROW DEPRESSION IN THE EARTH'S SURFACE, USUALLY WITH A FAIRLY REGULAR DOWNSLOPE.
SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MOORE
ATTRIB: LENGTH DEPTH SLOPE OF SIDES WATER NAME LOCATION AIR/LAND/WATER
INCLUD: TRENCH MOAT GLACIAL_CANYON CHASM CREVASSE DELL DELL_GLACIAL_GORGE GLEN COULEE RAVINE GORGE GRABEN HOLLOW RE-ENTRANT STRATH RIFT VALLEY GULCH GULLY DROWNED VALLEY FIORD RIA GDE DEPRESSION DEFILE SEACHANNEL

STANDARD FEATURE TERM 135: VEHICLE STORAGE
DEFN: AN AREA FOR PARKING OR STORING MOTOR VEHICLES.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION AREA TYPE OF VEHICLES
INCLUD: PARKING_LOT PARKING AREA PARKING GARAGE JUNK YARD GARAGE

FIELD
SEE: GRASSLAND

VERTICAL_CONTROL_POINT
SEE: CONTROL_POINT
<table>
<thead>
<tr>
<th>Feature</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Vertical Control Monument</td>
<td>SEE: CONTROL_POINT</td>
</tr>
<tr>
<td>Viaduct</td>
<td>SEE: BRIDGE</td>
</tr>
<tr>
<td>Village</td>
<td>SEE: PLACE</td>
</tr>
<tr>
<td>Vineyard</td>
<td>SEE: CROP_LAND</td>
</tr>
<tr>
<td>Volcano</td>
<td>SEE: MOUNT</td>
</tr>
</tbody>
</table>
| Wadi                         | SEE: WATERCOURSE
DEFN: ARID-CLIMATE (TYPICALLY DESERT) STREAM CHANNEL, ORDINARILY DRY BUT CAPABLE OF FLOWING, AT TIMES WITH CONSIDERABLE VELOCITY, WHEN CONCENTRATING LOCAL RUNOFF.
TERM ORIGINATED IN MEDITERRANEAN AFRICA BUT HAS COME INTO GENERAL USE. ALSO, ARROYO, WASH, BARRANCA, ETC.
SOURCE: OHIO STATE PRELIMINARY LIST (GNIS, CANADIAN COUNCIL, AND HERITAGE DICTIONARY) |
| Walk                         | SEE: ROAD                                                                   |
| Wall                         | SEE: BARRIER                                                                |
| Warehouse                    | SEE: BUILDING                                                                |
| Warning Beacon               | SEE: BEACON                                                                 |
| Warning Light                | SEE: BEACON                                                                 |
| Warning Radiobeacon          | SEE: BEACON                                                                 |
| Warping Buoy                 | SEE: BUOY                                                                   |
| Wash                         | SEE: WATERCOURSE
DEFN: THE DRY CHANNEL OF AN INTERMITTENT STREAM.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1985 |
| Watched Light                | SEE: BEACON                                                                 |
| Water Gap                    | SEE: WATERCOURSE                                                            |
FEAT URES

DEFN: A NARROW GORGE CUT BY A STREAM THROUGH A RIDGE OF HARD ROCK.
SOURCE: A DICTIONARY OF GEOGRAPHY, MOORE

WATER_HOLE
SEE: WELL

WATER_LANE
SEE: RUNWAY/LANE

WATER_TOWER
SEE: TOWER

STANDARD FEATURE TERM 136: WATERCOURSE
DEFN: A WAY OR COURSE THROUGH WHICH WATER MAY OR DOES FLOW, NOT TO BE CONFUSED WITH THE WATER ITSELF.
SOURCE: NEW TERM NO EXISTING DEFINITION
ATTRIB: LOCATION NAME WIDTH DEPTH VOLUME LENGTH GROUND_LEVEL_RELATIONSHIP COMPOSITION CHARTED_DEPTH COVERED SLOPE SHAPE
NAVIGABLE IRRIGATION DRAINAGE WATER_SUPPLY COMMERCIAL_SHIPPING PASSENGER_TRANSPORTATION WATER_BODY_CONNECTION
ACCESS BUOYED LIGHTED WATERAGE RECREATIONAL FLOOD_CONTROL HYDROELECTRIC_POWER GRADIENT_OF_SLOPE_OF_SIDES
ARTIFICIALLY_IMPROVED/MANMADE/NATURAL BLIND/OPEN CARGO_TRANSPORTATION DISCHARGE EMBANKED FEATURE_PRESENT LIGHTED TOLL
INCLUD: AQUEDUCT CANAL CHANNEL CULVERT DITCH DRAIN FAIRWAY FLUME LAKE OVERFLOW_CHANNEL SEAWAY SHIP_CHANNEL VIADUCT RACE SLUICE
SPILLWAY CUT ARROYO BARRANCA BEND CUTOFF DISTRIBUTARY DRAW GULCH GULLY GUT MEANDER NARROWS NULLAH PASS PASSAGE RAVINE
STREAM_CHANNEL WADI WASH THROFARE THOROUGHFARE STRAIT WATER_GAP COULEE IMPROVED_CHANNEL RIVER_BED GUTTER REACH FORD TIDEWAY SOUND SEACHANNEL

STANDARD FEATURE TERM 137: WATERFALL
DEFN: A SUDDEN DESCENT OF WATER OVER A STEP OR LEDGE IN THE BED OF A RIVER.
SOURCE: DICTIONARY OF GEOGRAPHY, STAMP
ATTRIB: LOCATION WIDTH DISCHARGE HYDROELECTRIC_POWER NAME LOCATION NAME
INCLUD: CASCADE FALLS

WATERING_PLACE
SEE: SPRING/WELL
DEFN: A PLACE WHERE WATER IS SUPPLIED FOR HUMAN OR ANIMAL CONSUMPTION
SOURCE: DEVISED AT VCU

WATERWAY
SEE: LANE

WAVE_BASIN
SEE: BREAKWATER/BASIN

WAVE_TRAP
SEE: BREAKWATER

WAY
SEE: LANE/ROAD

WAY_POINT
SEE: CONTROL_POINT

WAYSIDE_PARK
SEE: PARK
<table>
<thead>
<tr>
<th>Feature</th>
<th>Definition</th>
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<th>Attributes/Inclusion Terms</th>
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<tr>
<td>WEAK_LIGHT</td>
<td>SEE: BEACON</td>
<td></td>
<td></td>
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<tr>
<td>WEIR</td>
<td>SEE: FISH_TRAP/DAM</td>
<td></td>
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<tr>
<td>WEIR_JETTY</td>
<td>SEE: BREAKWATER</td>
<td></td>
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<tr>
<td>WELL</td>
<td>AN UNDERGROUND SOURCE OF WATER OR OTHER FLUIDS WHICH HAS BEEN RENDERED</td>
<td>A DICTIONARY OF GEOGRAPHY, MODRE</td>
<td>SUBSTANCE_EXTRACTED, SALINITY_OF_WATER, COMPOSITION, COVERED</td>
</tr>
<tr>
<td></td>
<td>ACCESSIBLE BY THE DRILLING OR DIGGING OF A HOLE FROM GROUND LEVEL TO THE</td>
<td></td>
<td>IRRIGATION</td>
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<tr>
<td></td>
<td>WATER TABLE. THE TERM IS ALSO USED IN CONNECTION WITH OIL DEPOSITS.</td>
<td></td>
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<tr>
<td>WETDOCK</td>
<td>A VEGETATED AREA THAT IS INUNDATED OR SATURATED BY SURFACE OR GROUNDWATER.</td>
<td>NEW DEFINITION</td>
<td>LOCATION, ELEVATION, NAME, AREA, SALINITY, PREDOMINANT_SPECIES,</td>
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<td></td>
<td>TIDAL, SEASONAL_DEPTH_OF_SURFACE_WATER, ACIDITY, NAVIGABLE</td>
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<td></td>
<td>INCLUD: BOG, PEAT_BOG, STRING_BOG, PALSA_BOG, MARSH, SLough,</td>
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<td></td>
<td></td>
<td></td>
<td>MUSKEG, FEN, SWAMP, POCOSIN, TIDAL_MARSH, SALT_MARSH, DISMAL,</td>
</tr>
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<td></td>
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<td>MIRE, MORASS, QUAGMIRE, SLASH, SLUDGE, TULELANDS, EVERGLADE,</td>
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<td>SWAMP-FOREST, SALTING, QUAKING_BOG, MANGROVE, SWAMP, SWAMPLAND,</td>
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<tr>
<td>WHARF</td>
<td>A STRUCTURE EXTENDING PARALLEL TO THE SHORELINE SO THAT VESSELS MAY LIE</td>
<td>NAUTICAL CHART MANUAL, US</td>
<td>FACILITIES_AVAILABLE, SIZE_VESSEL_CAN_ACCOMMODATE, NUMBER_OF</td>
</tr>
<tr>
<td></td>
<td>CLOSE ALONGSIDE TO RECEIVE AND DISCHARGE CARGO.</td>
<td>DEPT. OF COMMERCE, NATIONAL</td>
<td>SLIPS, NAME</td>
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<td>OCEAN SURVEY</td>
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<td>INCLUD: QUAY, LANDING, PENS, FERRY/ HOVERCRAFT/HYDROFOIL</td>
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<td>TERMINAL/STATION, TIDAL_QUAY, JETTY, FERRY_TERMINAL, FERRY_SITE/</td>
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<td>SLIP, CARGO_TRANSPORTATION, COMPOSITION, CONSTRUCTION_TYPE,</td>
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<td>BOAT_LANDING</td>
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<tr>
<td>WHISTLE_BUOY</td>
<td>SEE: BUOY</td>
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<tr>
<td>WINDBREAK</td>
<td>SEE: WOODLAND/BARRIER</td>
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<tr>
<td>WINDMILL</td>
<td>SEE: BUILDING</td>
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<tr>
<td>WINGED_HEADLAND</td>
<td>SEE: CAPE</td>
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<tr>
<td>WINTER_BUOY</td>
<td>SEE: BUOY</td>
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<tr>
<td>WINTER_LIGHT</td>
<td>SEE: BEACON</td>
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</table>
INTERIM PROPOSED STANDARD FEATURE DEFINITIONS  WORKING GROUP III, NCDCDS  PREPARED AT V.C.U. SEPTEMBER 6, 1985

FEATURES

WINTER_MARKER
SEE: BEACON
(INCLUDED TERM 1131)

WINTER_ROAD
SEE: ROAD
(INCLUDED TERM 1132)

WOOD
SEE: WOODLAND
(INCLUDED TERM 1133)

WOODED_AREA
SEE: WOODLAND
(INCLUDED TERM 1134)

STANDARD FEATURE TERM 141: WOODLAND
DEFN: LAND HAVING A COVER OF TREES, SHRUBS, OR BOTH.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION ELEVATION AREA PREDOMINANT_SPECIES AGE GROWTH LEAF_TYPE EVERGREEN/DECIDUOUS PERCENT_TREE_COVER
INCLUD: COMMERCIAL/NON-COMMERCIAL NAME AMOUNT_OF_ANNUAL_PRECIPITATION AVERAGE_ANNUAL_TEMPERATURE_EXTREMES
PREDOMINANT_HEIGHT ACIDITY ENCLODED GROWING_PATTERN TREE_COVER UNDERGROWTH PRESENCE_OF_LUMBERING STUNTED_GROWTH
CONIFEROUS_FOREST DECIDUOUS_FOREST EQUATORIAL_FOREST MONSOON_FOREST THORN_FOREST TROPICAL_RAIN_FOREST
EQUATORIAL_RAIN_FOREST CAATINGA SCRUB BUSH CHANARAL CHAPARRAL GARIGUE MALEE_SCRUB MAQUIS MULGA
MULGA_SCRUB SAGEBRUSH WINDBREAK MOOR HEATH BRIGALOW MANGROVE_SWAMP

WOODS
SEE: WOODLAND
(INCLUDED TERM 1135)

STANDARD FEATURE TERM 142: WRECK
DEFN: A WRECKED VESSEL, EITHER SUBMERGED OR VISIBLE, WHICH IS ATTACHED TO OR FOUL OF THE BOTTOM OR CAST UP ON THE SHORE.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME
INCLUD: STRANDED_WRECK SUNKEN_WRECK HULK DANGEROUS_WRECK

WRECK_BUOY
SEE: BUOY
(INCLUDED TERM 1136)

ZOO
SEE: PARK
(INCLUDED TERM 1137)
SOURCES USED:
AND SOURCE
BGNIS DOCUMENTATION, APPENDIX B
COHIO STATE PRELIMINARY LIST, INCLUD. GNIS, CANADA, HERITAGE
DU.S. NAVAL OCEANOGRAPHIC OFFICE, NAVIGATION DICTIONARY
EU.S. NAVAL OCEANOGRAPHIC OFFICE, GLOSSARY OF OCEANOGRAPHIC TERMS
FCANADIAN COUNCIL ON SURVEYING AND MAPPING, DRAFT STANDARDS
GBRUDER (ED.), NAUTICAL CHART MANUAL
HTHE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE
ISNEAD, COASTAL LANDFORMS AND SURFACE FEATURES
JMOORE, A DICTIONARY OF GEOGRAPHY
KSTAMP, DICTIONARY OF GEOGRAPHY
LMONKHOUSE, A DICTIONARY OF GEOGRAPHY
MDEFENSE MAPPING AGENCY, PRODUCT SPECIFICATIONS FOR DLMS DATA BASE
MSCHMIEDER ET AL, A DICTIONARY OF BASIC GEOGRAPHY
OUNKNOWN
P NATIONAL OCEAN SERVICE, DRAFT GLOSSARY, 1985
QWEBSTER'S NEW COLLEGIATE DICTIONARY
RDEFENSE INTELLIGENCE AGENCY, INTELLIGENCE DATA ELEMENTS (IDEAS), 1983
S
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X
Y
Z
ACCESS
FEATURE: ROAD RAILWAY WATERCOURSE
DEFN: THE TYPE OF CONNECTION AVAILABLE TO A GIVEN TRANSPORTATION FEATURE
SOURCE: DEVISED AT VCU
ALTERNATE DEFINITION(S) FROM: DEFENSE INTELLIGENCE AGENCY, INTELLIGENCE DATA ELEMENTS (IDEAS), 1983
THE TYPE OF TRANSPORTATION CONNECTION AVAILABLE AT A SPECIFIC LOCATION
VALUES: FREE/LIMITED

ACIDITY
FEATURE: STREAM LAKE SEA WOODLAND CROP LAND WETLAND GRASSLAND
DEFN: THE DEGREE TO WHICH HYDROGEN IONS ARE HELD BY SOIL COLLOIDS OR WATER
SOURCE: STRAHLER, PHYSICAL GEOGRAPHY
INCLUD: ACID/ALKALINE
VALUES: ACIDITY, PH

AGE
FEATURE: BUILDING CLEARING WOODLAND
DEFN: THE PERIOD DURING WHICH SOMETHING EXISTS SPECIFYING THE FIRST YEAR IN EXISTENCE WHERE APPLICABLE.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: YEAR_CONSTRUCTED, YEAR_CLEARING_OCCURRED, MATURE/SECOND_GROWTH

AIR/LAND/WATER
FEATURE: DANGER_AREA VALLEY CAVE DUMPING_GROUND
DEFN: EXISTING IN OR PART OF THE ATMOSPHERE, THE EARTH'S DRY SURFACE, OR A BODY OF WATER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: LAND WATER

ALKALINE
SEE: ACIDITY

ALTITUDE
FEATURE: SATELLITE
DEFN: THE HEIGHT OF A THING ABOVE A REFERENCE LEVEL, ESPECIALLY ABOVE THE EARTH'S SURFACE. SEE ALSO HEIGHT, ELEVATION.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

ANNUAL_PRECIPITATION
FEATURE: EARTH
DEFN: THE QUANTITY OF RAIN AND SNOW FALLING WITHIN THE PERIOD OF A YEAR
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

AREA
FEATURE: BAR SHORE ISLAND Isthmus CAVE GAP FISHING_GROUND HARBOR CROP LAND WOODLAND CLEARING TUNDRA GRASSLAND WETLAND
INTERSECTION AIRPORT DANGER_AREA DUMPING_GROUND VEHICLE_STORAGE POPULATED_PLACE APPROACHWAY INLET BASIN
DEFN: THE MEASURE OF A PLANAR REGION OF THE EARTH'S SURFACE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ARTIFICIALLY_IMPROVED/MANMADE/NATURAL
FEATURE: WATERCOURSE LAKE TROUGH CLEFT LEAD MOUNTAIN SWASH SPRING TUNDRA BACKWATER BREAKER CORAL HEAD COULEE DANGER_AREA FERRY_CROSSING FISH_HAVEN FISH_HATCHERY FISHING_GROUND FUMAROLE HEADWATERS Isthmus MOUTH POLYNA STREAM INLET BRIDGE GAP SEA ISLAND CLUSTER FLAT RIDGE HARBOR REEF ISLAND CLUSTER FOUL BOTTOM WETLAND CLEARING SHORE PORT DAM BASIN BAR LAGOON DELTA LAKE BEACH WOODLAND BREAKWATER DEPRESSION VALLEY WATERFALL VALLEY RAPIDS CAVE CLIFF COAST CAPE GRASSLAND BARRIER SCHOOL ROAD CABLEWAY AIRPORT BEACON TOWER STATION APPROACHWAY ANTENNA CLEARING DAM WHARF SIGN MoorING BREAKWATER POPULATED_PLACE WELL RAILWAY GATE TUNNEL CROP LAND DUMPING_GROUND EMBANKMENT LOCK TERMINAL
DEFN: ARTIFICIALLY IMPROVED: NATURALLY EXISTING FEATURE WITH MAN MADE ALTERATIONS.
SOURCE: DEVISED AT VCU

DEFN: MANMADE: MADE BY MAN, RATHER THAN OCCURRING IN NATURE.
NATURAL: PRESENT OR PRODUCED BY NATURE.
SOURCE: THE AMERICAN HERITAGE DICTIONARY
INCLUD: MANMADE NATURAL

BEARING CAPACITY
FEATURE: ROAD BRIDGE
DEFN: THE ABILITY OF A SURFACE OR A STRUCTURE TO BEAR WEIGHT
SOURCE: MODIFIED FROM IDEAS
INCLUD: WEIGHT_BEARING_CAPACITY

BLIND/OPEN
FEATURE: WATERCOURSE ROAD LEAD
DEFN: BLIND: NOT HAVING AN OUTLET
OPEN: ALLOWING CONTINUOUS PASSAGE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: OPEN DEAD_END CUL DE SAC THROUGH ROAD

BRAIDED
FEATURE: STREAM
DEFN: SPLIT INTO MANY PARTS OR CHOKED WITH SANDBARS THAT DIVIDE IT INTO AN INTRICATE NETWORK OF INTERLACING CHANNELS.
SOURCE: DEVISED AT VCU

BRANCH/PARENT
FEATURE: STREAM
DEFN: RELATIONSHIP BETWEEN A MAIN STREAM AND ONE OF ITS TRIBUTARIES
SOURCE: DEVISED AT VCU
INCLUD: PARENT

BUOYED
FEATURE: WATERCOURSE INLET STREAM PORT HARBOR LAGOON INLET
DEFN: MARKED WITH BUOYS USED AS NAVIGATION AIDS
SOURCE: DEVISED AT VCU

CARGO TRANSPORTATION
FEATURE: WHARF HARBOR AIRPORT WATERCOURSE ROAD RAILWAY
DEFN: USED FOR THE MOVING OF FREIGHT FROM ONE PLACE TO ANOTHER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

CHAMBERS NUMBER OF
FEATURE: CAVE
DEFN: THE NUMBER OF ENCLOSED SPACES OR COMPARTMENTS
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CHARTED_DEPTH
FEATURE: WATERCOURSE STREAM PORT LAGOON HARBOR SEA LAKE LEAD LANE
DEFN: THE VERTICAL DISTANCE FROM THE TIDAL DATUM TO THE BOTTOM
SOURCE: GLOSSARY OF OCEANOGRAPHIC TERMS
INCLUD: SOUNDING

CIRCUMFERENCE
<table>
<thead>
<tr>
<th>Attribute Term</th>
<th>Feature</th>
<th>Definition</th>
<th>Source</th>
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<tr>
<td>19</td>
<td>BASIN PINNACLE</td>
<td>THE LENGTH OF THE BOUNDARY LINE OF ANY CLOSED CURVILINEAR FEATURE</td>
<td>THE AMERICAN HERITAGE DICTIONARY</td>
</tr>
<tr>
<td>20</td>
<td>CIVILIAN</td>
<td>OWNER_TYPE USER_TYPE</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>COASTLINE</td>
<td>SHORELINE</td>
<td>DEVISED AT VCU</td>
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<td>22</td>
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<td>BEACON BUOY</td>
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<td>CONNECTED_FEATURE</td>
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<td>THE FEATURE(S) THAT IS(ARE) LINKED OR JOINED BY ANOTHER</td>
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</table>
ERIM PROPOSED STANDARD ATTRIBUTE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

ATTRIBUTES

SOURCE: DEVISED AT VCU

CONSTRUCTION_MATERIAL
SEE: COMPOSITION

CONSTRUCTION_TYPE
FILENAME: THE STRUCTURAL CONFIGURATION OF A FEATURE
SOURCE: MODIFIED FROM IDEAS
INCLUD: SOLID_CONSTRUCTION PILLAR_CONSTRUCTION

CONTROL
FILENAME: TO EXERCISE AUTHORITY OR DOMINATING INFLUENCE OVER; DIRECT; REGULATE/VERIFY
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CONTROL_OVER_WATER_LEVEL
FILENAME: HAVING SOME MEANS OF REGULATING THE HEIGHT OF A SPECIFIC BODY OF WATER
SOURCE: DEVISED AT VCU

COVERED
FILENAME: HAVING SOMETHING PLACED OVER OR ABOUT ANOTHER THING
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CROP_GROWN
FILENAME: TYPE OF AGRICULTURAL PRODUCE SUCH AS GRAIN, VEGETABLES, OR FRUIT
SOURCE: DEVISED AT VCU

CROSS_SECTIONAL_AREA
FILENAME: A SECTION FORMED BY A PLANE CUTTING THROUGH AN OBJECT AT RIGHT ANGLES TO AN AXIS.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CUL_DE_SAC
SEE: BLIND/OPEN

CULTIVATED
FILENAME: IMPROVED AND PREPARED LAND; PLowed OR FERTILIZED OR TENDED FOR GROWING CROPS
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

DATUM
FILENAME: ANY NUMERICAL OR GEOMETRICAL QUANTITY OR SET OF QUANTITIES WHICH MAY SERVE AS A REFERENCE OR BASE FOR OTHER QUANTITIES.
SOURCE: USGS AND NOA, COASTAL MAPPING HANDBOOK
VALUES: MEAN_SEA_LEVEL MEAN_HIGH_WATERS NATIONAL_GEODETHIC_VERTICAL_DATUM
VAL.DEF: MEAN_SEA_LEVEL: A STANDARD DATUM FOR HEIGHTS, LAST ADJUSTED IN 1929
MEAN_HIGH_WATERS: THE TIDAL DATUM THAT IS THE ARITHMETIC AVERAGE OF THE HIGH WATER HEIGHTS OBSERVED OVER A SPECIFIC 19-YEAR METONIC CYCLE
NATIONAL_GEODETHIC_VERTICAL_DATUM (NGVD) OF 1929: THE GEODETHIC DATUM IS FIXED AND DOES NOT TAKE INTO ACCOUNT THE CHANGING STANDS OF SEA LEVEL.
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<th>Attribute</th>
<th>Definition</th>
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<tr>
<td>DEAD END</td>
<td>Blind/Open</td>
<td>WORKING GROUP III, NCDCDS PREPARED AT V.C.U. SEPTEMBER 6, 1985</td>
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</tbody>
</table>
| DECIDUOUS/EVERGREEN WOODLAND | DECIDUOUS: CHARACTERIZED BY SHEDDING FOILAGE AT THE END OF ITS GROWING SEASON  
EVERGREEN: CHARACTERIZED BY HAVING FOILAGE THAT PERSISTS AND REMAINS GREEN THROUGHOUT THE YEAR. | SOURCE: THE AMERICAN HERITAGE DICTIONARY |
| DENSITY OF GROWTH WOODLAND | THE DEGREE OR MEASURED DEGREE TO WHICH THE AREA IS FILLED OR OCCUPIED BY PLANT LIFE | SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY |
| DEPRESSION CONTOUR LINE | A CLOSED LINE INDICATING DEPTH BELOW ADJACENT CONTOURS, RATHER THAN HEIGHT ABOVE SAME. | SOURCE: DEISED AT VCU |
| DEPTH WATERCOURSE SEA STREAM LAKE HARBOR BASIN INLET WELL LEAD LAGOON | THE VERTICAL MEASUREMENT DOWNWARD FROM THE SURFACE; FOR WATER FEATURES, THE VERTICAL DISTANCE FROM THE PLANE OF THE HYDROGRAPHIC DATUM TO THE BED OF THE SEA, LAKE, STREAM OR WATERCOURSE | SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY |
| DIAMETER Feature | THE LENGTH OF A LINE SEGMENT PASSING THROUGH THE CENTER OF A FEATURE; LOOSELY THE THICKNESS OF A FEATURE | SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY |
| DIRECTION OF FLOW STREAM | THE LINE OR COURSE OF MOVEMENT OF WATER OR LAVA SHOWN BY THE POSITION OF ONE POINT RELATIVE TO ANOTHER WITHOUT REFERENCE TO THE DISTANCE BETWEEN THEM. THE DIRECTION IS USUALLY INDICATED IN TERMS OF ITS ANGULAR DISTANCE FROM A REFERENCE DIRECTION | SOURCE: MODIFIED FROM THE DEFENSE MAPPING AGENCY |
| DISCHARGE WATERFALL STREAM DAM LOCK DELTA WATERCOURSE GEYSER RAPIDS | CUBIC MEASURE OF WATER FLOWING PER UNIT OF TIME | SOURCE: DEISED AT VCU |
| DRAINAGE WATERCOURSE STREAM DELTA CATCHMENT | THE ACT, PROCESS OR MODE OF DRAINING OR DRAWING OFF WATER FROM A LAND SURFACE | SOURCE: THE AMERICAN HERITAGE DICTIONARY |
| ELEVATION CROP LAND ISLAND GAP CLIFF RIDGE WOODLAND CLEARING TUNDRA WETLAND ROAD BRIDGE RAILWAY CONTROL_POINT | THE HEIGHT TO WHICH SOMETHING IS ABOVE A REFERENCE DATUM, ESPECIALLY ABOVE SEA LEVEL. |
ERIM PROPOSED STANDARD ATTRIBUTE DEFINITIONS
WORKING GROUP III, NCDCDS
PREPARED AT V.C.U. SEPTEMBER 6, 1985

ATTRIBUTES

SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: SEA_LEVEL_RELATIONSHIP
VALUES: ABOVE_SEA_LEVEL/Below_SEA_LEVEL

FM_BANKED
FEATURE: WATERCOURSE
DEFN: CONFINED, SUPPORTED OR PROTECTED BY A PILED UP MASS
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ENCLOSED
FEATURE: WOODLAND CROP_LAND LAKE
DEFN: SURROUNDED ON ALL SIDES BY FOR EXAMPLE A BARRIER
SOURCE: THE AMERICAN HERITAGE DICTIONARY

EVERGREEN
SEE: DECIDUOUS/EVERGREEN

EXISTING/PROPOSED
FEATURE: ROAD
DEFN: PREVIOUSLY CONSTRUCTED AND PRESENTLY EXISTING VS. IN THE PLANNING STAGE
SOURCE: DEVISED AT VCU
INCLUD: PROPOSED

EXPOSED/SHELTERED
FEATURE: HARBOR
DEFN: NOT PROTECTED OR COVERED VS. PROTECTED OR COVERED AS FROM THE WEATHER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: SHELTERED

FACILITIES_AVAILABLE
FEATURE: WATERCOURSE HARBOR ROAD LANE RAILWAY
DEFN: THE STRUCTURES OR INSTALLATIONS AVAILABLE FOR THE ENHANCEMENT OF THE USE OF THE RELATED FEATURE
SOURCE: DEVISED AT VCU
VALUES: REPAIR_FACILITIES COMFORT_FACILITIES DRINKING_WATER PICNIC_TABLES

FALLOW
FEATURE: CROP_LAND
DEFN: CULTIVATED LAND THAT IS ALLOWED TO LIE IDLE DURING THE GROWING SEASON.
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

FEATURE_PRESENT
FEATURE: WATERCOURSE HARBOR ROAD LANE RAILWAY
DEFN: PRESENCE OF ONE FEATURE WITHIN ANOTHER FEATURE, FOR EXAMPLE DAM IN WATERCOURSE, BREAKWATER IN HARBOR
SOURCE: DEVISED AT VCU

FIRE_LINE
FEATURE: CLEARED_AREA
DEFN: CLEARED OR PLOWED STRIP OF LAND TO STOP THE SPREAD OF FIRE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

FLOOD_CONTROL
FEATURE: WATERCOURSE CATCHMENT DAM LOCK
DEFN: DESIGNED FOR THE CONTROL OR DRAINAGE OF A RISING AND OVERFLOWING BODY OF WATER
ATTRIBUTES

FLOODED
FEATURE: EARTH
DEFN: INUNDATED WITH OR SUBMERGED UNDER AN EXCESS AMOUNT OF WATER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

FORCE_OF_FLOW
FEATURE: STREAM SPRING
DEFN: THE STRENGTH OF ENERGY EXERTED BY THE MOVEMENT OF WATER OR LAVA
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY
VALUES: FREE_FLOWING/SLUGGISH/STAGNANT
VAL.DEF: SLUGGISH: DISPLAYING LITTLE MOVEMENT OR ACTIVITY; SLOW; INACTIVE
STAGNANT: NOT MOVING OR FLOWING WITHOUT A CURRENT; MOTIONLESS.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

FORM_RATIO
FEATURE: STREAM
DEFN: THE RELATIONSHIP BETWEEN THE DEPTH AND WIDTH OF A STREAM, EXPRESSED AS A RATIO
SOURCE: MONKHOUSE, A DICTIONARY OF GEOGRAPHY

GAS_EMITTED_TYPE
FEATURE: FUMAROLE
DEFN: KIND OF GASEOUS SUBSTANCE RELEASED
SOURCE: DEVISED AT VCU

GLACIAL
FEATURE: STREAM
DEFN: OF, PERTAINING TO OR DERIVED FROM A GLACIER
SOURCE: THE AMERICAN HERITAGE DICTIONARY

GRADE SEPARATION
FEATURE: INTERSECTION
DEFN: AN INTERSECTION USING AN OVERPASS OR UNDERPASS
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

GRADIENT
SEE: SLOPE

GRADIENT_OF_SIDES
SEE: SLOPE_OF_SIDES

GRAZING
FEATURE: CROP_LAND
DEFN: LAND WHICH SUPPLIES HERBIAGE FOR GRAZING ANIMALS
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

GROUND_LEVEL_RELATIONSHIP
FEATURE: WATERCOURSE STREAM ROAD
DEFN: THE OCCUPATION OF SPACE IN RELATION TO THE EARTH'S SURFACE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: ABOVE_GROUND/AT_GROUND_LEVEL/BELONG_GROUND
GROWING PATTERN
FEATURE: CROP LAND WOODLAND
DEFN: THE LAYOUT OR ARRANGEMENT OF GROWING PLANT LIFE
SOURCE: DEVISED AT VCU

GROWING SEASON
FEATURE: CROP LAND
DEFN: THE PERIOD OF TIME DURING THE YEAR CHARACTERIZED BY ENVIRONMENTAL CONDITIONS SUITABLE FOR PLANTING AND GROWING CROPS
SOURCE: DEVISED AT VCU

HEIGHT
FEATURE: BUILDING CROPLAND WOODLAND REVETMENT EMBANKMENT BAR REEF CLIFF PINNACLE RIDGE BEACON BUOY APPROACHWAY CABLEWAY GATE BARRIER TOWER ANTENNA
DEFN: THE VERTICAL DISTANCE FROM THE BASE TO THE TOP
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: NUMBER OF STOREYS
PREDOMINANT HEIGHT OF VEGETATION

HORIZONTAL/VERTICAL
FEATURE: CONTROL POINT
DEFN: PARALLEL TO OR IN THE PLANE OF THE HORIZON VS. PERPENDICULAR TO THE PLANE OF THE HORIZON
SOURCE: THE AMERICAN HERITAGE DICTIONARY

HYDRAULIC RADIUS
FEATURE: STREAM
DEFN: THE RATIO BETWEEN THE CROSS-SECTIONAL AREA OF A STREAM AND ITS WETTED PERIMETER
SOURCE: MONKHOUSE, A DICTIONARY OF GEOGRAPHY

HYDROELECTRIC POWER
FEATURE: WATERCOURSE WATERFALL DAM
DEFN: USED FOR THE PRODUCTION OF ELECTRICITY BY WATER POWER
SOURCE: DEVISED AT VCU

ICE PRESENCE OF
FEATURE: STREAM LAKE SEA
DEFN: CONTAINING WATER WHICH IS EITHER PARTIALLY OR COMPLETELY FROZEN
SOURCE: DEVISED AT VCU

INCORPORATED/UNINCORPORATED
FEATURE: POPULATED PLACE
DEFN: UNITED OR COMBINED INTO AN ORGANIZED BODY WHICH IS MAINTAINED THROUGH A SERIES OF LAWS OR RULES
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: UNINCORPORATED

INFORMATION DISPLAYED
FEATURE: SIGN
DEFN: THE IDEA COMMUNICATED THROUGH EXHIBITION
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

INTERMITTENT/PERENNIAL
FEATURE: STREAM SPRING
DEFN: PRESENT AT ALL SEASONS OF THE YEAR VS. OCCURRING OR APPEARING IN INTERRUPTED SEQUENCE
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY
### INTERIM PROPOSED STANDARD ATTRIBUTE DEFINITIONS

**WORKING GROUP III. NCDCDS**  
**PREPARED AT V.C.U. SEPTEMBER 6, 1985**

#### Attributes

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<tr>
<td>IRRIGATED</td>
<td>FEATURE: CROP LAND</td>
<td><strong>SUPPLIED WITH WATER BY MEANS OF PIPES, DITCHES OR STREAMS FOR AGRICULTURAL PURPOSES.</strong></td>
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<tr>
<td>IRRIGATION</td>
<td>FEATURE: WATERCOURSE STREAM WELL LAKE DAM</td>
<td><strong>USED FOR THE SUPPLYING OF WATER BY ARTIFICIAL MEANS TO LAND FOR AGRICULTURAL PURPOSES.</strong></td>
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<td>SEE: AIR/LAND/WATER</td>
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<td>FEATURE: ROAD RAILWAY LANE</td>
<td><strong>THE NUMBER OF PATHS AVAILABLE SIDE BY SIDE FOR THE SIMULTANEOUS PASSAGE OF VEHICLES IN A ROAD, RAILWAY OR NAVIGATION ROUTE</strong></td>
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<tr>
<td>LATITUDINAL_ZONE</td>
<td>FEATURE: WOODLAND GRASSLAND CROP_LAND DESERT</td>
<td><strong>ONE OF THE LARGE REGIONS DELIMITED BY DISTANCE FROM THE EQUATOR, USED AS A BASIS FOR CLASSIFYING CLIMATES</strong></td>
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<td>FEATURE: LEAD</td>
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<td><strong>THE LONGER OR LONGER DIMENSION OF A FEATURE</strong></td>
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<td>LIGHTED</td>
<td>FEATURE: WATERCOURSE STREAM BUOY HARBOUR AIRPORT ROAD TOWER SIGN POPULATED_PLACE DAM BRIDGE TUNNEL INTERSECTION STATION RUNWAY</td>
<td><strong>MODIFIED FROM IDEAS</strong></td>
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<tr>
<td>Attribute Term</td>
<td>Feature</td>
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<td>MEAN_SEA_LEVEL</td>
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<td>MICROWAVE_TRANSMISSION</td>
<td>THE ACT OR PROCESS OF SENDING A SIGNAL OF ELECTROMAGNETIC RADIATION HAVING A WAVELENGTH IN THE APPROXIMATE RANGE FROM ONE CENTIMETER TO ONE METER</td>
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<td>PRESENCE OF ANY NATURALLY OCCURRING, HOMOGENEOUS INORGANIC SUBSTANCES.</td>
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<td>THE MEANS OF MOVING PEOPLE OR GOODS THAT ARE ACCOMMODATED</td>
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</table>
INCLUD: TRANSPORTATION_ACcommodated_Type

MOUNTED
FEATURE: ANTENNA
DEFN: FITTED INTO OR SET IN A BACKING OR SUPPORT
SOURCE: THE AMERICAN HERITAGE DICTIONARY

MOVABLE/STATIONARY
FEATURE: RAILWAY TOWER ANTENNA BRIDGE
DEFN: ABILITY TO CHANGE POSITION VS. FIXED IN POSITION UNABLE TO MOVE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: STATIONARY

NAME
FEATURE: ALL
DEFN: A WORD OR PHRASE THAT CONSTITUTES THE DISTINCTIVE DESIGNATION OF AN OCCURRENCE OF A FEATURE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

NATURAL
SEE: ARTIFICIALLY_IMPROVED/MANMADE/NATURAL

NAVIGABLE
FEATURE: WATERCOURSE STREAM INLET SEA LAKE HARBOR DELTA REEF LEAD LAGODON WETLAND
DEFN: HAVING WATER DEEP ENOUGH AND WIDE ENOUGH TO AFFORD PASSAGE TO SHIPS; CAPABLE OF BEING STEERED
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ONE WAY/TWO WAY
FEATURE: ROAD
DEFN: ACCOMODATING A LANE OR LANES OF TRAFFIC MOVING IN ONE DIRECTION ONLY VS. TRAFFIC MOVING IN OPPOSING DIRECTIONS WITH SOME SORT OF DIVISION BETWEEN LANES OF OPPOSING TRAFFIC
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: TWO WAY

OWNER_TYPE
SEE: BLIND/OPEN

PASSED_UNDER_FEATURE
FEATURE: TUNNEL
DEFN: THE FEATURE THAT ANOTHER FEATURE CROSSES BELOW WITHOUT JOINING
SOURCE: MODIFIED FROM IDEAS

PASSENGER_TRANSPORTATION
FEATURE: WATERCOURSE ROAD AIRPORT RUNWAY CABLEWAY RAILWAY TUNNEL INTERSECTION
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<td><strong>PEDESTRIAN USE</strong></td>
<td><strong>DEFN:</strong> USED FOR THE CONVEYANCE OF HUMAN PASSENGERS</td>
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<td><strong>SOURCE:</strong> MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY</td>
<td><strong>ATTRIBUTES TERMS:</strong> PEDESTRIAN_USE</td>
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<td><strong>FEATURE:</strong> ROAD</td>
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<tr>
<td><strong>DEFN:</strong> USED BY PEOPLE TRAVELING ON FOOT</td>
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<td><strong>SOURCE:</strong> MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY</td>
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<tr>
<td><strong>PERENNIAL</strong></td>
<td><strong>SEE:</strong> INTERMITTENT/PERENNIAL</td>
</tr>
<tr>
<td><strong>PERMEABILITY</strong></td>
<td><strong>FEATURE:</strong> BREAKWATER</td>
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<tr>
<td><strong>DEFN:</strong> THE ABILITY OF SUBSTANCES TO PASS THROUGH THE OPENINGS OR INTERSTICES</td>
<td><strong>SOURCE:</strong> THE AMERICAN HERITAGE DICTIONARY</td>
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<td><strong>VALUES:</strong> IMPERMEABLE/PERMEABLE</td>
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<tr>
<td><strong>PHYSICAL</strong></td>
<td><strong>FEATURE:</strong> BOUNDARY CONTROL POINT</td>
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<td><strong>DEFN:</strong> OF OR PERTAINING TO MATERIAL THINGS</td>
<td><strong>SOURCE:</strong> THE AMERICAN HERITAGE DICTIONIAN</td>
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<td><strong>VALUES:</strong> PHYSICAL/NOT_PHYSICAL</td>
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<tr>
<td><strong>PHYSICAL_CONDITION_OF_SURFACE_MATERIAL</strong></td>
<td><strong>FEATURE:</strong> ROAD RUNWAY BRIDGE TUNNEL</td>
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<td><strong>DEFN:</strong> THE PHYSICAL CONDITION OF A SPECIFIED TRANSPORTATION SURFACE WHICH ALLOWS FOR USE RANGING FROM SUSTAINED USE BY HEAVIEST VEHICLES TO NON-USE DUE TO DISREPAIR OR DETERIORATION</td>
<td><strong>SOURCE:</strong> IDEAS</td>
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<td><strong>PILLAR_CONSTRUCTION</strong></td>
<td><strong>SEE:</strong> CONSTRUCTION_TYPE</td>
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<tr>
<td><strong>POPULATION</strong></td>
<td><strong>FEATURE:</strong> POPULATED PLACE</td>
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<tr>
<td><strong>DEFN:</strong> THE NUMBER OF PEOPLE INHABITING A SPECIFIED AREA</td>
<td><strong>SOURCE:</strong> THE AMERICAN HERITAGE DICTIONIAN</td>
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<tr>
<td><strong>PREDOMINANT_SPECIES</strong></td>
<td><strong>FEATURE:</strong> CROP LAND FISHING GROUND CLEARING TUNDRA GRASSLAND WETLAND FISH_TRAP WOODLAND</td>
</tr>
<tr>
<td><strong>DEFN:</strong> THE MOST COMMON, CONSPICUOUS, OR PREVALENT ANIMAL OR PLANT LIFE BELONGING TO A DISTINCT BIOLOGICAL SPECIES</td>
<td><strong>SOURCE:</strong> THE AMERICAN HERITAGE DICTIONIAN</td>
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<tr>
<td><strong>PRIVATE</strong></td>
<td><strong>SEE:</strong> OWNER_TYPE USER_TYPE</td>
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<td><strong>PROPOSED</strong></td>
<td><strong>SEE:</strong> EXISTING/PROPOSED</td>
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<td><strong>PUBLIC</strong></td>
<td><strong>SEE:</strong> OWNER_TYPE USER_TYPE</td>
</tr>
<tr>
<td><strong>RADIO_SIGNAL_CHARACTERISTIC</strong></td>
<td><strong>FEATURE:</strong> BUOY</td>
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</tbody>
</table>
Attributes

RADIO TRANSMISSION
FEATURE: TOWER ANTENNA STATION BUILDING
DEFN: USED FOR OR CONTAINING THE EQUIPMENT USED TO TRANSMIT RADIO SIGNALS, ELECTROMAGNETIC WAVES IN APPROXIMATE FREQUENCY RANGE FROM 10 KILOCYCLES/SECOND TO 300,000 MEGACYCLES/SECOND. TO TRANSMIT OR TO RECEIVE ELECTRIC SIGNALS WITHOUT WIRES CONNECTING THE POINTS OF TRANSMISSION AND RECEPTION.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

RAIL CONNECTOR TYPE
FEATURE: RAILWAY
DEFN: THE METHOD USED TO JOIN OR CONNECT CONSECUTIVE RAILS OF A SPECIFIC RAIL LINE OR SEGMENT
SOURCE: IDEAS

RAIL DIRECTION CHANGES
FEATURE: RAILWAY
DEFN: TYPE OF FACILITY AVAILABLE AT A SPECIFIC LOCATION TO ACCOMPLISH CHANGING THE DIRECTION OF A LOCOMOTIVE
SOURCE: IDEAS

RAIL GAUGE ADAPTABILITY
FEATURE: RAILWAY
DEFN: METHOD USED TO CHANGE THE GAUGE ON A SPECIFIC PIECE OR CATEGORY OF RAILWAY EQUIPMENT
SOURCE: IDEAS

RAILS NUMBER OF
FEATURE: RAILWAY
DEFN: HAVING PARALLEL BARS FOR CONVEYANCE VS. A SINGLE BAR SYSTEM
SOURCE: DEVISED AT VCU
VALUES: MONORAIL SINGLE_TRACK DOUBLE_TRACK
VAL.DEF: SINGLE_TRACK: TWO PARALLEL RAILS MAKING A SINGLE RAIL LINE

RECREATIONAL
FEATURE: WATERCOURSE LAKE STREAM SEA
DEFN: USED FOR THE REFRESHMENT OF ONE'S MIND OR BODY AFTER LABOR THROUGH DIVERTING ACTIVITY; PLAY
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

REGULATED
SEE: RESTRICTIONS

RELATED FEATURE
FEATURE: GATE
DEFN: THE LOGICAL OR NATURAL ASSOCIATION BETWEEN TWO OR MORE FEATURES; RELEVANCE OF ONE TO ANOTHER; CONNECTION
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

RELIEF
FEATURE: EARTH
DEFN: THE DIFFERENCE BETWEEN HIGH AND LOW PLACES IN A LOCALITY
SOURCE: DEVISED AT VCU

RESTRICTIONS
FEATURE: HARBOR ROAD APPROACHWAY TUNNEL BRIDGE RUNWAY
DEFN: LIMITATIONS ON THE USE FOR LEGAL, SAFETY, SECURITY OR OTHER REASONS.
### Attributes

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<tr>
<th>Attribute</th>
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<td>USE_RESTRICTIONS, REGULATED, SEASONAL_LIMITS, SPECIAL_USE</td>
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<td><strong>ROAD_TYPE</strong></td>
<td><strong>FEATURE:</strong> ROAD&lt;br&gt;<strong>DEFN:</strong> CHARACTERISTICS OR CATEGORY OF ROAD&lt;br&gt;<strong>SOURCE:</strong> DEVISED AT VCU&lt;br&gt;<strong>VALUES:</strong> INTERSTATE/STATE_HIGHWAY/COUNTY_ROAD/LOCAL_ROAD</td>
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<td><strong>RUNWAYS_NUMBER_OF</strong></td>
<td><strong>FEATURE:</strong> AIRPORT&lt;br&gt;<strong>DEFN:</strong> THE NUMBER OF PREPARED SURFACES AVAILABLE TO ACCOMODATE THE LANDING AND TAKE-OFF OF AIRCRAFT&lt;br&gt;<strong>SOURCE:</strong> DEVISED AT VCU</td>
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<td><strong>SALINITY</strong></td>
<td><strong>FEATURE:</strong> STREAM LAKE SPRING INLET FISHING GROUND FISH_TRAP LOCK HARBOR TURNING_BASIN WETLAND DUMPING_GROUND WELL&lt;br&gt;<strong>DEFN:</strong> THE PROPORTION OF DISSOLVED SALTS IN PURE WATER, STATED IN PARTS PER THOUSAND BY MASS&lt;br&gt;<strong>SOURCE:</strong> MONKHOUSE, A DICTIONARY OF GEOGRAPHY&lt;br&gt;<strong>VALUES:</strong> SALTY/BRACKISH/FRESH&lt;br&gt;<strong>VAL.DEF:</strong> BRACKISH IS SLIGHTLY SALTY. BETWEEN 15 AND 30 PARTS PER THOUSAND&lt;br&gt;<strong>VALUES:</strong> PARTS OF SALT PER THOUSAND PARTS OF WATER</td>
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<td><strong>SEA_LEVEL_RELATIONSHIP</strong></td>
<td><strong>SEE:</strong> ELEVATION</td>
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<td><strong>SEASON_USED</strong></td>
<td><strong>FEATURE:</strong> FISH_TRAP FISH_LADDER CABLEWAY&lt;br&gt;<strong>DEFN:</strong> THE SPECIFIED SEASON OR TIME OF YEAR THAT SOMETHING CAN BE USED, ESPECIALLY IN REFERENCE TO SOMETHING THAT IS DEPENDENT ON OR CONTROLLED BY SEASONAL CHANGES&lt;br&gt;<strong>SOURCE:</strong> DEVISED AT VCU&lt;br&gt;<strong>INCLUD:</strong> SEASONAL_LIMITS</td>
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<td><strong>SEASONAL_DEPTH</strong></td>
<td><strong>FEATURE:</strong> WETLAND&lt;br&gt;<strong>DEFN:</strong> THE MEASUREMENT FROM THE WATER SURFACE TO THE BOTTOM OF THAT WATER BODY AT DIFFERENT SEASONS: USED IN RELATION TO WATER BODIES WHICH HAVE MARKED CHANGES DUE TO SEASON CHANGE&lt;br&gt;<strong>SOURCE:</strong> DEVISED AT VCU</td>
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<td><strong>SEASONAL_LIMITS</strong></td>
<td><strong>SEE:</strong> RESTRICTIONS, SEASON_USED</td>
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<td><strong>SERVICES_PROVIDED</strong></td>
<td><strong>FEATURE:</strong> AIRPORT STATION&lt;br&gt;<strong>DEFN:</strong> KINDS OF SERVICES PROVIDED AT A GIVEN FACILITY. SEE ALSO FACILITIES_AVAILABLE.&lt;br&gt;<strong>SOURCE:</strong> DEVISED AT VCU&lt;br&gt;<strong>VALUES:</strong> AIR_TRAFFIC_CONTROL_SERVICE, BAGGAGE_SERVICE</td>
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<td><strong>SHAPE</strong></td>
<td><strong>FEATURE:</strong> ALL&lt;br&gt;<strong>DEFN:</strong> SPATIAL FORM&lt;br&gt;<strong>SOURCE:</strong> THE AMERICAN HERITAGE DICTIONARY</td>
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<td><strong>SEE:</strong> FACILITIES_AVAILABLE.</td>
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SEE: EXPOSED/SHELTERED

SHORE_ORIENTATION
FEATURE: BREAKWATER WHARF BAR
DEFN: THE POSITION OF SOMETHING RELATIVE TO THE SHORE: FOR EXAMPLE, PARALLEL
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SIGNAL_DIRECTION
FEATURE: BEACON
DEFN: THE LINE OR COURSE ALONG WHICH THE SOUND, IMAGE, OR OTHER TRANSMITTED MESSAGE TRAVELS
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SIGNAL_INTENSITY
FEATURE: BEACON BUOY
DEFN: THE CONCENTRATION OF POWER OR FORCE OF THE SIGNAL EMITTED
SOURCE: THE AMERICAN HERITAGE DICTIONARY

SIGNAL_TYPE
FEATURE: BEACON BUOY ANTENNA
DEFN: THE SPECIFIC SOUND, IMAGE, OR OTHER TRANSMITTED MESSAGE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SIZE
FEATURE: BUILDING
DEFN: THE PHYSICAL DIMENSIONS, PROPORTIONS, MAGNITUDE, OR EXTENT OF SOMETHING
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: LARGE SMALL

SLIPS_NUMBER_OF
FEATURE: WHARF
DEFN: THE NUMBER OF SPACES BETWEEN WHARFS OR PIERS DESIGNED TO ACCOMMODATE WATER VESSELS
SOURCE: DEVISED AT VCU

SLOPE
FEATURE: WATERCOURSE SHORE GAP CLIFF RIDGE ROAD LAUNCHING RAMP RAILWAY
DEFN: UNIT INCREASE (DECREASE) IN HEIGHT PER UNIT OF HORIZONTAL DISTANCE. EXPRESSED AS A PERCENTAGE.
SOURCE: DEVISED AT VCU
INCLUD: GRADIENT

SLOPE_OF_SIDES
FEATURE: BASIN VALLEY WATERCOURSE
DEFN: THE SAME AS FOR "SLOPE," BUT MEASURED BETWEEN THE UPPER AND LOWER SURFACES OF THE FEATURE, ALONG ITS SIDES.
SOURCE: DEVISED AT VCU
INCLUD: GRADIENT_OF_SIDES

SMOKE_EMISSION
FEATURE: TOWER
DEFN: THE VENTING OF VAPOR MADE UP OF SMALL PARTICLES OF CARBONACEOUS MATTER IN THE AIR, RESULTING MAINLY FROM INCOMPLETE COMBUSTION OF ORGANIC MATERIAL, SUCH AS WOOD OR COAL. (A SUSPENSION OF PARTICLES IN A GASEOUS MEDIUM.)
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SOLID_CONSTRUCTION
SEE: CONSTRUCTION_TYPE
<table>
<thead>
<tr>
<th>Attribute Term</th>
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<tr>
<td>SOUND CHARACTERISTIC</td>
<td>THE DISTINCTIVE CHARACTER OR QUALITY TYPICAL OF A SPECIFIC SOUND EMITTED</td>
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<td>SPANNED_FEATURE</td>
<td>THE FEATURE THAT A BRIDGE OR OTHER SPECIFIC FEATURE CROSSES ABOVE WITHOUT JOINING</td>
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<td>SPAN_LENGTH</td>
<td>THE LENGTH OF THE SECTION BETWEEN INTERMEDIATE SUPPORTS OF A BRIDGE</td>
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<td>SPAN_MOTION</td>
<td>THE ABILITY OF THE SECTION BETWEEN TWO INTERMEDIATE SUPPORTS OF A BRIDGE TO MOVE</td>
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<td>SPECIES</td>
<td>A FUNDAMENTAL CATEGORY OF TAXONOMIC CLASSIFICATION, RANKING AFTER A GENUS, AND CONSISTING OF ORGANISMS CAPABLE OF INTERBREEDING</td>
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<td>SUBSTANCE_EXTRACTED</td>
<td>THE MATTER (LIQUID OR SOLID) BEING DRAWN FORTH BY MECHANICAL OR CHEMICAL PROCESSES</td>
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<td>SUPPORT_TYPE</td>
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</table>
FEATURE: TOWER BRIDGE
DEFN: "SUPPORT:" TO BEAR THE WEIGHT OF ESPECIALLY FROM BELOW, TO HOLD IN POSITION; PREVENT FROM FALLING, SINKING OR SLIPPING.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

SURFACE_MATERIAL
SEE: COMPOSITION

TELEVISION_TRANSMISSION
FEATURE: TOWER BUILDING ANTENNA
DEFN: THE TRANSMISSION OF VISUAL IMAGES OF MOVING AND STATIONARY OBJECTS, GENERALLY WITH ACCOMPANYING SOUND, AS ELECTROMAGNETIC WAVES, AND THE RECONVERSION OF RECEIVED WAVES INTO VISUAL IMAGES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TEMPERATURE
FEATURE: SPRING STREAM GUYSER GLACIER SEA LAKE
DEFN: A SPECIFIC DEGREE OF HOTNESS OR COLDNESS AS INDICATED ON OR REFERED TO A STANDARD SCALE
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: AVERAGE_ANNUAL, MINIMUM_RECORDED, MAXIMUM_RECORDED

THROUGH_ROAD
SEE: BLIND/OPEN

TIDAL
FEATURE: STREAM LAKE SEA
DEFN: SUBJECT TO THE ALTERNATING RISE AND FALL OF WATER LEVEL CAUSED BY THE ASTRONOMIC TIDE-PRODUCING FORCES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TOLL
FEATURE: ROAD BRIDGE WATERCOURSE TUNNEL
DEFN: A FIXED CHARGE OR TAX FOR ACCESS, ESPECIALLY FOR PASSAGE ACROSS A BRIDGE OR ALONG A ROAD.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

TRACK_GAUGE
FEATURE: RAILWAY TURNTABLE
DEFN: THE DISTANCE BETWEEN THE RAILS OF A RAILWAY
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TRAFFIC_LIGHTS_PRESENCE_OF
FEATURE: ROAD RAILWAY
DEFN: PRESENCE OF ROAD SIGNALS THAT BEAM A RED OR GREEN LIGHT OR AN AMBER WARNING LIGHT TO DIRECT TRAFFIC TO STOP OR PROCEED
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TRANSPORTATION_ACCOMMODATED_TYPE
SEE: MODE_TRANSPORTED

TREE_COVER
FEATURE: WOODLAND CROP LAND
DEFN: THE AMOUNT, OR DENSITY OF TALL WOODY PLANTS OCCUPYING THE SURFACE OF A SPECIFIED AREA
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: PERCENT OF AREA COVERED BY TREES
FEATURE: ROAD RAILWAY
DEFN: HAVING A BORDER OF TREES ALONG ITS SIDES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TWO WAY
SEE: ONE WAY/TWO WAY

UNDERGROWTH PRESENCE_OF
FEATURE: WOODLAND
DEFN: PRESENCE OF LOW GROWING PLANTS, SAPLINGS, AND SHRUBS BENEATH THE TREES IN A FOREST.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

UNINCORPORATED
SEE: INCORPORATED/UNINCORPORATED

USE_RESTRICTIONS
SEE: RESTRICTIONS

USE_TYPE
FEATURE: BUILDING TOWER
DEFN: THE DISTINGUISHED EMPLOYMENT OF SOMETHING FOR A PURPOSE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: RESIDENTIAL COMMERCIAL INDUSTRIAL PUBLIC AND_INSTITUTIONAL

USER_TYPE
FEATURE: AIRPORT ROAD BUILDING
DEFN: CHARACTERISTICS OR CATEGORY OF USERS OF THE FEATURE
SOURCE: DEVISED AT VCU
VALUES: CIVILIAN MILITARY PRIVATE PUBLIC

VEHICLE_SIZE_SERVED
FEATURE: AIRPORT RUNWAY LAUNCHING RAMP LOCK WHARF PORT HARBOR MOORING
DEFN: THE PHYSICAL DIMENSION, PROPORTION, MAGNITUDE, OR EXTENT OF ANY DEVICE FOR CARRYING PASSENGERS, GOODS, OR EQUIPMENT THAT THE SPECIFIED FEATURE HAS SPACE FOR STORAGE OR SERVICE FOR
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

VEHICLE_TYPE
FEATURE: VEHICLE_STORAGE MOORING HARBOR
DEFN: THE DISTINGUISHED DEVICES FOR CARRYING PASSENGERS, GOODS, OR EQUIPMENT THAT ARE ACCOMMODATED
INCLUD: VESSEL_TYPE

VERTICAL
SEE: HORIZONTAL/VERTICAL

VESSEL_TYPE
SEE: VEHICLE_TYPE

VOLUME
ATTRIBUTES

FEATURE: STREAM WATERCOURSE LAKE
DEFN: SPACE OCCUPIED OR CUBIC CAPACITY AS MEASURED IN CUBIC UNITS
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

WASTE_MATERIAL
FEATURE: DUMPING GROUND
DEFN: THE USELESS OR WORTHLESS BYPRODUCTS OF A PROCESS OR THE LIKE; REFUSE OR EXCESS MATERIAL
SOURCE: THE AMERICAN HERITAGE DICTIONARY

WATCHED
FEATURE: BEACON
DEFN: OBSERVED ATTENTIVELY OR CAREFULLY
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: WATCHED/UNWATCHED

WATER
SEE: AIR/LAND/WATER

WATER_BODY_CONNECTION
FEATURE: WATERCOURSE
DEFN: ACTING AS A LINK BETWEEN TWO LARGER BODIES OF WATER
SOURCE: DEVISED AT VCU

WATER_LEVEL_RELATIONSHIP
FEATURE: BREAKWATER SPRING
DEFN: THE POSITION OF SOMETHING IN REFERENCE TO THE SURFACE OF THE SURROUNDING OR CLOSEST WATER BODY
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: PROTRUDING/SUBMERGED

WATER_SUPPLY
FEATURE: WATERCOURSE LAKE
DEFN: EQUIPPED OR USED TO FURNISH WATER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

WATERAGE
FEATURE: WATERCOURSE
DEFN: THE MOVEMENT OF GOODS OR MERCHANDISE (SUCH AS LOGS) BY WATER
SOURCE: THE AMERICAN HERITAGE DICTIONARY

WEIGHT_BEARING_CAPACITY
DEFN: THE ABILITY OF SURFACE MATERIAL OR A STRUCTURE TO WITHSTAND THE WEIGHT OF SUCH THINGS AS TRANSPORTATION VEHICLES
SOURCE: MODIFIED FROM DIA IDEAS
SEE: BEARING_CAPACITY

WETTED_PERIMETER
FEATURE: STREAM
DEFN: LENGTH OF THE LINE OF CROSS-SECTIONAL CONTACT BETWEEN THE WATER IN A STREAM AND ITS WATERCOURSE
SOURCE: ADAPTED FROM MONKHOUSE, A DICTIONARY OF GEOGRAPHY

WIDTH
FEATURE: WATERCOURSE STREAM INLET FISH_LADDER FISH_TRAP LOCK TURNING_BASIN BREAKWATER WHARF MOORING REVESTMENT EMBANKMENT BAR SHORE REEF VALLEY Isthmus CAVE GAP RIDGE BEACON BUOY ROAD LAUNCHING_RAMP BRIDGE RUNWAY TUNNEL GATE
DEFN: THE MEASUREMENT TAKEN AT RIGHT ANGLES TO THE LENGTH; BREADTH; THE MEASUREMENT OF THE EXTENT OF SOMETHING FROM SIDE TO SIDE
WINDBREAK

FEATURE: BARRIER

DEFN: A HEDGE, ROW OF TREES, OR FENCE SERVING TO LESSEN OR BREAK THE FORCE OF THE WIND

SOURCE: THE AMERICAN HERITAGE DICTIONARY
General Comments on the Work of the National Committee for Digital Cartographic Data Standards, Report No. 7.

NAME: ___________________________ WORK PHONE: _________________________

ADDRESS: ___________________________ EVENING PHONE: _________________________

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Your Comments Please:

SIGNED: ___________________________

DATE: ___________________________