

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27

**Information Technology – Geographic Information
Framework Data Content Standard
Part 7e: Inland waterways**

CAUTION NOTICE

This standard document may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Users of American National Standards may receive current information on all standards by contacting the American National Standards institute (ANSI).

34 Secretariat:
35 INFORMATION TECHNOLOGY INDUSTRY COUNCIL
36 Approved:
37 YEAR-MM
38 **American National Standards Institute**

Information Technology – Geographic Information Framework Data Content Standard
Part 7e: Inland waterways

39 **American**
40 **National**
41 **Standard**

66 Approval of an American National Standard requires verification by the
67 American National Standards Institute (ANSI) that the requirements for due
68 process, consensus, and other criteria for approval have been met by the
69 standards developer.
70
71 Consensus is established when, in the judgment of the ANSI Board of
72 Standards review, substantial agreement has been reached by directly and
73 materially affected interests. Substantial agreement means much more than
74 a simple majority, but not necessarily unanimity. Consensus requires that
75 all views and objections be considered, and that a concerted effort be made
76 toward their resolution.
77
78 The use of American National Standards is completely voluntary; their
79 existence does not in any respect preclude anyone, whether he or she has
80 approved the standards or not, from manufacturing, marketing, purchasing,
81 or using products, processes, or procedures not conforming to the standards.
82
83 The American National Standards Institute does not develop standards and
84 will in no circumstances give an interpretation of any American National
85 Standard. Moreover, no person shall have the right or authority to issue an
86 interpretation of an American National Standard in the name of the
87 American National Standards Institute. Request for interpretations should
88 be addressed to the secretariat or sponsor whose name appears on the title
89 page of this standard.
90
91
92
93
94
95
96
97

98
99 Published by:
100 Information Technology Industry Council
101 1250 Eye Street NW, Suite 200
102 Washington, DC 20005
103 Voice: 202.737.8888
104 FAX: 202.638.4922
105 WEB: www.itic.org

106
107 Copyright © by Information Technology Industry Council
108 All rights reserved.
109 No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise,
110 without the written permission of the publisher.
111 Printed in the United States of America.

112
113
114
115

| | | |
|-----|--|-----------|
| 116 | Contents | |
| 117 | Introduction | iv |
| 118 | 1 Scope | 1 |
| 119 | 2 Conformance | 1 |
| 120 | 3 Normative references | 1 |
| 121 | 4 Maintenance authority | 1 |
| 122 | 4.1 Level of responsibility | 1 |
| 123 | 4.2 Contact information | 1 |
| 124 | 5 Terms and definitions | 2 |
| 125 | 6 Symbols, abbreviated terms, and notations | 2 |
| 126 | 7 Inland waterways model | 2 |
| 127 | 7.1 Conceptual model for inland waterways | 2 |
| 128 | 7.1.1 TranFeature | 3 |
| 129 | 7.1.2 ProjectDepthArea | 3 |
| 130 | 7.1.3 MileMarker | 3 |
| 131 | 7.1.4 TranPoint | 3 |
| 132 | 7.1.5 TranSeg | 3 |
| 133 | 7.1.6 SailingLine | 3 |
| 134 | 7.2 Inland waterways data dictionary | 3 |
| 135 | Annex A (informative) Bibliography | 6 |
| 136 | Figures | |
| 137 | Figure 1 – Primary UML classes for inland waterways | 3 |
| 138 | Tables | |
| 139 | Table 1 – Data dictionary for inland waterways | 4 |
| 140 | | |

141 **Foreword**

142 Geographic information, also known as geospatial information, both underlies and is the subject
143 of much of the political, economic, environmental, and security activities of the United States. In
144 recognition of this, the United States Office of Management and Budget issued Circular A-16
145 (revised 2002), which established the Federal Geographic Data Committee (FGDC) as a
146 coordinating organization.

147 Work on this standard started under the Geospatial One-Stop e-Government initiative. The
148 standard was developed with the support of the member agencies and organizations of the
149 FGDC and aids in fulfilling a primary objective of the National Spatial Data Infrastructure (NSDI),
150 that is, creation of common geographic base data for seven critical data themes. The seven core
151 data themes are considered framework data of critical importance to the spatial data
152 infrastructure.

153 The increasing need to coordinate collection of new data, identify applicability of existing data,
154 and exchange data at the national level led to the submission of this standard to the ANSI
155 process to become an American National Standard. The national standard contained in this
156 document and its parts was sponsored by Technical Committee L1, Geographic Information
157 Systems, of the InterNational Committee for Information Technology Standards (INCITS), an
158 ANSI-accredited standards development organization.

159 As the Geographic Information Framework Data Content Standard was developed using public
160 funds, the U.S. Government will be free to publish and distribute its contents to the public, as
161 provided through the Freedom of Information Act (FOIA), Part 5 United States Code, Section 552,
162 as amended by Public Law No. 104-231, "Electronic Freedom of Information Act Amendments of
163 1996".

164 **Introduction**

165 The primary purpose of this part of the Geographic Information Framework Data Content
166 Standard is to support the exchange of navigable river (inland waterway) transportation data.
167 This part seeks to establish a common baseline for the semantic content of inland waterway
168 transportation databases for public agencies and private enterprises. It also seeks to decrease
169 the costs and simplify the exchange of inland waterway transportation data among local, Tribal,
170 State, and Federal users and producers. That, in turn, discourages duplicative data collection.
171 Benefits of adopting this part of the standard also include the long-term improvement of the
172 geospatial inland waterway transportation data within the community, the improved integration of
173 safety, emergency response, and enforcement data, and streamlined maintenance procedures.

174 This effort is derivative of an ongoing program within the U.S. Army Corps of Engineers (USACE),
175 called the Inland Electronic Navigation Charts (IENCs). The IENCs are posted on the Internet for
176 direct download for use as navigational charts for several of the major rivers within the United
177 States.

178 Part 7e: Inland Waterways is one of five parts within the Transportation theme of the Geographic
179 Information Framework Data Content Standard. Together, these five parts provide a multi-modal
180 view of transportation, including road infrastructure, rail systems, air transportation, and
181 conveyances or public transit. The Inland Waterways part is unique, in that the USACE maintains
182 8,200 miles of rivers in 22 States. As a part of the Geographic Information Framework Data
183 Content Standard, the Inland Waterways part can enable a capability to construct a detailed
184 multi-modal description of a transportation system.

185

186 **Framework Data Content Standard – Inland waterways**

187 **1 Scope**

188 The Geographic Information Framework Data Content Standard, Part 7e: Inland Waterways
189 provides common definitions and syntax to enable the use and exchange of geospatial data
190 content as compiled for the IENC. The part describes authoritative data content derived from the
191 IENC. It is expected that in conjunction with the other parts of the Transportation theme, this data
192 will support the construction of a complex multi-modal model from disparate data collections and
193 from a variety of different government entities.

194 **2 Conformance**

195 Each thematic part of the Framework Data Content Standard includes a data dictionary based on
196 the conceptual schema presented in that part. To conform to the Base Document (Part 0), a
197 thematic dataset shall satisfy the requirements of the data dictionary for that theme. It shall
198 include a value for each mandatory element, and a value for each conditional element for which
199 the condition is true. It may contain values for any optional element. The data type of each value
200 shall be that specified for the element in the data dictionary and the value shall lie within the
201 domain specified for the element.

202 **3 Normative references**

203 Annex A of the Base Document (Part 0) lists normative references applicable to two or more parts
204 of the standard, including those other than the transportation parts. No additional normative
205 references are specified in the Transportation Base (Part 7). Informative references applicable to
206 the Inland Waterways part only are listed in Annex A. Informative references applicable to two or
207 more transportation parts only are listed in Annex C of the Transportation Base. Annex D of the
208 Base Document lists informative references applicable to two or more of the parts, including
209 those other than the transportation parts.

210 **4 Maintenance authority**

211 **4.1 Level of responsibility**

212 The FGDC is the responsible organization for coordinating work on all parts of the Geographic
213 Information Framework Data Content Standard. The United States Department of Transportation
214 (USDOT), working with the FGDC, is the responsible organization for coordinating work on the
215 Geographic Information Framework Data Content Standard, Part 7: Transportation Base and
216 subparts (Parts 7a, 7b, 7c, and 7d, excluding 7e) and is directly responsible for development and
217 maintenance of the transportation parts (excluding Part 7e) of the Framework Data Content
218 Standard. The development and maintenance authority for Part 7e: Inland Waterways is the U.S.
219 Army Corps of Engineers.

220 The FGDC shall be the sole organization responsible for direct coordination with the InterNational
221 Committee for Information Technology Standards (INCITS) concerning any maintenance or any
222 other requirements mandated by INCITS or ANSI.

223 **4.2 Contact information**

224 Address questions concerning this part of the standard to:

225 Federal Geographic Data Committee Secretariat
226 c/o U.S. Geological Survey
227 590 National Center
228 Reston, Virginia 20192 USA

229 Telephone: (703) 648-5514
230 Facsimile: (703) 648-5755

231 Internet (electronic mail): gdc@fgdc.gov
232 WWW Home Page: <http://fgdc.gov>

233 **5 Terms and definitions**

234 Definitions applicable to the Inland Waterways part are listed here. These definitions derive from
235 the IENC encoding guide [USACE]. Other terms and definitions applicable to multiple
236 transportation parts of the standard are listed in the Transportation Base (Part 7). More general
237 terms and definitions can be found in the Base Document (Part 0) part of the standard. Users are
238 advised to consult these documents for a complete set of definitions.

239 **5.1** 240 **depth contour**

241 contour of equal water depth, which is sometimes significantly displaced outside of soundings,
242 symbols, and other chart detail for clarity as well as generalization

243 NOTE Depth contours, therefore, often represent an approximate location of the line of equal depth as
244 related to the surveyed line delineated on the source.

245 **5.2** 246 **mile marker**

247 distance mark not physically installed, denoting a system of reference for position along a
248 waterway

249 **5.3** 250 **sailing line**

251 generally accepted course or route on inland waterways used for navigation by commercial
252 vessels

253 NOTE The line is not always in the center of the river or waterway.

254 **6 Symbols, abbreviated terms, and notations**

255 The following symbols, abbreviations, and notations are applicable to the Inland Waterways part.
256 Those common to two or more transportation parts are listed in the Transportation Base (Part 7).
257 Symbols, abbreviations, and notations applicable to multiple parts, including the transportation
258 parts, are listed in the Base Document (Part (0)).

259 IENC – Inland Electronic Navigation Chart

260 USACE – U.S. Army Corps of Engineers

261 **7 Inland waterways model**

262 **7.1 Conceptual model for inland waterways**

263 Subsections are presented below for this UML model. The following information includes a
264 narrative for context and understanding, and a table to define the contents.

265

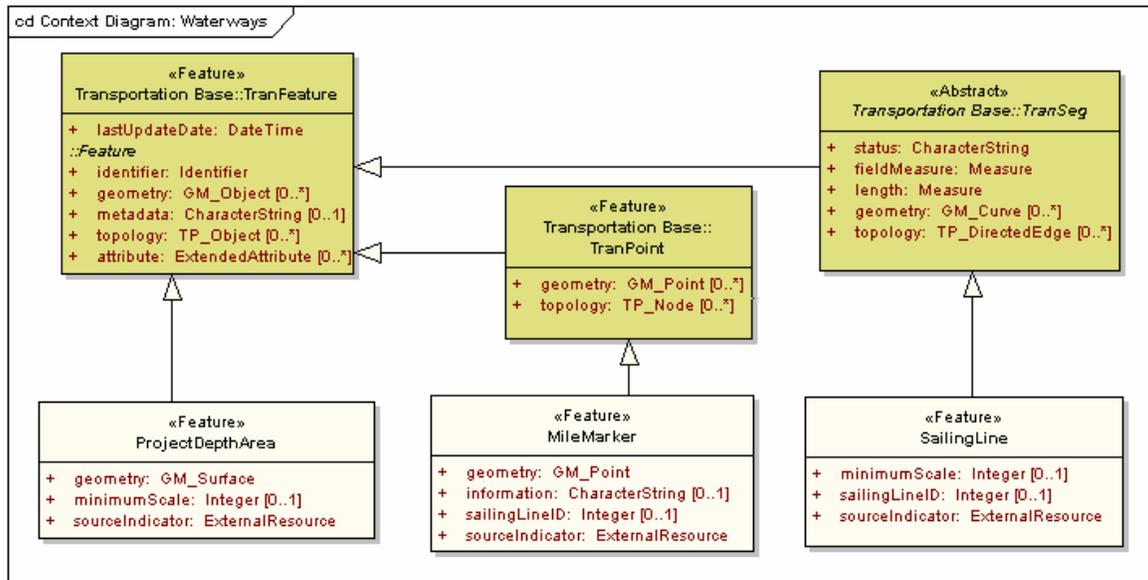


Figure 1 – Primary UML classes for inland waterways

266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294

7.1.1 TranFeature

TranFeature is a superclass as referenced by the inland waterways model. See the Transportation Base part of the standard for a full description of TranFeature. TranFeature generalizes all of the feature subclasses in the inland waterways model.

7.1.2 ProjectDepthArea

ProjectDepthArea is a subclass of TranFeature. ProjectDepthArea has polygon geometry that represents the area within the waterway bounded by a depth contour that denotes the designated navigation area with a minimum depth of 9 feet.

7.1.3 MileMarker

MileMarker is a subclass of TranPoint. MileMarker has point geometry that describes the position of a mile marker in or near the waterway to serve as a reference for distance along the waterway.

7.1.4 TranPoint

TranPoint is a subclass of TranFeature. See the Transportation Base part of the standard for a full description of TranPoint.

7.1.5 TranSeg

TranSeg is a subclass of TranFeature. See the Transportation Base part of the standard for a full description of TranSeg.

7.1.6 SailingLine

SailingLine is a subclass of TranSeg. SailingLine describes the sailing line, or recommended transit route, based on sufficient water depth and permitted passage along the waterway, between the 9-foot depth contours.

7.2 Inland waterways data dictionary

The data dictionary (see Table 1) describes the characteristics of the Inland Waterways part classes presented in the UML diagram in Figure 1. The data dictionary is structured in accordance with the Base Document (Part 0).

Table 1 – Data dictionary for inland waterways

| Line | Name/Role name | Definition | Obligation/Condition | Maximum Occurrence | Data Type | Domain |
|------|------------------|--|----------------------|--------------------|---|----------------------|
| 1 | ProjectDepthArea | Area within the waterway bounded by a depth contour of at least 9 feet | | | <<Feature>> | Lines 2-4 |
| 2 | geometry | Area feature that denotes a water depth of at least 9 feet within the waterway | M | 1 | <<Type>> GM_Surface | Defined in ISO 19107 |
| 3 | minimumScale | Denominator of a ratio that is the recommended minimum scale for viewing | O | 1 | Integer | > 0 |
| 4 | sourceIndicator | Character string referencing the authoritative source of the data entity | M | 1 | <<DataType>> Framework:: ExternalResource | Unrestricted |
| 5 | MileMarker | Abstraction of the mile markers along the waterway | | | <<Feature>> | Lines 6-9 |
| 6 | geometry | Unique point that represents the position of a waterway mile marker | M | 1 | <<Type>> GM_Point | Defined in ISO 19107 |
| 7 | information | Additional information related to the mile marker | O | 1 | CharacterString | Unrestricted |
| 8 | sailingLineID | Unique integer that associates MileMarker with a particular SailingLine | O | 1 | Integer | > 0 |
| 9 | sourceIndicator | Character string referencing the authoritative source of the data entity | M | 1 | <<DataType>> Framework:: ExternalResource | Unrestricted |
| 10 | SailingLine | Recommended transit route along the length of a waterway within the ProjectDepthArea | | | <<Feature>> | Lines 11-13 |
| 11 | minimumScale | Recommended minimum scale for viewing | O | 1 | Integer | > 0 |

Information Technology – Geographic Information Framework Data Content Standard
 Part 7e: Inland waterways

| Line | Name/Role name | Definition | Obligation/ Condition | Maximum Occurrence | Data Type | Domain |
|------|-----------------|--|--------------------------|-----------------------|---|--------------|
| 12 | sailingLineID | Unique integer that identifies a particular SailingLine | O | 1 | Integer | > 0 |
| 13 | sourceIndicator | Character string referencing the authoritative source of the data entity | M | 1 | <<DataType>> Framework:: ExternalResource | Unrestricted |

296
297
298

**Annex A
(informative)
Bibliography**

299 The following documents contain provisions that are relevant to this part of the Framework Data
300 Content Standard. Informative references applicable to two or more transportation parts only are
301 listed in Annex C of the Transportation Base (Part 7). Annex D of the Base Document (Part 0)
302 lists informative references applicable to two or more of the parts of the standard, including the
303 transportation parts. For dated references, only the edition cited applies. For undated
304 references, the latest edition of the referenced document applies.

305 ANSI and ISO standards may be purchased through the ANSI eStandards Store at
306 <http://webstore.ansi.org/ansidocstore/default.asp>, accessed October 2006.

307 USACE, April 2005, Inland electronic navigational chart, Chart no. 1 and encoding guide,
308 (Version 3.0)