Accuracy and Suitability Analysis of Map 92337

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Introduction:

Map 92337 was adopted by Congress to provide for a reciprocal exchange of easements between the Federal government and the State of Alaska. The Federal government received access across State lands to access log transfer facilities and marine access points and the State was granted transportation and utility corridors throughout the Tongass National Forest to connect the communities of Southeast Alaska. Because the accuracy of map 92337 was not explicitly stated, professional best practice would be to use the map as a conceptual depiction of road easements and for the US Forest Service (USFS) and the State to work together to establish easements that best serve the public interest by avoiding environmentally or culturally sensitive locations and are economical to build. This approach would save the the taxpayers money, protect the environment, and meet the intent of Congress--all desirable things for both the Federal government and the State.

A prior version of map 92337 dated January 22, 2004 has the following in the legend: *"Disclaimer: Boundaries and locations are approximate. This map should not be used or interpreted for legal or administrative actions."* This statement is quite clear and should have been included on the final map adopted by Congress. Whatever the reason for it being dropped from the final map dated June 15, 2005, this statement gives a clear indication of the quality (*"locations are approximate"*) and suitability of purpose (*"should not be used or interpreted for legal or administrative actions"*). Unless the entire map was redrawn using source data of known high accuracy, this statement would still hold for the final map. The lack of any metadata describing the source information used to draw the map, documenting procedures used to make the map, or estimating accuracy of map 92337 is a major problem discussed in detail below.

The USFS prepared a document titled "Map 92337 talking points" which describes how they believe the map should be interpreted. Unfortunately, the talking points memo contains statements and assumptions that are not in accordance with industry standards used by cartographers and surveyors. Below, specific statement from the "Map 92337 talking points" document are analyzed and discussed in the context of standard industry practices.

Quotations from and analysis of "Map 92337 talking points" document:

"The map does not have a map accuracy statement, therefore no standard applies."
Incorrect: Lacking a statement, based upon the US National Map Accuracy Standards, the map accuracy is inferred from the scale, if the map was published by cartographers following industry standard practices. If not prepared using standard practices, there is absolutely no implication of accuracy, especially high accuracy. If the map was prepared without stated accuracy or a scale-implied accuracy, it has the accuracy of a crayon drawing on a napkin. A crayon drawing on a napkin can convey tremendous conceptual information. A drawing of this kind contains no accurate data and certainly no data that could be used to establish real property boundaries. Therefore, because the map does not have a stated accuracy, one of two choices applies: either the accuracy can be inferred from the published map scale or the map is merely a conceptual drawing with no accuracy whatsoever. It is contrary to professional practices to attempt to infer precise coordinates from a map lacking stated or implied accuracy. It is in accordance with profession practices to infer information and intent (not coordinates) from a map of unknown or unstated accuracy.

"Modern digital technology allows us to improve the accuracy of a map using the same methodology used to test for map accuracy."
Incorrect: Map accuracy cannot simply be improved using any technology, digital or otherwise. The accuracy of a given map is an inherent property. A new, more accurate map can be created based on conceptual information depicted in a map of low or unknown accuracy. For example, if a map of low or unknown accuracy depicted a road easement as running along the top of a ridge or along a coastline, a more accurate centerline for that road easement could be created by several methods. Examples of how a more accurate map could be produced: (1) a survey crew could walk the ridge or coastline with a high accuracy GPS and determine precise coordinates; (2) a GIS analyst could load a orthoimage (map image) or elevation model of known accuracy into a GIS software and digitize (draw electronically) a road easement centerline vector along the ridge or coastline of an accuracy equal to that of the orthoimage or elevation model they were digitizing from. To summarize: a map's accuracy cannot simply be improved; however, a map of low or unknown accuracy can be used to infer information that is used to create a new, more accurate map.

"Congress chose to use the yellow line on the map regardless of any positional inaccuracy that may be inherently contained in the map."
Incorrect: It is contrary to professional practice to attempt to infer coordinates of higher accuracy from a map than that map's accuracy supports. Congress chose to grant easements along the lines conceptually depicted on map 92337. The lack of a stated accuracy on the map and the lack any other associated descriptive metadata regarding the map's suitability to purpose limits how the map can be used. It is an overreach contrary to professional cartographic practices to state that a map of undocumented and unknown accuracy was accepted by Congress as literal

geographic coordinate truth. Standard professional practice is to interpret a map such as 92337 as depiction of conceptual intent regardless of the audience, including Congress.

"Using the maximum range of error permissible to meet NMAS as a buffer is a mis-use of the standard."
Incorrect: The overall problem with map 92337 is that it contains no statement of accuracy or suitability of purpose. A prior version of map 92337 dated January 22, 2004 has the following in the legend: *"Disclaimer: Boundaries and locations are approximate. This map should not be used or interpreted for legal or administrative actions."* This statement is clear that map 92337 has no inherent accuracy and that coordinates are approximate and no rigorous measurements should be made using the map. However, if map 92337 is going to be interpreted as map product with an accuracy implied by its scale of publication, applying the NMAS error as buffer to use as a guideline is an extremely rational and statistically valid approach. The 1:754,286 map publication scale implies a NMAS accuracy of 1257 feet. This means that 90% of the points on the map fall within 1257 feet of their true location on the Earth. It is rational to buffer the line by 1257 feet on each side because this leads to an easement centerline that has a 90% probability of being within the yellow line on the map presented to Congress. As stated previously, interpreting map 92337 as anything other than a conceptual depiction of intent is fraught with problems. However, if this approach is taken, a systematic technique that draws from the information that can be inferred and mathematically and statistically derived using professional best practices is the only rigorous approach. Buffering the yellow line by 1257 feet on both sides, measuring out from the edge of the yellow line on both sides, gives the surveyors and engineers laying out the easement boundaries a 90% chance of meeting the intent of Congress.

Without going too deeply into the statistical underpinnings of the NMAS and NSSDA accuracy standards, the description in the "talking points memo" of the how the two accuracy standards assess accuracy is measured is correct: NMAS is based on a threshold evaluation and NSSDA is based on a computation of the statistical distribution of accuracies. However, both are governed by the same fundamental statistical properties of measurements. For any accuracy measurement method--including NMAS or NSSDA--standard statistical assumptions about the distribution of measurement error (accuracy) are required. From these properties of normal (Gaussian) distributions of measurement errors, the NMAS and NSSDA standards can be related to each other rigorously. The "talking points memo" attempts to imply that NMAS is an old, defunct, no longer applicable standard. It is true that advances in computing and digital map production and surveying have led to more statistically rigorous method for assessing accuracy. However, the laws of nature and statistics did not change in the 51 years between publication of the NMAS (1947) and NSSDA (1998) standards. To summarize, if the ill-advised approach of attempting to derive coordinates from map 92337--which has no stated accuracy--is taken, falling back to accuracies implied by the map publication scale and the NMAS is a professionally accepted practice. The fact that there are newer assessment methods better suited to modern digital map making and surveying in the NSSDA standard does not invalidate NMAS. The NSSDA standards do not provide a method for inferring accuracy from publication scale. The

only way accuracy is depicted in NSSDA is by explicit statement of the measured accuracy statistics. Period. This leaves the long standing, proven, widely used, and still statistically valid NMAS standard to be the professionally accepted method to infer map accuracy from publication scale.

Lack of metadata--an enormous problem:

The “Map 92337 talking points” memo goes through considerable contortions attempting to get at “the truth.” One of the most fundamental responsibilities of a geospatial and mapping practitioner is to document their products with metadata. The US has a Federal Geographic Data Committee which has published the Content Standards for Digital Geospatial Metadata (FGDC CSDGM). These standards are universally adopted across all public and private sector organizations. One of the very core, most fundamental standard practices is to document map products with FGDC CSDGM. This is required by Federal regulation for all Federal agencies and is widely adhered to.

The case was made above that taking the coordinates from an undocumented GIS file to attempt to establish precise coordinates for the boundaries of a road easement corridor is an extremely bad idea in terms of common sense, the intent of Congress, and standard industry practices. Even beyond that, the lack of metadata for the file leaves the user without critical knowledge such as the accuracy, provenance, and applicability of the data. All of these critical pieces of information should have been documented in a FGDC CSDGM metadata file if the organization creating the map intended to use it for anything other than a conceptual depiction.

The prior version of map 92337 dated January 22, 2004 was documented with general yet clear metadata in the legend: *“Disclaimer: Boundaries and locations are approximate. This map should not be used or interpreted for legal or administrative actions.”* This statement says the map is not accurate *(“locations are approximate”)* and only conveys intent (*“should not be used or interpreted for legal or administrative actions”*). Given that this is the only metadata ever associated with the map product, it would be prudent to accept this statement at face value given there is no subsequent documentation (newer metadata) to the contrary.

Of all the best practices and industry standards referred to in this document, the lack of metadata is perhaps the most damning for interpretation of map 92337 as a cartographic product from which coordinates can be derived. This is a requirement taught in the first hours of introductory GIS training classes and reinforced constantly by regulations, industry practice, and peer pressure. If the creators of map 92337 had intended for it to be used to depict actual coordinates, they had a professional obligation to document the map with metadata. By not documenting map 92337 with metadata, its creators imply its data’s accuracy, provenance, and applicability are unknown and that it is best interpreted as a conceptual sketch depicting intent.

Conclusion:

Professional best practices would have map 92337 used as a guide to the intent of Congress. In an ideal situation, the USFS and State would work together to interpret the Congressional intent and to establish easements that are the most economical use of taxpayer funds and the least impactful to environmental and cultural resources. However, map 92337 could possibly be used to establish corridor boundaries. This is not advisable and an over-interpretation of the map, but if it comes to that, there are long-established methods for inferring accuracy and statistical uncertainty from published map scale. Professional standards call for buffering the outside edge of the yellow line's coordinates by 1257 feet on both sides. If the width of the yellow line could be established, based upon the US National Map Accuracy Standard, a road easement within a corridor measured out 1257 feet from the outside edge of the yellow line would have a 90% chance of meeting the intent of Congress.

References:

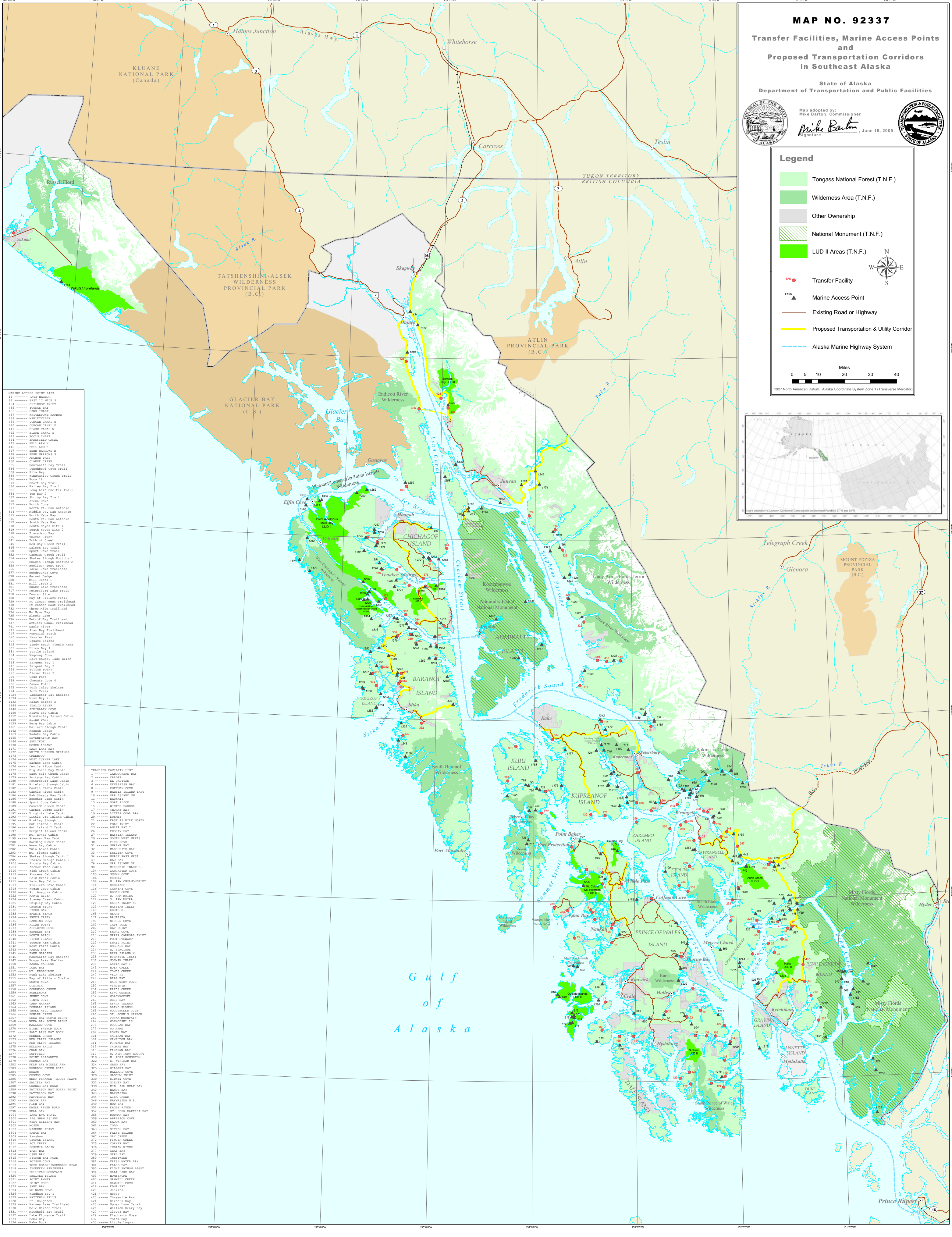
U.S. Bureau of the Budget, 1947. *United States National Map Accuracy Standards* (http://nationalmap.gov/standards/pdf/NMAS647.PDF)

Federal Geographic Data Committee, 1998. *Content Standard for Digital Geospatial Metadata (CSDGM), Vers. 2 (FGDC-STD-001-1998)* (https://www.fgdc.gov/standards/projects/metadata/base-metadata/v2_0698.pdf)

Federal Geographic Data Committee, 1998. *Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy. (FGDC-STD-007.3-1998)* (https://www.fgdc.gov/standards/projects/accuracy/part3/chapter3)

Attached:

- Map 92337, reduced to fit an 8.5 x 11-inch paper
- Legend with disclaimer for map draft dated January 22, 2004
- "Map 92337 talking points" memorandum



MARINE ACCESS POINT LIST
16 ------- RATZ HARBOR
62 ------- EAST 12 MILE S
434 ------ CHILKOOT INLET
435 ------ YOUNGS BAY
436 ------ HAWK INLET
437 ------ WHITESTONE HARBOR
438 ------ MANLEYVILLE
439 ------ DUNCAN CANAL W
440 ------ DUNCAN CANAL E
441 ------ BLAKE CANAL W
442 ------ BLAKE CANAL E
443 ------ FOOLS INLET
444 ------ BRADFIELD CANAL
445 ------ BELL ARM N
446 ------ BELL ARM S
447 ------ BEHM NARROWS N
448 ------ BEHM NARROWS S
449 ------ ANCHOR PASS
450 ------ CLAUDE CREEK
565 ------ Manzanita Bay Trail
566 ------ Punchbowl Cove Trail
568 ------ Ella Bay
569 ------ Winstanley Creek Trail
576 ------ Boca 16
579 ------ Short Bay Trail
580 ------ Bailey Bay Trail
581 ------ Long Lake Shelter Trail
584 ------ Yes Bay 2
587 ------ Shrimp Bay Trail
610 ------ Arena Cove
612 ------ North Cove
613 ------ North Pt. San Antonio
614 ------ Middle Pt. San Antonio
615 ------ North Veta Bay
616 ------ South Pt. San Antonio
617 ------ South Veta Bay
618 ------ South Noyes Site 1
619 ------ South Noyes Site 2
620 ------ Tracadaro Bay
635 ------ Thorne River
641 ------ Tokhini Creek
645 ------ Red Bay Creek Trail
646 ------ Salmon Bay Trail
650 ------ Spurt Cove Trail
652 ------ Cascade Creek Trail
654 ------ Shakes Slough Hottubs 1
655 ------ Shakes Slough Hottubs 2
658 ------ Hooligan Tent Spot
666 ------ Ideal Cove Trailhead
677 ------ Woodpecker Cove
678 ------ Garnet Ledge
680 ------ Mill Creek 1
681 ------ Mill Creek 2
701 ------ Kunkk Lake Trailhead
717 ------ Petersburg Lake Trail
718 ------ Duncan Site
728 ------ Bay of Pillars Trail
729 ------ Pt Camden West Trailhead
730 ------ Pt Camden East Trailhead
732 ------ Three Mile Trailhead
734 ------ No Name Bay
735 ------ Alecks Lake
736 ------ Petrof Bay Trailhead
737 ------ Affleck Canal Trailhead
741 ------ Eagle River
742 ------ Anan Bay Trailhead
747 ------ Memorial Beach
820 ------ Hassler Pass
826 ------ Square Island
845 ------ Sandy Beach Picnic Area
863 ------ Union Bay 4
881 ------ Turtle Island
884 ------ Nagosay Cove
889 ------ Salt Chuck, Lake Ellen
913 ------ Sargent Bay 1
916 ------ Sargent Bay 2
924 ------ BUTTON POINT
926 ------ Clover Pass 2
929 ------ Cruz Pass
938 ------ Checats Cove 4
966 ------ Canoe Point
975 ------ Polk Inlet Shelter
994 ------ Polk Creek
1029 ----- Lancaster Bay Shelter
1074 ----- Mink Bay 2
1132 ----- Nakat Harbor 2
1144 ----- ITALIO RIVER
1148 ----- ADMIRALTY COVE
1150 ----- Alava Bay Cabin
1152 ----- Winstanley Island Cabin
1158 ----- BLIND PASS
1159 ----- Berg Bay Cabin
1161 ----- Mallard Slough Cabin
1162 ----- Koknuk Cabin
1163 ----- Kadake Bay Cabin
1165 ----- SEVENFATHOM BAY
1166 ----- SHELIKOF
1170 ----- MOSER ISLAND
1171 ----- SALT LAKE BAY
1172 ----- WHITE SULPHER SPRINGS
1173 ----- GREENTOP
1174 ----- WEST TURNER LAKE
1175 ----- Barnes Lake Cabin
1176 ----- Devils Elbow Cabin
1177 ----- Big Johns Bay Cabin
1178 ----- East Salt Chuck Cabin
1179 ----- Portage Bay Cabin
1180 ----- Petersburg Lake Cabin
1181 ----- Brieland Slough Cabin
1182 ----- Castle Flats Cabin
1183 ----- Castle River Cabin
1184 ----- Kah Sheets Bay Cabin
1186 ----- Beecher Pass Cabin
1188 ----- Spurt Cove Cabin
1189 ----- Cascade Creek Cabin
1191 ----- Garnet Ledge Cabin
1192 ----- Virginia Lake Cabin
1193 ----- Little Dry Island Cabin
1194 ----- Binkley Slough
1195 ----- Gut Island 1 Cabin
1196 ----- Gut Island 2 Cabin
1197 ----- Sergief Island Cabin
1198 ----- Mt. Rynda Cabin
1199 ----- Steamer Bay Cabin
1200 ----- Harding River Cabin
1201 ----- Anan Bay Cabin
1202 ----- Twin Lakes Cabin
1203 ----- Mt. Flemer Cabin
1204 ----- Shakes Slough Cabin 1
1205 ----- Shakes Slough Cabin 2
1206 ----- Frosty Bay Cabin
1207 ----- Anchor Pass Cabin
1210 ----- Fish Creek Cabin
1213 ----- Phocena Cabin
1214 ----- Helm Creek Cabin
1215 ----- Helm Bay Cabin
1217 ----- Trollers Cove Cabin
1218 ----- Kegan Cove Cabin
1220 ----- Pt. Amagura Cabin
1222 ----- KARTA RIVER
1224 ----- Staney Creek Cabin
1225 ----- Shipley Bay Cabin
1231 ----- CHURCH BIGHT
1232 ----- PYBUS BAY
1233 ----- BRENTS BEACH
1234 ----- FREDS CREEK
1235 ----- SAMSING COVE
1236 ----- ALLAN POINT
1237 ----- APPLETON COVE
1238 ----- BERNERS BAY
1239 ----- NORTH BEACH
1240 ----- PIPER ISLAND
1241 ----- Towers Arm Cabin
1242 ----- West Point Cabin
1243 ----- KANGA BAY
1245 ----- TAKU GLACIER
1246 ----- Manzanita Bay Shelter
1247 ----- Nooya Lake Shelter
1250 ----- KAKUL NARROWS
1251 ----- LONG BAY
1252 ----- MT. EDGECUMBE
1253 ----- Kunk Lake Shelter
1255 ----- Bay of Pillars Shelter
1256 ----- NORTH NEVA
1257 ----- OTSTOIA
1258 ----- CORDWOOD CREEK
1259 ----- HOMESHORE
1261 ----- SUNNY COVE
1262 ----- PINTA COVE
1263 ----- DAMP MARKER
1264 ----- DOUGLAS ISLAND
1265 ----- THREE HILL ISLAND
1266 ----- FOWLER CREEK
1267 ----- NEKA BAY NORTH BIGHT
1268 ----- NEKA BAY SOUTH BIGHT
1269 ----- MALLARD COVE
1270 ----- EIGHT FATHOM DOCK
1271 ----- SALT LAKE BAY DOCK
1272 ----- KENNEL CREEK
1273 ----- RED CLIFF ISLANDS
1274 ----- RED CLIFF ISLANDS
1275 ----- NELSON FALLS
1276 ----- CRAB BAY
1277 ----- DUFFIELD
1278 ----- POINT ELIZABETH
1279 ----- RODMAN BAY
1282 ----- KELP BAY MIDDLE ARM
1283 ----- BOURBON CREEK ROAD
1284 ----- NOXON
1285 ----- COSMOS COVE
1286 ----- WEST TENAKEE (GOOSE FLATS
1287 ----- SALTERY BAY
1288 ----- CORNER BAY ROAD
1289 ----- PATTERSON BAY NORTH POINT
1290 ----- PATTERSON BAY
1292 ----- PATTERSON BAY
1293 ----- SAOOK BAY
1294 ----- FISH BAY
1297 ----- EAGLE RIVER ROAD
1298 ----- SEAL BAY
1299 ----- LAKE EVA TRAIL
1300 ----- BIG SHAW ISLAND
1301 ----- WEST GILBERT BAY
1302 ----- MOSER
1303 ----- NISMENI POINT
1304 ----- HANUS BAY
1309 ----- Fanshaw
1310 ----- GEORGE ISLAND
1311 ----- FOX CREEK
1312 ----- BOHEMIA BASIN
1313 ----- TRAP BAY
1314 ----- USHK BAY
1315 ----- SITKOH BAY ROAD
1316 ----- POISON COVE
1317 ----- TODD ROAD/LINDENBERG HEAD
1318 ----- IYOUKEEN PENINSULA
1319 ----- SULLIVAN MOUNTAIN
1320 ----- SHELTER ISLAND
1321 ----- POINT AMNER
1322 ----- POINT COKE
1323 ----- SAND BAY
1324 ----- NO NAME COVE
1326 ----- Windham Bay 1
1327 ----- KATZEHIN FALLS
1328 ----- Pt. Houghton
1329 ----- Harvey Lake Trailhead
1330 ----- Mole Harbor Trail
1331 ----- Mitchell Bay Trail
1332 ----- Lake Florence Trail
1333 ----- Bobs Bay
1334 ----- Naha Dock

TRANSFER FACILITY LIST
1 ------- LABOUCHERE BAY
2 ------- CALDER
3 ------- EL CAPITAN
6 ------- DEVILFISH BAY
8 ------- COFFMAN COVE
9 ------- MARBLE ISLAND EAST
10 ------ ORR ISLAND SW
11 ------ NAUKATI
13 ------ PORT ALICE
15 ------ WINTER HARBOR
17 ------ THORNE BAY
19 ------ LITTLE COAL BAY
20 ------ SUEMEZ
21 ------ EAST 12 MILE NORTH
22 ------ POLK INLET
23 ------ ANITA BAY 2
26 ------ FROSTY BAY
27 ------ HASSLER ISLAND
29 ------ SOUTH WEST NEETS
30 ------ FIRE COVE
31 ------ SHRIMP BAY
32 ------ MARGURITE BAY
33 ------ SHELTER COVE
34 ------ WHALE PASS WEST
47 ------ KLU BAY
76 ------ ORR ISLAND SE
98 ------ McKENZIE INLET E.
104 ----- LANCASTER COVE
105 ----- SUNNY COVE
106 ----- CHOMLY
108 ----- W. ARM CHOLMONDELEY
114 ----- SHELIKOF
116 ----- CANNERY COVE
119 ----- KEGAN COVE
120 ----- W. ARM MOIRA
124 ----- S. ARM MOIRA
128 ----- KASSA INLET N.
129 ----- HASSIAH INLET
149 ----- KEETE S.
165 ----- MEARS
171 ----- BAUTISTA
190 ----- NICHEN COVE
200 ----- CAPE POLE
207 ----- ELF POINT
210 ----- SHOAL COVE
215 ----- UPPER CARROLL INLET
219 ----- PORT STEWART
222 ----- SNAIL POINT
223 ----- EMERALD BAY
224 ----- N. SPACIOUS
233 ----- DEER ISLAND W.
235 ----- BURNETTE INLET
236 ----- MOSMAN INLET
239 ----- ANITA BAY 1
243 ----- HOYA CREEK
244 ----- TOM'S CREEK
247 ----- VEGA PT.
248 ----- BERG BAY
249 ----- EARL WEST COVE
250 ----- VIRGINIA
251 ----- PAT'S CREEK
252 ----- KING GEORGE
259 ----- WORONKOFSKI
260 ----- DEEP BAY
263 ----- RYNDA ISLAND
264 ----- BLIND SLOUGH
265 ----- WOODPECKER COVE
266 ----- ST. JOHN'S HARBOR
267 ----- TONKA MOUNTAIN
269 ----- WOEWODSKI IS.
273 ----- DOUGLAS BAY
277 ----- NO NAME
297 ----- ROWAN BAY
301 ----- SAGINAW BAY
304 ----- HAMILTON BAY
311 ----- PORTAGE BAY
312 ----- THOMAS BAY
315 ----- FANSHAW BAY
317 ----- N. ARM PORT HOUGHT
319 ----- N. PORT HOUGHTON
322 ----- S. WINDHAM BAY
324 ----- SAND BAY
325 ----- GILBERT BAY
327 ----- MALLARD COVE
329 ----- SLOCUM INLET
330 ----- KIDNEY COVE
332 ----- SILVER BAY
339 ----- MID. ARM KELP BAY
340 ----- HANUS BAY
343 ----- NAKWASINA
344 ----- LISA CREEK
346 ----- NAKWASINA N.E.
349 ----- MUD BAY
351 ----- EAGLE RIVER
352 ----- ST. JOHN BAPTIST BAY
358 ----- RODMAN BAY
359 ----- APPLETON COVE
360 ----- SAOOK BAY
361 ----- TODD
363 ----- SITKOH BAY
364 ----- FALSE ISLAND
367 ----- OLY CREEK
372 ----- FINGER CREEK
375 ----- CORNER BAY
376 ----- INDIAN RIVER
377 ----- CRAB BAY
379 ----- SEAL BAY
380 ----- INBETWEEN
381 ----- FRESH WATER BAY
384 ----- FALSE BAY
393 ----- EIGHT FATHOM BIGHT
394 ----- SALT LAKE BAY
403 ----- HOMESHORE
407 ----- SAWMILL CREEK
414 ----- SAWMILL COVE
418 ----- EDNA BAY
420 ----- Jenkins
421 ----- Moose
423 ----- Threemile Arm
424 ----- Berners Bay
425 ----- Upper Lynn Canal
426 ----- William Henry Bay
427 ----- Clover Bay
429 ----- Elephants Nose
432 ----- Totam Bay
433 ----- Little Lagoon

Transfer Facilities, Marine Access Points and Proposed Transportation Corridors in Southeast Alaska

Legend

- LUD II Areas
- Wilderness Area
- Other Ownership
- National Monument
- 125 Transfer Facility
- 1136 Marine Access Point
- Existing Road or Highway
- Proposed Transportation & Utility Corridor
- Alaska Marine Highway System

N

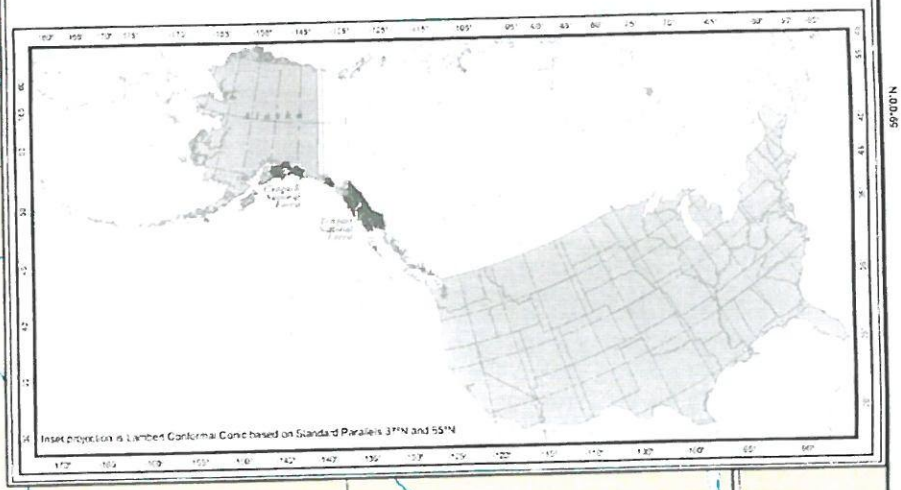
Miles

0 5 10 20 30 40

Disclaimer: Boundaries and locations are approximate. This map should not be used or interpreted for legal or administrative actions.

Prepared January 22, 2004 by USDA Forest Service Region 10, Geometronics

1927 North American Datum. Alaska Coordinate System Zone 1 (Transverse Mercator)



Dease Lake

60°0.0'N

59°0.0'N

Map 92337 talking points

The National Map Accuracy Standard is intended as a data usability standard with which map and map data producers communicate the accuracy of map and data users. It allows the user to determine whether a map or dataset is appropriate for their use. It does not indicate how accurate any given map feature is, just whether a selection of well defined points are within acceptable tolerances. If after testing the map meets the standard, the statement "This map complies with National Map Accuracy Standards" is placed on the map or in its metadata. Based on the accurancy statement the user determines whether the data analysis is acceptable for his intended use.

Congress did not assess the usability of the map base for the purpose for which it used it. The map does not have a map accuracy statement, therefore no standard applies.

How do you determine if a map meets National Map Accuracy Standards?

1. Basically, there are 2 iterations of Map Accuracy Standards. The June 1947 National Map Accuracy Standard (NMAS) "Threshold" method, and the 1998 National Standard for Spatial Data Accuracy (NSSDA) "root-mean-square error" method . The former is an update to the latter because "map dependent measures of accuacy ...were not fully applicable when digital geospatial data can be readily manipulated and output to any scale or data format".
2. Both methods require rigourous testing to establish the accuracy of well defined points.
    1. The 92337 map was "published" without a map accuracy statement. By mapping standard protocol that means **the map was not evaluated for map accuracy and has no established accuracy threshold.**
    2. Using the PDF as a source of measurement to eliminate any paper stretch, the 92337 map was "published" at the scale of 1:754,286.
    3. **Map accuracy is based on analysis of well-defined points, not a buffer of expected error.**
        a. To meet the June 1947 NMAS threshold, 90% of the well-defined points have to be within 1257 feet of the same point on a higher standard product. The higher standard product could be a GPS field survey or a highly accurate map or data source such as the new Alaska IFSAR data.
            i. In theory 89% of points could be dead-on to the centimeter, and still not meet the accuracy standard, or 90% of the points could be 1256 feet from true position and still meet the standard.
        b. Under the NSSDA, the analysis just shows the root-mean-square-error of tested points. It has no 1/50th threshold. That has been eliminated in the new standard.

Using the maximum range of error permissible to meet NMAS as a buffer is a miss-use of the standard.

1. **The standard is to inform users of appropriate use of the data, not to assume the extent of untested error.**
2. **The new NSSDA standard eliminates the "threshold distance".**

Modern digital technology allows us to improve the accuracy of a map using the same methodology used to test for map accuracy.

1. Geo-referencing can be used to adjust well defined points on the map to their true position as established by the higher accuracy data.
    - The new AK IFSAR is available as a higher accuracy source.
    - Algorithms adjust the remaining un-defined points to the accuracy of the defined points.
        - The spatial relationships of all features to one another are preserved, but adjusted mathematically to best fit upon the higher accuracy source terrain.
        - The "fabric" of the old map is warped to fit the highly accurate data model.
    - **The centerline of the 92337 corridors adjust to fit the highly accurate data model as well as the quality and proximity of the well-defined points, and spatial relataionships allow**.
    - The centerlines have coordinate values that can be precisely located on the ground using GPS.

Summary:

Congress chose to use the yellow line on the map regardless of any positional inaccuracy that may inherently be contained in the map. Establishing the accuracy of Map 92337 would require testing. National Map Accuracy Standard does not provide positional inaccuracy data that can be turned into a buffer.

With modern digital technology we can improve the accuracy of the map to the extent that well-defined points are available.

The map establishes locational relationships between features independent of ground accuracy. We can georeferenced the map to a highly accurate base map that will preserve the relationships of map features while establishing a centerline location that can be transferred to the ground.