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Benchmarking FUNdamentals

by

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Benchmarking FUNdamentals



Benchmark Outline:



- What is a benchmark?
- Why search for benchmarks?
- "Adjusted" vs "Scaled" vs "Cadastral"
- Types of Bench Mark Stations
- Reading NGS / GC Datasheets
- Finding Benchmarks
- Logging Benchmarks
- Other Benchmark Questions / Sources

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What is a benchmark?



- A benchmark (or survey mark) is a type of Datum Point developed using Geodesy
- Geodesy is the science of measuring and monitoring the size and shape of the Earth and the location of points on its surface
- Benchmarks are used in the national geodetic data system for navigation, communication, mapping and charting

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Why search for benchmarks? **ADVENTURE!**



- Geocaching.com imported a snapshot of the national geodetic system database in 2000.
- Since then, cachers have had the option to search for hundreds of thousands of survey markers scattered from seashores to mountaintops all across America.
- Hone your GPS skills while searching for 'adjusted' or 'GPS-observed' marks
- Discover America's history – on your travels or on your own doorstep

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What is the difference between Adjusted & Scaled & Cadastral?



- “**Location Adjusted**” means that the published coordinates are **very accurate**
- “**Location Scaled**” means that the published coordinates are **not very accurate**
- Adjusted horizontal coordinates were computed using advanced surveying techniques and are far more accurate than even the finest handheld GPS
- The position of a benchmark with "scaled" coordinates was derived by a human in an office by estimating the location of the mark on a topographic map with a scale (ruler). They can be off by 100 to 600 feet or more from the actual position. **The datasheet description is the best help here.**
- **Cadastral** benchmarks are survey markers set during a land survey for the purpose of marking property boundaries, road rights of way, etc. They **generally** aren't in the national geodetic system, for reasons of accuracy, cost, or survey design. Thus, they're not loggable as a find on geocaching.com

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Types of Benchmark Stations:



- **Vertical Control Marks** (elevation above MSL)
- NGS Data Sheet will generally read *adjusted elevation & scaled* coordinates
- Set as tidal marks, road/railroad grade marks, and 'leveled' to very precise elevation readings



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Types of Benchmark Stations:



- **Horizontal Control Marks** – of various sorts:
 - Disk, chiseled cross, bolt, drill hole, or others...
 - Triangulation Station – generally with minimum 2 RM + an azimuth mark; *a/ways* adjusted coords



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Types of Benchmark Stations:



- **Elevation Station** – a tall tower, spire, mast, or peak – used for long-distance triangulation before GPS; *a/ways* adjusted coordinates



UW5913 KENAI RUSSIAN CHAPEL SPIRE

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UW5498 HOMER SPIT SALTY DAWG TOWER

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UV4344 (TANK) and UV4333 (PEAK B) Mat-Su Borough AK



Types of Benchmark Stations:



Elevation Stations – in plain view!



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What are the different parts of a datasheet and what do they mean?



- PID (Permanent Identifier) in 2 letter / 4 number format (such as UW7498)
- Two-letter prefix references a national grid – shown below



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What are the different parts of a datasheet and what do they mean?



- **Designation**, such as 'SALMON' or 'SHIPROCK PEAK'
- **Coordinates** (*and whether they are scaled or adjusted*)
- the **Box Score** (if the **PID** has one) – measurements from the main station to various reference marks (found on NGS data sheets – not geocaching.com listings)
- the **original station description** and the subsequent recovery reports. These contain the "to-reach" directions, the mark description, and the distances and compass directions from local landmarks or reference marks to the station. They should indicate '**STAMPING**' – the actual text stamped on a disk or rod cover. The description is critical to a successful recovery effort.

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Geocaching.com Datasheet



Details for Benchmark: UW7741

[Start a New Search](#)

[Download Waypoint File \(*.LOC\)](#)
[Learn More About Waypoint Downloads](#)

N 60° 56.917 W 149° 53.732 (NAD 83)

Altitude: 0

Coordinates may not be exact. Altitude is UNKNOWN and location is ADJUSTED. ([more info](#))

Location: In county, AK [View Original Datasheet](#)

Designation: BURNT 1912

Marker Type: NGS Benchmark

Setting: setting not listed - see description

Stability: Mark of questionable or unknown stability.

Reference Points

- [UW7862](#)
- [UW6142](#)

Nearest

- [Benchmarks](#)
- [Geocaches](#)

Documented History (by the NGS)

1/1/1912 by CGS (MONUMENTED)

DESCRIBED BY COAST AND GEODETIC SURVEY 1912 (FHH) STATION IS LOCATED ON THE SOUTHEAST EDGE OF THE FLAT TOP OF BURNT ISLAND. IT IS MARKED BY A METAL STATION MARK IN CONCRETE FLUSH WITH SURFACE. REFERENCE MARK NO. 1 IS A DRILL HOLE 2 INCHES DEEP ON A RISING PART OF THE LEDGE WHERE THE STEEP SLOPE BEGINS. IT IS 5.80 METERS DISTANT AND BEARS S. 12 DEG W. MAGNETIC, FROM STATION. REFERENCE MARK NO. 2 IS A LARGE NAIL IN A BIRCH SAPLING, DISTANT 6.40 METERS AND BEARING N. 57 DEG W. MAGNETIC.

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Geocaching FUNdamentals

Navigation

- [Log This Benchmark](#)

Must Read!

Benchmarks may be on private property or in dangerous locations. Obey local laws. By using the services on Geocaching.com you [agree to this disclaimer](#).



- [Geocaching.com Google Map](#)
- [MyTolop Maps](#)
- [Google Maps](#)
- [MapQuest](#)
- [Bing Maps](#)
- [Yahoo Maps](#)
- [Rand McNally](#)
- [Terraserver](#)

NGS Datasheet



(SHOWN HERE IN TWO COLUMNS)

"BOX SCORE"

The NGS Data Sheet

See file `_dadata.txt` for more information about the datasheet.

```
DATABASE = PROGRAM = datasheet, VERSION = 7.95
1 National Geodetic Survey, Retrieval Date = JULY 21, 2010
UNW741 *****
UNW741 DESIGNATION - BHNMT 1912
UNW741 FID - UNW741
UNW741 STATE/COUNTY - AK/
UNW741 USGS QUAD - SEWARD D-8
UNW741
UNW741 *CURRENT SURVEY CONTROL
UNW741
UNW741 NAD 83(1986) - 60 56 55.01089(N) 149 53 43.89258(W) ADJUSTED
UNW741 NAVD 88 - ** (meters) ** (feet)
UNW741
UNW741 LAPLACE CORR - 28.86 (seconds) DEFLECO9
UNW741 GEOID HEIGHT - 7.57 (meters) GEOID09
UNW741 MORS ORDER - SECOND
UNW741
UNW741 The horizontal coordinates were established by classical geodetic methods
UNW741 and adjusted by the National Geodetic Survey in July 1986.
UNW741
UNW741 The Laplace correction was computed from DEFLECO9 derived deflections.
UNW741
UNW741 The geoid height was determined by GEOID09.
UNW741
UNW741 North East Units Scale Factor Converg.
UNW741:SPC AK 4 - 773,778.787 505,461.432 MT 0.99990039 +0 05 28.8
UNW741:UTM 06 - 6,760,828.980 343,175.459 MT 0.99990135 -2 31 54.2
UNW741
UNW741 Primary Azimuth Mark Grid Az
UNW741:SPC AK 4 - DARK RESET 031 17 58.1
UNW741:UTM 06 - DARK RESET 033 55 21.1
```

```
UNW741|-----|
UNW741| FID Reference Object Distance Geod. Az |
UNW741|-----|
UNW741| UNW7862 DARK RESET APPROX.11.9 KM 0312326.9 |
UNW741| CU8486 NAIL IN TREE 08038 |
UNW741| CU8849 DRILL HOLE 22130 |
UNW741| DM6142 BOUT APPROX.27.1 KM 3162122.4 |
UNW741|-----|
UNW741| SUPERSEDED SURVEY CONTROL
UNW741
UNW741 NAD 27 - 60 56 57.03700(N) 149 53 36.05200(W) AD( ) 2
UNW741
UNW741.SuperseDED values are not recommended for survey control.
UNW741.NGS no longer adjusts projects to the NAD 27 or NAVD 29 datums.
UNW741.See file _dadata.txt to determine how the superseDED data were derived.
UNW741
UNW741 U.S. NATIONAL GRID SPATIAL ADDRESS: 6VUN4317560528 (NAD 83)
UNW741 MARKER: I = SEE DESCRIPTION
UNW741 SETTING: O = UNVERIFIED SETTING
UNW741 STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
UNW741
UNW741 HISTORY - Date Condition Report By
UNW741 HISTORY - 1912 MONUMENTED CGS
UNW741
UNW741 STATION DESCRIPTION
UNW741
UNW741 DESCRIBED BY COAST AND GEODETIC SURVEY 1912 (FWS)
UNW741 STATION IS LOCATED ON THE SOUTHEAST EDGE OF THE FLAT TOP OF
UNW741 BURST ISLAND.
UNW741
UNW741 IT IS MARKED BY A METAL STATION MARK IN CONCRETE FLUSH WITH
UNW741 SURFACE.
UNW741
UNW741 REFERENCE MARK NO. 1 IS A DRILL HOLE 2 INCHES DEEP ON A
UNW741 RISING PART OF THE LEDGE WHERE THE STEEP SLOPE BEGINS. IT IS
UNW741 5.90 METERS DISTANT AND BEARS S. 12 DEG W. MAGNETIC, FROM
UNW741 STATION.
UNW741
UNW741 REFERENCE MARK NO. 2 IS A LARGE NAIL IN A BIRCH SAPLING, DISTANT
UNW741 6.40 METERS AND BEARING N. 57 DEG W. MAGNETIC.
```

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Finding Benchmarks:



- Beginners should look for adjusted marks already found by another geocacher – look for 'found' logs online – and study how experienced benchmarker log their finds with photos
- For both adjusted and scaled marks, the most important tools in searching are a compass, a long tape measure – often a hundred-foot tape – and a partner in the field to help. A probe, cleaning tools, and a small shovel are useful
- Learn how to run a 'back azimuth', shoot a bearing, and determine True North versus Magnetic North with both your compass and your GPS unit – as well as project a waypoint
- Take the time to read the most current NGS datasheet for clues (from either Holocene or ScaredyCat sites)

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Finding Benchmarks:



Exemplary logs of 'how to find benchmarks - chiknlips45 invited me along on a fabulous succesful hunt for UV4396 Peters E Base, first placed in 1922. What an adventure!



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Geocaching FUNdamentals

Finding Benchmarks:



- **Be studious** – read the data sheet & visualize the described placement in your mind's eye
- **Be detail-oriented** – look for every described feature on the datasheet to orient yourself
- **Be meticulous** – make sure what you find matches the description exactly of the mark
- **Be a historian** – file your log with annotated photos (close-up & area) & current site descriptions.
- **Be a pathfinder** –Supply averaged hand-held GPS coordinates & take good pictures to post to help others follow in your footsteps on scaled finds!

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Logging Benchmarks:



Found – Not Found – Note – Destroyed...

Found – after making sure your find **exactly matches** the description from the datasheet of the mark, record a new to-reach description (if necessary) and post photographs annotated with PID / Designation to help document your find.

Take at least one in-focus close-up photo, and photos which show the area and any special views from or across the mark. Remember your photos automatically appear in the Benchmark Gallery!

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Logging Benchmarks:



- **Not Found** – documents your attempt
- **Note** – any special comments you want to place in the mark's record, including photos
- **Destroyed** – only to be used if you're 100% certain the mark was destroyed – CERTAIN!
- *Logging your find with the NGS is possible – only recommended after much experience!*

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Resources



- Geocaching.com's "Find a Benchmark" page – Best Resource!
<http://www.geocaching.com/mark/default.aspx>
- Geocaching.com's Benchmark Forum:
<http://forums.groundspeak.com/GC/index.php?showforum=10>
- NGS Benchmark Viewer (*by Scaredycat Films*) – The Best Tool!
<http://benchmarks.scaredycatfilms.com/>
- Holoscenes Benchmark Hunting Pages – stats & power-user tools
(including county data files for GSAK use):
http://www.holoscenes.com/special/geocac/ds_archive.html
- GeocacheAlaska Benchmark Forum – Bulk Download thread
<http://geocachealaska.proboards.com/index.cgi?board=benchmarkinggeneral&action=display&thread=229>

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Resources



- Google Earth Survey Marker Overlays (*useful for planning the hunt*):
<http://ngs.tsqmadness.com/ge/index.html>
- Disney Benchmark Pages:
<http://www.wintertime.com/OH/GC/Disney/disneymarks.html>
- Waymarking Benchmark Categories:
<http://www.waymarking.com/cat/search.aspx?f=1&cst=7&kw=benchmark&qid=5&st=2>
- NGS Geodesy Discovery Toolkit (great for intro/family/teachers)
http://oceanservice.noaa.gov/education/tutorial_geodesy/welcome.html
- NGS & Survey Marks – a closer look:
http://celebrating200years.noaa.gov/survey_marks/welcome.html#look
- Commemorative Survey Markers of the NGS:
http://celebrating200years.noaa.gov/survey_marks/welcome.html

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