NPS Form 10-900 OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

1069

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

1. Name of Property

Historic name: (Former) Calais Observatory
Other names/site number: Old Calais Academy Grounds
Name of related multiple property listing: n/a
(Enter "N/A" if property is not part of a multiple property listing)

2. Location

Street & number: Meridian Park, North Street
City or town: Calais State: Maine County: Washington
Not For Publication: n/a Vicinity: n/a

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this x nomination _____request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property x meets _____does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

X national **_____ statewide** **_____ local**

Applicable National Register Criteria:

x A **_____ B** **_____ C** **_____ D**

Signature of certifying official/Title: 10/31/12
Date

MAINE HISTORIC PRESERVATION COMMISSION
State or Federal agency/bureau or Tribal Government

In my opinion, the property ___ meets ___ does not meet the National Register criteria.

Signature of commenting official: **Date**

Title **State or Federal agency/bureau or Tribal Government**

4. National Park Service Certification

I hereby certify that this property is:

✓ entered in the National Register
___ determined eligible for the National Register
___ determined not eligible for the National Register
___ removed from the National Register
___ other (explain:) _____

Signature of the Keeper — Date of Action: 12/19/13

5. Classification

Ownership of Property
(Check as many boxes as apply.)

Private	☐
Public – Local	☒
Public – State	☐
Public – Federal	☐

Category of Property
(Check only **one** box.)

Building(s)	☐
District	☐
Site	☒
Structure	☐
Object	☐

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
____	____	buildings
1	____	sites
____	____	structures
____	____	objects
1	0	Total

Number of contributing resources previously listed in the National Register none

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6. Function or Use

Historic Functions
(Enter categories from instructions.)
INDUSTRY/PROCESSING/EXTRACTION/ Communications facility
____
____
____
____
____
____

Current Functions
(Enter categories from instructions.)
LANDSCAPE / Park
____
____
____
____
____

7. Description

Architectural Classification
(Enter categories from instructions.)

NO STYLE
_____
_____
_____
_____
_____
_____

Materials: (enter categories from instructions.)
Principal exterior materials of the property: STONE / Granite

Narrative Description

(Describe the historic and current physical appearance and condition of the property. Describe contributing and noncontributing resources if applicable. Begin with **a summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity.)

Summary Paragraph

The site of the former Calais Observatory is an elevated granite rock outcrop in the city of Calais. The site occupies a portion of a small park owned and maintained by the city. Meridian Park is bound on the west by North Street, (U.S. Route 1), on the south by Lincoln Street and on the north by Academy Street. The southeastern edge of the park abuts the town-owned Calais Community Center (a former school gymnasium) and the Calais Grade School. The southwestern edge of the park ends at the property line of residences that face southerly towards Lincoln Street, or easterly toward Calais Avenue. The outcrop is essentially centered within the park, almost directly west of the Community Center. West of the outcrop a gravel driveway exits Lincoln Street, skirts the base of the stone hill, and curves northeast to a large parking area west of the Community Center. Between this drive and Route 1 the park has lawn, mature trees and some landscaped gardens. East of the outcrop are mostly overgrown shrubs, while a wide strip of grass shaded by a line of mature maple trees lie adjacent to Lincoln Street. The un-even outcrop hosts tall grasses, shrubs, birch clusters and young maple trees. Located at the highest point of the outcrop are a stone pillar and stone base, as well as two drill holes and a pair of stone pads chiseled out of the granite. These items, upon which where fastened instruments for determining longitude, constitute the

remains of the Calais Observatory. The Observatory was utilized periodically between 1857 and 1895. While the instruments were removed when the Observatory was not in use, a small building had been erected in 1857 to shelter the site, and it was still extant in 1866. However, no mention of it is found with reference to the 1895 measurements taken at the site.

Narrative Description

Stone Pillar, or "Clock Stone."

The 'clock stone' is of rough quarried granite about 1 foot square tapering to about 8 inches square at the top and about 8 feet tall. This object is oriented approximately 45' east of due north, so the sides face southwest, northeast, etc. On the southeast face there is an approximately 2 inches x 3 inches mortise hole drilled approximately six inches down from the top, running southeast to northwest through the stone. About an inch below this is a second smaller mortise that does not extend through the thickness of the pillar. Also on the southeast face, about 18" to 2' off the ground are three, approximately ¾ inch diameter drill holes of varying depth. These three holes are arranged in a triangular plan, with one hole located below two parallel upper holes. Another set of three holes, in a similar pattern, are present on the southwest face of the pillar, approximately 2 ½ to 3' above grade.

The function of this pillar has not been clearly documented. The 1857 report of the U.S. Coast Survey references a granite pier upon which the Hardy Astronomical clock was mounted. This makes sense as the Hardy Clock was a 'grandfather' type clock with pendulum apparatus, though not mounted in its own wooden case. It is not physically possible to mount the Hardy Clock on the Transit Stone and have it function. The Coast Survey publication "Astronomical Determinations by the U. S. Coast and Geodetic Survey and other Organizations", describes Calais Latitude "marked by a granite column 0.193m (0.63ft) latitude north and 1.584m (5.23ft) west of Calais Longitude." The longitude station in the same publication is described as a stone block.[1] Furthermore, the 1857 Coast Survey Report states that Latitude Observations were done with Zenith Telescope No. 4. Zenith Telescopes, since the first one arrived in America in 1847, have always been mounted on a substantial brass column and base plate, and it does not seem feasible to mount this instrument on the column.

Transit Stone

The 'transit stone' is a granite block with the approximate dimensions of 3'6" feet tall, 2'7" feet wide, and 2 feet deep. This block is located about 4 feet east of the clock stone, and is oriented so that each side corresponds with a cardinal direction. The top is relatively flat with two carved channel. The larger, and deeper curved channel has a radius of perhaps 5 inches and starts at the southern face of the block and extends north about 10 inches. The second channel, which is only about 3 inches in radius, is positioned at the northern end of the first channel. The deeper channel accommodated a crank apparatus that was used to operate the Astronomical Transit. The geographical location of the survey station formally designated as CALAIS OBSERVATORY is at the center of this stone, and was marked by a flag mounted on the observatory building directly over the stone.

[1] Sarah Beal. "Astronomical Determinations by the U. S. Coast and Geodetic Surve and other Organizations." U.S. Coast and Geodetic Survey, Special Publication No. 110, 1925, p.189-190.

The transit stone sits on a rectangular pad, 2' deep by 3' wide, carved into the bedrock outcrop. In 1998 the transit stone was found pushed over the north side of the granite outcrop, resting against a dead tree. In 2005, the City of Calais moved the stone back to the original 1857 location. It is interesting to note that standing where the transit observer would stand to work the crank, one faces true North, and of course the North Star, Polaris, which was used to orient the transit and define the Calais Meridian. In June of 2004, Curt Crow, then a National Geodetic Survey Advisor for New Hampshire and Massachusetts performed GPS observations on the NOAA Heritage Plaque disk No. 1, and observations on the center of the carved pad for the Transit Stone. The position derived by NGS in 2004 agreed with the results of the 1866 triangulation observations within 2 inches horizontally.

Stone Pads

There are two additional stone pads, each about one foot square, roughly carved into the bedrock. One of these pads is located due north of the transit stone and the other is due south, both at a distance of about 4 ½ to 5 feet. The function of these pads are not yet known.

Drill Holes

There are two circular holes drilled into the granite outcrop. The first measures 1 inch in diameter and 2 ½ inches deep. This hole is located approximately 20 feet west of the clock stone. The second hole is shallower, with a ¾ inch diameter, and is located 36 feet west of the clock stone. As with the stone pads, the function of these drill holes has not yet been discovered.

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

☒ A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

☐ B. Property is associated with the lives of persons significant in our past.

☐ C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

☐ D. Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

☐ A. Owned by a religious institution or used for religious purposes

☐ B. Removed from its original location

☐ C. A birthplace or grave

☐ D. A cemetery

☐ E. A reconstructed building, object, or structure

☐ F. A commemorative property

☐ G. Less than 50 years old or achieving significance within the past 50 years

Areas of Significance (Enter categories from instructions.)
SCIENCE

Period of Significance
1866
1857
1895

Significant Dates
1857
1866
1895

Significant Person (Complete only if Criterion B is marked above.)

Cultural Affiliation

Architect/Builder
U.S. COAST AND GEODETIC SURVEY

Statement of Significance Summary Paragraph

(Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations.) (Refer to photographs)

The Calais Observatory is a site on which was formerly located a United States Coast Survey astronomical observatory[2]. The observatory is located in the far eastern town of Calais, Washington County, Maine, upon an outcrop dome in a residential neighborhood. Marking the site of the observatory are a stone pillar and stone base, both used to support astronomical instruments, as well as two drill holes and a pair of stone pads chiseled out of the granite. Erected first in 1857, and utilized again in 1866 and 1895, the observations and measurements recorded at the site made nationally significant contributions to the advancement of a broad range of geophysical scientific fields. Here in December 1866, astronomical observations (star meridian passages) were taken that finalized the longitudinal measurements between America and the Greenwich Meridian in England, an important step in determining the precise shape of the earth and creating a universal geophysical framework for measuring time and space. In addition, this observatory is unique as the only remaining observatory from the Transatlantic Telegraphic Longitude Campaign of 1866 that still has in-situ the stones upon which the scientific instruments were mounted. The Calais Observatory is eligible for listing in the National Register of Historic Places at the national level of significance under Criterion A. The area of significance is science and the period of significance,1857, 1866 and 1895, represent the three campaigns during which the Observatory was utilized.

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

Calais Observatory is the meeting place of longitudes determined by telegraphic means easterly from Harvard Observatory in Cambridge, Massachusetts in 1857 and with longitudes measured west of the Greenwich Observatory in England in 1866. This endeavor improved the accuracy of the location of the Harvard Observatory, the prime merdian for longitude and the U.S. Naval Observatory in Washington, D.C. As the "Golden Spike" did for the railroad industry, the measurements made at the Calais Observatory were key for establishing the precise geospatial positioning of North America.

The observations and measurements made in Calais must be seen as discrete events that contributed to a process of defining and refining a global geophysical framework – an effort that began with the earliest civilizations and continues today through the use of satellites and global positioning systems. In 1857 the Calais Observatory became the northeasternmost point in the country with a known longitude as measured from Cambridge, Massachusetts. In 1866 this Observatory became the first location in the country to have a

[2] The name "United States Coast Survey" was utilized from 1836 until 1878 when the name was changed to the "United States Coast and Geodetic Survey." From 1807 to 1836 it was called the "Survey of the Coast".

known longitude as measured west from the prime meridian in Greenwich, England. As such, for a short time, it was probably the most accurately located 'place' in the United States. However, its overall importance is as a link in a system that continued to evolve, both in methods of measurements and in application.

Prior to the successful installation of a transatlantic telegraph cable in 1866, the longitude of Harvard College Observatory was determined by star meridian passages based on the time brought to America via 1,056 chronometer crossings between Liverpool, England, and Cambridge, Massachusetts. As late as 1857 and up to 1866, some astronomers were still experimenting with using occultations of stars such as the Pleadies, or observations on moon culminations, or Mercury or Venus transiting the sun, as an improvement over the chronometer crossings. The process of determining longitude by star timing via the telegraph began shortly after Samuel Morse developed Crook and Wheatsone's (English) invention of the electromagnetic telegraph in the United States c. 1836. Over the next two decades the method of coordinating and communicating precisely the observance of star passages was the focus of multiple experiments and refinements. However, by 1849 a method had been developed by which an astronomical pendulum clock calibrated a cylindrical (chronograph) paper upon which time was recorded. The interruption of that recordation was used to signal a star observance while at the same time sending a signal to the other end of the telegraph wire, where the process was repeated. This came to be known as the *American Method* of telegraphic longitude determination.[3]

In 1847, the meridian running through the Harvard College Observatory in Cambridge, Massachusetts was designated as the United States' prime reference point for measuring longitude in North America. Over the next decade and a half measurements emanated north, south and west from this point, reaching the Thomas Hill Observatory in Bangor, Maine in 1851, then onward to the Calais Observatory in 1857[4]. The entire effort was done under the Superintendence of Professor Alexander Dallas Bache, head of the Coast Survey from 1847 to his death in 1867. Bache was a great grandson of Benjamin Franklin and made observations at most of the First Order triangulation stations in Maine. He personally measured the Epping Baseline near Cherryfield, Maine, and upon its completion sent his men to Calais to seek the site for a longitude station near the northeast frontier of the country.

Cartography

One of the more tangible and immediate aspects of precisely measuring longitude was the production of accurate coastal charts by the U.S. Coast Survey. This in turn allowed for more precise mapping of nautical hazards, which helped make shipping safer. In the prologue of his book Longitude by Wire: Finding North America, the geodetic historian Richard Stachurski provides the context for understanding the importance of determining precise longitude.

[3] Ibid, 105-107.

[4] By 1857 telegraphic longitudes had been triangulated from Calais south to New Orleans and Nashville. As late as 1880 there were only two longitudinal observation stations in Maine: Bangor and Calais.

> Along the coast of the newly independent United States, incorrectness of charts, acting sometimes alone but often in deadly conspiracy with weather, position errors, stupidity, greed, and plain bad luck, waged a relentless campaign of attrition against seaborne commerce...Coastal charts were either scarce and frequently wrong or nonexistent. Federal- and state-sponsored charting efforts were isolated and sporadic. Commercial map makers tried to meet the need but were overwhelmed by the scale of the work. Accidents happened; ships were destroyed. Mariners and insurance underwriters clamored for help. The United States Congress, motivated by defense and commercial concerns resolved to do what it could and in 1807 founded the United States Coast Survey...[to complete] "an accurate chart of every part of the coasts...".
>
> For the next century the survey would struggle with the problem of making coastal maps accurate enough to reduce the deadly toll taken by incorrectness of charts. The focus of that struggle on the coast, just as it had been at sea, would be the precise measurement of longitude."[5]

The first Coast Survey charts for Maine were produced in 1851 (the same year the survey reached Bangor), with new or updated charts appearing every few years.

Science and Time

While the formation of accurate coastal charts favored maritime commerce, insurance companies and the lives of mariners, the goal of accurately determining longitude on a world wide basis, with reference to the prime meridian in Greenwich, was also imperative to the earth sciences. In 1957 Rear Admiral Robert W. Knox, former assistant director of the U.S. Coast and Geodetic Survey, wrote a paper recounting the history and significance of the Coast Survey's contributions to longitudinal studies. Expanding the context beyond cartographic significance, he states:

> Aside from navigational considerations, several purely scientific requirements involve the precise determination of longitude with reference to a standard meridian, such as Greenwich. The astronomer requires an accurate position for the time coordination of world-wide astronomical observations; the geophysicist needs longitudes of the highest precision in his studies of the drift of continents; and finally, the geodesist desires to place all triangulation datums as closely as possible to their proper relation one with the other.[6]

Indeed, all efforts to figure out the precise shape of the earth are dependent upon creating a geophysical framework, as are the documentation of gravity, magnetism, weather, and tides. The mathematical models used in these sciences, and others,

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[5] Richard Stachurski, *Longitude by Wire: Finding North America* (Columbia, South Carolina: The University of South Carolina Press, 2009), 2-3.

[6] Robert W. Knox, "Precise Determination of Longitude in the United States". *Geographical Review, vol. 47, No. 4.* October, 1957, p. 555. The author also notes on the same page that the mid-20th century development of intercontinental guided missiles is dependent on knowing the precise 'longitudinal ties between continents."

require knowledge of the precise shape of the earth and the precise distance between the continents – the measurement of longitude.

Because longitude and time are equivalent – 15 degrees of longitude equals one hour of time - establishment of longitude is dependent upon the accurate measurement of time, and vice versa. Linking longitude between Greenwich and Calais, and then on to Harvard also had the effect of establishing a consistent and precise time. This was extremely important for the regulation of the railroads, and the American Method of longitudinal measurement also enabled standardized time to be telegraphed to stations throughout the nation. At the same time, the industrial enterprises of the mid-nineteenth century were becoming more time conscious, as was commerce and business in general.[7]

The practical applications of establishing precise longitude were recognized by William Bond, the first director of the Harvard College Observatory,(between 1839 and 1859), who was intimately connected with measuring both time and longitude. After the Cambridge Observatory was designated as the North American prime meridian for longitude in 1847, Bond was intensely involved in the effort to refine the latitude of his observatory vis-à-vis Greenwich, England. His interest was both academic and pragmatic. According to historian Carlene Stephens, Bond also "pioneered the distribution of telegraphed time signals for railroad use. In 1851 Bond started the world's first public time service based on clock signals telegraphed from the observatory…[his] principal customers for the service were the New England railroads." His family company, William Bond and Son, was one of the "principal instrument purveyors of the 19th century. Intimately connected to navigation and commercial shipping, the firm rated and repaired marine chronometers for the busy Boston port and supplied instruments of all sorts to agencies of the federal government – specifically the coast survey, the topographical engineers, and the navy." Among the most important contributions the firm made to geophysical measurement was the device that linked an astronomical clock to the drum chronograph in order to instantly record "an astronomical event in a time scale," i.e. the instrumentation that was utilized at the Calais Observatory. When the more accurate telegraphic longitudinal connection from Greenwich to the United States was made in 1866 it refined the precise measurement of both space and time, and it was at the Calais Observatory that the final link was made to Greenwich.[8]

The longitudinal campaigns.

The Calais Observatory was utilized for specific projects on three occasions. During projects instruments were brought to the site, measurements were taken, and then the instruments were packed up and taken to the next site.[9] The location of the Observatory remained the same, and the instruments were mounted on the granite bases, ensuring

[7] Carlene Stephens, ""The Most Reliable Time": William bond, the New England Railroads, and Time Awareness in 19th-Century America". *Technology and Culture,* Vol. 30, No.1 (Jan.,1989), 24.

[8] Stephens, 1989, quote on pages 11, 8, and 13, respectively.

[9] See the Developmental history/additional historic context for an overview of the measurement and recordation process utilized at the Observatory.

consistency from one project to another. A structure of some form enclosed the site in 1857 and 1866, but a tent or other temporary covering may have been used in 1895.[10]

1857. Longitude measurements, east from Cambridge, Massachusetts and Bangor, Maine.

According to the August 31, 1857 edition of the Bangor Whig and Courier "apparatus has been placed on Thomas Hill in a temporary building erected for the purpose, to take the longitude of the point and Columbia [District of Columbia], Calais and stations to the east."[11] Between August and October of that year coordinated observations were made in Bangor and Calais and also between Calais and Professor William Brydone Jack, astronomer at King's College, Fredericton, New Brunswick, in order for him to calculate the longitude of his observatory.[12]

Also during September 1857 latitude observations were made in Calais, using a Zenith Telescope No. 4. It is unclear whether the telescope was mounted on the transit stone, or on the pillar. According to a 1925 report on Astronomic Determinations the latitude mark was on a "granite column 0.193 meter (0.63 foot) ...and 1.594 meters (5.23 feet) west of *Calais longitude*[mark]...[13]. A similar description is still provided in the on-line National Geodetic Survey Data Sheet.[14] However the field notes written by Dean suggest that the latitude and longitude measurements were performed on the transit stone.[15]

Over the next 10 year thirteen new or revised coastal charts were issued for Maine, extending up the coast from the Blue Hill peninsula (the northernmost extent of the USCS charts for Maine in 1857) to Calais.

1866 Transatlantic Telegraphic Longitude Campaign

Obtaining a precise time via the transatlantic cable ended the astronomical endeavors used to set the time in Cambridge, Massachusetts.

In July and early August of 1858 the first transatlantic telegraph cable was laid across the floor of the Atlantic from Telegraph Field, Foilhommerum Bay, Valentia Island in western Ireland to Heart's Content in eastern Newfoundland. The first successful message was sent on

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[10] According to page 41 of the *Report of the Superintendent of the Coast Survey*, 1857, "The observing station at Calais was erected by Thomas McDonnell, artificer in the Coast Survey."

[11] Bangor Whig and Courier, August 31, 1857, p. 2.

[12] The work at Calais Observatory in 1857 was so important that Professor Jack visited Calais to see the "American Method " of telegraphic longitude determination and reported his findings to his superior, Professor George Biddle Airy, the Astronomer Royal at the Greenwich Observatory in England, who later participated in the 1866 campaign.

[13] Beall, 1925; copy on file at the Maine Historic Preservation Commission, Augusta, Maine. Page unknown.

[14] NGS Data Sheet: http://www.ngs.noaa.gov/cgi-bin/ds_desig.prl. Accessed 10 October 2012.

[15] George W. Dean, Remarks: Astronomical Station at Calais. 1857 Field Notes, Calais Observatory. Records Group 23.4.2. (National Archives, College Park, Maryland).

August 16th, 1858, in effect replacing the practice of sending mail and communications by ship with virtually instant electronic communication between North American and Europe. Although the technology functioned initially, the cable itself was mechanically flawed and in September of that year the cable failed. Not until 1866 was another cable successfully laid.

With the successful laying of the cable in July 1866, the Coast Survey dispatched men to Calais, Maine, Heart's Content, Newfoundland and Foilhommerum, Ireland. The 1857 Calais Observatory building was still intact, but dilapidated. The stone piers were undisturbed. First, the Coast Survey had to determine longitude differences between the Greenwich Observatory in England and Ireland, and then again from Ireland to Newfoundland. This occupied the latter part of summer and into the fall, then observations between Heart's Content and Calais began. Electrical connectivity was not good, despite the placing of automated telegraphic relays at intermediate stations. Then in December 1866, a sharp frost threw the telegraph lines into near perfect working order. The final observations were taken on December 16, 1866 making the Calais Observatory the 'golden spike' in the telegraphic longitude determination.

About a mile true north of the Calais Observatory, in St. Stephen, New Brunswick, was the location of the Meridian Mark 1866 that was set on a true North line, and was the sight upon which the astronomical transit in Calais was oriented. The mark consisted of a stake with a nail in it next to a stone that was marked. Although both Calais and Meridian Mark 1866 stations were part of the triangulation network that tied the latitude and longitude work there into the national network of triangulation, the Meridian Mark is not included in this nomination.

1895 Longitude Measurements

Staff of the U. S. Coast Survey returned to the Calais Observatory site again in August of 1895, in order to more precisely determine the difference of longitude directly, between Cambridge, Massachusetts and Calais, Maine, this time without the intermediary station at Thomas Hill, Bangor. According to the report published in 1896 "the two observatories were at once erected and connected with the Western Union lines, and observations began on the 21st [of August]. Exchanges of time signals took place on the nights of August 21, 25, 27 and 30, and September 1, and again, after the usual interchange of observers, on September 5, 8, 10, 13 and 14."[16] During these weeks additional observations were made in Calais. About 400 feet south of the Calais Observatory, near the then Calais Powder house, is the location where observations for magnetic declination, dip, and intensity were also performed. This location is not included in this nomination, and it is doubtful if anything remains of the magnetic site or powder house.

In 1904, the Coast Survey closed the telegraphic longitude loop around the world and closed it out by less than one second. The next improvement in the determination of longitude was time via radio signals in the 1920's and later through Global Positioning System (GPS) in the 1980's, which includes latitude and longitude and height (elevation). Although the

[16] Report of the Superintendent of the U.S. Coast and Geodetic Survey Showing The Progress of the Work during the Fiscal Year Ending with June, 1896. 1897. Page 12.

Canadian 'geological survey type map' of the area still shows station CALAIS OBSERVATORY, the Coast and Geodetic Survey report of 1935 reported the position 'lost'. On July 2, 2005 the National Oceanic and Atmospheric Administration recognized the Calais Observatory by setting the first disk of their Heritage Trail in the bedrock west of the transit and clock stones.

Developmental history/additional historic context information (If appropriate.)

The process

Each temporary observatory had an astronomical transit. An astronomical clock and chronograph register were wired together with battery and connected to the nearby commercial telegraph line, which was usually used free of charge after 9 p.m. A local true north meridian was established and a point set upon which to point the transit, then it was aimed skyward through a slit in the roof of the observatory building. The pendulum of the clock was dipped in a pool of mercury, which, by making electrical connection, made second beats on the chronograph drum. The electromagnetic pen was also wired to a telegraph key. When a particular star passed the crosshair, the observer tapped the key, which made an "out of sync" mark on the chronograph register. An etched glass plate could then be placed over the chronograph paper to read time to the hundredth of a second. The surveyor-measurer would then subtract the west station time from the east station time for a particular star, and have longitude in hours, minutes and seconds, which easily converted to DMS (degrees, minutes, seconds) format. These "pie pieces" of longitude spread south in the winter and north in the summer from Harvard College Observatory, the cardinal point of longitude in North America.[17]

Instruments

The site chosen in Calais was the top of a granite dome on the grounds of Calais Academy. The following paragraphs from the report of George W. Dean, Assistant CS, describe the specific instruments used in the longitude campaign between Bangor and Calais Maine in October 1857. These were transcribed from the original and duplicate records of the U.S. Coast Survey, Calais Observatory Station, stored at the National Archives in Maryland.

Remarks: Astronomical Station at Calais.

> With the permission of the trustees of the Calais Academy the site selected for making the following astronomical observations was upon a granite ledge in the academy grounds which is in every respect well adapted for such obsv's, it affording a solid foundation for the instruments besides being the most elevated point in the vicinity, and commanding every prominent point which may be selected in the execution of the triangulation in the locality.

[17] The preceding paragraph was first published in *Rebuilding The Chimney*, by Harold E. Nelson. POB Journal (on-line), December 2005. http://www.pobonline.com/Archives?issue=132362

The station point is marked by a copper bolt driven firmly into the rock. (Lead was used instead, as copper could not be obtained), coinciding with the center of the Zenith Telescope.[18]

The transit used at this station is known as No. 3 USCS and was made by Troughton & Simms for the Coast Survey in 1845, but it has recently been much improved at the CS Office by the addition of a reversing apparatus similar to the one on transit No. 6 CS. In several respects the mechanical construction of this instrument is inferior to transits No 6 & 8 CS. The diaphragm was a new one consisting of twenty-five threads arranged in five group or tallies like those of transits No. 6 & 8. As many circumpolar and other stars were obs'd for Equatorial Intervals as practical during the campaign. The value of the Level "A" which was used at this station was carefully determined by a series of obsv's with the micrometer of Zen. Tel. No 4 CS (see record of obs'ns in this volume). The inequality of the pivots were determined by several series of leveling which show that they are in excellent condition. The focal length of the telescope is 44 inches in an aperture of 3 inches and used with a magnifying power of about one hundred.

The instrument was first adjusted upon a suitable granite block, which rested upon the ledge & retained its meridional adjustment in a satisfactory manner.

HARDY CLOCK:

This clock was set up at this station upon a granite pier, which rested upon the ledge below. (This granite pier is still as solid today as the day it was set.) The CS Annual Report of 1866 states that the Hardy Clock has a 'cumbrous' structure, and the escapement wheel became bent in shipment, but the zeal of the party members overcame all obstacles.

The performance of the clock was not altogether satisfactory & the cold weather on one or two occasions stopped the pendulum from vibrating during the night. It was in perfect adjustment and no defect was found on examining the clock movement, which led me to suppose that the oil was bad & consequently affected by changes in the temperature. Additional weight was suspended upon the pulley, after which the performance of the clock was more satisfactory.

CHRONOGRAPH REGISTER:

The observations for difference of longitude and instrumental corrections were recorded upon Bond's Spring Governor No. 2 CS which was used at Liverpool England in the late chronometer expeditions executed under the directions of the Superintendent of the Coast Survey.

[18] No trace of the lead bolt has been found on the site, however, the location of the zenith telescope may have corresponded to one of the two drill holes in the granite outcrops on the site. The zenith telescope was used to determine latitutde.

It's mechanical construction and arrangements differs from that of Spring Governor No. 1 in several respects and must be considered an improvement upon the latter. It's cylinder is constructed of a light brass plate 13 ½ inches in length and 6 inches in diameter and makes one revolution per minute. It's centrifugal regulator is similar to that of No. 1 with the exception of the spring for increasing the friction upon the circular brass chamber for checking the velocity of the register. In No. 2 this spring is not used nor does the centrifugal fly at maximum velocity come in contact with the circular chamber, but the momentum is checked by a light spring which falls in contact with the pallet, which in this instrument gives impulse to the pendulum.

The spring through which the velocity of the centrifugal regulator is communicated to the pendulum pallet is quite heavy and in no respect similar to that used for communicating the motion to the pendulum in No. 1. It's performance at this station has been good but not entirely satisfactory.

TELEGRAPHIC APPARATUS:

This consisted of a Morse Register Receiving Magnet, Grove's battery and similar to that heretofore used & which requires no particular description. For the purpose of ascertaining whether the velocity of the galvanic current was the same through the wire & ground, a slide as devised for the purpose of the changing the poles of the batteries at any moment. This was used in the circuit & the poles of the batteries were changed twice during the obv'sn each night.

TELEGRAPH LINE:

The telegraph line from Bangor to Calais is constructed in a most substantial & thorough manner upon the stage road via Ellsworth, Cherryfield, Machias, Dennysville and Eastport to Calais and is 165 miles in length. The wire is of good quality and generally known in the trade as No. 10 single strand. The insulation of the line has been greatly improved within the last few months by the use of the India rubber insulators (1857) recently invented by Farmer & others of Boston.

The programme heretofore used for telegraphic differences of longitude in the Coast Survey has been followed...in this campaign. The amount of battery used at each station will be found stated in the remarks at the close of each nights observations.

Calais, Maine
Oct 1857

Geo. W. Dean
Assist. CS

Report on the 1866 Transatlantic Longitudinal Campaign.

The Annual Report of the U.S. Coast Survey, excerpts of which are transcribed below, provided extensive details about the 1866 longitudinal campaign between North America and Europe.

Telegraphic determination of longitude between America and Europe.-Soon after the completion of the telegraphic junction between Ireland and Newfoundland, the project of determining the difference of longitude between Valencia and Heart's Content, by means of the Atlantic cable, was carried into successful execution. All the preliminaries had been previously arranged, plans in fact, having been matured before the year 1858, when the prospect first opened for affording such facilities as had been freely used in the longitude determinations of the Coast Survey.

By the liberality of the Anglo-American Telegraph Company, the early use of their cable had been accorded for passing time signals, and permission had also been given by the New York, Newfoundland, and London Telegraph Company for the free use of their lines connecting Newfoundland with the telegraphic system of the United States.

The purpose of determining the difference of longitude between the ends of the Atlantic cable was carried into effect by the assignment of observers who had had long practice with the telegraphic method- all the important telegraphic points between Calais, in Maine and New Orleans, in Louisiana, having been fixed by their observations.

In September, Dr. Gould, accompanied by Sub-Assistant A.T. Mosman, proceeded to Ireland, provided with a transit instrument, astronomical clock, and chronograph register. These were used in the observations made at Foilhommerum, on Valencia island. A similar set of instruments was taken by Assistant George W. Dean, and employed in the observations made at Heart's Content by himself and Assistant Edward Goodfellow. A third set was sent to Calais, Maine, for the use of Assistant George Davidson, who was to be aided by Mr. S.C. Chandler, Jr., and Mr. F.W. Perkins.

Variable weather and other circumstances presented many difficulties in the intended interchange of signals through the Atlantic Cable. The obstacles met were, however, inseparable from the service undertaken at that time, all the facilities possible being afforded for the comfort of the observers by residents nearest to the stations at Foilhommerum and at Heart's content. Dr. Gould and Assistant Dean succeeded in exchanging satisfactory sets of clock signals on the nights of October 24 and 28, and on the nights of November 5, 6, and 9. The signals on two nights were sent by one of the cables only; but on the other three nights both cables were used in telegraphic connection without reference to the earth current. The cable was used during one night in addition for experimenting on the velocity of the magnetic current in transmitting signals.

The astronomer royal of Greenwich observatory, Professor Airy, having concerted arrangements with Dr. Gould, the telegraphic operations in Europe were completed by the exchange of time signals sent respectively from the Royal observatory and Foilhommerum.

Between Heart's Content and Calais, great difficulties were experienced in efforts to pass signals owing to the condition of time. Assistant Davidson remained at Calais until the 4th of December, his services being then due in the prosecution of a special survey across the Isthmus of Darien, arrangements for which had been previously made. During his stay at Calais, all the requisite means for the speedy completion of the work had been provided, dependent, however, for success, upon the repairs which had been for some time in progress along the telegraph lines to Newfoundland. The lines being reported as in working order suitable for longitude purposes, Assistant C.O. Boutelle, reached Calais on the 11th and exchanged time signals with Mr. Dean, the observer at Heart's Content, on four nights, closing on the 16th of December the observations required for determining the difference of longitude between Washington and Greenwich by the telegraphic method.

9. Major Bibliographical References

Bibliography (Cite the books, articles, and other sources used in preparing this form.)

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Beall, Sara. *Astonomic Determinations by United States Coast and Geodetic Survey and other Organizations. Special Publication No. 110.* Washington D.C.: Department of Commerce, 1925.

"Continuation of the list of magnetic stations and results..." In *Report of the Superintendent of the Coast Survey Showing The Progress of the Survey during the Year 1858.*, Appendix No. 24, 191. Washington, D.C.: William A. Harris, Printer, 1859.

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National Geodetic Survey, NOAA. *NGS Data Sheet "Calais Observatory".* 1998. http://www.ngs.noaa.gov/cgi-bin/ds_desig.prl (accessed October 10, 2012).

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Stachurski, Richard. *Longitude By Wire: Finding North America.* Columbia, SC: The Univeristy of South Carolina Press, 2009.

Stephens, Carlene. ""The Most Reliable Time": William Bond, the New England Railroads, and Time Awareness in 19th-Century America." *Technology and Culture, Vol. 30, No. 1*

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Previous documentation on file (NPS):

☐ preliminary determination of individual listing (36 CFR 67) has been requested
☐ previously listed in the National Register
☐ previously determined eligible by the National Register
☐ designated a National Historic Landmark
☐ recorded by Historic American Buildings Survey # _____
☐ recorded by Historic American Engineering Record # _____
☐ recorded by Historic American Landscape Survey # _____

Primary location of additional data:

☒ State Historic Preservation Office
☐ Other State agency
☒ Federal agency, *National Archives, NOAA*
☐ Local government
☐ University
☐ Other
Name of repository: _____

Historic Resources Survey Number (if assigned): _____

10. Geographical Data

Acreage of Property Approximately 65/100 acre.

Use either the UTM system or latitude/longitude coordinates

Latitude/Longitude Coordinates
Datum if other than WGS84:
(enter coordinates to 6 decimal places)

1. Latitude:	Longitude:
2. Latitude:	Longitude:
3. Latitude:	Longitude:
4. Latitude:	Longitude:

Or

UTM References
Datum (indicated on USGS map):

☒ NAD 1927 or ☐ NAD 1983

1. Zone: 19	Easting:	635042	Northing: 5004676
2. Zone:	Easting:		Northing:
3. Zone:	Easting:		Northing:
4. Zone:	Easting:		Northing:

Verbal Boundary Description (Describe the boundaries of the property.)

The nominated site occupies the bedrock dome located in Meridian Park, at the corner of Lincoln and North Streets in Calais, Maine. The approximate boundaries are shown on the aerial map labeled Calais Observatory Boundary Map.

Boundary Justification (Explain why the boundaries were selected.)

The boundaries of this site represent the natural limits of the elevated granite outcrop upon which the Calais Observatory was located.

11. Form Prepared By

name/title: Harold E. Nelson
organization: _____
street & number: 14 Hill Avenue
city or town: Newport state: Maine zip code: 04953
e-mail: harrydeb@gwi.net
telephone: (207) 368-5012
date: 5 October 2012

name/title: Christi A. Mitchell
organization: Maine Historic Preservation Commission
street & number: 55 Capitol Street
city or town: Augusta state: Maine zip code: 04333-0065
e-mail: christi.mitchell@maine.gov
telephone: (207) 287-2132
date: 5 October 2012

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.
- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.
- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

Photographs

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels (minimum), 3000x2000 preferred, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

Photo Log

Name of Property: Calais Observatory

City or Vicinity: Calais

County: Washington State: Maine

Photographer: Christi A. Mitchell

Date Photographed: July 9 and 10, 2012

Description of Photograph(s) and number, include description of view indicating direction of camera:

1 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0001.TIF
Granite outcrop at Meridian Park; facing southeast.

2 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0002.TIF
Transit stone (left) and clock stone (right); facing west southwest.

3 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0003.TIF
Clock stone (left) and transit stone (right); facing north.

4 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0004.TIF
Transit stone, north and west sides; facing west northwest.

5 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0005.TIF
Transit stone, top and south elevation; facing north.

6 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0006.TIF
Clock stone with through mortise (top) and half mortise (bottom); facing northwest.

7 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0007.TIF
Clock Stone with three drill holes; facing northwest.

8 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0008.TIF
Pad chiseled into granite outcrop, south of transit stone; facing south southeast.

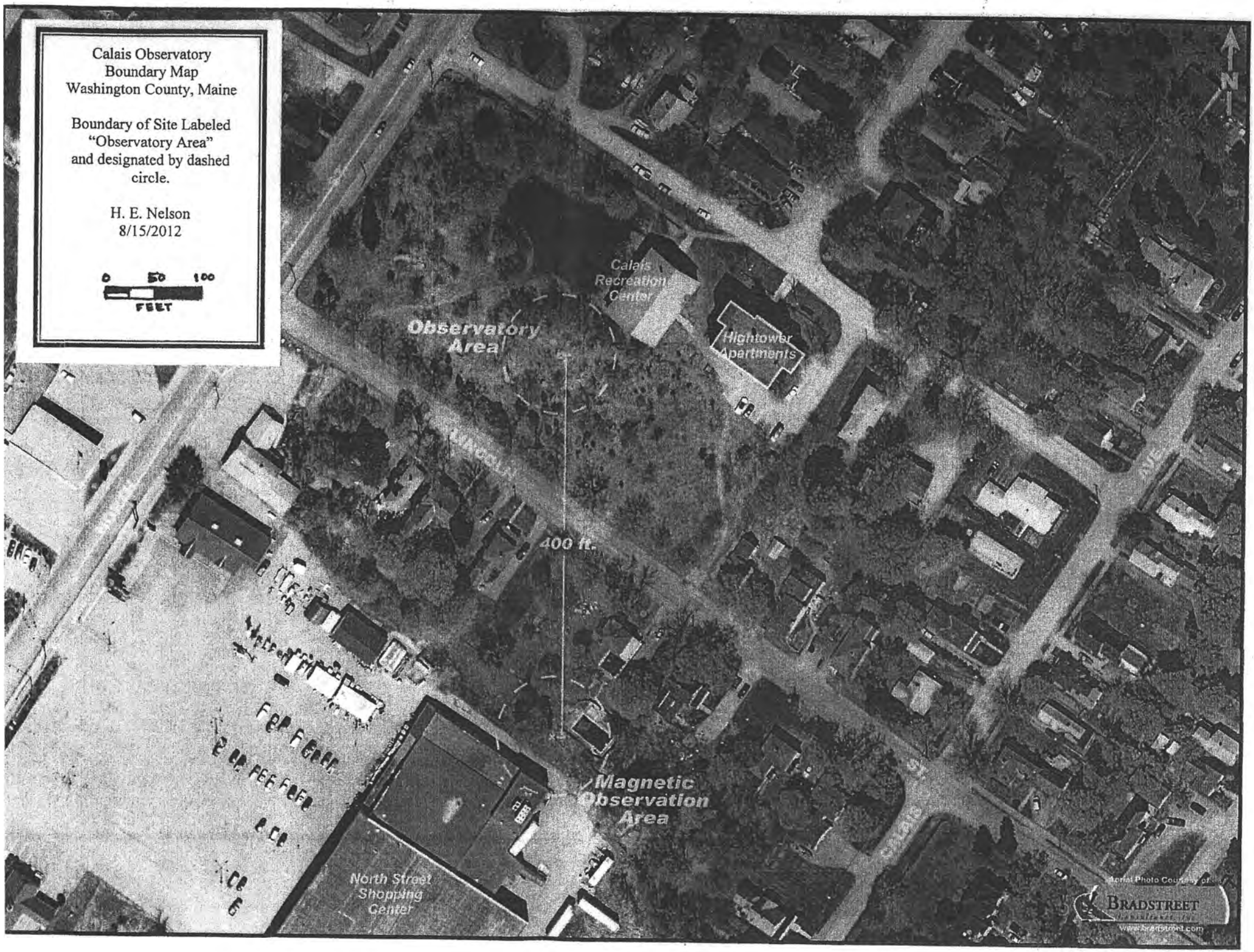
9 of 9 ME_WASHINGTON COUNTY_CALAIS OBSERVETORY_0009.TIF
Eastern drill hole, facing south.

Additional History

There are other observatories in Maine: an observatory (c. 1912) and seismographic station (1929) in East Machias, owned by Massachusetts Institute of Technology (MIT). The property consists of a small building and a concrete transit stone. It was used by students, not the Coast Survey.

There was also an observatory in Farmington (1866) that was used by the Coast Survey for latitude measurements, but never for longitude. Building plans remain, but it is unclear whether the site still exists.

There are no above ground remains at the former Thomas Hill Observatory in Bangor.


Calais Observatory
Boundary Map
Washington County, Maine
Boundary of Site Labeled
"Observatory Area"
and designated by dashed
circle.
H. E. Nelson
8/15/2012
0 50 100
FEET
Observatory Area
Calais Recreation Center
Hightower Apartments
400 ft.
Magnetic Observation Area
North Street Shopping Center
N
Aerial Photo Courtesy of
BRADSTREET

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

REQUESTED ACTION: NOMINATION

PROPERTY NAME: Calais Observatory

MULTIPLE NAME:

STATE & COUNTY: MAINE, Washington

DATE RECEIVED: 11/02/12 DATE OF PENDING LIST: 12/04/12
DATE OF 16TH DAY: 12/19/12 DATE OF 45TH DAY: 12/19/12
DATE OF WEEKLY LIST:

REFERENCE NUMBER: 12001069

REASONS FOR REVIEW:

APPEAL:	N	DATA PROBLEM:	N	LANDSCAPE:	N	LESS THAN 50 YEARS:	N
OTHER:	N	PDIL:	N	PERIOD:	N	PROGRAM UNAPPROVED:	N
REQUEST:	N	SAMPLE:	N	SLR DRAFT:	N	NATIONAL:	N

COMMENT WAIVER: N

✓ ACCEPT ___ RETURN ___ REJECT 12/19/12 DATE

ABSTRACT/SUMMARY COMMENTS:

national level
area of significance - science

RECOM./CRITERIA A

REVIEWER Lisa Deline DISCIPLINE Historian

TELEPHONE _____ DATE 12/19/12

DOCUMENTATION see attached comments Y/N see attached SLR (Y)/N

If a nomination is returned to the nominating authority, the nomination is no longer under consideration by the NPS.

CALAIS OBSERVATORY; WASHINGTON CO., ME

CALAIS OBSERVATORY | WASHINGTON CO., ME

2 OF 9

CALAIS OBSERVATORY ; WASHINGTON CO., ME

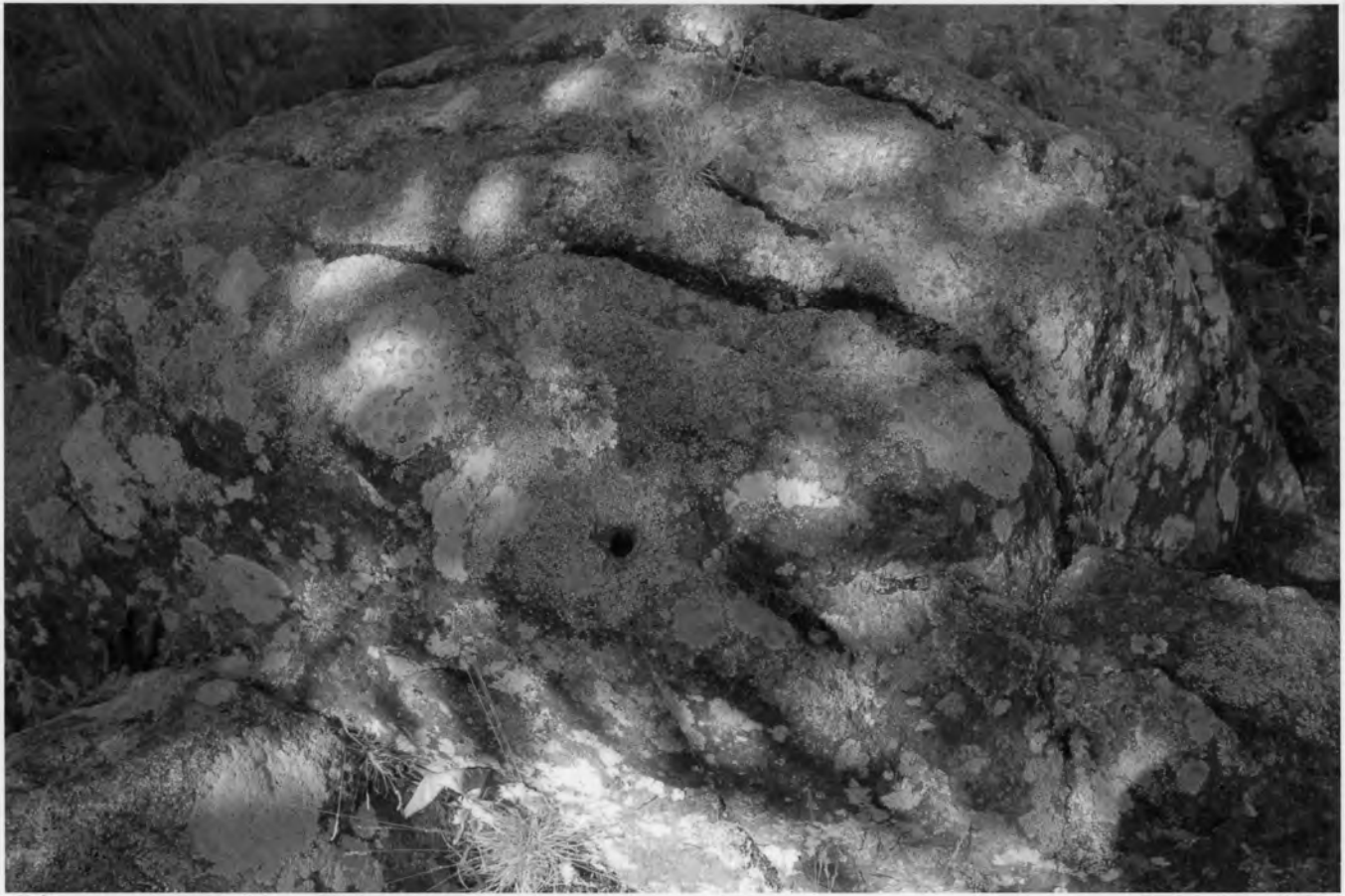
CALAIS OBSERVATORY; WASHINGTON CO., ME 4 OF 9

CALAIS OBSERVATORY ; WASHINGTON CO., ME

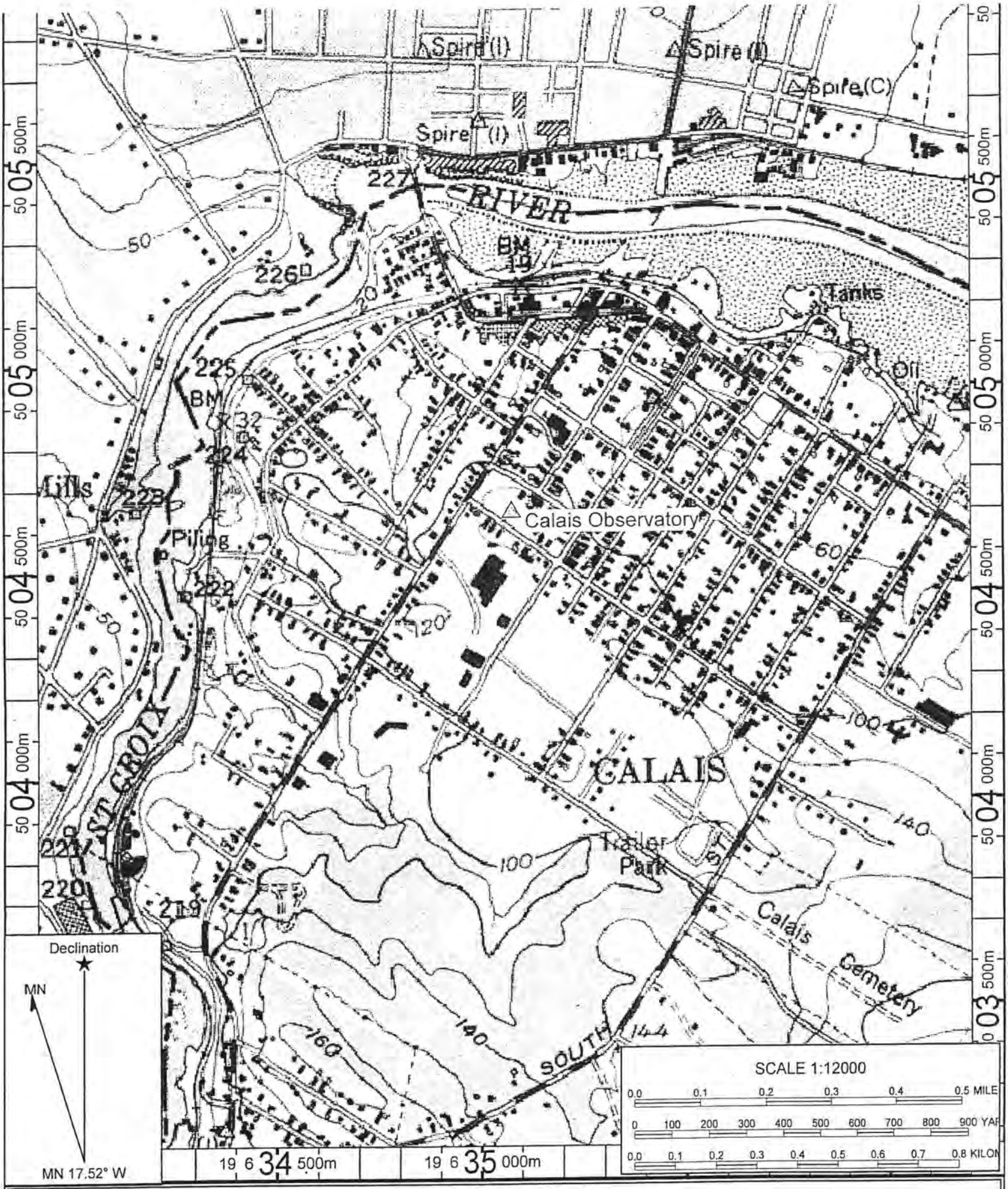
CALAIS OBSERVATORY: WASHINGTON CO., ME 6 OF 9

CALAIS OBSERVATORY; WASHINGTON CO., ME 7 OF 9

CALAIS OBSERVATORY; WASHINGTON CO., ME



CALAIS OBSERVATORY ; WASHINGTON CO., ME



CALAIS OBSERVATORY
WASHINGTON COUNTY, ME

Name: CALAIS
Date: 10/02/12
Scale: 1 inch = 1,000 ft.

UTM: 19/ 635042 / 5004676

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

PAUL R. LEPAGE
GOVERNOR

EARLE G. SHETTLEWORTH, JR.
DIRECTOR

31 October 2012

Keeper of the National Register
National Park Service 2280
National Register of Historic Places
1201 "I" (Eye) Street, NW,
Washington D.C. 20005

To Whom It May Concern:

Enclosed please find three (3) new National Register nominations for individual properties, and two (2) new National Register nominations for historic districts, all in the State of Maine:

Calais Observatory, Washington County
Sewall Memorial Congregational Church, Washington County
Colonial Apartments, Penobscot County
American Woolen Company Foxcroft Mill, Piscataquis County
Waterville Main Street Historic District, Kennebec County

If you have any questions relating to these nominations, please do not hesitate to contact me at (207) 787-2132 x 2.

Sincerely,

Christi A. Mitchell

Christi A. Mitchell
Architectural Historian

Enc.

PHONE: (207) 287-2132