

THE PITTSBURGH GEOLOGICAL SOCIETY

CONQUEST OF THE ALLEGHENY MOUNTAINS IN
PENNSYLVANIA:
THE ENGINEERING GEOLOGY OF FORBES ROAD
1758-1764

Field Trip Guide

May 3, 1997



**CONQUEST OF THE ALLEGHENY MOUNTAINS IN
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Pittsburgh Geological Society Field Trip

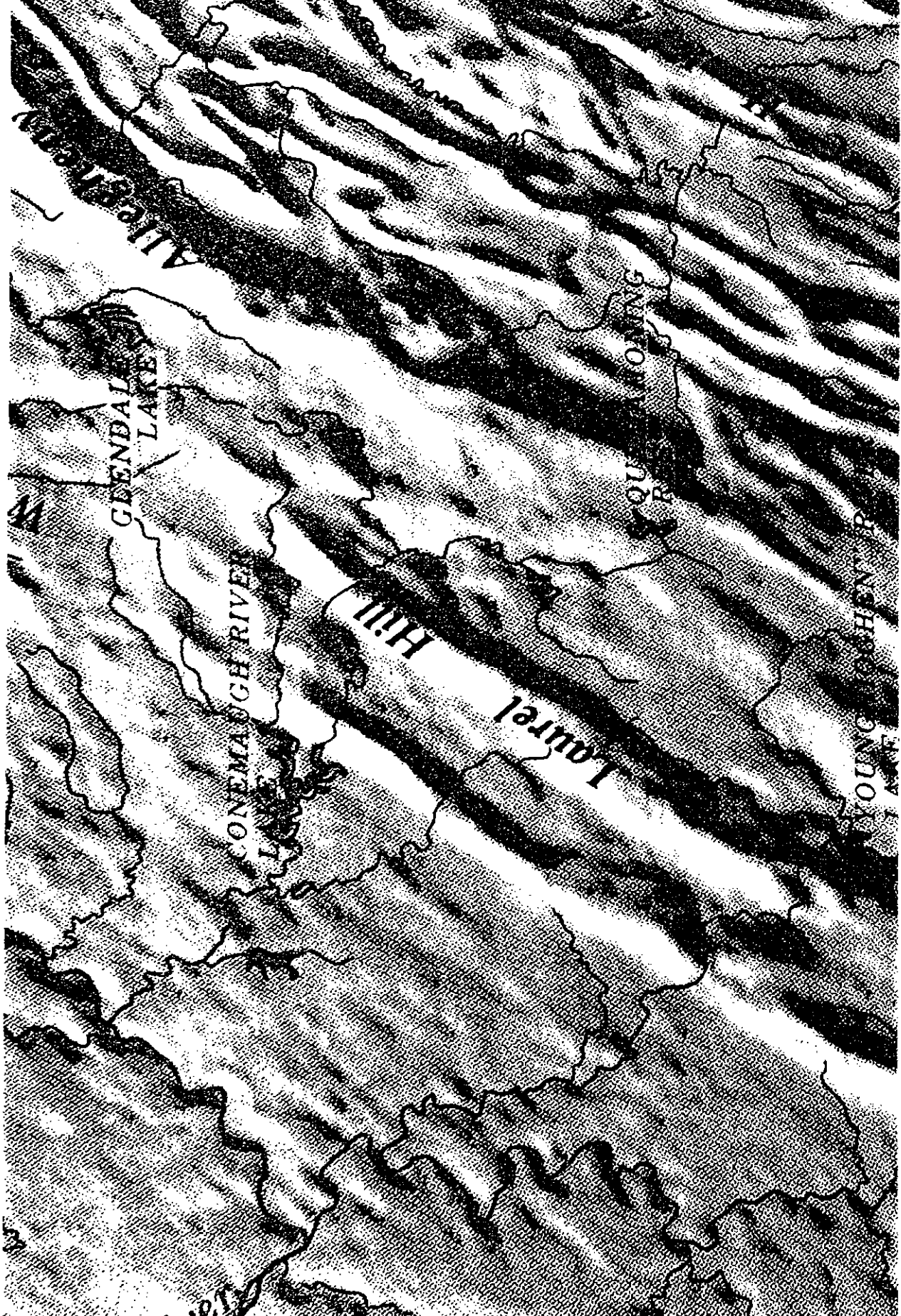
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Glenbally
Lake

Conemacagh
River

Lauriel
Hill

Young's
Lake

Young's
Lake

FORT BEDFORD

Old Fort Bedford was a British stockade built in 1758 as part of the French and Indian War campaign against the French at Fort Duquesne. After several failed attempts in the early 1750s, the British launched a major offensive against Fort Duquesne in 1758. Facing the formidable task of crossing the Allegheny Mountains and the threat of attack, numerous stockades were built along the way west. Fort Bedford was constructed as a key fortification along the military path -- Forbes Road -- and served as the staging area for the successful campaign. After the war Fort Bedford stood until the 1770s, used as a British outpost on the frontier and as a refuge from Indian attack as westward migration increased in the 18th century.

BEDFORD MUSEUM

Thousands of travelers stopping in Bedford have enjoyed visiting historic and educational Fort Bedford Museum. The blockhouse structure houses a large scale model of the original fort and depicts Forbes Road and the surrounding area. Fort Bedford Museum displays Native American artifacts collected from the region. Thousands of household items dating back 100 to more than 200 years ago -- from flintlock rifles to early clothing to antique hand tools -- help to recreate the atmosphere of pioneer days on the frontier of western Pennsylvania.

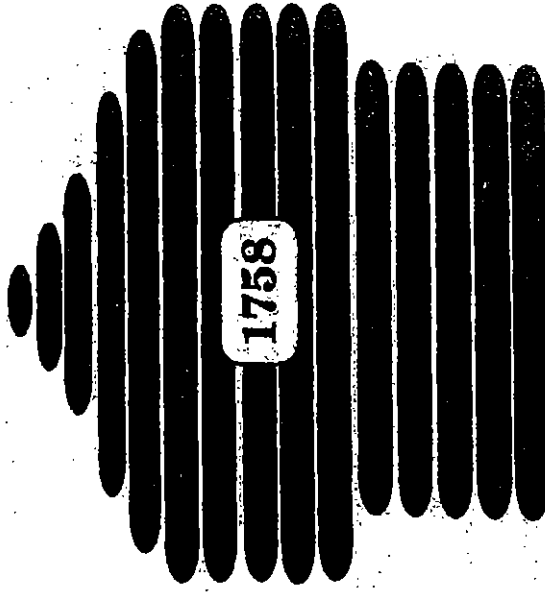
MUSEUM SCHEDULE

Fort Bedford Museum is open daily, May through October, except Tuesdays in May, September and October. Open 10-5. Admission charged. Group rates. Gift shop.



FORT BEDFORD MUSEUM

In Historic Downtown
BEDFORD, PENNSYLVANIA



Fort Bedford Museum
P.O. Box 1758
Fort Bedford Drive
Bedford, PA 15522
(814) 623-8891
800-259-4284

Fort Bedford Museum
P.O. Box 1758
Bedford, Pennsylvania 15522

FBM
1758

Model 1855 Griffen Field Gun

Identification: Griffen Field Gun, 3.67-Inch, Model 1855

Bore: Diameter - 3.67 Smoothbore, Wrought Iron

Common Name: 6-Pounder Griffen

Left trunnion marked: "Phoenix, 1861" and the weight of the tube "1030 lbs."

Right trunnion marked: "Patented Dec. 25, 1855"

Cascable marked: "12" to right of knob

Ammunition: Shot, shell, case shot and canister

Powder Charge: 1.25 lbs.

Range: 1,523 yds., but accurate at 600 yds.

This cannon was cast by John Griffen at his Phoenix Iron Company, Phoenixville, Pennsylvania in 1861. Griffen began making cannon in 1854. He developed a process whereby strips of wrought iron about 3/4-inch thick and 4 1/2 wide were wrapped by lathe around an iron core. Five layers were laid on in alternate spirals until the tube, with a thin covering of iron staves on the outside, was built to thickness. The core was removed and an iron plug driven into the breach to close it and form the cascabel. The metal was then wrought to a welding heat and upset 2 inches in a press. Finally, it was rolled out from 4.5 to 7 feet, trunnions were welded on, the bore reamed out, and the chase reduced to proper size by turning in a lathe

Griffen's first piece, a 3.67-inch smoothbore which resembled the M-1841, bronze 6-pounder, was tested successfully in 1855 by the founder, and a year later passed Army proving with flying colors, not bursting until filled with 7 pounds of powder and thirteen balls. However, Army orders failed to materialize until 1861, when the United States government was desperate for arms at the outbreak of the Civil War.

Secretary of War Simon Cameron contracted on June 22, 1861 for "300 wrought iron field pieces, 6-pound caliber, from the Phoenix Iron Company . . . a portion (two thirds) of these guns to be rifled . . ." Three days later Lieutenant Colonel J.W. Ripley, of the Ordnance Board, suggested that all the guns be rifled. This was done in an effort to secure uniform ammunition. Ripley sent Griffen drawings to work by, and was probably responsible for a design change which resulted in the clean lines at the rear of the cannon tube. Price paid was \$250 per gun. The rifled guns became known as the 3-Inch Ordnance Rifle. They became one of the three most popular field artillery pieces in the Union Army, along with the 12-Pounder Napoleon smoothbores and the 10-Pounder Parrott Rifles. At Gettysburg, 146 or 41 percent of Meade's 360 guns were 3-Inch Ordnance Rifles. Griffen supplied the government with a total of 1,400 3-Inch Ordnance Rifles. Today his guns still dot our National Civil War Battlefield Parks. There are 146 Griffen 3-Inch Ordnance Rifles on the Gettysburg Battlefield alone.

The 6-Pounder Griffen Gun on display in the Fort Bedford Museum was one of possibly three batteries, or 36 smoothbore guns, made in 1861 before Ripley ordered the guns to be rifled. This is a rare artillery piece. It is one of twelve known

smoothbore Griffen Guns. Because the Army of Potomac did not use 6-Pounders after 1862, it is doubtful if this gun saw much field service in the Civil War. It is interesting to note that the original carriage it was mounted on was not U.S. Army regulation. It is believed to have been of Confederate manufacture. A Griffen Gun was known to have been tested in Virginia in 1861.

This gun was brought to Bedford in 1890 for the dedication of the town's Civil War monument. John M. Bain of Northumberland wrote to the local paper that "... For the dedication ceremonies a field piece which had been in service in the Civil War had been acquired and was used in the parade. . . Evidently there was some hitch about the return of this piece of artillery. I know that it got as far as the Pennsylvania station, but apparently there was a hitch over who would pay the freight, and it was still there in 1896 when I left Bedford. I know, (because) we boys for many occasions loaded it with blasting powder and fired it on proper occasions." This may explain why a file is broken off in the vent hole! Legend has it that it was fired over a river in an attempt to raise the body of a man who had drown. This cannon was a popular sight on the squares of Bedford for many years. It was located on the corner diagonally from the Court House. After being climbed over by thousands of young children and photographed by a like number of tourists, the cannon was brought to this museum to save it from the elements and preserve it for future generations. It is a reminder of America's Military and Industrial Heritage.

Locations of known Griffen 6-Pounder Guns.

- #7 National Guard. Smith, Pa.
- #8 Dick Neff [Private collector]
- #9 National Guard Headquarters. Indian Town Gap, Pa.
- #10 Cemetery. Freeland, Pa.
- #11 Pennsylvania National Guard Headquarters
- #12 Fort Bedford Museum. Bedford, Pa.
- #?? The Gettysburg Wax Museum. Gettysburg, Pa.
- #14 William Penn Museum. Harrisburg, Pa.
- #15 Sandwich, Massachusetts
- #17 Battery Park. Franklin, Pa.
- #18 Romansville, Pa. [Sleeved to 3"]
- **** Phoenixville, Pa. [Unfinished]

The Fort Bedford Museum wishes to thank Mr. Ed Olmstead of Carlisle, Pennsylvania for the locations of 6-Pounder Griffen Guns.

This exhibit was supported jointly by grants from the Pennsylvania Historical and Museum Commission, Senator Robert Jubelirer. Representative Dick Hess, the Bedford Lions, the Bedford Jaycees, and Bedford Borough Council. Restoration of the gun and limber was completed by Jeff Stafford of Coatesville, Pennsylvania. Construction of the exhibit was by Paul & Richard Clark, Inc.

Conquest of the Allegheny Mountains in Pennsylvania:

The Engineering Geology of Forbes Road -- 1758-1764

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Keywords: *Highway geology, Highway construction, Allegheny Mountains, Pennsylvania, Mountain barriers, Rock slopes, Ohio River, Juniata River, Military history, French and Indian War, Chief Pontiac's War*

ABSTRACT

By the mid-1700s, the parts of British colonies along the eastern seaboard of North America were settled, safe and civilized. This was by no means the case not very far inland in the Allegheny Mountains and at The Forks of The Ohio, now the site of Pittsburgh, from which the Ohio River flows west. Virginia claimed The Forks but was driven out by the French. In 1754, Lieutenant Colonel George Washington of the Virginia Militia tried and failed to reverse this, bringing on the French-British Seven Years War, our French and Indian War. A second British attempt in 1755 via Washington's route, Virginia, Maryland and to The Forks, was crushed. In 1758, the invalid General Sir John Forbes was ordered to try again. He concluded to go from Carlisle, Pennsylvania to The Forks as directly as possible. There was no through road, but in five months his 6,000-man army, managed for Forbes by Colonel Henry Bouquet, cut a road capable of carrying wagons and artillery through the mountainous, heavily forested Alleghenies. Late in the year the outnumbered French abandoned The Forks and retreated to Canada. This paper examines the setting of the 217 miles of Forbes Road and the physical obstacles facing his army. Adding only the most significant climbs and descents, construction of Forbes Road was the equivalent of conquering a single obstacle more than 8,000 feet high, something that might have given even Hannibal pause. It was a remarkable job, done with very few of the tools we now have.

INTRODUCTION

It may seem odd to refer to the engineering geology of a major work that was done almost 200 years before engineering geology was fully recognized as a legitimate subdiscipline of geology. However, if engineering geology can be briefly defined as the understanding and use of rock and soil materials in planning, design, construction, and operation of an engineering structure, and a highway is an engineering structure, with respect to the Forbes Road "project" all the elements were there. This is not surprising, for successful military and civil enterprise for some millennia has to a significant degree been dependent on the intelligent use of earth materials. Much earlier great works that come readily to mind include the Pyramids of Egypt, the Great Wall of China, and the widespread systems of Roman roads, aqueducts and fortifications.

The reader may fairly ask how I happened on to Forbes Road. A while ago I was asked to give a seminar on the geology, geomorphology, and resources of southwestern Pennsylvania as part of a summer course on regional history for teachers in primary and secondary schools. An important thrust of the course was how in the early days of settlement, before the American Revolution, this area had developed in relative isolation from the then settled, and generally safe and civilized, eastern seaboard of the continent. I was to emphasize the part that the high Appalachian ridges and the higher Allegheny Mountains, for the purpose lumped into an all-inclusive "Alleghenies," played as a barrier to communication, supply, and westward migration. From a purely physical point this seemed a fairly simple task. Landsat and side-looking-radar imagery and regional topographic maps would seem to tell a compelling story. That's rough country to traverse! However, I wanted to tie this to real experience in the early days, so I cast around and fortunately found a fine example with which to work.

HISTORICAL BACKGROUND

Before 1758, most movement westward across the Alleghenies passed near or through what is now Cumberland, Maryland on the upper Potomac River, then by various paths approximating the line of current US-40 across the mountains to the Monongahela River and down that river to "The Forks of the Ohio," the confluence of the Monongahela with the Allegheny River to form the mighty Ohio. At the time Virginia claimed the area as part of its Augusta County, though this was disputed by Pennsylvania. This was the route of Lieutenant Colonel George Washington of the Virginia Militia in his dealings with the French that led to his defeat at Fort Necessity in 1754 and the start of The Seven Years War (O'Meara, 1979, p. 77-105). This also was the route taken by the army of British General George Braddock to his defeat and death at the hands of the French and Indians on Turtle Creek in now Allegheny County in 1755 (O'Meara, 1979, p. 109-151). Three years later, the 6,000-man army of General Sir John Forbes marched a different way. Forbes' chief executive officer was Colonel Henry Bouquet, a Swiss in British service, and he figures large in what follows.

Starting from Carlisle, Pennsylvania, 15 miles west of the Susquehanna River, and as far as then Raystown, Forbes' army followed first the "Virginia Road," opened in 1744, and then a path to Raystown cut hastily by Colonel Burd in 1755 in support of Braddock's campaign. At Raystown in 1758 Colonel Bouquet constructed Fort Bedford, and Raystown later became Bedford. From the fort westward the army's route followed a new road constructed under the direction of Bouquet. From Raystown "Forbes' Road" ran about as straight toward "The Forks" as topography, geology, exigencies of the campaign, and engineering skills of the times allowed. Forbes' campaign was successful. The French abandoned "The Forks," Fort Pitt was built, and Pittsburgh was founded (O'Meara, 1979, p. 183-223). Other British victories followed in Canada and elsewhere, and the war, our French and Indian War, came to an end.

In 1763, however, Chief Pontiac's War descended on the frontier. In the Ohio River drainage west of the Alleghenies only powerful and "modern" Fort Pitt, though undermanned, and its eastern satellite Fort Ligonier, with modest reinforcement from Fort Bedford, held out against the Indian Confederation (O'Meara, p.223-236). Those settlers and traders not inside the forts were killed or taken captive or fled eastward across the mountains. Colonel Bouquet was ordered to relieve beleaguered Fort Pitt, an expedition considered by most a "forlorn hope" (military language of the times for a very risky, desperate enterprise). He was almost there when, in now Westmoreland County just 40 miles east of Fort Pitt, he and his 497 men indeed were attacked by a large band of well-led Indians. On August 5-6, 1763 Bouquet fought and won the touch-and-go two-day battle of Bushy Run, in which the many of the Indians' best fighting chiefs died. Bouquet relieved Fort Pitt, but his force was too exhausted and reduced in numbers to follow up on the sharp defeat administered to the Indians, who, almost leaderless, retired in disarray to the Muskingum River in Ohio country (O'Meara, p. 236-244).

In 1764 Bouquet was again in the field, leading a larger, though still small, army westward from Carlisle to again face the Indian Confederacy. Bouquet's Orderly Book from this march to Fort Pitt survives, and it is this which provides a real sense of what it took to cross the mountains during the early days. The chief source for this article is the volume by Edward G. Williams (1975) that reproduces the Orderly Book with Williams' own detailed annotation and interpretation of Bouquet's 1764 experience. Contained also in this volume is a thorough description of Forbes Road, largely based on Williams' own many years of research. Historian Williams' Preface concludes: "From all the evidence, it appears as a cogent fact that [in 1758] the invalid General Forbes made the ultimate decision to cut the road over the Pennsylvania mountains rather than to take the Virginia-Maryland-Pennsylvania route of Braddock's road. Beyond that point, Forbes had very little to do with the actual construction of the road, other than to receive from Bouquet careful reports upon its progress and to be transported over it in his horse-borne litter. All the executive responsibility for construction, selection of the courses of the road, organization of the personnel, and troop supply and movements were capably carried to a successful conclusion by that consummate soldier, Bouquet."

BOUQUET'S MARCH OF 1764

Table 1 is a summary of Colonel Bouquet's itinerary in 1764. Daily distances shown in the table were measured on planimetric maps enclosed with Williams' book (at scale approximately 1 inch = 2.2 miles) using a Dietzgen Map Measure, and the route and these distances were compared to 7.5-minute series topographic maps. The distances are subject to some interpretation, so they are given only to the nearest half mile. The sites of night camps on September 15-16 and September 16-17 are not located in the Orderly Book (for the reason that the orders for the march onward to Fort Pitt were issued at Fort Ligonier on September 14th and no additional written orders were given until the 19th), so the 49 miles marched on these three days are divided about equally across the three days.

The departure and arrival places named in Table 1 are where Headquarters, that is, Bouquet and staff, were located, but this by no means indicates that all his men were there. As examples, while headquartered at Fort Loudoun (Bouquet's spelling), he ordered a "Brigade of Wagons" sent forward to Fort Bedford on August 14. And on August 27 two "Brigades of Pack Horses" (72 horses each) were ordered to Fort Littleton the following day. And movement was not all in one direction. A 450-man detachment left Fort Loudoun on August 15 to guard a pack train to Fort Pitt, and they rejoined the army at Fort Bedford on September 4. On September 6, a small body of men left Fort Bedford to escort a "convoy" headed south to Fort Cumberland. Plainly, the periods during which Headquarters stayed in one place were not idle days for the army. Only from Fort Ligonier to Fort Pitt did the army move as a single "convoy." This may in part account for the relatively slow rate of advance over relatively easy terrain on the last days of the march, for one has no trouble imagining the crowded scene – troops, horses, artillery, and cattle moving in an orderly and cohesive self-protecting mass.

On the 14 days that Bouquet and his staff were moving from headquarters location to headquarters location, distances ranged from 8 to 23 and averaged 15½ miles per day. Total elapsed time for the whole army's journey to Fort Pitt was approximately 40 days, during which the average advance was about 5½ miles per day. However, his 17 days at Fort Loudoun probably should be largely discounted, for this time chiefly was spent in assembling his army and its supplies, as well as having advance parties improve the road. If, from Table 1, only the march from Fort Loudoun to Fort Pitt is considered, Bouquet travelled about 170 miles in the elapsed time of 21 days, a somewhat faster overall average of 8½ miles per day, but still hardly breakneck speed. The march of the detachment that went from Fort Loudoun to Fort Pitt and returned to Fort Bedford from August 15 to September 4 provides a view of what infantry leading packhorses but otherwise unencumbered could do in the terrain. From the distances in Table 1, these men covered about 283 miles in 21 days, about 13 ½ miles per day. If they took "Sundays" off, they averaged about 15 miles per day.

Table 1.- Colonel Bouquet's Itinerary, Carlisle to Fort Pitt
August 10 through September 18, 1764
(current county locations)

<u>Date</u>	<u>Marching days</u>	<u>Start and finish of day's march</u>	<u>Day's route miles</u>	<u>Cumulative miles</u>
Aug 10	1	Carlisle, Cumberland Co., to Millers Spring, Cumberland Co. -----	8	8
Aug 11	2	Millers Spring to "beyond Shippensborough" (Reynolds Spring?), Franklin Co. -----	15 ½	23 ½
Aug 12	3	Reynolds Spring (?) to Fort Loudoun, Franklin Co., on the West Branch, Conococheague Creek -----	23	46½
Aug 12 to 30	--	CONCENTRATING AT FORT LOUDOUN (with much to-and-fro movement) - 17½ days--	-0-	46 ½
Aug 30	4	Fort Loudoun through Cowans Gap in Tuscarora Mtn. and past Burnt Cabins to Fort Littleton, Fulton Co., on Little Aughwick Creek -----	20 ½	67
Aug 31	5	Fort Littleton over Sideling Hill to "Sidling Hill and at Juniata" (Jerry Spring?), Fulton Co. ----	15	82
Sept 1	6	Jerry Spring (?) to the Raystown Branch Juniata River and through water gaps in Tussey Mtn. and Evitts Mtn. to Fort Bedford, Bedford Co. -	23	105
Sept 1 to 9	--	CONCENTRATING AT FORT BEDFORD - 7½ days -----	-0-	105
Sept 9	7	Fort Bedford to "Shawanese Cabbins", Bedford Co., on Shawnee Creek -----	8 ½	113 ½
Sept 10	8	"Shawanese Cabbins" through Rhor's Gap on the Allegheny Front to Edmond's Swamp, Somerset Co., on Millers Run -----	17	130 ½
Sept 11	9	Edmond's Swamp to "Kuymony Bridge," Somerset Co., on Quemahoning Creek -----	15 ½	146

Table 1 (continued)

<u>Date</u>	<u>Marching days</u>	<u>Start and finish of day's march</u>	<u>Day's route miles</u>	<u>Cumulative miles</u>
Sept 12	10	"Kuymony" Bridge over Laurel Hill to Fort Ligonier, Westmoreland Co., on Loyalhanna Creek -----	14	160
Sept 12 to 15	--	CONCENTRATING AT FORT LIGONIER - 2½ days -----	-0-	160
Sept 15	11	Fort Ligonier over Chestnut Ridge, Westmoreland Co. (Camp sites from the evening of Sept 15 through the morning of Sept 17 are not described in the Orderly Book. Miles for Sept 15, 16, and 17 are averaged from the measured total of 49 miles) -----	16 ½ est	176 ½
Sept 16	12	West of Chestnut Ridge to the vicinity of Turtle Creek, Westmoreland Co. or Allegheny Co. ---	16 ½ est	193
Sept 17	13	Turtle Creek vicinity to Nine Mile Run (Bullock Pens), Allegheny Co. -----	16 est	209
Sept 18	14	Nine Mile Run to Fort Pitt, Allegheny Co., at The Forks of the Ohio -----	8	217

In contrast to Bouquet's progress in 1764, General Forbes' army took more than 5 months to get from Carlisle to Fort Pitt in 1758. However, along the way the army had to turn Burd's 1755 path into a road for wagons and artillery and construct the new road from Fort Bedford onward, as well as build Fort Bedford and Fort Ligonier and lesser redoubts. Unlike the rash General Braddock, General Forbes was a belt-and-suspenders man. In case things went wrong he wanted the fortifications to fall back upon.

Colonel Bouquet's total distance from Carlisle to Fort Pitt of about 217 miles (Table 1) appears reasonable. Except for the dog leg via "Shippensborough" and Fort Loudoun to Burnt Cabins and Fort Littleton, Bouquet's route is quite direct and does not vary greatly from the routes of current highways. As added by segments on the Pennsylvania Official Transportation Map, the highway distance via the Pennsylvania Turnpike (I-76) from Carlisle to Bedford and US-30 from Bedford to downtown Pittsburgh is 179 miles. The sum of highway realignments made possible by developing

technology and the omission of the dog leg adequately account for the 35 to 40 miles since cut off from Bouquet's marching distance from Carlisle to Pittsburgh.

Other factors to be considered include the following. In 1764, Colonel Bouquet was travelling an existing road, "Forbes Road," through country familiar to him. Though not a good road, this was the only road from central Pennsylvania to the west, so en route he ordered substantial repairs and improvements. In 1764, his army numbered about 1,500, about one-fourth that of Forbes, so it was more readily managed. Bouquet's force was largely infantry, both regulars and less-disciplined militia, so the bulk of the army walked. Its supplies were mostly carried on horseback, with the number of pack horses more than 1,200, more than a mile of horseflesh if marched in double file. Wagons were used chiefly for tents and ammunition, and artillery also was on wheels. The army's meat was on the hoof, cattle and sheep that had to be driven.

From Fort Pitt Bouquet's army went on to the Forks of the Muskingum in Ohio territory. There Bouquet faced down the Indian Confederacy, recovered hostages, himself took hostages, and brought general peace to the frontier that lasted until Dunmore's War in 1774.

Returning briefly to the point of the summer-school course, extrapolating Bouquet's 1764 experience to more mundane travel of the times is not difficult. All in all, it is hard to imagine a pioneer, with family, livestock, and a Conestoga wagon, now making repairs and then resting, and hunting along the way, getting all the way from Carlisle to Fort Pitt much faster than did Bouquet, perhaps even including his Fort Loudoun sojourn. The Alleghenies were indeed a significant barrier to migration and communication.

THE TOPOGRAPHIC AND GEOLOGIC SETTING OF FORBES ROAD

Figures are at the end of the guide. Figure 1 identifies the 7.5-minute quadrangles that include Forbes Road. The numbers in the quadrangles indicate the pages on which geologic maps of the quadrangles appear in the atlas by Thomas M. Berg and Christine M. Dodge (1981). Quadrangles without numbers in their boxes are not in the atlas, and their geology is covered in separate publications, which are cited. Figure 2 shows the trace of Forbes Road and its modifications through the quadrangles and locates the principal topographic barriers and sites of 1764 encampments. Quadrangle names and numbers are omitted to reduce map clutter. Figure 3 also shows the trace, but in comparison to features of geologic structure and the chief escarpments overcome. Figure 4 is a simplified profile of Colonel Bouquet's route, with vertical scale much exaggerated.

Carlisle to Fort Bedford

From Carlisle along the Great Valley to Fort Loudoun the three-day march of Bouquet's army was relatively easy going through Cambrian and Ordovician terrane of generally low relief, mostly along the well established "Virginia Road." The route essentially followed the line of current US Highway 11 to a short distance past Shippensburg, then turned west through Pinola and Culbertson, passed a short distance north of St. Thomas, and then went straight west to Fort Loudoun (Williams, 1975, p.11-13; Berg and Dodge, 1981, p. 428, 453, 491, 496, 513, and 597; Pierce, 1966; Root, 1971; Root, 1978).

Onward from Fort Loudoun, the first real obstacle was anticlinal Tuscarora Mountain, with the resistant Silurian Tuscarora Sandstone on its flanks and crest, a rise of about 600 feet from Fort Loudoun to just over 1,200 feet elevation at Cowans Gap. The road prepared by Colonel Burd in 1755 went north up Path Valley and then climbed to the gap, most of the way close to the West Branch of Conococheague Creek. However, marshy conditions on the less resistant Ordovician Reedsville Shale made this route impassible under heavy use in wet weather, so in 1758, Colonel Bouquet built an alternative road up the east slope of the mountain on the better-drained ground of weathered sandstone. This had the additional advantage of permitting lesser grades, except for the last steep one-mile pull to the gap. From Cowans Gap, Forbes Road went north-northeasterly down synclinal Allens Valley between high Tuscarora Sandstone ridges, crossing the South Branch of Little Aughwick Creek about halfway down, then turned westward across the toe of Cove Mountain, here also avoiding marshy ground by construction along the slopes, then west-southwestward generally paralleling current US-522 to Fort Littleton, across tightly folded and faulted middle Paleozoic clastic and carbonate rocks of relatively low relief (Pierce, 1966, pls. 1 and 2; Berg and Dodge, 1981, p. 89; Williams, 1975, p. 38-39).

For 11 miles westward from Fort Littleton the route rises gradually across chiefly Devonian clastic rocks from about 800 feet elevation at the fort to about 1,200 feet at the foot of Sideling Hill, a north-northeast-trending ridge many miles long both to north and south. Here, however, was met a significant obstacle to progress, the sharp rise to almost 2,000 feet on the crest of the "hill," starting at the bottom in redbeds of the Devonian Catskill Formation; then up the chiefly sandstone cliffy reverse-dip slopes of the Mississippian and Devonian Rockwell Formation to the Mississippian Pocono Formation which caps the top (Berg and Dodge, 1981, p. 287 and 608). As constructed in 1758, the Forbes Road overcame this rise by resorting to a zigzag switchback system of "seven reverse curves and two 90-degree turns, with several connecting long tangents – one about a half mile in length – climbing the long and steep slope. The construction was accomplished by dragging large blocks, in which the mountainside abounds, into a line against which earth was scooped from the mountainside above, the large rocks serving as a retaining wall. A short, steep 'pinch' at the top completed the ascent" (Williams, 1975, p. 40). At the top, the road turned generally southwest along the crest, in about 2 ¼ miles reaching the site of Jerry Spring, even recently a reliable source of

water for travellers. In 1764, Captain Williams, the Chief Engineer on Bouquet's staff (not to be confused with historian Williams, of course), made a considerable improvement in the route up Sideling Hill. "By producing a prolongation of the third long tangent of the switchback and taking advantage of an existing natural, inclined shelf rising along the side of the narrow valley of the falling Wooden Bridge Creek, for two miles, then passing through a gap between the lofty King's Knob and the main ridge of Sideling Hill, [Captain] Williams gained the comparatively level top of the connecting ridge to Ray's Hill summit" (Williams, 1975, p. 40), joining the route of the 1758 road not far from Jerry Spring. This change also reduced the vertical climb by about 100 feet. For this effort, Captain Williams received a most unusual honor in the Orders for September 3:

"Coll Bouquet Orders his Thanks to be given to Capt. Williams Chief Engineer and to the Officers & Soldiers under his direction for their Great Assiduity & dilligence in Compleating so speedily and Effectually the New Road at the Sidling Hill. --- And That the Country may know who performed that useful & publick service That part of the Road shall for the future be called Capt Williams Gapp. ---" (as recorded in the Orderly Book, Williams, 1975, p. 101).

Historian Williams makes the point that what was good engineering geology in the 18th century was equally good in the 20th. The current trace of the Pennsylvania Turnpike (I-76) up the east side of Sideling Hill "covers, with its broad concrete ribbon, all but two traces of Bouquet's 1764 roadbed, which can still be distinguished." Williams climbed down the slope to see what he could see and wrote, "The earth fill had been mostly washed away, but the long lines of retaining-wall rocks were still standing in seemingly interminable rows" (Williams, 1975, p. 40). From the Orderly Book we know very little more in any detail about what Captain Williams did, but we do know he was a busy man. As examples, on August 14 Captain Williams left Fort Loudoun with 114 officers and men and 10-days' rations and "with a proportion of Tools.....to repair the road towards Bedford," which included Sideling Hill. On August 24, he left again with 107 officers and men, this time with 12-days rations. As the the officer responsible for tools, on September 8 we see him issuing hatchets (as weapons, tomahawks, as well as tools) to "Light Horse & Light Infantry." And on September 10, two infantry companies are ordered to "proceed with Capt Williams and receive directions from him." In addition, Captain Williams had the regular responsibility for laying out the army's encampments, each of which normally encompassed some 50 acres, inclusive of redoubts for the advance guards (Williams, 1975, p. 25-26, 56, 60, 75, 107, and 110).

About 1½ miles to the west of Jerry Spring, the trace of Forbes Road is very close to the right of way of current US-30, and it is rarely much more than a mile or two north or south of US-30, here and there essentially coincident with it, for 80 highway miles to vicinity of Latrobe in Westmoreland County. That is, in 200 or so years of improvements here and improvements there, Forbes Road evolved into this segment of US-30. From Sideling Hill Forbes Road ran westward across Pocono Formation strata in the southern extention of the Broad Top synclinorium, at elevations never less than 1,700 feet, to the

west-facing slope of Rays Hill. Here there was a descent equally as daunting as the climb up Sideling Hill, and in 1758 here too there was resort to zigzag, although the original trace now is completely obscured. "In 1762, however, engineer Colonel William Eyre complained of the steepness of the descent -- '.... it should have been zig'zagged more'" (Williams, 1975, p. 41).

At the bottom, the road was once more in Catskill strata, and it continued on the Catskill past its crossing of the Raystown Branch of the Juniata River at about 950 feet elevation. This ford was about two miles west of now Breezewood and 3/4 of a mile downstream from the current US-30 bridge. Here the river has a complex meandering pattern, and for about four miles west of the ford Forbes Road ran along a Catskill ridge separating upstream and downstream reaches of the river by an average of less than a mile. Near the end of this stretch, the road crossed a fault into older Devonian terrane, and it continued onto progressively older rocks as it approached Tussey Mountain (Berg and Dodge, 1981, p. 79, 208, 375, and 608; Williams, 1975, p. 42).

The opposing limbs of the Friends Cove anticline, cored as they are by the Tuscarora Sandstone, form impressive ridges that enclose the Cambrian and Ordovician Snake Spring Valley, except for Aliquippa's Gap through Tussey Mountain and The Narrows gap in Evitts Mountain, both incised by the antecedent Raystown Branch through zones of faulting. Forbes Road took advantage of both gaps, as did later road construction, including both US-30 and the Pennsylvania Turnpike, as well as a branch of the Pennsylvania Railroad (Knowles, 1966, p. 43 and pl. 1; Berg and Dodge, 1981, p. 209). Forbes Road stayed on the north side of the Raystown Branch until through The Narrows, then crossed to the south side to reach Fort Bedford (Williams, 1975, p. 42). The current Fort Bedford Museum (where a nicely done model of the fort and its setting is displayed) is located just downslope from the low bluff which was the original site of the fort, and now part of the town, about 1½ miles east of The Narrows. Here alluvium of the Raystown Branch rests on limestones of the Silurian to Devonian Keyser and Tonoloway Formations.

Fort Bedford to Fort Ligonier

From Fort Bedford upstream, the Raystown Branch curves northward then westward and southwestward across a saddle in the Wills Mountain anticline, and Forbes Road (and US-30) followed this course to the vicinity of now Wolfsburg, in Silurian terrane on the anticlinal axis, where it recrossed the branch to the north side. Here in 1760 Captain Ourry built a bridge, but it was washed out by 100-year flooding in 1762, so in 1763 and 1764 Bouquet's armies had to ford the branch. From Wolfsburg he and his army headed west across hilly Devonian terrane in the Wellersburg syncline to "Shawanese Cabbins," now Shawnee State Park where a segment of park road is identified as Forbes Road (Berg and Dodge, 1981, p. 43). This was the original route adopted by Colonel Bouquet in the summer of 1758. However, an alternative route also was prepared in 1758, on the suggestion of Lieutenant Colonel St. Clair that the first route across and along the Shawnee Creek floodplain might be too wet for use during the

autumn. This alternative ran through now Schellsburg and "over the two Risings", the flanks of the Schellsburg dome, east and west of the town, and it is essentially coincident with today's US-30 for some distance. Historian Williams (1975, p. 87) notes that it "certainly was drier and 2½ miles shorter." In 1758 different elements of Forbes' army used both routes, but in 1764 Bouquet apparently took the "Shawanese Cabbins" route. No reasons are given in the Orderly Book, but with the indefatigable Captain Williams working on the road ahead, this decision probably was based on his opinion of road conditions. The summer of 1764 may have been a dry and hot one, as is suggested when Bouquet on September 2 ordered "a Shade built for a Camp Guard" at Fort Bedford (Williams, 1975, p. 101).

The greatest mountain barrier lay just ahead, the Allegheny Front, which rose from about 1,200 feet elevation at "Shawanese Cabbins" to almost 3,000 feet locally along its crest. Macfarlane (1873, p.102-104) provided an elegant early description of the Front: "The most important feature of the North-American Continent in connection with our subject [coal regions] is the Alleghany Mountain.... The whole length of this mountain is about 1,300 miles....the most remarkable peculiarity about this mountain is the great regularity of the east or southeast summit of the ridges. It is not of an unusual height....being usually about 1,000 feet above the adjoining valley....but it pursues a remarkably straight course, sometimes hardly diverging from a straight line for a distance of 50 or 60 miles. Throughout its entire length it pursues a uniformly northeast course, and from the North Branch of the Susquehanna in Pennsylvania to the line between Tennessee and Alabama....it is one continuous, unbroken range of high table-land....and throughout this whole length there is no clean cut through the range."

The original and alternative 1758 roads rose irregularly and relatively gradually over several miles of northwest-dipping Devonian rocks and rejoined each other on the Front where the current US-30 crosses the 2,100 foot contour, as mapped by historian Williams (1975, map 3). From this elevation about at the top of the Catskill redbeds, Forbes Road had to surmount the cliff-forming Mississippian-Devonian Rockwell Formation (Sideling Hill revisited), here capped by the Mississippian Burgoon Sandstone. Credit is given to Ensign Charles Rhor, a former French sergeant (on an expedition against the French!), who discovered a narrow ravine rising steeply, but not too steeply, almost due north to about 2,700 feet at its top, which was at the contact of the Burgoon and less resistant shales of the overlying Mississippian Mauch Chunk Formation. This "Rhor's Gap," the key to conquest of the Allegheny Front, rose about 600 feet in ¾ of a mile, an average gradient of 15 percent, punishing but practicable. General Forbes wrote, "Mr. Rhor the Engineer was of more service than all the rest of that Class put together" (Williams, 1975, p. 89). US-30 today makes a sharp climbing turn where it crosses the ravine, and one driving up the Front is too concerned with the road to give the ravine much attention. However, to stop and look at the ravine is a lesson in the great progress of two centuries, as well as perhaps in humility. Stand back and imagine Bouquet's 1,500 men, 1,300 horses, artillery, wagons, and cattle going up this narrow ravine in 1764, let alone Forbes' 6,000 men and their gear during the 1758 campaign. Amazing!

Once through "Rhor's Gap" and above the Burgoon Formation, the remaining way over the Front was relatively gentle and easy over strata of the Mauch Chunk and through a pass in the lower part of the Pennsylvanian Pottsville Group at just over 2,800 feet elevation, and Forbes Road passed from the Susquehanna River drainage into the Ohio River basin (Berg and Dodge, 1981, p. 109 and 502).

Across Somerset County from the top of the Allegheny Front to the lower slopes of the eastern face of Laurel Hill, Forbes Road crosses the Pennsylvanian Pottsville (chiefly sandstone), Allegheny (chiefly shale), and Conemaugh (interlayered shale and sandstone) Groups, the strata of which are molded into a number of relatively gentle north-northeast-trending folds, the Berlin, Somerset, and Johnstown synclines, the Negro Mountain anticline, and the Boswell dome. In general, the synclines correspond to valleys and the anticlines to intervening ridges, hilly country contrary to the westward line of march (Berg and Dodge, 1981, p. 71, 109, 280, and 541). From the top of the Front the road followed an irregular course to the encampment at Edmond's Swamp on Millers Run. In 1758, a corduroy road was laid across the swamp, in the language of the time, "bridging" the swamp (Williams, 1975, p. 90).

From Edmond's Swamp the road followed a more direct path to Stonycreek River, crossing it at present-day Kantner, near the PA-403 bridge, where Stonycreek flows northeasterly on strata of the Pennsylvanian Allegheny Group. Here the road again split into alternative tracks, both laid out in 1758. The first alternative turned north for about 5 miles, then west across Quemahoning Creek, through about the center of today's Quemahoning Reservoir, then went pretty much straight on to "The Clear Fields" or "Tomahawk Encampment" in the Beaverdam Creek drainage about 1 mile northwest of the center of now Jennerstown. However, in late July 1758, Major George Armstrong wrote that he had found a better route to The Clear Fields, a close parallel to the route of current US-30. This "new" Forbes Road was in use by October 1758, and both routes were used by elements of Forbes' army. In 1764, Colonel Bouquet's army also used both routes. Bouquet's headquarters encampment just east of Laurel Hill is called "Kuymony Bridge" (Table 1), suggesting that the 1764 camp may have been closer to "Kuymony" (Quemahoning) Creek than The Clear Fields. Be that as it may, for the measurement of mileage for Table 1, Williams location of The Clear Fields was used (Williams, 1975, p. 91, 92, and 110, map 5).

From the top of the Allegheny Front to the crossing of Quemahoning Creek at elevation about 1,800 feet, Forbes Road gradually and irregularly lost 1,000 feet in elevation over an airline distance of about 15 miles. Rising beyond the creek is the next to last important mountain barrier on Forbes Road, Laurel Hill, a high anticlinal ridge that parallels the lower ridges to the east. It is almost as high as the Allegheny Front, just under 2,800 feet elevation on the Forbes Road trace, so the "lost" 1,000 feet was regained, here in about 6 miles. On its west side it drops about 1,600 feet to Fort Ligonier in a similar distance. In 1758 crossing Laurel Hill did not come easily. The first road opened swung well to the north of Beaverdam Creek. Bouquet labelled it

"absolutely impracticable" and said it was "opened in such great haste", that is, exploration for a route had been inadequate (Williams, 1975, p. 92-93). Nevertheless, it had to suffice for some months to allow construction of Fort Ligonier and to keep the fort supplied.

A new route was sought, and by October 1758 the road had been relocated. From The Clear Fields the new route went almost directly to the top about one mile north of current US-30, by way of a nose just north of Pickings Run, a tributary of Beaverdam Creek, and from the top it went almost straight down hill directly to Fort Ligonier, chiefly along one of the characteristic long descending noses of the ridge. Bouquet wrote that the October 1758 road across Laurel Hill "is 4 miles shorter and 8 miles better" than the first attempt and styled it the "finest road of the Communication" (Williams, 1975, p. 93-94). Though for Colonel Bouquet's army in 1764 it was still a long climb and longer descent, there were no special problems, what with Captain Williams and two companies of men out ahead to make any needed repairs (Williams, 1975, p. 110). Much of the trace of the relocated Forbes Road over Laurel Hill is shown on current topographic maps of the Boswell and Ligonier quadrangles as a Jeep trail labelled "Old Forbes Road."

Although Laurel Hill was a very high barrier, its symmetrical anticlinal form probably was an assistance in its conquest. Strata on its flanks mostly dip at angles steeper than the slopes, with the Pennsylvanian Conemaugh Group forming the bedrock of the basal slopes, and progressively older stratigraphic units encountered as one goes up a given nose. The Mississippian Burgoon Formation underlies Forbes Road at the crest (Berg and Dodge, 1981, p. 71 and 342). This underdip-slope relationship provides for greater stability in road construction, that is, somewhat easier to construct and much easier to maintain, than the cliffy reverse-dip slopes faced by the road builders at Sideling Hill, Rays Hill, and the Allegheny Front. Slopes on both flanks of Laurel Hill average about 5 percent of grade and rarely exceed 10 percent over any distance, compared, for example, to the continuous average of 15 percent encountered over the 3/4 of a mile of Rohr's Gap on the Allegheny Front.

Fort Ligonier to Fort Pitt

From Fort Ligonier, Forbes Road crossed Loyalhanna Creek and then travelled northwest-ward across the Ligonier synclinal valley to Fourmile Run at the eastern foot of anticlinal Chestnut Ridge, which in general character is here a half-size Laurel Hill (Berg and Dodge, 1981, p. 164 and 535). From Fourmile Run the road climbed more than 700 feet to the top of the ridge and descended about 900 feet to Ninemile Run at now Youngstown in a distance of about 5 miles. At first blush, routing the road over Chestnut Ridge may seem most curious, considering the presence less than two miles to the north of the Loyalhanna Creek Water Gap that now carries US-30 through the ridge. On reflection, under the war conditions of the time, passage through the narrow gap could have been very hazardous militarily, just begging to be ambushed, something a

good general would not do when closing in on enemy concentrations, which certainly was the case in 1758 and 1763, less so in 1764. In addition, putting an effective and reliable road through that wet, rocky and bouldery, and flood-prone gap would have been a long hard job in the face of approaching winter in 1758. Quite possibly it also was beyond the economical engineering capabilities of the period. Too, as historian Williams (1975, p. 95) put it, "The relatively even top of the ridge offers all the advantages of a high, dry road with no obstructions" on the well-drained soils weathered from sandstone of the Pottsville Group. In any case, this also was the route of Colonel Bouquet in 1764. His marching soldiers may have considered Chestnut Ridge easy, compared to the long, almost 14 miles, trek over higher Laurel Hill just three days earlier. Just east of the crest of Chestnut Ridge, a stream parallels the current Ridge Road on its south side for some distance. This stream runs caterslaunchways (Appalachian for at an odd angle) to the topography, and it is believed to be a segment of old Forbes Road worn down by travellers to below adjacent ground surface and now incised into strata of the Pottsville by waters flowing in the worn-down track.

Once down off Chestnut Ridge and on the incised Pittsburgh Plateau, the remainder of the march to Fort Pitt was fairly easy going, over hilly terrain underlain by the Pennsylvanian Conemaugh and Monongahela Groups (Berg and Dodge, 1981, p. 330 and 518; Wagner and others, 1975). Forbes Road wandered purposefully generally westward across central Westmoreland County, chiefly keeping to sides or tops of relatively low ridges that defined the route. Near the junction of current PA-66 and PA-993 in Penn Township northeast of now Jeannette, Forbes Road of 1758 and Bouquet's later route diverge. Forbes Road went generally northwestward, then turned westward south of current US-22 to the vicinity of now Murrysville, still following the sinuous path dictated by the topography. There it crossed the line of US-22 and went northwestward up Piersons Run and met Frankstown Road (a then-existing Indian and trading path) in now Allegheny County. Very sinuous ridge-top Frankstown Road faithfully reproduces Forbes Road for most of the way into the eastern part of the City of Pittsburgh, and the rest of the route to Fort Pitt for most purposes can be said to have been along the general line of now Penn Avenue.

Bouquet's 1764 route from Penn Township to Fort Pitt was somewhat shorter than the route along Forbes Road, and it became the favored route for travellers for some years afterward. This was the same route he had taken to the Battle of Bushy Run in 1763. Travelling westward along the line of now PA-993, in about 3 miles he was passing across that battlefield. The trace of Bouquet's road is visible a short distance north of the Bushy Run Battlefield State Park's main entrance, where to the east it appears as worn tracks, of course also worn from much more recent use than that of Bouquet's army, and to the west of the entrance road it appears as a grassy partially tree-lined linear swale slightly lower than adjacent ground. Bouquet's road then went on to now Harrison City, where current PA-993 and PA-130 join, from where it generally coincided with PA-130 to, into, and along the Turtle Creek valley to the now Borough of Turtle Creek, where it turned sharply northwestward along the line of the Greensburg Pike, which joins Penn Avenue in present-day Wilkinsburg. A short distance onward

Forbes Road and Bouquet's 1764 road rejoined in the vicinity of "Bullock Pens" encampment, which was in an elevated abandoned meander of the Monongahela River, about on the current boundary of Wilkesburg and Pittsburgh (Williams, 1975, p. 97-98; Heyman, 1970). There followed the relatively short distance to Fort Pitt in now Point State Park in Pittsburgh, where at elevation 725 feet the partially reconstructed fort rests on thick alluvial fill resting on the middle part of the Conemaugh Group.

DISCUSSION

With the Forbes Road "project" we see a schedule, as well as planning, construction, and improvements. The basis of the schedule was that the French had to be ousted from The Forks of the Ohio before Winter 1758-59, in order to mesh with British campaigns planned elsewhere. What with the problems of campaigning across the Alleghenies barriers and the attendant military and communications requirements, this schedule was barely met; the French abandoned The Forks on November 24, 1758. As to planning, the concepts of latitude and longitude were well known at the time, though truly accurate longitudes were difficult to measure in the field owing to clocks and watches insufficiently accurate for precise navigational purposes. That is, in 1758, Bouquet knew the general map relationships of Carlisle, Raystown, and The Forks (the latter probably through George Washington's surveying calculations), so he knew approximately how far Forbes' army had to go and in what direction (about N70°W from Raystown to The Forks). Compasses of the time, though bulky, were sufficiently accurate to lay out a course, and he, or more probably General Forbes' engineers, must have had at least one. They may also have had an astrolabe or transit to shoot sun and star angles. Essentially lacking was topographical detail, especially from Raystown onward. From Colonel Burd's experience in 1755 (and probably from earlier hunters, traders, and settlers), Bouquet in 1758 knew of Tuscarora Mountain, Sideling Hill, and the gaps cut by the Raystown Branch of the Juniata. Beyond Raystown, intelligence (perhaps more accurately "lore") almost surely informed Bouquet of the existence of the Allegheny Front, Laurel Hill, and Chestnut Ridge, but the casting around for routes in 1758 shows no advance knowledge of ways to surmount them. Imagining him and his men in the relative gloom of almost continuous distant-sight-denying forest, it seems remarkable that they did as well as they did, in the absence of any good maps, not to mention such frills as aerial photographs and other imagery.

Basic planning chiefly involved identifying obstacles and seeking ways to get around them, or over them if circumvention proved not feasible. This explains the dog-leg to Fort Loudoun, for taking this route avoided Blue Mountain and Kittatinny Mountain, which lie on the direct line between Carlisle and Fort Littleton. These ridges, through which the Pennsylvania Turnpike had to drive tunnels, die out southwestward, just east of Fort Loudoun. Tuscarora Mountain, through which the Turnpike also has a tunnel, thus was the first ridge Forbes Road climbed, not the third as on the Turnpike route. Sideling Hill, The Allegheny Front, and Laurel Hill just could not be avoided, and,

as was discussed briefly earlier, going over Chestnut Ridge rather than through it by the Loyalhanna Creek water gap may have been more a military decision than engineering one.

Historian Williams gives us glimpses of the degree of engineering sophistication that may have been standard to the British army's (and probably all other European armies') military practice of the time. In general westward progression, from Fort Loudoun to Cowans Gap, Bouquet avoided Colonel Burd's soggy path by building along the well drained slopes of Tuscarora Mountain. Colonel Burd was of the colonial militia and may not have had the same practical grounding. Or he may just have not had the time to do it right. Approaching Fort Littleton, the same side-hill principal was applied, as well as farther on along the road, where ridge tops as well as sides were preferred road locations. At Sideling Hill in 1758 a zigzag climbing route was laid out to keep grades to a reasonable minimum, and slabs of rock were worked into place for retaining walls, with fill scraped down from above. In 1764, Captain Williams found a better route and used the same construction method, at the same time cutting out a number of zig-zags and reducing the total climb. To get down off Rays Hill the zigzag plan also was adopted, though Colonel Eyre later grumbled about the steepness of its segments. On a steep segment of the original Forbes Road from the Shawanese Cabbins encampment to its junction with Lieutenant Colonel St. Clair's alternative route near Rhor's Gap a less-tight version of a zigzag also was used. Edmonds Swamp was a geological barrier, though not a major one, and it was readily "bridged" by a timber corduroy road, and historian Williams (1975, p.118) suggests that this also was done elsewhere.

The Orderly Book provides fascinating insight to the problems of a good field commander, with meticulous concern for the safety, health, feeding, cleanliness, and sanitary facilities for his men, as well as their employment and deployment and their care for horses and cattle. But almost lacking is mention of water, which word appears just once. In Colonel Bouquet's orders for the advance to Fort Pitt promulgated at Fort Ligonier on September 14, 1764 appears, "The Officers of the Different Corps to see that their men fill their canteens w^l. fresh water every morning before they march. they will thereby avoid the Inconveniency of Stopping and the Danger that may arise from their drinking too much Cold water during the Heat of the Day" (Williams, 1975, p. 113), and plainly this chiefly relates to a health matter. That is, water supply was a concern not worthy of an order during the whole march. To those familiar with the climate of Pennsylvania, this will come as no surprise. The average annual precipitation in the south-central to southwestern parts of the state was over 41 inches during the period 1931-1955, and precipitation was well distributed over the average year, with 3.00 inches or less only in February, November, and December (U.S. Department of Commerce, 1968, p. 45-48). There is no historical evidence that precipitation in the 1700's was greatly different. Except in their highest headwaters, flow in most streams in the area is, and doubtless was, perennial, subject to spate and fairly frequent flooding with snowmelt in the Spring and with infrequent passage of very heavy rainfall, mostly from dying tropical storms and hurricanes, which latter may have contributed to the destruction of Captain Oury's bridge at Wolfsburg in 1762. Springs, ground-water

resurgences, are common, particularly in the Great Valley. From Table 1 it is clear that camp sites were selected where there was abundant water for the troops, horses, and cattle. If anything, water was seen as an impediment, as was seen at Edmonds Swamp, and is suggested by Lieutenant Colonel St. Clair's concern about the route through Shawanese Cabbins.

It seems a reasonable certainty that engineers of Forbes' army made a map or maps of the route of Forbes Road, but no such military map is known to survive. However, one John Potts, a Pennsylvanian, accompanied the army in 1758 and made a map that was found in archives about 1900. It was titled "General Forbes marching Journal to the Ohio by John Potts," styled by historian Williams (1975, p.13) as "nothing but a day-by-day drawing of the progress of the army." It is not clear what Potts' capacity was in the campaign, but he had been licensed as an Indian trader in 1744 and was trading on the Allegheny River in 1750, so he may have been attached to the army as a guide. Though historians, including Williams himself, at first tended to discount Potts' map, Williams later tested it thoroughly against topographic maps and in the field and found that at places it was very useful record, offering "many clues to distinctive aspects of the road's location, topographical features, and particularly its resemblance to, or difference from, modern thoroughfares" (Williams, 1975, p. 13-17, 38-40, 85-96).

DENOUEMENT

The conquest of the Alleghenies barrier by construction of Forbes Road and its subsequent betterment was a brilliant engineering feat for the times, done under conditions and stresses that today it is very difficult to imagine. Totalling only the more significant ascents and descents along the road, it was the equivalent of overcoming a single irregular obstacle more than 8,000 feet high, with the net result of only about 170 feet of elevation rise for the 217 miles from Carlisle to Fort Pitt.

NOTE FOR THOSE WHO MAY VISIT FORBES ROAD ON THEIR OWN

For earth scientists who themselves wish to travel along Forbes Road, recommended companions in addition to this article are the Geologic Map of Pennsylvania at scale 1:250,000 (Berg and others, 1980) or the bulkier, but more readable, Atlas of Preliminary Geologic Quadrangle Maps (Berg and Dodge, 1981) at scale 1:62,500. The atlas is composed of the many maps from which the state geologic map was compiled, with the exception of medium and large-scale geologic maps that were published prior to 1980. Maps in the atlas cover a part of Forbes Road through the Great Valley and all of Forbes Road from just north of Cowans Gap to just west of Chestnut ridge. The other geologic maps needed for complete coverage are those by Pierce (1966), Wagner, Craft,

Heyman and Harper (1975), and Root (1971 and 1978). Recommended also are topographic maps; the 1:100,000-scale series will suffice for most purposes.

For persons perhaps more interested in the history of Forbes Road than its geology, the 1:100,000-scale topographic maps also are recommended and highly recommended is the Guide to State Historical Markers of Pennsylvania (Beyer, 1991). The Guide provides the texts and locations of the historical markers, as well additional historical information. At Fort Littleton, Edmonds Swamp, Kantner, and elsewhere are large brass-on-stone markers commemorating Forbes Road that were emplaced in the early 1930s by the Pennsylvania Historical Commission (now the Historical and Museum Commission). There also are many later historical markers placed by the Commission that tell of Forbes Road and related features and happenings, such as the Battle of Bushy Run. These are on roadside poles or affixed to buildings, with texts in yellow letters on a blue background. The total of relevant 1930s and newer markers is about 37. The excellent book by historian Williams (1975) of course is also recommended, but regrettably it was published in a limited edition of just 500 copies and is long out of print.

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ITINERARY-- MAY 3, 1997

Leaders: MICHAEL BIKERMAN AND REGINALD P. BRIGGS

This field trip starts at the Monroeville interchange of the Pennsylvania Turnpike. Take the Turnpike east toward Harrisburg as far as the Bedford exit, 89 miles by the Pennsylvania Transportation map, and leave the Turnpike there

In the Illustrations section that follows the Itinerary are nine geologic quadrangle maps that cover the route from Bedford to Latrobe, taken from the Atlas by Berg and Dodge (1981). From east to west they are: I -- Bedford; II -- Schellsburg; III -- Central City; IV -- Stoystown; V -- Hooversville; VI -- Boswell; VII -- Ligonier; VIII -- Stahlstown; IX -- Derry. The trace of Forbes Road is dashed. The route of this itinerary is dotted. Where Forbes Road and this itinerary coincide both symbols are shown. Maps covering the route from Latrobe to Pittsburgh do not appear in the Atlas and so are not included.

<u>Mile</u>	<u>Description</u>
0.0	The road log starts at the Bedford exit toll booth. If you have a trip odometer, set it to zero here. At the end of the Bedford toll plaza turn right (south) onto business route US-220.
2.5	At the light at the intersection of business US-220 and business US-30 in Bedford turn right (west) on US-30, Pitt Street.
2.7	At the light at the intersection of US-30 and Juliana Street turn right (north). Near this intersection is a sign pointing right, toward the Fort Bedford Museum.
2.8	<u>STOP 1 -- The Fort Bedford Museum.</u> Here the alluvium of the Raystown Branch of the Juniata River rests on the Silurian to Devonian Keyser and Tonoloway Fms, undivided. About 1.5 miles to the east is Evitts Mountain, cored by the Silurian Tuscarora Sandstone, and The Narrows gap through the mountain, through which passed the Forbes Road and now pass the Raystown Branch, US-30, and the Turnpike. The fort was located on the bluff above the site of the museum, as you can see on the model in the museum.

As mapped by historian Williams and marked by the Pennsylvania Historical and Museum Commission, Forbes Road began in Carlisle. Here at Bedford, we are a little over half way from Carlisle to Fort Pitt (see Table 1). Two of the five principal mountain barriers, Tuscarora Mountain and Sideling Hill/Rays Hill, lie to the east, and are not seen on this field trip.

Head west along the south side of the Raystown Branch through the park. This road shortly curves south and becomes West Street.

- 3.0 Stop sign at the corner of West Street and US-30. Turn right (west) on US-30. Don't let all the US-220 signs confuse you. Continue straight on US-30
- 4.6 Intersection of business US-30 with the US-30 Bedford bypass. At the stop sign turn left (northwest) on US-30.
- 5.4 Crossing the US-30 bridge to Wolfsburg. Forbes Road crossed from the south to the north side of the Raystown Branch here. In 1760 Captain Lewis Ourry built a bridge over the branch 60 to 80 yards upstream (to the left), but it was washed out in 1762, so in 1764 Bouquet had to ford the branch. The ford is believed to have been about at the site of the current bridge. Wolfsburg is on the axis of the Wills Mountain anticline, here exposing Silurian rocks.
- 7.4 Passing under the Pennsylvania Turnpike.
- 8.0 About here the original Forbes Road of 1758 curved southwest toward "Shawanese Cabbins" (now Shawnee State Park) across hills capped by the Devonian Scherr Fm near the north end of the Wellersburg syncline. Lieutenant Colonel St. Clair's alternative route of later in the same year headed straight west along the line of US-30. In 1758 elements of Forbes army used both routes. In 1764, Bouquet apparently used the original route.
- 8.7 Approximate axis of the Wellersburg syncline.
- 9.1 This is the top of the first "rising" around Schellsburg, the east flank of the Schellsburg dome.
- 10.8 On the left the entrance to Shawnee State Park, which is the site of Bouquet's "Shawanese Cabbins" encampment in 1764.
- 11.9 Traffic light at intersection with PA-96 in Schellsburg. There is another entrance to Shawnee State Park a short distance south of this intersection. Continue straight on US 30.
- 12.1 Historical markers on Forbes Road and Shawnee Cabins. The Shawnee Cabins marker reads "A village site nearby on the Raystown Path. Named for a group of Indians who halted here on their retreat from the Potomac to the lower Allegheny valley in the early 18th century."
- 12.2 Bear off to the left on old Route 30, which is the St. Clair alternate route, passing the site of the Old Log Church. Just ahead is the other "rising", the west flank of the Schellsburg dome.
- 12.5 The Old Log Church, constructed in 1806, is on your left. Just past the church, on the left we parallel a segment of the original Forbes Road for about 0.2 miles.

- 12.9 Junction with U.S.-30 turn left. Approximate axis of the Schellsburg dome.
- 13.1 Photo stop. From here you have one of the best views of the Allegheny Front. Almost directly ahead the scar you see angling upward and to the left is US-30 scaling the Front.
- 18.3 STOP 2 -- Rhor's Gap. This was the key to conquest of the Allegheny Front. As mapped by historian Williams, the original Forbes Road and St. Clair's alternative Forbes Road came up from the east to about 2,100 feet and there became a single route again. The problem was how to surmount the cliff-forming Mississippian-Devonian Rockwell Fm and the almost equally competent Mississippian Burgoon. Ensign Rhor discovered this north-trending defile, which rises about 600 feet in 3/4 of a mile, a punishing average gradient of 15 percent. Stand back and imagine Bouquet's 1,500 men, 1,300 horses, artillery, wagons, and cattle going up this narrow ravine in 1764, let alone Forbes' 6,000 men and their gear in the 1758 campaign. Amazing! At the top of the "Gap" at about 2,700 feet is much gentler terrain on the Mississippian Mauch Chunk Fm. The army crossed into the Ohio drainage through a pass in the lowermost Pennsylvanian Pottsville at about 2,800 feet.
- 19.2 This is the top of the "first rising" of the Allegheny Front. The dip just ahead goes down into the headwaters of the appropriately named Breastwork Run, because in 1758 Fort Dewart was constructed not far to the south of here.
- 20.4 The top of the "second rising". From here to about halfway up Laurel Hill we are riding on strata of the Pennsylvanian Pottsville, Allegheny, and Conemaugh Groups.
- 23.1 Intersection with PA-160. Continue straight on US-30.
- 24.4 Approximate axis of the Berlin syncline.
- 25.0 On the right is an historical marker on Edmonds (or Edmunds) Swamp, which reads "FORBES ROAD (EDMUNDS SWAMP) -- named for Edmund Cartlidge, Indian trader. A camp located here, on the Raystown Path, provided good grass for the horses of General Forbes' Army in 1758. The site of the redoubt is marked two and a half miles north of here." Bouquet also used this camp site in 1764. The historical mark er there is still in place on Miller Run, but surface mining for coal has so altered the area that there is nothing more to see.
- 27.0 Approximate axis of the Negro Mountain anticline.
- 30.1 Intersection with PA-403 turn right.
- 30.4 Entering Kantner. Follow 403 to the right.
- 30.8 STOP 3 -- Stonycreek crossing at Kantner. This brass marker is one of several emplaced in 1930 by the Pennsylvania Historical Commission (now the Historical and Museum Commission), most of which still survive. Here Stonycreek flows northeasterly on strata

of the Pennsylvanian Allegheny Group. Bouquet's army came here through the hilly country to the east from Edmonds' Swamp. The road on the other side of the creek that descends to the railroad and the creek probably is a good approximation of the location of Forbes Road. His army, and Forbes' army in 1758, crossed the creek near the current bridge. Here the road again splits into original and alternative tracks, both laid out in 1758. The original road went north then west and crossed Quemahoning Creek where now there is a reservoir. Major Armstrong's alternative went more westerly, approximating the course of US-30. Both routes were used by elements of the 1758 and 1764 armies.

Reverse direction.

- 31.2 In Kantner continue straight ahead on Forbes Road, rather than turning left to follow PA-403.
- 31.9 In Stoystown turn right.
- 32.5 Bear off left and rejoin US-30.
- 33.3 Approximate axis of Somerset syncline.
- 33.6 STOP 4 -- Segment of Armstrong's alternative Forbes Road just east of Stone Bridge.
The track segment leading northwest from the well heads on the west (left) side of US-30 is believed to be part of alternative Forbes Road. Here we are about at the upper contact of the Pennsylvanian Glenshaw Fm, and the track rises into the Casselman Fm. The well heads reportedly were used in a mine-subsidence project of the U.S. Bureau of Mines. With the demise of the Bureau, the status of this project is not known.
- 34.7 Stone Bridge.
- 36.6 US-219 overpass. Continue straight on US-30.
- 37.3 Approximate axis of the Boswell dome.
- 38.4 Crossing of Quemahoning Creek. "Kuymony" bridge (Table 1) encampment was near here.
- 39.9 Traffic light a intersection with PA-985 in Jennerstown. Turn right on PA-985.
- 41.9 Turn left on Stemler Road. Stemler Road and its continuation Barnick Road lie right on the trace of Old Forbes Road. To the right front is a good view of impressive Laurel Hill.
- 42.5 Approximate axis of Johnstown syncline.
- 43.1 Stop sign. End of Stemler Road. Continue straight on Barnick Road.

- 44.7 Stop sign at the end of Barnick Road. Turn left.
- 45.0 On the right one of the Historical Museum Commission 1930s Forbes Road markers. In 1758, this was known as the Tomahawk encampment. It is believed that the encampment labelled Clear Fields by Bouquet was also here. Pickings Run, a tributary of Beavertown Creek, continues upstream from the Clear Fields, and Forbes Road went up the nose on the north side of the run. On the Boswell and Ligonier topographic maps the trace is called a Jeep trail and is labelled Old Forbes Road.
- Turn right on Sliding Rock Road. Though continuing uphill, in this stretch we go stratigraphically down into the Mississippian Mauch Chunk Fm.
- 46.4 Intersection of Sliding Rock Road with US-30. Angle right on to US-30.
- 47.8 The crest of Laurel Hill and the Laurel Hill anticline. Here we are in the Mississippian Burgoon Ss
- 49.9 On the south side of Furnace Run about here we "climb" back up into the Pennsylvanian.
- 50.6 Blinker light in Laughlintown. Turn right.
- 52.9 Turn left on paved road. This is another preserved remnant of Forbes Road. In the next mile or so is a good view of the last mountain barrier, Chestnut Ridge.
- 54.8 Thomas Crossroads. From here Forbes Road went more or less straight ahead down the nose. Bear off left.
- 54.9 Turn right down the valley.
- 56.7 Stop sign. Turn right.
- 56.8 Stop sign at angled intersection. Turn very sharp left.
- 57.0 Stop sign at intersection with US-30. Turn right on US-30.
- 57.6 Intersection with PA-711 at Ligonier. The town of Ligonier is entirely to our right and the restored Fort Ligonier is to our right a short distance back of us. At Main and Market Streets in Ligonier are two historical markers reading, "FORBES ROAD, 1758. FORT BEDFORD TO FORT DUQUESNE -- Fort Ligonier, built by order of General Forbes was located 200 yards west of this marker. The road leads southwestward to 12-mile encampment. Eminent service was rendered here by Colonel Henry Bouquet and Colonel John Armstrong, and an engagement with the French and Indians near this place Colonel George Washington, Colonel James Burd and Lieutenant Colonel Hugh Mercer distinguished themselves. 50 miles from Fort Bedford," and "FORT LIGONIER -- built here 1758 as a base for

Forbes expedition. Under Col. James Burd withstood a French and Indian attack, October 12, 1758. Only small fort in West not taken in Pontiac's War, 1763, it made possible Bouquet's rescue of Fort Pitt." We won't visit Fort Ligonier today.

- 58.1 Approximate axis of Ligonier syncline.
- 60.8 Intersection just past the Idlewild amusement park. Turn left onto Darlington Road.
- 61.1 Crossing Loyalhanna Creek and heading up Fourmile Run.
- 62.8 Intersection with Ridge Road from the right, opposite the Darlington Volunteer Fire Department. Turn right. According to historian Williams, Ridge Road from here all the way across Chestnut Ridge to Youngstown is a very close approximation of Forbes Road.
- 63.8 Small orphan strip mine on the right. Mercer coalbed?
- 64.4 STOP 5 -- Ridge Road, just east of the crest of Chestnut Ridge. The gully parallel to the road on the south runs caterslaunchways to the topography. It is believed to be a segment of Forbes Road, worn down by travellers and now incised into strata of the Pottsville Group by waters flowing in the worn-down track. Loyalhanna Creek runs through its water gap just a mile to the north. Local relief in the water gap is more than 700 feet.
- 65.2 Approximate axis of Chestnut Ridge anticline.
- 66.0 Possible photo stop. Good view looking down on the Pittsburgh Plateaus
- 67.5 Traffic light in Youngstown (not Ohio). Continue straight and across Ninemile Run.
- 69.1 Intersection with PA-981 opposite Westmoreland-Latrobe Airport. Turn right on PA-981. From Youngstown to here we have also been on a good approximation of Forbes Road. From here the road ran right across the airport to Monastery Run.
- 69.3 Intersection with US-30. Turn left.
- 69.5 Intersection with Monastery Road. A large sign on the left opposite the intersection points to St. Vincent College. Turn right, passing St. Vincent's College on the left. From here to Stop 6 we take a wandering route cross country which mostly is also an approximation of Forbes Road.
- 70.3 At a three-way intersection just past St. Vincent's College turn right following Monastery Road.
- 70.4 Cross Monastery Run and turn immediately left following Monastery Road.

- 71.1 This great railroad cut exposes strata of the Conemaugh Group.
- 71.2 At T intersection just after crossing the high bridge (5-ton limit) over the Conrail tracks, turn left..
- 71.7 T intersection to the right. Turn right, on McCullough Road, almost immediately passing Unity Church on the left.
- 73.1 At stop sign on the ridge crest continue straight.
- 73.7 At stop sign at T intersection from the right, continue straight.
- 73.9 Turn left at the unlabelled paved road opposite the Old Crabtree Sportsman Association
- 74.1 T intersection from the right with bridge warning signs nearby. Turn right.
- 75.0 Intersection with Cemetery Road from the right. Turn right down Little Crabtree Creek.
- 75.7 At crossroads intersection with Calvary Drive, turn left, crossing Little Crabtree Creek.
- 76.1 Intersection with US-119. Turn left.
- 76.5. Bear off right where sign points to Hannastown. The historic marker reads
"HANNASTOWN -- site of former county seat of Westmoreland County is just west of here. First county seat west of mountains, 1773. Citizens adopted a declaration in support of the revolution, 1775. Burned by the Indians in 1782." Current Hannastown is about a mile to the east. The next about two miles are certainly along the original Forbes Road.
- 76.9 Crossroads intersection with S.R. 1055. Continue straight.
- 78.3 This ridge top is the sight of the "3 redoubts" encampment of the 1758 campaign.
- 78.4 Stop sign at the intersection with PA-819. Continue straight.
- 80.1 Intersection with a barn on far right corner, just after recreation area. Turn sharp left.
Here Forbes Road went more or less straight ahead across the ridge in front of you and into the valley beyond.
- 80.6 Intersection with old PA-66. Turn left.
- 81.0 Stop sign at the intersection with new PA-66. Turn sharp right..
- 82.3 Passing under new Greensburg Bypass.

- 82.7 Turn left onto PA-993. The original Forbes Road of 1758 paralleled PA-66 straight north approximately to US-22, then turned west through now Murrysville. From here we are following Bouquet's route in 1763 and 1764.
- 85.8 **STOP 6 -- Bushy Run Battlefield** on the right Turn right into the main entrance. Here in 1763, en route to relieve Fort Pitt, Colonel Bouquet and his 497 men were attacked by a large number of Indians of Pontiac's Indian Confederacy. In a desperate two-day battle Bouquet's superior tactics won out. The Indians suffered heavy losses and retired in disarray to the Muskingum River in Ohio country. It was to complete what he accomplished here that Bouquet set out with his larger army in 1764. The site rests on lower strata of the Pennsylvanian Monongahela Group. The trace of Bouquet's road is visible a short distance north of the main entrance. To the east of the entrance road it appears as worn tracks, of course probably from much more recent use. To the west of the entrance road it appears as a grassy partially tree-lined swathe slightly lower than adjacent ground.
- 86.0 Bushy Run Battlefield parking area.
- 86.2 Return to PA-993 and turn right (west).
- 87.4 Intersection with PA-130 in Harrison City. Turn right and continue through traffic light on PA-130. Do not follow PA-993 signs to the left a short distance ahead.
- 89.4 Crossing the Pennsylvania Turnpike.
- 93.9 Intersection of PA-130 and "Forbes Road" in the Turtle Creek Valley. Turn right on Forbes Road shortly crossing Turtle Creek.
- 95.0 Intersection of "Forbes Road" with Haymaker Road and with PA-130/993. Haymaker Road is the road immediately to the right and PA-130/993 is just beyond. Go past Haymaker Road and turn right on PA-130/993.
- 95.5 Intersection with PA-48, Mosside Boulevard. Turn right and return to Monroeville in about 3.5 miles. Bouquet's route in 1763 and 1764 continued about 3.5 miles farther down Turtle Creek, then turned sharply right and generally paralleled Greensburg Pike to rejoin the original Forbes Road near the "Bullock Pens" encampment in now Wilkensburg. Then Forbes Road generally followed Penn Avenue to the Point and Fort Pitt.

END OF FIELD TRIP

ILLUSTRATIONS

Text figures 1 through 4

Itinerary maps I through IX

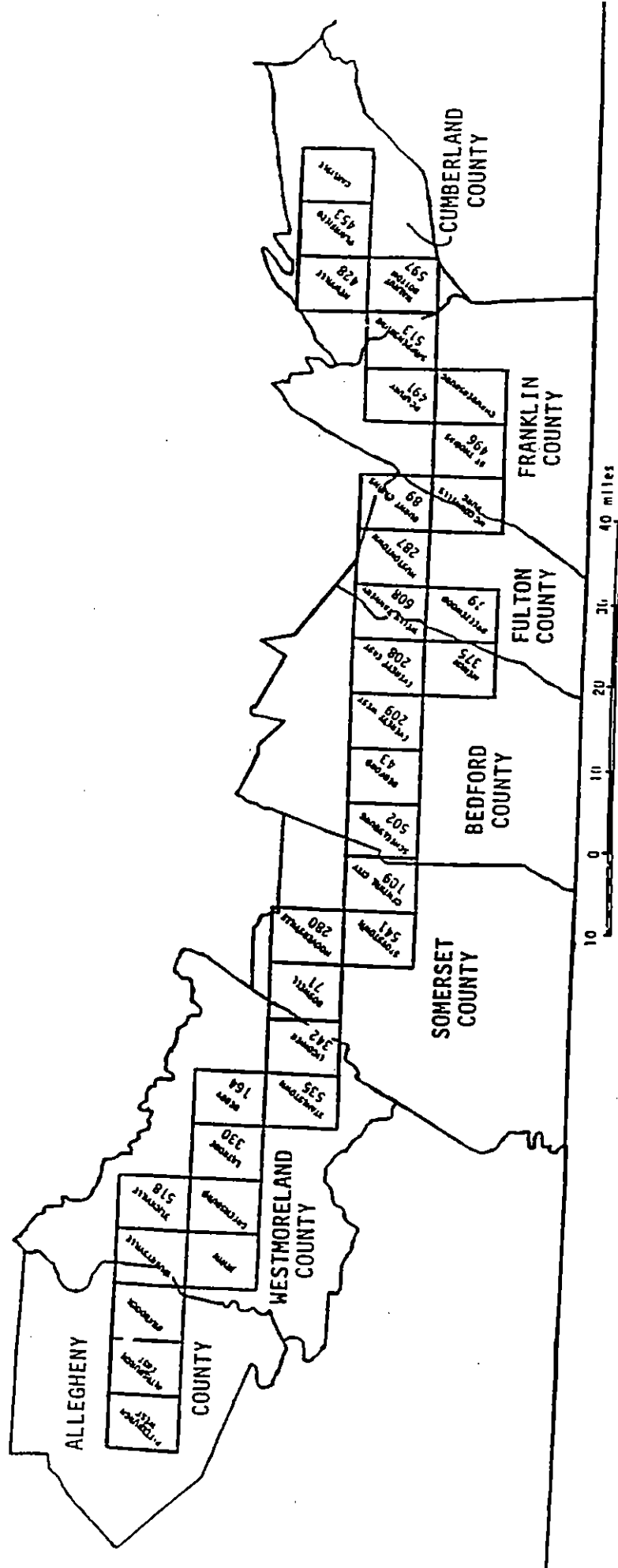


Figure 1. -- Index map of 7.5-minute quadrangle topographic maps that include the route of Forbes Road and modifications, 1758-1764. The numbers in 24 of the 33 quadrangles boxes are page numbers of geologic quadrangle maps in the atlas by Berg and Dodge (1981).

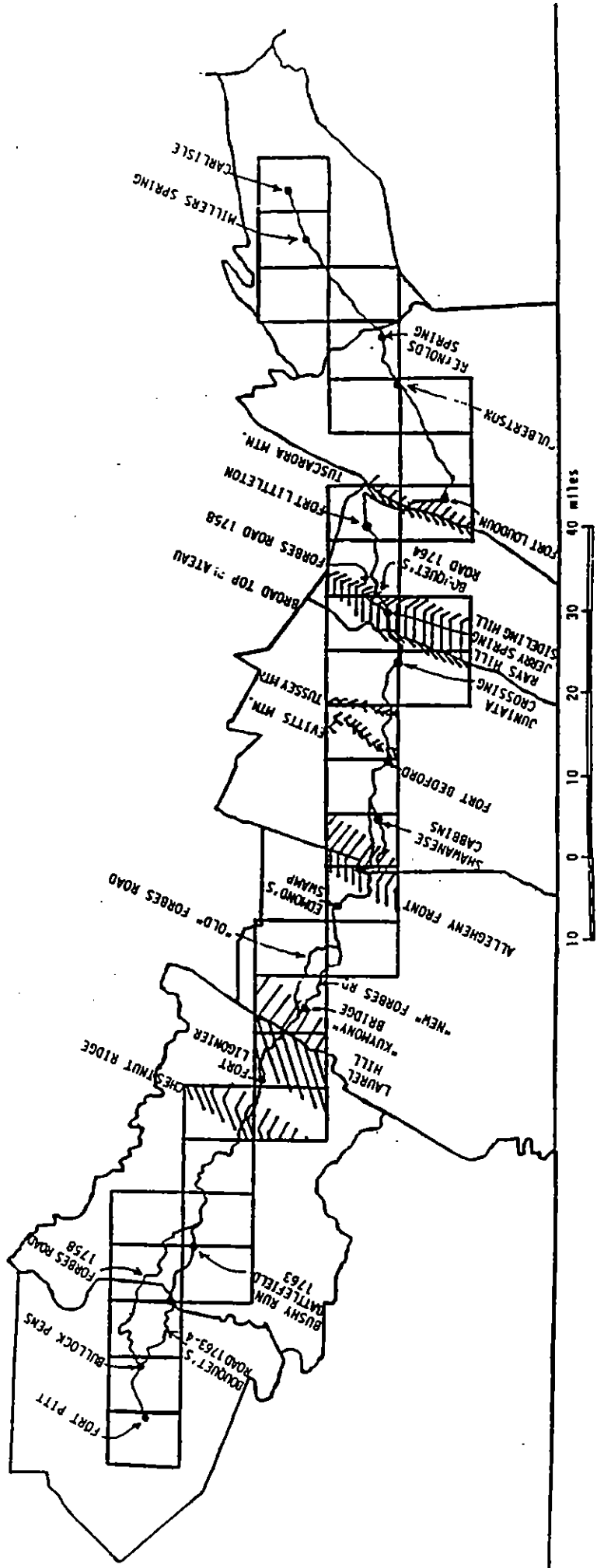
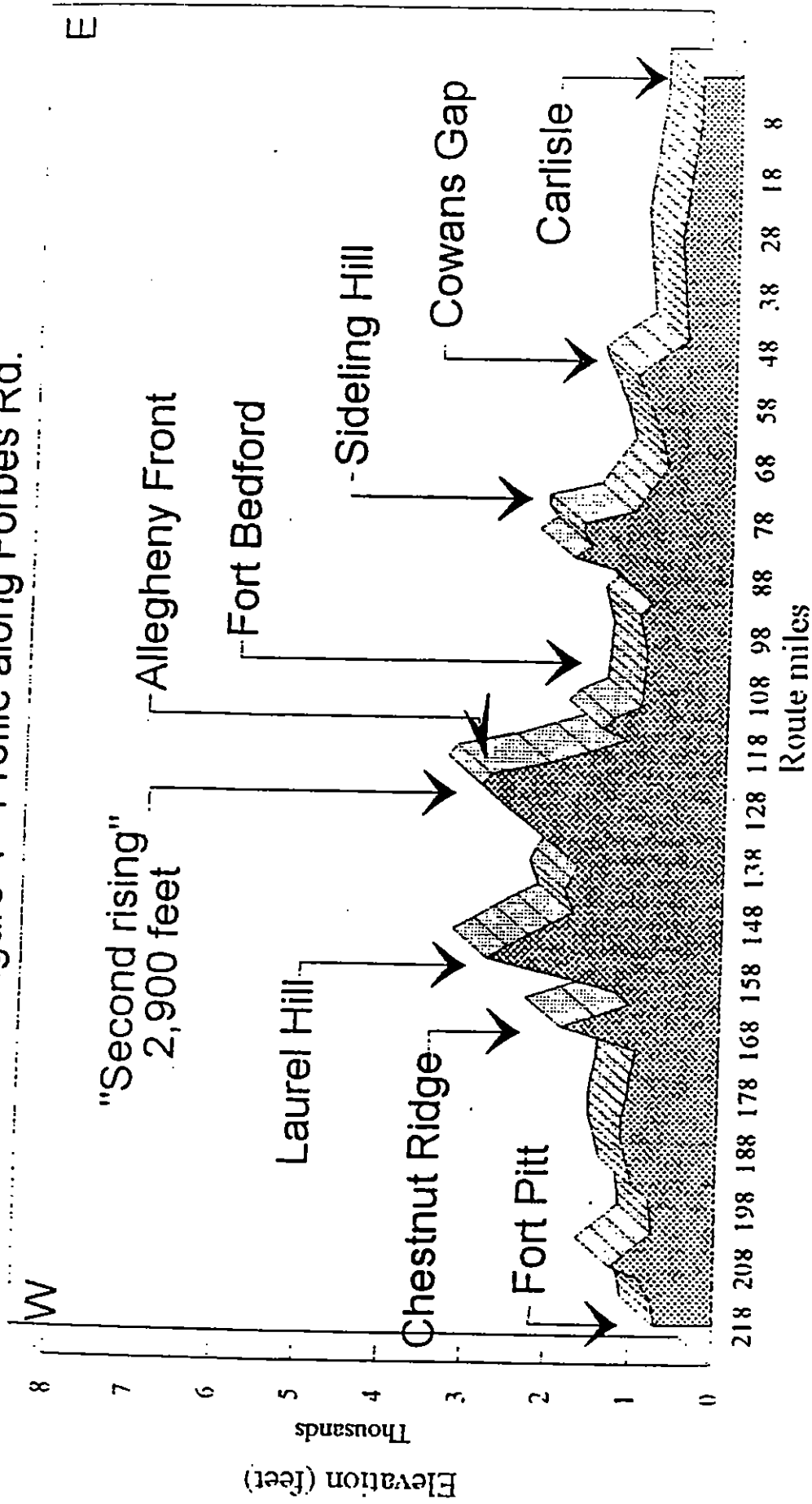


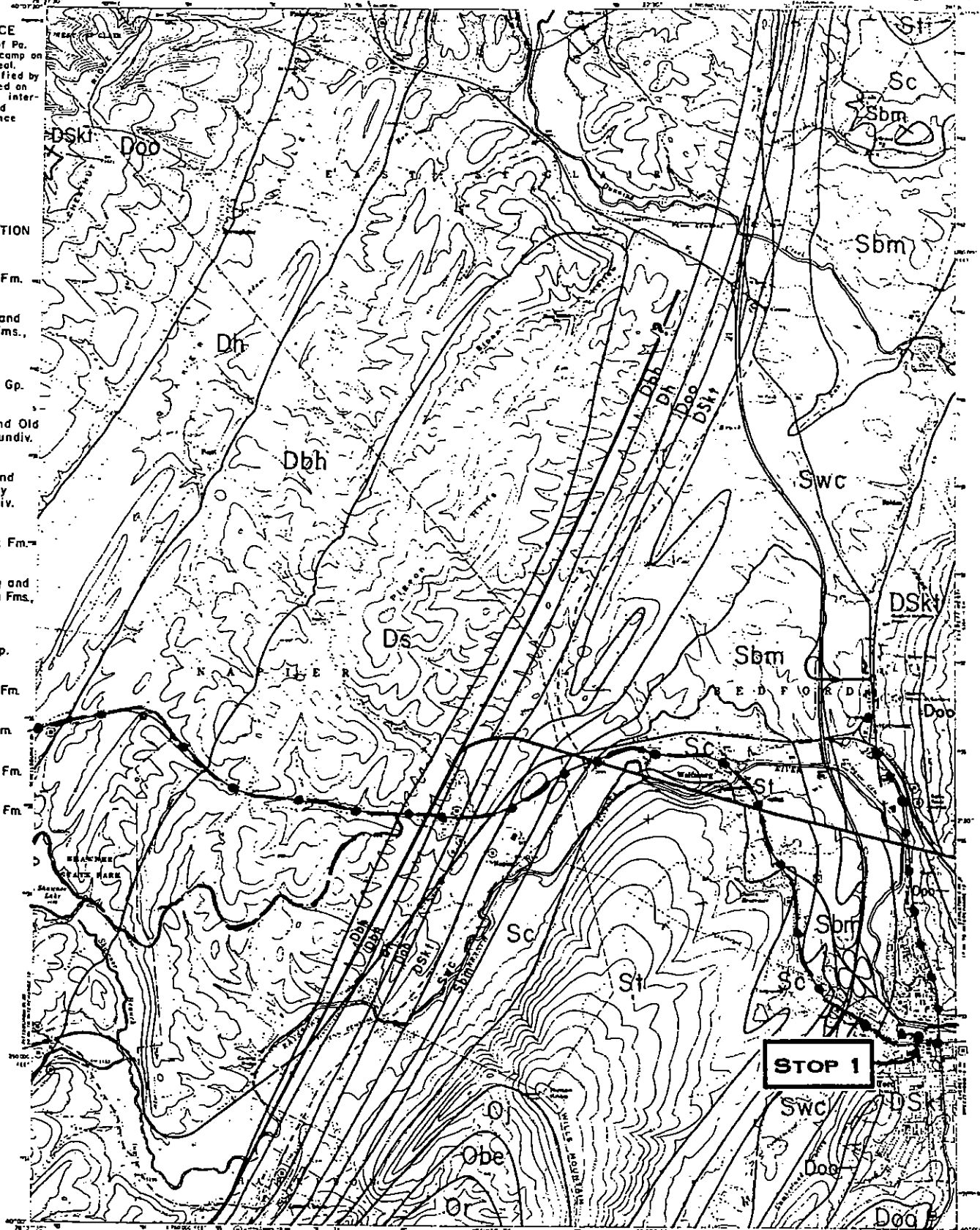
Figure 2.-- Map of Forbes Road and modifications, 1758-1764, showing: principal topographic barriers; known and possible alternative sites of Bouquet's encampments during the 1764 campaign; "parallel" segments of the road; and the Bushy Run Battlefield.

Figure 4 - Profile along Forbes Rd.



SOURCE
Unpub. map of Pa. State field camp on file at Pa. Geol. Survey, modified by Hoskins based on aerial photo interpretation and reconnaissance field check.

- EXPLANATION**
- Ds Scherr Fm.
 - Dbh Brallier and Harrell Fms., undiv.
 - Dh Hamilton Gp.
 - Doo Onondaga and Old Port Fms., undiv.
 - DSki Keyser and Tonoloway Fms., undiv.
 - Swc Wills Creek Fm.
 - Sbm Bloomsburg and Mifflintown Fms., undiv.
 - Sc Clinton Gp.
 - St Tuscarora Fm.
 - Oj Juniata Fm.
 - Obe Bald Eagle Fm.
 - Or Reedsville Fm.



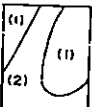
Map produced and published by the Geological Survey
 Copyright © USGS and USGCS
 Topography by photogrammetric methods from aerial photos (1946, 1967, and 1969) and checked 1973
 Guidebook description: 1927 Geol. Survey Bulletin
 SC 1000-foot grid based on Pennsylvania coordinate system; 1000-foot
 1:250,000 scale; 1:250,000 scale; 1:250,000 scale
 Contour interval 20 feet
 Scale 1:62,500
 ROAD CLASSIFICATION
 Primary highways
 Secondary highways
 Tertiary highways
 Unimproved roads
 U.S. State Route 113
 U.S. State Route 114
 U.S. State Route 115

II -- SCHELLSBURG

SHELLSBURG QUADRANGLE
PENNSYLVANIA
15 MINUTE SERIES (TOPOGRAPHIC)
Scale 1:62,500

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

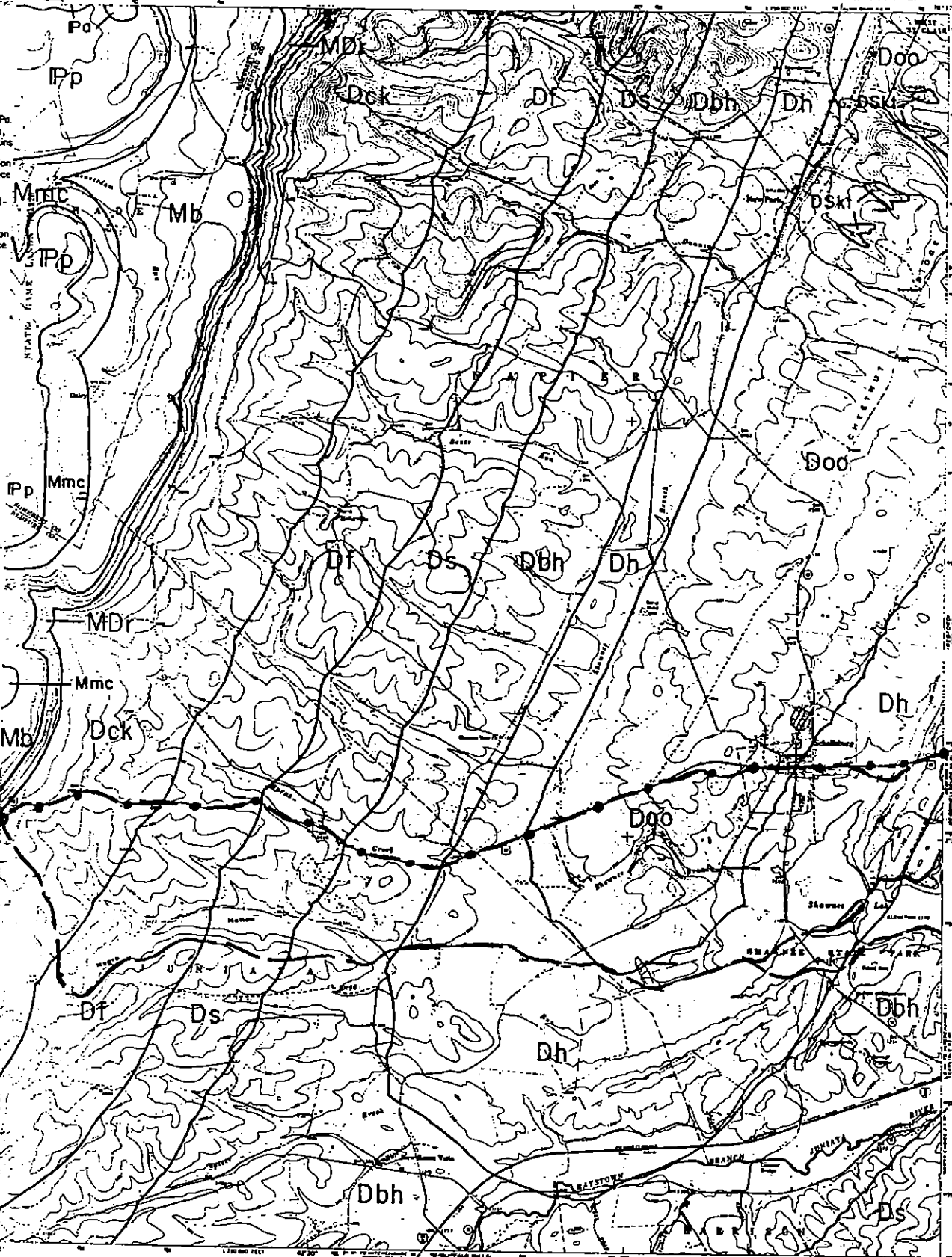
SOURCE



- (1) Unpub. maps by Pa. State field camp, modified by Hoskins based on aerial photo interpretation and reconnaissance field check.
- (2) Turley thesis, modified by Hoskins based on aerial photo interpretation and reconnaissance field check.

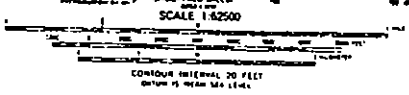
EXPLANATION

- Pa Allegheny Gp
- Pp Pottsville Gp
- Mmc Mauch Chunk Fm.
- Mb Burgoon Ss.
- MDr Rockwell Fm.
- Ucr Catskill Fm.
- Df Foreknobs Fm.
- Ds Scherr Fm.
- Dbh Brallier and Harrell Fms., undiv.
- Dh Hamilton Gp.
- Doo Onondago and Old Port Fms., undiv.
- DSKl Keyser and Tonoloway Fms., undiv.



REFERENCE

Turley, M. R. (1952). Upper Devonian sediments of the Bedford quadrangle, western Tinned N.S. thesis, The Pennsylvania State University, 99 p.



ROAD CLASSIFICATION

Primary highway	Light duty road, hard-surfaced
Secondary highway	Unimproved road
Interstate Road	U.S. Road
State Road	

Compiled by D. M. HOSKINS, 1976

SCHELLSBURG

III - CENTRAL CITY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CENTRAL CITY QUADRANGLE
PENNSYLVANIA
1:5 MINUTE SERIES (TOPOGRAPHIC)
REVISED TO 1966

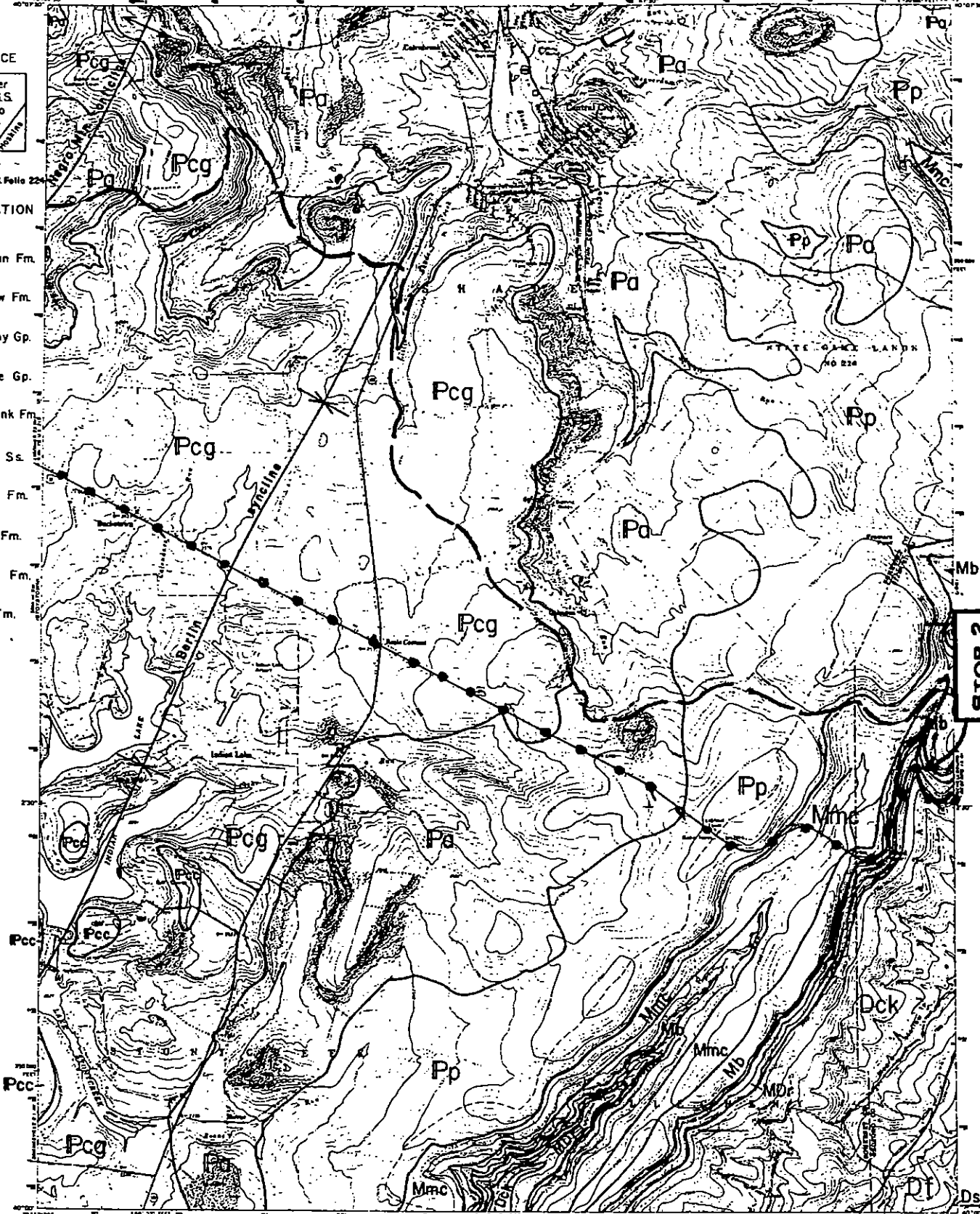
SOURCE

Glover
U.S.G.S.
Folio
224

Photo
USGS Folio 224

EXPLANATION

- Pcc Casselman Fm.
- Pcg Glenshaw Fm.
- Pa Allegheny Gp.
- Pp Pottsville Gp.
- Mmc Mauch Chunk Fm.
- Mb Burgoon Ss.
- Mdr Rockwell Fm.
- Dck Catskill Fm.
- Df Foreknobs Fm.
- Ds Scherr Fm.



REFERENCE

Richardson, C. B. (1934). Somerset-Windber folio, Pennsylvania, U. S. Geological Survey Geologic Atlas of the U. S., Folio 224, 14 p.

SCALE 1:50,000

ROAD CLASSIFICATION

- Primary road
- State road
- Secondary road
- Local road
- Light duty road
- Unimproved road
- U.S. Road
- State Road

Compiled by
A. D. GLOVER and D. M. HOSKINS, 1976

CENTRAL CITY

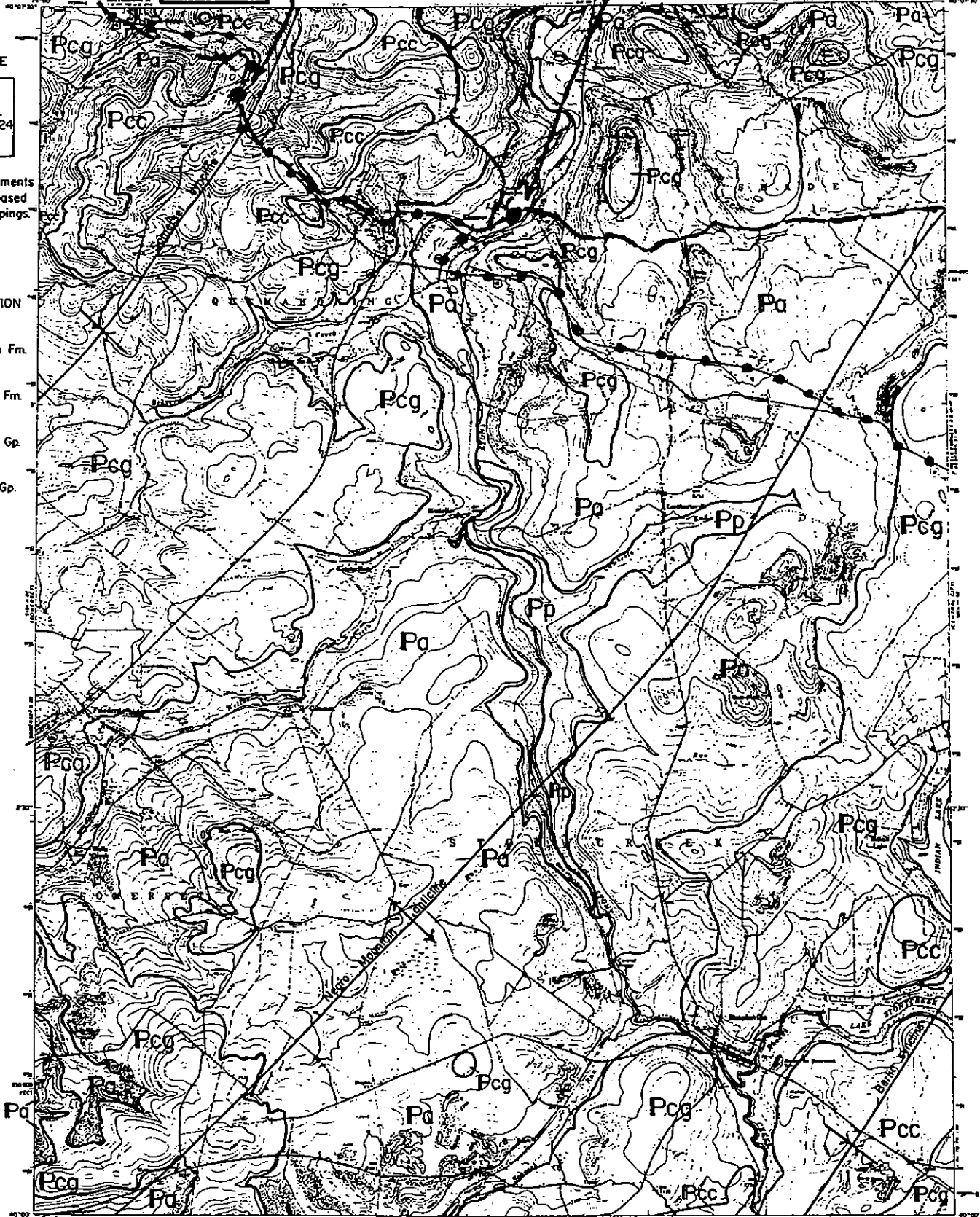
SOURCE

U.S.G.S.
Folio 224

Minor adjustments
were made based
on new strippings.

EXPLANATION

- Pcc
Casselman Fm.
- Pcg
Glenshaw Fm.
- Pa
Allegheny Gp.
- Pp
Pottsville Gp.



REFERENCE

Richardson, G. B. (1934). Somerset-Kittling
folios, Pennsylvania, U. S. Geological
Survey Geologic Atlas of the U. S.,
Folio 224, 14 p.

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
unless it is noted otherwise

ROAD CLASSIFICATION

- Primary highway
- Secondary highway
- Unimproved road
- Interstate Route
- U. S. Route
- State Route
- Light duty road built on improved surface
- Unimproved road

V -- HOOVERVILLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

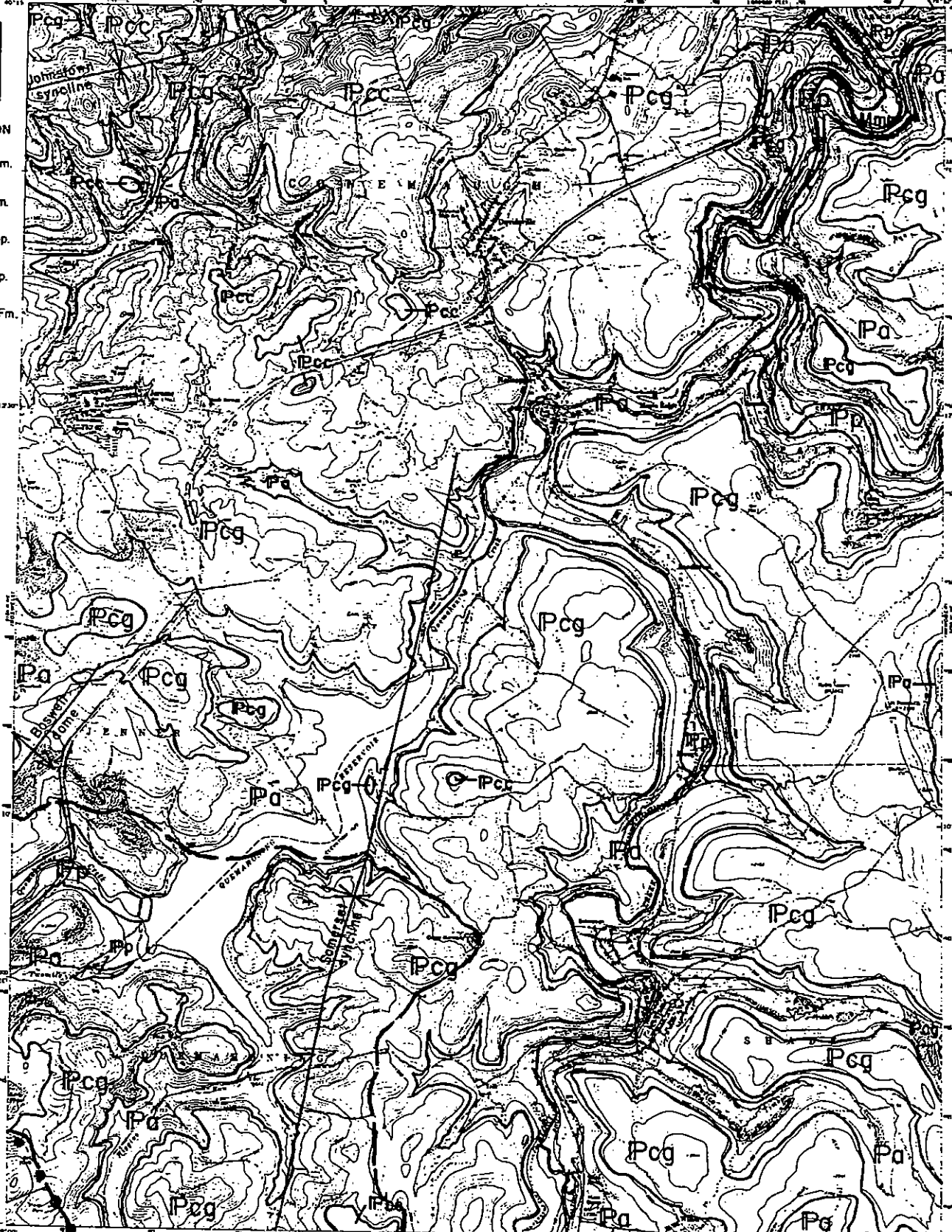
HOOVERVILLE QUADRANGLE
PENNSYLVANIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SOURCE

U.S.G.S.
Folio 224

EXPLANATION

- Pcc Casselman Fm.
- Pcg Glenshaw Fm.
- Pa Allegheny Gp.
- Pp Pottsville Gp.
- Mmc Mauch Chunk Fm.



REFERENCE

Richardson, G. B. (1894), *Southern-Windber folio*, Pennsylvania, U. S. Geological Survey Geologic Atlas of the U. S., Folio 224, 14 p.

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
EXCEPT WHERE SHOWN OTHERWISE

ROAD CLASSIFICATION

- Primary highway
- Secondary highway
- Interstate Road
- Light duty road
- Unimproved road
- U. S. Road
- State Road

Compiled by A. D. GLOVER, 1976

HOOVERVILLE

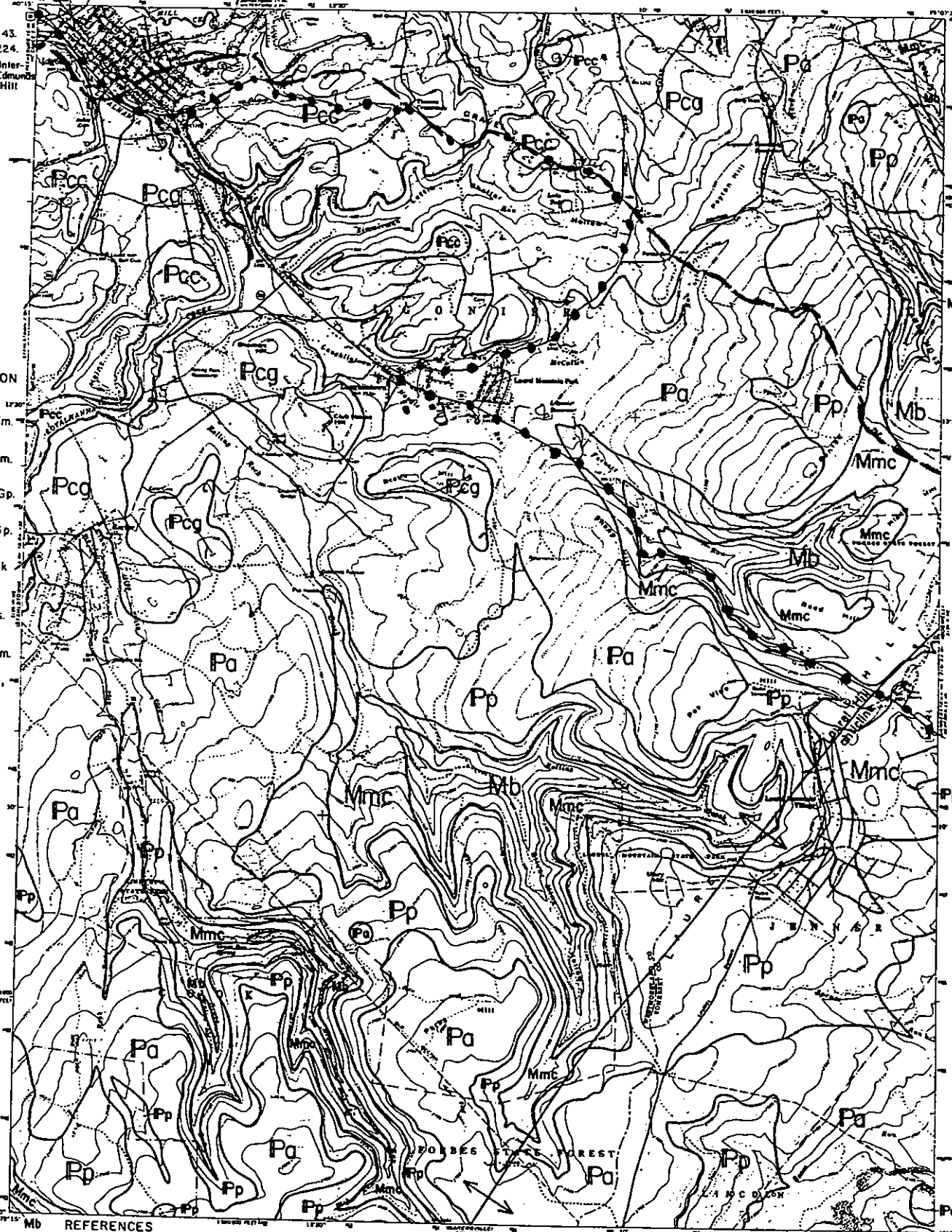
VII -- LIGONIER

LIGONIER QUADRANGLE
PENNSYLVANIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

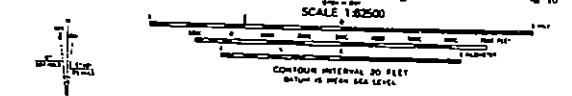
SOURCE
(1) Maps 42 and 43.
(2) U.S.G.S. Folio 224.
(3) Aerial photo interpretation by Edmunds along Laurel Hill anticline.

EXPLANATION

- Pcc Casselman Fm.
- Pcg Glenshaw Fm.
- Pa Allegheny Gp.
- Pp Pottsville Gp.
- Mmc Mauch Chunk Fm.
- Mb Burgoan Ss.
- MDso Shenango Fm. through Oswayo Fm., undiv.



REFERENCES
Richardson, G. B. (1934), Somerset-Windber folio, Pennsylvania, U. S. Geological Survey Geologic Atlas of the U. S., Folio 224, 14 p.
Wagner, W. R., Craft, J. L., Heyman, L. and Harter, J. A. (1975), Greater Pittsburgh Region geologic map and cross sections, Pennsylvania Geological Survey, 4th ser., Map 42.
Wagner, W. R., Heyman, L., Craft, J. L. and others (1975), Greater Pittsburgh Region structure contour map, Pennsylvania Geological Survey, 4th ser., Map 43.



ROAD CLASSIFICATION
Primary highway, all weather
Secondary highway, all weather
Unimproved road, bar or dry road surface
Light duty road, all weather
Unimproved surface
U.S. Route
State Route

Compiled by A. D. GLOVER and W. E. EDMUNDS, 1976

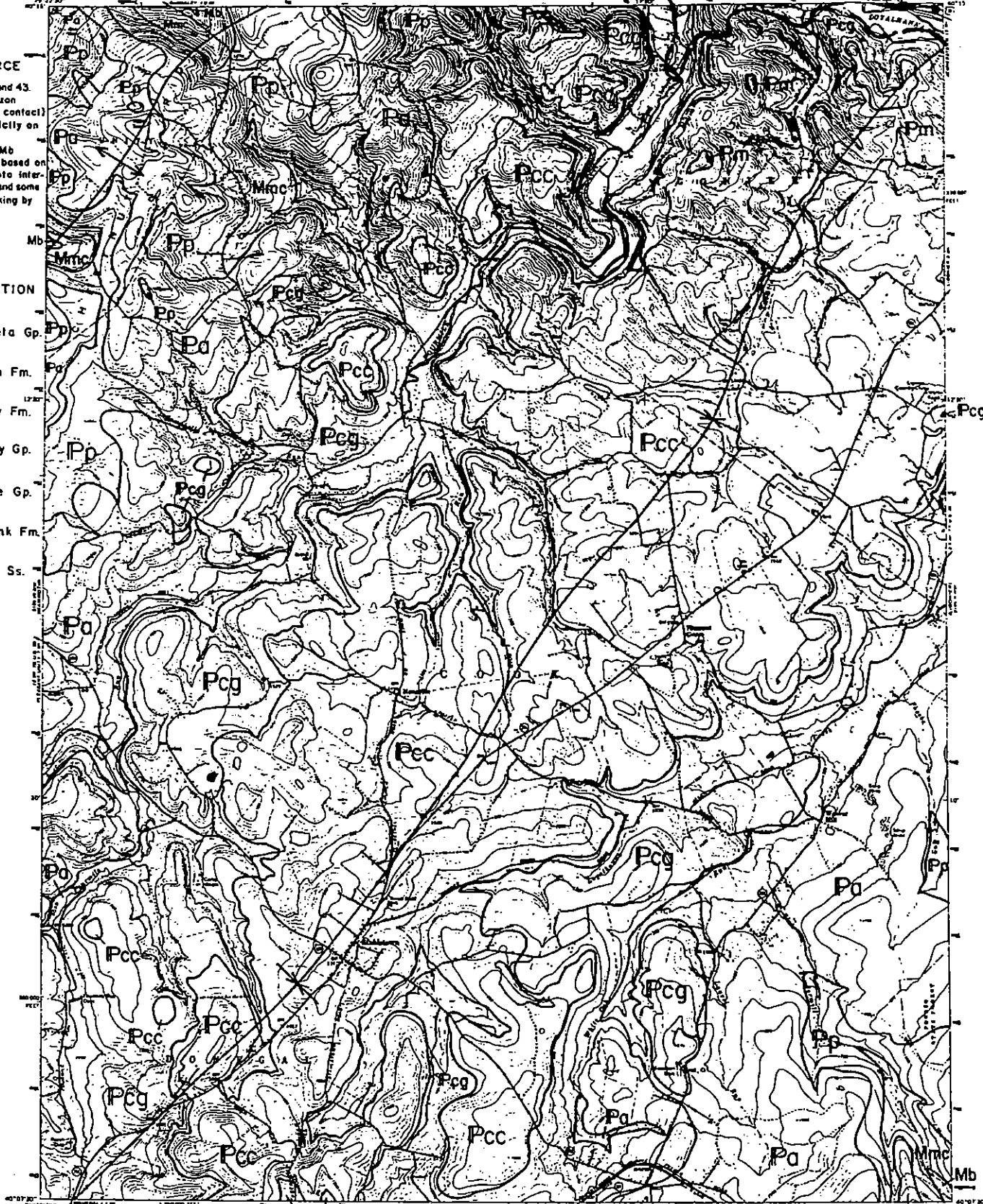
LIGONIER

VIII -- STAHLSTOWN

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STAHLSTOWN QUADRANGLE
PENNSYLVANIA--WESTMORELAND CO.
1:5 MINUTE SERIES (TOPOGRAPHIC)

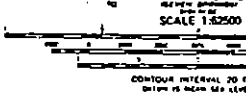
- SOURCE**
- (1) Maps 42 and 43.
 - (2) Ames horizon (Pcc-Pcg contact) based strictly on interval.
 - (3) Mmc and Mb contacts based on aerial photo interpretation and some field checking by Edmunds.
- EXPLANATION**
- Pm Monongahela Gp.
 - Pcc Cosselman Fm.
 - Pcg Glenshaw Fm.
 - Pa Allegheny Gp.
 - Pp Pottsville Gp.
 - Mmc Mauch Chunk Fm.
 - Mb Burgoon Ss.



REFERENCES

Wagner, W. R., Craft, J. L., Heyman, L., and Herper, J. A. (1975), Greater Pittsburgh Region geologic map and cross sections, Pennsylvania Geological Survey, 4th ser., Map 42.

Wagner, W. R., Heyman, L., Craft, J. L., and others (1975), Greater Pittsburgh Region structure contour map, Pennsylvania Geological Survey, 4th ser., Map 43.



ROAD CLASSIFICATION

Primary highway, all weather, light duty road, all weather
Secondary highway, all weather, unpaved road, for or dry
Interstate Road, U.S. Road, State Road

Compiled by A. D. GLOVER and W. E. EDMUNDS, 1976

STAHLSTOWN

IX -- DERRY

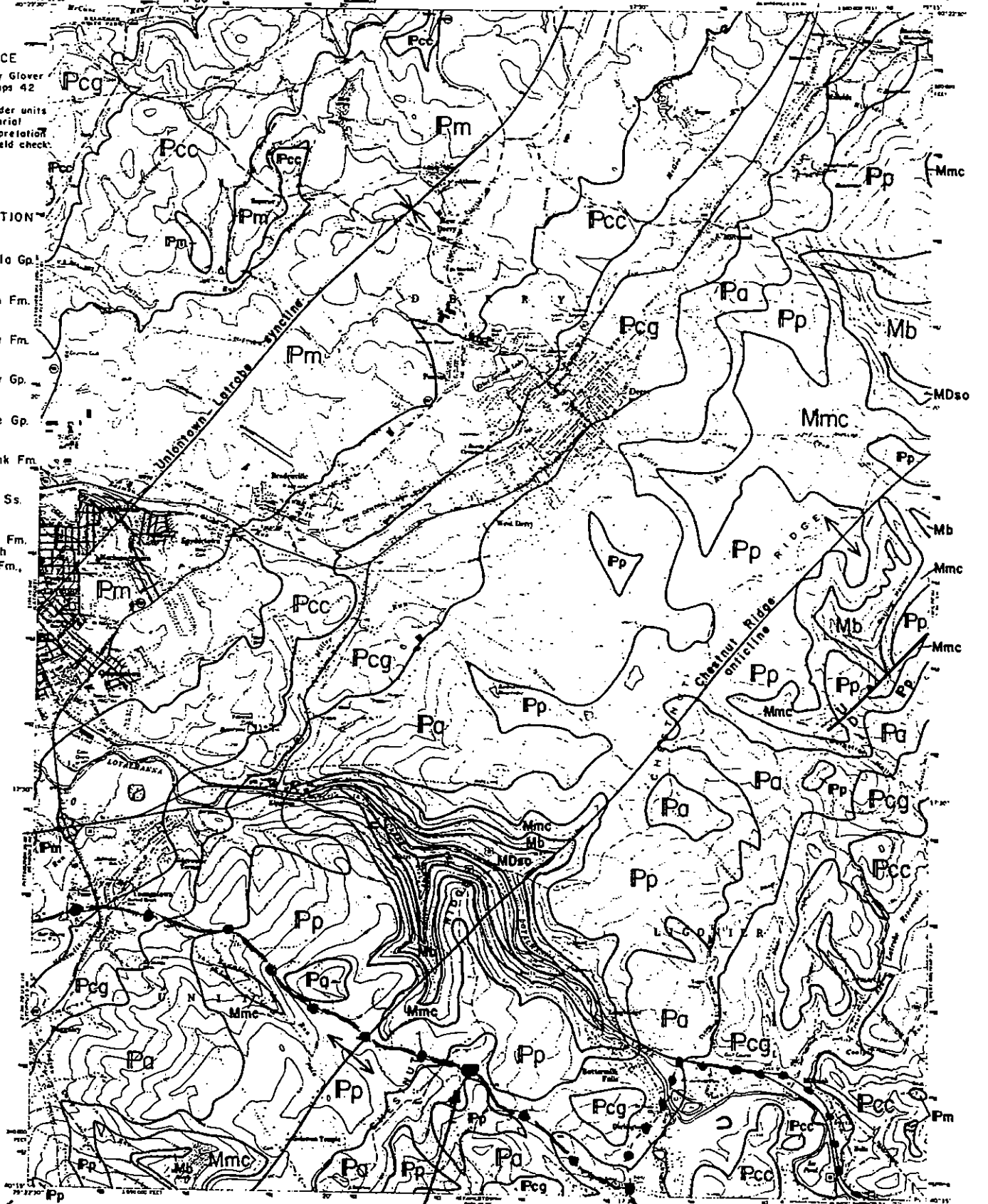
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DERRY QUADRANGLE
PENNSYLVANIA--WESTMORELAND CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SOURCE
Compiled by Glover
based on Maps 42
and 43.
Mmc and older units
based on aerial
photo interpretation
and some field check
by Edmunds.

EXPLANATION

- Pm Monongahela Gp.
- Pcc Casselman Fm.
- Pcg Glenshaw Fm.
- Pa Allegheny Gp.
- Pp Pottsville Gp.
- Mmc Mauch Chunk Fm.
- Mb Burgoon Ss.
- MDso Shenango Fm. through Oswayo Fm. undiv.



REFERENCES

Wagner, W. R., Craft, J. L., Heyman, L., and Harper, J. A. (1975). Greater Pittsburgh Region geologic map and cross sections, Pennsylvania Geological Survey, 4th ser., Map 42.
Wagner, W. R., Heyman, L., Craft, J. L., and others (1975). Greater Pittsburgh Region structure contour map, Pennsylvania Geological Survey, 4th ser., Map 43.

STOP 5

Compiled by A. D. GLOVER and W. E. EDMUNDS, 1976

DERRY

ROAD CLASSIFICATION
Main road Expressway
State road Unimproved rd.
U.S. Route State Route

SCALE 1:62500