

Summary of 1940s Water Tracing Work in Southeastern Minnesota
Summarized by Betty Wheeler, 2-Nov-2012, from work of S. P. Kingston

Kingston, S. P., 1943, "Contamination of water supplies in limestone formation," in: *Journal of the American Water Works Association*, vol. 35, no. 11, Nov. 1943, p. 1450-1456.

Typhoid cases in 1939-40 from a village in Fillmore County. Article does not state which village.):

- a. The first 3 cases occurred at a farm with Well A. (This farm also received water from the village water supply.)
- b. Then 5 additional typhoid cases occurred in 1939-40 within the village. No information is given if these people were drinking only from the village water supply system (but this is a reasonable assumption). Just prior to the onset of these cases, the old municipal well had been used during an emergency.
- c. In spring, 1940, 3 more cases occurred at a different farm with Well B (about 2 miles away). There is no indication these people had village water (so it is a reasonable assumption that they did not).
- d. Epidemiology: No typhoid fever carriers were found with who any of the cases had been in contact; and no common vector was found, other than the water supplies.

Trace #1

1940: 3 lbs. fluorescein dye was introduced into a sinkhole which was receiving discharge (about 60,000 gpd) of partly treated sewage from the village.

Sampling strategy--article states: "periodic sampling of wells A, B and the two municipal wells":

1: **Well "A"** --farm well, south of municipal wells, and 1500 ft. NW of sinkhole in southern part of the village. Well was cased only to the first bedrock.

Type of test	Bacteria	Fluorescein
Detection?	Yes (positive)	Yes (positive)
Result	Max. concentration: 900,000 coliform orgs. per 100 ml (by most probable no. test)	Detected within 4 hrs. after tracing began
Travel time	--	1500 ft. within 4 hrs. (equivalent to: > 1.7 miles/day)

2: **Well "B"** —farm well about 2 miles NW of the village, and also NW of stone quarry. Well was cased only to the first bedrock.

Type of test	Bacteria	Fluorescein
Detection?	Yes (positive)	No (negative)
Result	Max. concentration: 92,000 coliform orgs. per 100 ml (by most probable no. test). Directly isolated typhoid orgs. (<u>Eb. typhosis</u>)	--
Travel time	--	--

Summary of 1940s Water Tracing Work in Southeastern Minnesota

Summarized by Betty Wheeler, 2_Nov-2012

Page 2

3: **“Old” municipal well** --270 ft. deep and cased only to the first bedrock. Located about 4000 ft. NW of sinkhole receiving sewage.

Type of test	Bacteria	Fluorescein
Detection?	Yes (positive) for all samples	No (negative)
Result	Max. concentration: 1,600 coliform orgs. per 100 ml (by most probable no. test).	--
Travel time	--	--

4: **“New” municipal well** --1126 ft. deep; cased to 20-ft. with 16” casing; cased to 340 ft. with 12” casing; and cased to 400 ft. with 10” casing; all cement-grouted. Located about 4000 ft. NW of sinkhole receiving sewage.

Type of test	Bacteria	Fluorescein
Detection?	No (negative)	No (negative)
Result	--	--
Travel time	--	--

Trace #2

1941: 1 lb. fluorescein dye introduced into sinkhole which was receiving the floor drainage from a creamery in the same village in Fillmore County.

Sampling strategy--article only states the creamery well was sampled:

Creamery well --150 ft. from the sinkhole receiving discharge.

Type of test	Bacteria	Fluorescein
Detection?	Yes (positive)	Yes (positive)
Result	“grossly contaminated”	Detected within 2 hrs. after tracing began
Travel time	--	150 ft. within 2 hrs. (equivalent to: > 0.34 miles/day)

Summary of 1940s Water Tracing Work in Southeastern Minnesota

Summarized by Betty Wheeler, 2_Nov-2012

Page 3

Trace #3

1941: Fluorescein dye (amount not specified) introduced into opening in a quarry, which had been used as a toilet by employees, near the same village in Fillmore County.

Sampling strategy--article only states Well B and the large spring near the quarry were sampled:

Well "B" --farm well where 3 more cases occurred in spring, 1940 about 2 miles NW of the village, and also NW of stone quarry. Well was cased only to the first bedrock. (Bacteria results are restated, because article is not clear if all the results from Well B during Traces # 1 and #3 were positive.)

Type of test	Bacteria	Fluorescein
Detection?	Yes (positive) (these results are restated)	No (negative)
Result	Max. concentration: 92,000 coliform orgs. per 100 ml (by most probable no. test). Directly isolated typhoid orgs. (<u>Eb. typhosis</u>) (Results restated, same as Trace #1)	--
Travel time	--	--

Author speculates contamination from the quarry might enter the well during heavy rains and spring thaws.

Big spring near quarry --located about 100 ft. from well "B" and 1600 ft. from the quarry

Type of test	Bacteria	Fluorescein
Detection?	No information given	Yes (positive)
Result	No information given	Detected within 6 hrs. after tracing began
Travel time	--	1600 ft. within 6 hrs. (equivalent to: > 1.2 miles/day)

Summary of 1940s Water Tracing Work in Southeastern Minnesota

Summarized by Betty Wheeler, 2-Nov-2012

Page 4

Trace #4

1942 (or 1943): 1 lb. fluorescein dye introduced into the leaching pit of a private residence in Olmsted County, which was receiving discharge of partly treated sewage from the septic tank.

Sampling strategy--article only states the “old” well was sampled:

“Old” private well --located 110 ft. from the septic tank and leaching pit. Well was cased only 8 ft. into the first bedrock (Platteville formation).

Type of test	Bacteria	Fluorescein
Detection?	Yes (positive)	Yes (positive)
Result	Bacteriological contamination confirmed	Detected within 14 hrs. after tracing began
Travel time	--	110 ft. within 14 hrs. (equivalent to: > 0.03 miles/day)