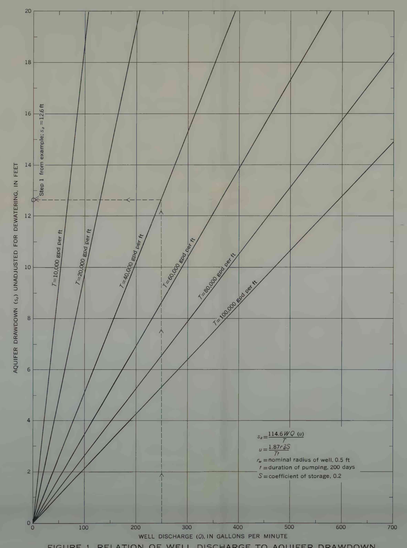

FIGURE 1. RELATION OF WELL DISCHARGE TO AQUIFER DRAWDOWN

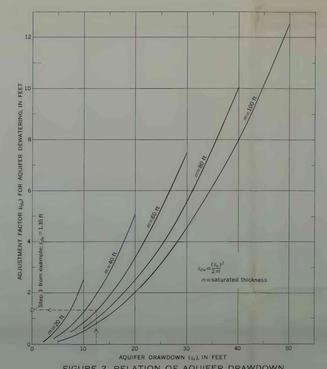

FIGURE 2. RELATION OF AQUIFER DRAWDOWN TO ADJUSTMENT FOR DEWATERING

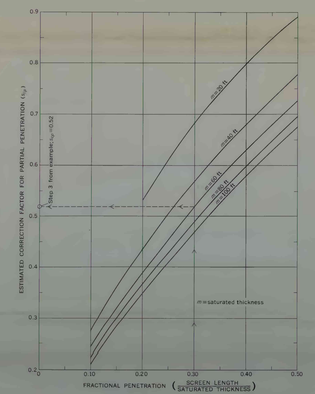

FIGURE 3. RELATION OF FRACTIONAL PENETRATION TO ESTIMATED CORRECTION FOR PARTIAL PENETRATION

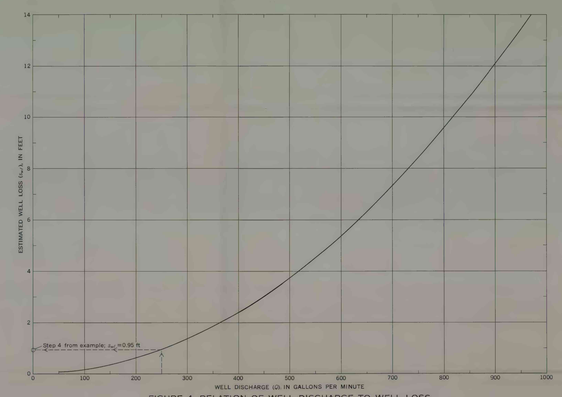

FIGURE 4. RELATION OF WELL DISCHARGE TO WELL LOSS

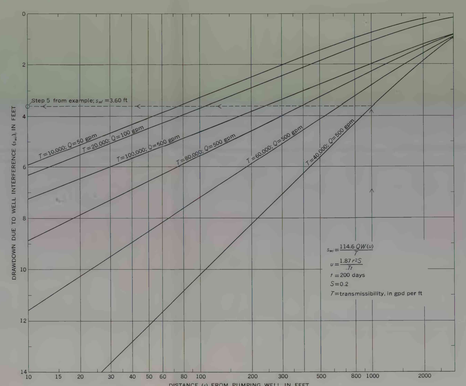

FIGURE 5. RELATION OF DISTANCE FROM PUMPED WELL TO DRAWDOWN DUE TO WELL INTERFERENCE

ESTIMATING WELL YIELD

An estimate of the well yield that may be possible at a specified site can be obtained by using the graphs associated with the equation below. The drawdown available for development at the site can be obtained from plate 3. In appraising the possible yield of a well, the maximum allowable drawdown should be limited to the saturated thickness in the well available above the screen.

The graphs permit an approximate evaluation of the factors to which most of the observed drawdown in a pumping well is generally attributed. The aquifer drawdown in figure 1 was computed by using a pumping period of 200 days without recharge and should provide a reasonable estimate of drawdown for continuous withdrawal. Drawdown at various distances from the pumped well at rates other than that given on figure 5 can be obtained by the method shown in the example, step 5 (stated below).

For a specified well discharge (Q)

$s_{total} = (s_a + s_{dw})/s_{cp} + s_{wl} + s_{wi} + s_b$, where:

- s_{total} is the estimated drawdown to be anticipated in a well for a specified discharge and aquifer transmissibility;
- s_a is the aquifer drawdown for a specified well discharge and aquifer transmissibility—taken from figure 1;
- s_{dw} is the adjustment factor for aquifer dewatering for a specified saturated thickness (pl. 3)—taken from figure 2;
- s_{cp} is the correction for partial penetration for a specified saturated thickness—taken from figure 3;
- s_{wl} is the estimated drawdown at a specified discharge due to well loss—taken from figure 4;
- s_{wi} is the estimated drawdown due to other wells pumping—taken from figure 5;
- s_b is the estimated drawdown due to boundary affects—may be obtained from figure 5 as the drawdown for twice the measured distance from well site to the aquifer boundary (zero transmissibility line).

Example.—Supply well is needed at site where aquifer transmissibility (T) is 40,000 gpd per foot. From plate 3 the saturated thickness is about 60 feet. Yield desired is 250 gpm and proposed screen length is 18 feet. Screen is to be set in lower part of aquifer. Proposed site of new well is about 1,000 feet from existing well discharging 100 gpm; aquifer transmissibility is the same.

$s_{total} = (s_a + s_{dw})/s_{cp} + s_{wl} + s_{wi} + s_b$

Step 1: From figure 1 (follow arrows) for a discharge of 250 gpm and T=40,000 gpd per foot, s_a is 12.6 feet.

Step 2: From figure 2 (follow arrows) for s_a of 12.6 feet and saturated thickness of 60 feet, s_{dw} is 1.35 feet.

$s_a + s_{dw}$ = 12.6 + 1.35 feet or 13.95 feet.

Step 3: To determine s_{cp} an estimate of fractional penetration is needed.

Fractional penetration (fig. 3) = $\frac{18 \text{ feet}}{60 \text{ feet}}$ = 0.30.

From figure 3 for a fractional penetration of 0.30 and a saturated thickness of 60 feet, s_{cp} is 0.52.

Step 4: From figure 4 for a well discharge of 250 gpm, s_{wl} is 0.95 feet.

Step 5: From figure 5 at 1,000 feet from existing pumping well for a T=40,000 gpd per foot and a well discharge (Q) of 500 gpm, s_{wi} is 3.60 feet.

Drawdown at any distance is directly proportional to the pumping rate (Q).

In figure 5, s_{wi} is proportional to Q; actual discharge of the existing well is 150 gpm;

s_{wi} = 150 gpm/500 gpm × 3.60 feet = 0.3 × 3.60 feet = 1.08 feet.

Because the new well is not near a boundary, s_b is neglected.

Therefore: $s_{total} = (s_a + s_{dw})/s_{cp} + s_{wl} + s_{wi}$,

s_{total} = 26.8 feet + 1 foot + 1.1 feet = 28.9.

Maximum drawdown available for development is 60 feet (saturated thickness) − 18 feet (screen length) or 42 feet.

Estimated drawdown in the well is 29 feet; well at this site should adequately meet the needs.

MAP SHOWING TRANSMISSIBILITY OF THE POTOWOMUT-WICKFORD AQUIFER AND GRAPHS FOR ESTIMATING WATER-SUPPLY CAPACITY, POTOWOMUT-WICKFORD AREA, RHODE ISLAND

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