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Pouch 7-005
Anchorage, 99510

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State Office Bldg.
Ketchikan, 99901

794 University Ave.
(Basement)
Fairbanks, 99701

230 So. Franklin
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P.O. Box 772116
Eagle River, 99577

STATE OF ALASKA

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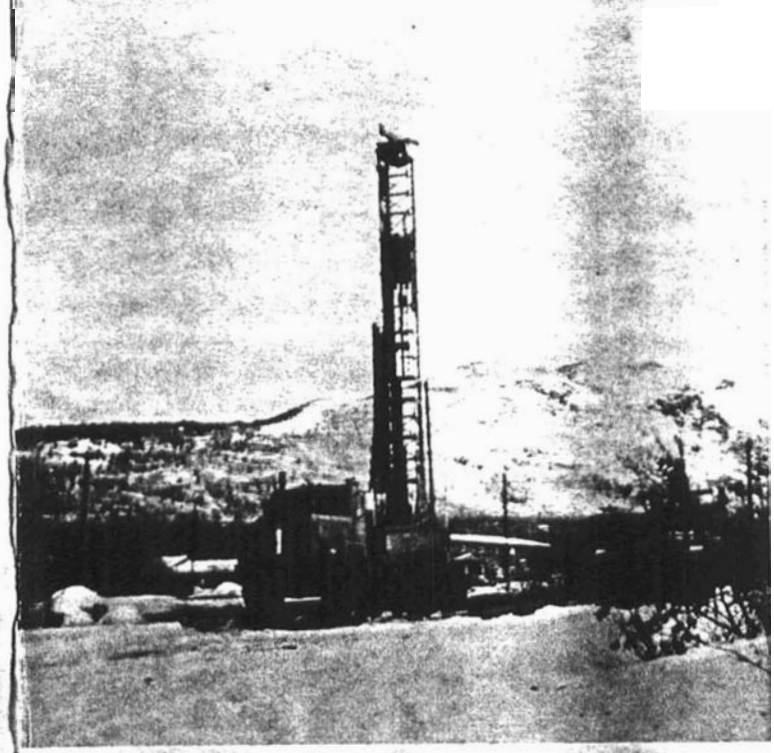
Dept. of Natural Resources
Ross G. Schaff, *State Geologist*

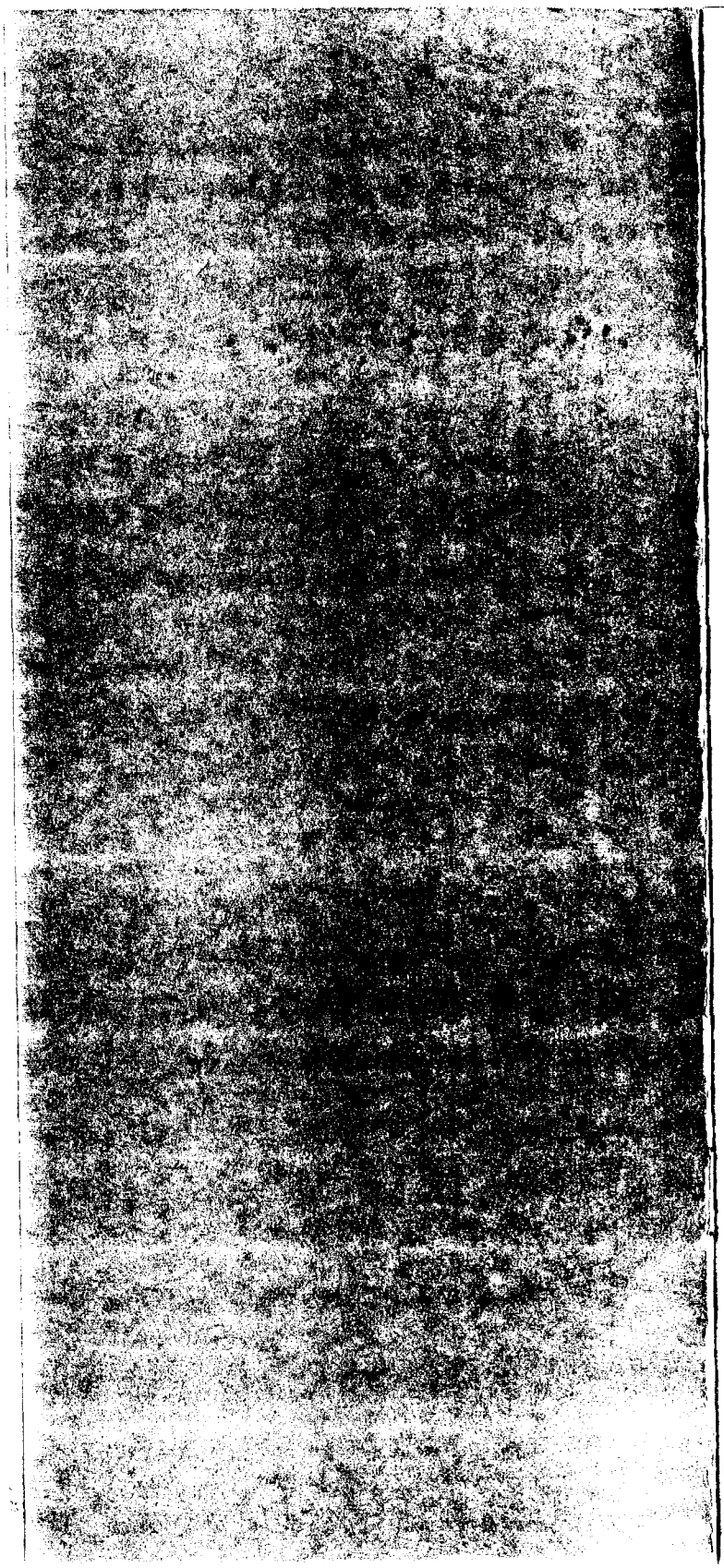
DRILLING A WATER WELL?



INFORMATION CIRCULAR
29

DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

Alaska Department of
NATURAL
RESOURCES



STATE OF ALASKA
Department of Natural Resources
DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

According to Alaska Statute 41, the Alaska Division of Geological and Geophysical Surveys is charged with conducting 'geological and geophysical surveys to determine: the potential of Alaska lands for production of metals, minerals, fuels, and geothermal resources; the locations and supplies of ground water and construction materials; the potential geologic and seismic hazards to buildings, roads, bridges, and other installations and structures; collect, evaluate, and distribute data on seismic events and engineering geology; and shall conduct other surveys and investigations as will advance knowledge of the geology of Alaska.'

In addition, the Division shall collect, evaluate, and publish data on the underground, surface, and coastal waters of the state. It shall also acquire, process, and file data from well-drilling logs.

DGGS performs numerous functions, all under the direction of the State Geologist—resource investigations (including mineral, petroleum, geothermal, and water), geologic-hazard and geochemical investigations, and information services.

Administrative functions are performed under the direction of the State Geologist, who maintains his office in Anchorage (ph. 276-2653). The DGGS Water Resources section is located on Fish Hatchery Road in Eagle River (P.O. Box 772116, zip 99577; ph. 688-3555). Other DGGS offices are at:

.794 University Ave.
(Basement)
Fairbanks, 99701
(907) 474-7147

.3601 C St (8th fl.)
Pouch 7-005
Anchorage, 99510
(907) 786-2205

.230 So. Franklin
(4th floor)
Juneau, 99801
(907) 465-3400, Ext. 39

.P.O. Box 772116
Eagle River, 99577
(907) 688-3555

Cover: *Anchorage contractor drilling a DGGS water-level observation well in the community of Eagle River, 1982. (Photograph by J.A. Munter.)*

DRILLING A WATER WELL?
(Drilling considerations and contractors - 1983)

Major Ground-water Data Source

The Division of Geological and Geophysical Surveys (DGGS) routinely receives—from a variety of sources—well logs that contain geologic and hydrologic information recorded by water-well contractors during drilling operations.

This information serves as the most important source of data used by hydrologists in interpreting Alaska's ground water. Driller's logs are used in a series of DGGS Reports of Investigations that illustrate ground-water use and well construction in south-central Alaska's Matanuska Valley (see RI 83-19, for example). These reports and those published by the U.S. Geological Survey provide data on average yields and depths of wells for a designated area.[1]

DGGS Charter

To further hydrologic knowledge as mandated by Alaska Statute 41.08.020, DGGS conducts hydrological surveys to determine the potential of Alaskan lands for the development of ground- and surface-water supplies. This statute empowers DGGS to collect, record, evaluate, and distribute data on the quantity, quality, and location of underground, surface, and coastal waters of the state.

Considerations for Prospective Well Owners

Drilling a water-well for domestic or commercial use is a long-term investment. Although initial costs can be high, a properly constructed and maintained water well should provide an adequate water supply for decades. A poorly constructed well, on the other hand, will plague the owner for years.

The prospective well owner is advised to select a reputable contractor, one who offers the expertise and

[1]Specific well data are available to the public at the DGGS Eagle River office located off Fish Hatchery Road (ph. 688-3555).

skill required to correctly develop a supply from water-yielding substrata called aquifers.

After your well is drilled, you should obtain a copy of the well log from the driller. This should include a record of geologic materials encountered while drilling and test-pumping results. The document will be important if problems develop with the well, if you file for water rights,[2] or if hydrologists study ground-water flow in your area. (For various reasons, DGGS does not receive all well records from drillers.)

Guidelines in Selecting a Driller

Brochures addressing driller selection and what questions to ask of a drilling contractor are available. Two publications that we recommend are 'The Water User's Handbook,' issued by the Alaska Division of Land and Water Management (48 p.),[2] and the National Water Well Association's 'When you need a water well' (16 p.).[3]

Developing your well-water supply—from site selection to pump selection—is an integral part of your new home. Therefore, as a new homeowner, you must ask some important questions before a driller is employed:

1. Are written contracts drawn up for our (owner's and driller's) mutual protection?
2. Is the drilling contractor adequately insured?
3. How will the driller construct the well? (Inquire about casing dimension, probable yield, and drawdown testing.)
4. Will the well be sanitized? If so, how?
5. Will the contractor provide a signed and complete well log?
6. Are state and local codes met? (This includes furnishing DGGS with a copy of the log.)

[2]To obtain a water-rights permit or certificate, contact your nearest Alaska Division of Land and Water Management (555 Cordova St., Anchorage; 4420 Airport Way, Fairbanks; 230 So. Franklin St., Juneau).

[3]NWWA, 500 W. Wilson Bridge Rd., Worthington, Ohio 43085 (ph: 614-846-9355).

Development and Testing Essential to Determine Yield and Capacity of Wells[4]

A successful water well is one that is 'developed' to maximize efficiency to extend its useful life. Also, a well's yield should be tested after it is drilled to determine well performance and pump size.

Well Development

Drilling a water well can do extensive damage to the transmitting capacity of the aquifer immediately surrounding the well. Drilling often introduces fine silt or clay that may clog the surface of the aquifer. Well development involves the removal of these materials to restore the aquifer to its natural water-yielding capacity and commonly can increase this natural capacity.

The simplest method of well development is called surging. A plunger is rapidly moved up and down in the standing water in the well, causing water to flow into and out of the aquifer. This action cleans the exposed wells of the drillhole and leaves the silt and clay particles in the bottom of the well, where they can be removed easily.

Other methods of well development are hydraulic jetting (spraying the walls of the well with high-velocity water); detonating small amounts of explosives to create fractures, which commonly increase the aquifer yield; adding acid to increase the yield of a limestone aquifer; using compressed air in the same way as a hydraulic jet; and adding dry ice to the water to create a violent foaming action.

Drawdown Tests

To effectively plan the complete water system, drawdown tests should be conducted before decisions on the well pump, storage tanks, and plumbing can be made. A competent well driller will test the well soon after it is developed, furnish the owner with the data, and discuss sizing the pump to his water needs.

A common drawdown-test procedure used by drillers is 'bailing' the well. A 'bailer,' or cylindrical bucket of

[4]Modified from "A practical handbook for individual water-supply systems in West Virginia," by R.A. Landers (1976): West Virginia Geological and Economic Survey, Morgantown, West Virginia 26505, p. 36-37.

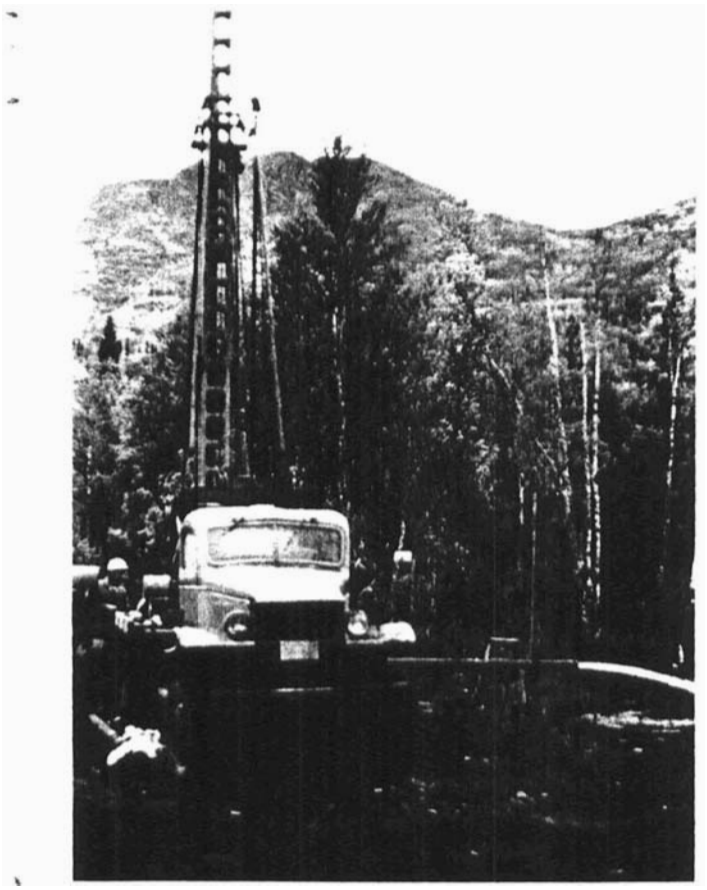
known capacity with a check valve on the bottom, is lowered into the well. The cable is marked when the bucket hits standing ('static') water. The bailer is filled, rapidly pulled from the well, and emptied. This procedure is repeated many times over a known period of time. When the last bailerful is removed, the water level, marked on the cable, is noted; this is the final test-pumping water level. The difference between the static- and the pumping-water levels is the 'drawdown.' The number of bailers emptied times the capacity of the bailer, in gallons, is the volume bailed. This figure, divided by the duration of the test, in minutes, is the 'yield' in gallons per minute (gpm). If feasible, the driller should bail rapidly enough to give a yield at least equal to the planned yield of the water system. The yield divided by the drawdown is the 'specific capacity' of the well (in gpm/ft of drawdown) for the specified length of time of the bailing test.

Bailing tests, most frequently used on small-capacity home water wells, have several shortcomings. Water levels will rise between bailings, and the test will overestimate specific capacity by a variable amount that depends on the speed of bailing and aquifer properties. The water level in a well pumped at a constant rate will drop rapidly at first and then more slowly. Therefore, the specific capacity will vary with the duration of the test.

Eventually, the pumped-water level will remain constant when the rate of pumping (or bailing) equals the rate of inflow from the aquifer. The well may be bailed dry first, however. It is this 'equilibrium' drawdown that most accurately tests the specific capacity of the aquifer and would be the best figure to use in calculating the size of the pump. However, a reasonably good estimate of this can be obtained from a properly run bailer test of shorter duration (1/2 to 1 hr).

Test Results

The results of well-yield tests are used in three important ways: 1) determining whether the well will fully meet the total water requirements of the user; 2) determining the best pump size; and 3) comparing with results of tests made at later dates to reveal any failure of the aquifer, pump, or well. If the yield of the well during the test was greater than the expected maximum-use rate and if the drawdown was substantially less than the maximum available drawdown, the well should serve as an adequate source of supply. But, if the well was bailed dry at the tested rate of yield, it would be inappropriate and a waste of money to buy a pump that is rated at any more than 70 to 80 percent of this yield. Also, if the static water level is measured periodically and is found to decline significantly, problems may be encountered during times of drought.



Well-pumping test in progress at the South Fork Eagle River alluvial fan. An Anchorage driller, under contract to the U.S. Geological Survey Water Resources Division, developed several hundred gallons of water per minute. Photograph by L.L. Dearborn, 1973.

Registered Water-Well Contractors - 1983

Water-well drillers in Alaska are registered as specialty contractors with the Alaska Department of Commerce and Economic Development (DCED) Division of Occupational Licensing. Water-well contractors licensed and registered by DCED in 1983 to legally conduct drilling operations in Alaska are listed below.

This listing, which is updated annually, may not include newly registered drillers. Some drillers have joined NWWA, a national leader in water-well technology that actively supports an affiliate chapter in Alaska.[5] The list is broken into six regional subsections: south-central, interior, southeastern, southwestern, and northwestern Alaska, and 'Out-of-state.'

South-central

Alaska Now-well
Vern's Drilling*/**
SRA Box 1560
Anchorage, AK 99507

Alpine Drilling
P.O. Box 4-895
Anchorage, AK 99507

Arctic Drilling & Roofing Co.
P.O. Box 10-976
Anchorage, AK 99511

B & B Well Drillers
1020 Edwards
Anchorage, AK 99504

Bell & Sons Water Well Drilling
P.O. Box 486
Soldotna, AK 99669

[5]That a driller is not certified by NWWA does not mean he is not qualified to practice; rather, he has elected not to participate in NWWA's certification program.

*NWAA member.
**Certified to perform specialized work categories through testing administered by NWWA. See p. 12.

B. Spires Drilling Co.
Rt. 1, Box 22
Kenai, AK 99611

Bill's Waterwells
St. Rt. B, Box 7022
Palmer, AK 99645

Blue Bear Drilling Co.*
SR Box 2275
Wasilla, AK 99687

C & N Water Well Drilling Co.
Box 8938 SRC
Palmer, AK 99645

C B Drilling*
P.O. Box 1210
Wasilla, AK 99687

D & E Excavating
P.O. Box 1690
Wasilla, AK 99687

Darc Enterprises
Box 158
Kenai, AK 99661

Davis Drilling & Excavating
SR Box 2085
Wasilla, AK 99687

Delta Drilling Co.*
S.R. Box 5310 - Mi. 5.2 Knik Road
Wasilla, AK 99687

Dotten Drilling Co.
P.O. Box 10056 Klatt Station
Anchorage, AK 99502

Echo Lake Drilling Co.*
Box 551
Soldotna, AK 99669

Foss Drilling
909 Chugach Drive, no. 37
Anchorage, AK 99503

Gee's Water Wells
SRA 6472-G
Palmer, AK 99645

H & H Construction Co., Inc.
SR Box 2070
Wasilla, AK 99687

Dave Harper
P.O. Box 4-895
Anchorage, AK 99509

Hefty Well Drilling
SRA Box 1553-H
Anchorage, AK 99507

Hood & Sons Pump and Drilling
P.O. Box 875195
Wasilla, AK 99687

Jay Byrd Drilling
Box 1703
Soldotna, AK 99669

Jay Williams Drilling Co.*
P.O. Box 42
Chugiak, AK 99567

Ken's Co.
3163 Linden Dr.
Anchorage, AK 99502

Kraxberger Drilling
Rt. 2, Box 905
Soldotna, AK 99669

L & M Drilling
P.O. Box 891
Palmer, AK 99645

Leo's Drilling Service
P.O. Box 1976
Soldotna, AK 99669

Mainline Drilling
P.O. Box 3712
Kenai, AK 99611

M-W Drilling, Inc.*/**
P.O. Box 10-378
Anchorage, AK 99511

Magnuson Drilling
P.O. Box 504
Eagle River, AK 99577

Moon Drilling & Construction Co.*
SRA Box 6554
Palmer, AK 99645

Northland Drilling
P.O. Box 1292
Kenai, AK 99611

101 Drilling
SR C, Box 88
Palmer, AK 99645

Peninsula Drilling*/**
Box 1283
Kenai, AK 99611

Penn Jersey Drilling Co.*/**
SR Box 2201
Wasilla, AK 99687

Phillips Drilling
Box 111
Ninilchik, AK 99639

Rampart Drilling Works*/**
SRA 1369
Anchorage, AK 99502

Sommerville Well Drilling
SR Box 1773-T
Anchorage, AK 99507

Stariski Water Co.
Box 88
Anchor Point, AK 99556

Sullivan Water Wells
P.O. Box 272
Chugiak, AK 99567

Syren Brothers Drilling, Inc.
2701 Eagle St.
Anchorage, AK 99503

T & T Drilling Co.
665 West 87th Ave.
Anchorage, AK 99502

Vester Tadlock
7800 Debarr Rd - Sp. 443
Anchorage, AK 99504

Valley Drilling & Pump Supply
P.O. Box 145
Wasilla, AK 99687

Water Systems & Service Co.
Rt. 1, Box 1517
Kenai, AK 99611

Western States Associates, Inc.*/**
633 East 81st St.
Anchorage, AK 99502

Wheaton Water Wells, Inc.
Box 1218
Wasilla, AK 99687

W.N. White Drilling
3720 Westminster Way
Anchorage, AK 99508

Zia Inc.
SRA Box 3171-C
Anchorage, AK 99502

Interior Alaska

Aurora Drilling Co.
1030 Aurora Dr.
Fairbanks, AK 99701

Clearwater Drilling Co., Inc.
Box 151
Fairbanks, AK 99707

Cook Drilling**
Box 311
Delta Junction, AK 99737

Hatch Drilling Co., Inc.
Box 60148
Fairbanks, AK 99706

Legend Drill Service*
Box 65
Galena, AK 99741

Swan Drilling Co.*
P.O. Box 10109
Fairbanks, AK 99701

Thibedeau Drilling Contractors*
3864 Peger Rd
Fairbanks, AK 99701

Southeastern Alaska

Channel Drilling
2010 Radcliffe Rd.
Juneau, AK 99801

Coleman Drilling
P.O. Box 7420
Ketchikan, AK 99901

Wallace Drilling Co.*
P.O. Box 210129
Juneau, AK 99821

Southwestern Alaska

Custom Drilling
P.O. Box 141
Naknek, AK 99633

Island Drilling Co.
P.O. Box 2338
Kodiak, AK 99615

Nicholsen's Drilling
P.O. Box 405
Bethel, AK 99559

Paug-Vic, Inc., Ltd.
P.O. Box 61
Naknek, AK 99633

Northwestern Alaska

Thrasher and Associates, Inc.
Box 114
Nome, AK 99762

Out-of-state

Fluor Drilling Services, Inc.
3333 Michelson Dr.
Irvine, CA 92730

NWWA-certified Capabilities

Listed below are the various categories of well-construction specialties that are certified by NWWA testing.

A - Cable-tool drilling in unconsolidated material
B - Cable-tool drilling in rock material
C - Air-rotary drilling in unconsolidated material
D - Air-rotary drilling in rock material
E - Mud-rotary drilling in unconsolidated material
F - Mud-rotary drilling in rock material
G - Reverse-rotary drilling in unconsolidated material
H - Jetting and driving wells in unconsolidated material
I - Boring and augering in unconsolidated material
J - Pump installation - domestic, 1 to 3 hp
K - Pump installation - commercial, 3-20 hp
L - Pump installation - industrial and municipal, more than 20 hp

The following six drillers are certified by NWWA in the above categories of drilling and pump installation.

.Cook Drilling - C
.M-W Drilling, Inc. - A, B, C, D, E, F, G, H, I, J, K, L
.Peninsula Drilling - A, J
.Penn Jersey Drilling Company - A, C, D, J, K, L
.Vern's Drilling & Enterprises - A, B, L
.Western States Associates, Inc. - A, B, C, D, E, F, G, H, I, J, K, L.

NOTES