EXECUTIVE SUMMARY
ROMP TR 9-3 "Simmons #3"
S. 32 T. 31 S. R. 19E.

February 27, 1984 John L. Decker

I. General Description

The TR 9-3 monitor well is located approximately 1.5 miles north of Ruskin in Hillsborough County, Florida. The wellsite is adjacent to the eastern right-of-way easement for U.S. 41 South. TR 9-3 lies in the S.E. 1/4 of the N.W. 1/4 of the S.E. 1/4 of Section 32, Township 31 South; Range 19 East at latitude 27° 44' 18", longtitude 82° 25' 37".

II. Site Easement

TR 9-3 includes both a perpetual and a temporary construction easement for the purpose of drilling, maintaining a monitor well for test purposes. The perpetual easement of 20' x 20', granted by Hillsborough County, is contained within a temporary construction easement of 100' x 100'.

III. Reasons For The Monitor

TR 9-3 was constructed for the purpose of collecting hydrogeological data. The TR 9-3 site was selected for the purpose of monitoring coastal aquifers in the Ruskin area. Present overdevelopment of coastal aquifers from pumping by agricultural and commercial interests have reduced freshwater head and consequently has induced the inland migration of seawater. Other reasons for the construction of the monitor include: determination of the 250 mg/l isochlor, potentiometric surface water levels, zones of low and high permeability, describing lithology and identifying geologic formation boundaries.

IV. Geology

The TR 9-3 wellsite lies within the Pamlico Terrace, a part of the Gulf Coastal Lowlands near Ruskin, Florida. The elevation at this site is approximately 8.0 feet above MSL. The geologic formations encountered during drilling operations ranged from Recent to Eocene in age. The following geologic data was obtained from the examination of drill cuttings (LSD - 785') and correlated with geophysical logs completed by the District's and Northwest Florida Water Management District's geophysical logging equipment.

Borehole Depth (ft. below LSD)	Name of Rock Unit
LSD - 28'	Undifferentiated Sand, Clay and Shell= sand-dark gray, clay and organic matrix, clay - dark yellowish green to black; low permeability; clay, organic and calcilutite matrix; shell - white to light brown; clay matrix; gastropods (Turritella), mollusks, high to low permeability.
28' - 160'	Hawthorn Formation (Miocene) = (top of formation)- calcilutite, very light green to moderate grayish green; clay- light green; phosphatic sand and gravel, minor chert; dolomite - light brown to light olive gray; limestone-very light orange; interbedded with dolomite, clay and chert at bottom of formation; low permeability.

160' - 285'	Tampa Formation (Miocene) = clay-grayish green to yellowish gray; low permeability; limestone-very light orange to light grayish brown; dolomite-yellowish gray to dark yellowish brown; the formation includes phosphatic sand and gravel chert; porosity and permeability-usually low to moderate.
285' - 514'	Suwannee Formation (Oligocene) = limestone-biomicrite, very light orange; dolomite (near the bottom of formation)-very light orange to light brown, some fractured porosity; fossils-foraminifera (=Dictyoconus cookei); moderate-high porosity and permeability.
514' - 605'	Ocala Group (Crystal River Formation), (Eocene Age) = limestone-biomicrite, very light orange to yellowish gray; fossils-foraminifera (Lepidocyclina, and Nummulites (numerous), Lagena), mollusks, crustacea, echinoids-spicules; often poorly indurated; moderate-high permeability.
605' - 675'	Ocala Group (Williston Formation), (Eocene Age) = Limestone biomicrite, very light orange, yellowish gray; fossils-foraminifera - (Lepidocyclina, Nummulites, Operculinoides-fall in?), echinoids (Periarchus lyelli floridana); usually poorly indurated; dolomite-dark yellowish brown; clay seam near bottom of formation; zones of moderately high porosity and permeabilitiy.
680' - 773'	Ocala Group (Inglis Formation) (Eocene Age) = Limestone-biomicrite, very light orange, yellowish gray, grayish orange; coquina; some organics and laminations at top of formation, fossils-foraminifera (Lepidocyclina, Nummulites, Operculinoides-fall in?) echinoids (Periarchus lyelli floridana), usually poorly indurated; dolomite-dark yellowish brown; clay seam near bottom of formation; zones of moderately high porosity and permeability.
773' - 785' TD	Avon Park Formation (Eocene Age) = dolomite-moderate yellowish brown to olive gray, sucrosic, banded, clay seam near top of formation, good induration, fracture porosity and permeability.

The Hawthorn Formation and upper Tampa Formation is composed of interbedded layers of clay, dolomite and limestone (28' - 180' below LSD).

According to the neutron/bulk density cross plot the zone between 370' - 437' below LSD is composed of sandy limestone. Most of the formational material between 180' and 780; below LSD is limestone or dolomitic limestone. The intervals 220' - 230', 240' - 255', 275' - 280', 495' - 510', 735' - 785' below LSD is predominately dolomite or fractured dolomite.

V. Hydrogeology

The potentiometric surface, measured at the TR 9-3 site, was approximately 8.9' above MSL after completion of drilling operations (785' below LSD).

The non-artesian zone is consistent with the surficial aquifer (water table) and extends from land surface to approximately 25' below LSD.

A small zone of higher porosity and permeability, consisting of limestone, lies between 65' - 90' below LSD in the upper Hawthorn Formation. Most of the Hawthorn Formation and the upper Tampa Formation (28' - 180' below LSD) consists of clay calcilutite, some chert, and dolomite. The zone appears to be low in permeability and acts as a confiner above the first artesian zone (I). The first artesian zone (I) extends from approximately 180' to 225' below LSD and possibly even intermittantly from 225' to 275' below LSD. The dolomite lenses between 225' and 285' below LSD appear to act as a semiconfiner for the bottom of the first artesian zone. The second artesian zone II extends from approximately 285' below LSD, top of the Suwannee Formation, to near the bottom of the Ocala Formation (760' below LSD). A dolomite confiner with lenses of clay is located near the bottom of the Ocala Group and at the top of the Avon Park Formation (760' - 785' below LSD). Between 370' and 437' below LSD, the quantitative values obtained from the 64' normal electric, neutron, and density logs indicated a sandy limestone. Porosity ranged from 22% - 28%. Low density rock material values ranged from 2.20 g/cc to 2.35 g/cc in this interval. From 440' - 484' below LSD the values from the 64' normal electric logs increased (77 - 230 ohmmeters). The range of values for density of rock material were 2.35 g/cc to 2.60 g/cc. Values for porosity ranged from 23% to 25%. The values basically indicated a limestone which correlated very well with the descriptions given to the drill cuttings.

The interval from 488' to 511' below LSD was identified as interbedded limestone and dolomite in the descriptions given to the drill cuttings. The drill cuttings correlated with the 64" normal electric high resistivity log values, (ranged from 255 ohmmeters to 372 ohmmeters), high density values (2.48 g/cc - 2.67 g/cc) and low porosity values from the neutron log (11% - 25%). This interval with high resistivity, high density and low porosity is mostly dolomite (fractured), dolomitic limestone, and competent limestone. From 514' to 702' below LSD fairly high resistivity values were derived from the 64" normal electric log. In most cases, values derived from the density log were also high, ranging from 2.21 g/cc to 2.53 g/cc. Values for porosity found in this interval were fairly consistent, ranging from 24% - 30%. The interval (514' - 702' below LSD) appeared to be a moderately high zone of permeable limestone. From 702' to 742' below LSD permeabilities of the limestone appeared to decrease along with some decrease in porosity. During the final stages of drilling (742' - 776' below LSD) resistivity values derived from the 64" normal electric log began to increase, ranging from 110 - 191 ohmmeters, densities increased from 2.49 to 2.67 g/cc while porosities ranged from 25% to a low of 13%. This interval consisted of permeable fractured dolomite, seams of clay and limestone. The zone appears to be a semi-permeable confiner between the Ocala and Avon Park Formations.

VI. Hydrology

Water quality samples (specific conductivity, chlorides and sulfates) were retrieved between 420' and 780' below LSD. Specific conductivities ranged from 1100 - 2250 Umhos between 420' and 760' below LSD, chlorides (51 mg/l - 175 mg/l) and sulfates (230 mg/l - 832 mg/l). The 250 isochlor was reached between 760' and 780' below LSD. At 780' below LSD, specific conductivity increased to 3810 Umhos, Chlorides (595 mg/l), and sulfates (1568 mg/l). Following drilling operations, the geophysical logger sampler retrieved water samples from the top, 300', 400', 600', 700', 780' below LSD. Specific conductivity ranged from 1600 Uhmos near the top to 4400

Uhmos at 780' below LSD, chlorides increased from 123 mg/l to 820 mg/l, and sulfates (675 mg/l - 1651 mg/l). There appears to be upward migration of poorer water quality in this well after encountering the confiner near the Ocala-Avon Park Formation boundary. Two months following the completion of the well samples indicated that water quality degraded even further. Water samples were retrieved from 665', 705', 745', 785' below LSD. Specific conductivity increased from 485 Umhos to 5600 Umhos, chlorides (1010 - 1090 mg/l), sulfates (1587 - 1609 mg/l). The data verified earlier conclusions regarding upward migration of poorer water quality.

Water level was approximately -11.4' at a drilling depth of 460' below LSD. At 520' below LSD, water level rose to +1.8' indicating that an artesian zone had been encountered after penetrating the dolomite and limestone confiner between 488' and 511' below LSD.

Water levels varied as much as .8' between 560' and 785' below LSD. The water level at the drilling depth of 785' was +1.0' above LSD. Cross plotting techniques from data obtained from neutron, fluid resistivity and 64" normal resistivity logs indicated a gradual change in water quality from 444' to 458' below LSD. R_w changed from R_w=11 ohmmeters to R_w=25 ohmmeters. Water quality between 370'-458' below LSD is approximately R_w=11 ohmmeters. Better water quality in the interval 460' - 702' and 744' - 746' below LSD with R_w= 25 ohmmeters was derived from cross-plotting techniques. Between 702' and 742' below LSD there may be a zone where water quality drops and is possibly caused by the presence of a low permeable zone which may contain mineralized water. (Water quality and water level data can be found in detail in the TR 9-3 "Simmons #3 file).

VII. Well Construction - Deep Monitor

The TR 9-3 "Simmons #3" deep well was constructed as a dual monitor. An upper zone (sulfate monitor) and a lower zone (chloride monitor) was drilled to a depth of 785' below LSD.

The dual sulfate and chloride monitor was constructed in the following method: an 18" inch nominal borehole was drilled to a depth of 40' below LSD, using a 17 1/2" drill bit and conventional mud rotary drilling techniques. A 14" steel casing was seated and cement grouted from bottom to top. From 40' to 289' below LSD, a 12 1/4" drill bit was utilized in drilling out of the 14" casing. At a depth of 289' below LSD, an 8" PVC casing was seated and pressure grouted to surface. A 8"-inch nominal borehole (289'-785' below LSD) was drilled, using a 7 5/8" drill bit and reverse air drilling techniques.

The final stages of construction involved the setting of 3" PVC screen (no. 0.030) in an interval (764' - 779') below LSD. The 3" PVC well screen was coupled to approximately 766.5' of 3" PVC monitor tubing. White silica river gravel (3/8" to 1/2") was placed in the well from a depth of 785' to 762' below LSD. A layer of 6-20 silica sand (762'-757' below LSD) was placed in the well. Cement grout was then injected into the well from a depth of 757' to 525' below LSD. An open hole interval exists from 525' to 289' below LSD (bottom of the 8" PVC casing).

VIII. Geophysical Logs

Suites of geophysical logs were completed with logging equipment from the District, and Northwest Florida Water Management District. Cross-plotting techniques, using quantitative data from neutron porosity, density, 64" normal electric and fluid resistivity logs identified zones of dolomite, limestone, low and high permeabilities.

U.S.G.S. Notification

The Technical Support Section was notified in March 1984, that TR 9-3 is complete and ready for monitoring by the U.S. Geological Survey.

Definition of Formation Boundaries—SPECIAL Note

The specific definition of formations penetrated at this well site was done partially on the basis of biostratigraphic evidence and partially on the basis of lithologic evidence. Additional correlating evidence (geophysical well logs and/or hydrologic data) was also utilized in the delineation of these formation boundaries. Therefore, the chosen formational boundaries are tentative at best, according to standard stratigrahic methods.

Borehole Depth (ft. below LSD)	Simplified Lithology TR 9-3 Name of Rock Unit
LSD - 28'	Undifferentiated Sand Clay And Shell
28'-160'	Hawthorn Formation
160'-285'	Tampa Formation
285'-514'	Suwannee Formation
514'-605'	Ocala Group - Crystal River Formation
605'-675'	Ocala Group - Williston Formation
675'-773'	Ocala Group - Inglis Formation
773'-785'TD	Avon Park Formation