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LCP WATER WELL STUDY
MARIN COUNTY

PREPARED FOR
COUNTY OF MARIN

July 1983

PREPARED BY

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LSA #82-063

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INTRODUCTION

This study presents the results of investigations into the basis for the water well policies contained in the County's Local Coastal Programs (LCP). The County's Unit I and Unit II LCP's contain a policy which essentially prohibits new individual domestic water wells on lots located within service district or mutual water system boundaries. The County requested that the basis for this policy in the Coastal Act be reviewed to determine if a more flexible approach was possible while still conforming to the goals and policies of the Coastal Act. This study contains the following work tasks:

1. A history of the County's LCP Water Well Policies
2. The Coastal Act basis for the Well Policies
3. Analyzes Current Water Sources and Service Capabilities of Coastal Water Districts
4. The effects individual well use would have on coastal resources
5. Recommended Policy changes.

This work was conducted by Larry Seeman Associates with review and direction provided by Houshang Esmaili Associates (HEA) consulting groundwater hydrologists.

History of LCP Well Policies

The County's adopted Local Coastal Plans (Units I and II) contain policies on the use of water wells. These policies were added by the North Central Coast Regional Commission staff after the Unit I LCP had been adopted by the County Board of Supervisors. The history and sequence of events which led to the inclusion of these policies in the LCP is outlined below.

The County's LCP process began with an Issue Identification and Work Program phase. The Work Program contained specific tasks and products, based on the Issue Identification workshops, which were necessary to bring the County's development plans, policies, and ordinances into conformance with the Coastal Act. The tasks in the Work Program addressed specific issues such as seacliff retreat in Bolinas rather than general issues such as seacliff retreat along the entire coastline. They were focused in this manner based on the County's belief that County plans, ordinances, and policies were in substantial conformance with the Coastal Act. The Work Program was adopted by the County and approved and funded by the Coastal Commission. The work item on the Allocation of Water/ Land Use in the Work Program contained tasks to determine if adequate water would be available to meet future needs and to allocate uncommitted supply among visitor serving, residential and other uses. There were no specific work tasks to evaluate or regulate the use of individual wells.

The Unit I LCP was prepared by County staff based on the approved Work Program. It evaluated the water availability in the three villages in the Unit I area and concluded that only in Bolinas was there a water shortage and an allocation program should be developed when an application is received to expand the system. The County well ordinance was incorporated into the LCP as the applicable regulations governing well use and construction. The original draft underwent numerous revisions as a result of comments made on it. One change made during this period was to incorporate proposed changes to Section 7.28 (Domestic Water Supply) of the County Code which were designed to insure water availability to all homes using individual wells. The 6th draft (August 21, 1979) was approved by the Board of Supervisors. It contained no policies on water wells.

Throughout this period Regional and State Coastal Commission staff had commented extensively on the Unit I LCP and had made no reference to the need for a policy which prohibited the use of wells within areas served by water companies. Although the Regional Commission had not commented specifically on the well issue in their review of the LCP, they had previously, in their Interpretive Permit Guidelines indicated a need for a well policy in the Inverness area. Interpretive Permit Guidelines were developed to review development prior to the adoption of an LCP. The North Central Coast Regions

Interpretive Permit Guidelines discussing Inverness contain a statement that reads "...The utilization of individual water supply sources within these areas is inconsistent with the sound management and protection of limited water resources. Where individual water wells are the only practical means of service (e.g. outside community service area), applicants shall be required to demonstrate a sustained safe yield of 2 gpm and shall provide on-site storage capacity for fire protection purposes." This prohibition on individual domestic wells was not applied to any other portion of the County's Coastal zone.

Upon adoption by the Board of Supervisors, the Unit I LCP was sent to the North Central Coast Regional Commission for their review. A series of staff reports examining the Unit I LCP were prepared by Regional Commission staff which focused on expanding or modifying the "Policy" section of the report. This modification was based on the premise that general development policies were needed to form the basis for the more specific policies already in the report. Policies on water wells were first proposed in the Regional Commission staff report of October 18, 1979. They read substantially as currently written with the exception of the language which allows wells for non-domestic purposes which was not in this original draft. A later staff report dated December 4, 1979 presents the Regional Commission's basis for the proposed water well policies which is presented below:

E. Development Standards

Several sections of the Coastal Act establish general standards for development in the coastal zone in order to assure that such development is adequately served by public services, and that coastal resources are adequately protected. The Commission finds that additional development standards are required in the Unit I land use plan in order to assure that Coastal Act policies on new development are incorporated into the LCP. The Commission finds that additional development standards are required in several different areas, including: Septic Systems, Water Wells (emphasis added), Grading, Archaeological Resources, and Historic Preservation. Each set of standards is discussed separately as follows:

1. Water Wells

Section 30231 of the Coastal Act requires that the biological productivity and quality of coastal waters be protected through, among other mechanisms, preventing depletion of groundwater supplies. Additionally, Section 30250 of the Coastal Act requires new development be served by adequate public services, including water service. The Commission finds therefore, that the additional standards proposed in Policy No. _____ are necessary to assure that coastal developments involving development of

water wells assure the protection of groundwater resources in accordance with Coastal Act objectives.

The Unit I LCP approved in December 1979 by the North Central Coast Regional Commission contained a modified version of the well policy from that presented in the 10/18/79 staff report. The revised policy incorporated language to allow wells for non-domestic purposes. The inclusion of this provision indicates that the primary although not the sole concern of the Coastal Commission in regulating wells was to prevent the possible contamination of domestic water by septic systems or other sources of contaminants. If protection of groundwater supplies and biologic productivity was a major concern, non-domestic wells would also have been regulated throughout the coastal zone. Water use for landscape irrigation and particularly any type of agricultural operation uses much greater quantities of water in comparison to domestic use. This policy, as contained in the Unit I LCP approved by the Regional Commission, was a part of the Unit I LCP certified by the State Coastal Commission. This policy, in a version with a modified format is also part of the Unit II LCP. Section 22.56.130(A) of the Marin County Code implements the policy.

Coastal Act Basis for Well Policies

The Coastal Act contains two policies which were used by Regional Commission staff as the primary basis for the water well policies in the County's Unit I and Unit II LCP's. These are:

SEC. 30231

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

SEC 30250

(a) New development, except as otherwise provided in this division, shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either indivi-

dually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller than the average size of surrounding parcels.

The adoption of the water well policies partially based on Section 30231 makes the assumption that the withdrawal of groundwater will deplete the supply and effect the productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes. It was reasoned that groundwater withdrawal for domestic purposes would reduce the amount of water available to surface water bodies and as a consequence reduce the productivity and quality of them.

The second section (30250) combines the requirements that adequate public services be available and that coastal resources will not be significantly adversely affected by new development. By excluding wells for domestic purposes from areas served by a water system, the assumption is made that wells could 1) effect the amount of water available to the water system as a whole and thereby reduce the service capability of a system, and 2) that the ability of the system to provide adequate facilities and maintenance is associated with the number of connections a system has. The greater the number of connections, the better able it is to finance maintenance work and improvements. The inclusion of the stipulation that coastal resources not be significantly adversely effected by new development is a reiteration of Section 30231 where this concern is more explicitly stated.

The State Coastal Commission has not adopted a uniform policy for water wells within areas served by existing water systems throughout the State's coastal zone. Statewide Interpretive Guidelines were adopted for a variety of topics to assist local governments in the application of the Coastal Act prior to the certification of local coastal programs. The regulation of wells was left up to the discretion of the Regional Commissions. As a result the regulation of individual wells has varied between the regions. The North Central Coast Regional Commissions (NCCRC) regulation of wells has been among the most strict in the State. The prohibition of individual wells within areas served by water systems by the NCCRC was also included in the Sonoma County LCP for coastal communities such as Timber Cove and Sereno del Mar.

In other parts of the State a greater degree of flexibility has been permitted. In the Carpinteria and Morro Bay regions, where large aquifers provide water for domestic use as well as irrigated agriculture, specific policies have been adopted to prevent overdrafting of the groundwater basin. In these areas single family homes using wells have been allowed with the

condition that the wells be metered to obtain a record of water use. In the Big Sur region of Monterey County individual wells are also allowed in areas served by water systems but have been conditioned to require that any water withdrawn is used within the watershed from which it is taken. The purpose of this condition is to maintain to the greatest extent possible the amount of water feeding a stream. Santa Cruz County incorporated the existing County well ordinance into their LCP, a method attempted by Marin County which was not accepted by the Regional Commission. This code allows individual wells within the areas served by water systems with one exception. The exception is the area served by the Soquel Creek County Water District. Individual wells for domestic purposes are prohibited within this District's boundaries because many of the Districts' own wells are within residential areas.

Analysis of Current Water Sources for Coastal Water Districts

The following section describes the sources of water used by the water districts serving the coastal zone. Both groundwater and surface water sources are discussed, and the relative importance of groundwater and surface sources is noted wherever possible. The discussion emphasizes groundwater sources, particularly the type of aquifer tapped by a particular source. Some of the water districts experienced severe damage during the storms of January 1982 and are in the process of rebuilding their systems. The discussion of their water sources represent current plans. Production figures are given in gallons per minute (gpm) and acre feet per year (AF/y). One gpm is approximately equal to 1.6 AF/y, and 1 AF/y is approximately equal to 0.6 gpm.

Estero Mutual Water Company. The Estero Mutual Water Company (EMWC) obtains water from both surface and groundwater sources. The surface source is a diversion from a stream tributary to the Estero de San Antonio. EMWC has water rights and pumps capable of using up to 400 AF/y from this source, but storage and filtration facilities limit the amount of surface water used to 55 AF/y or less, depending on demand. Groundwater sources for EMWC include two actively used wells and two abandoned wells. One abandoned well has never been used for municipal water, and the other was recently abandoned due to its proximity to sewage treatment facilities. The two abandoned wells produced a total of about 1.8 gpm (2.9 AF/y).

EMWC has two wells currently used for municipal water which produce 3.2 and 3.8 gpm, or about 11.3 AF/y. These wells can supply all or most of EMWC's needs, depending on demand and season, and are used to the fullest extent possible because water from the surface source is more expensive to pump and treat. Both wells are on 50 foot diameter sites owned by EMWC on the ridge above Oceana Marin/Dillon Beach at an elevation of about 450 feet. The well sites are surrounded by a 305 acre parcel zoned C-APZ-60. The wells are 162

and 230 feet deep. The upper geologic strata penetrated by both wells is the Merced Formation (Rice and Strand 1971), and the shallower well appears to be entirely within this formation. The bottom 55 feet of the deeper well extends through the Merced Formation and into the Franciscan Formation.

The EMWC wells tap an aquifer formed by the Merced Formation. Although the newest well penetrates the Franciscan Formation, the rock encountered is not likely to contribute much of the well's water, so this well should also be considered to be tapping the same aquifer. The Merced formation aquifer is one of the most productive types of aquifer found in western Marin County. It contains waterbearing strata of coarse sandstones and gravel beds. Other strata of fine sandstones and siltstone are less permeable. The areal extent of the aquifer is unknown, but it is most likely confined to the hill behind Oceana Marin/Dillon Beach, an area of roughly 500 acres.

Coast Springs Water Company. The Coast Springs Water Company (CSWC) obtains all of its water from groundwater sources. CSWC owns a reservoir east of Dillon Beach which is used for storage and emergency supplies. The individual production of CSWC's eight wells is not known, as sustained tests have not been made on individual wells. The well system as a whole has sustained peak day use as high as 43,000 gallons, although peak day use in 1981 and 1982 averaged about 30,000 gallons. To provide 43,000 gallons of water in one day the average production of each well would have to be 3.7 gpm.

One of CSWC's wells is a dug well 12 feet in diameter and 24 feet deep located in Dillon Beach at an elevation of 5 feet. This well is dug through dune and beach sand to the Franciscan Formation. The well is located on a 100 by 100 foot parcel owned by CSWC and surrounded by small parcels zoned Resort-Commercial. CSWC has a second dug well that consists of a horizontal drift tunnel about 100 feet deep. Water flows out of the drift by gravity and into the system via a catch basin. Production of this well is not known. The drift is located on the reservoir parcel owned by CSWC at an elevation of about 350 feet. This well is in the Merced Formation. The remaining six wells are located on the ridge behind Oceana Marin/Dillon Beach at an average elevation of 420 feet. The wells range from 148 to 237 feet deep and average 206.5 feet in depth. No drilling logs are available for the three older wells, but all six wells are in the Merced Formation and apparently none penetrate to the Franciscan Formation. Three of the wells are on 100 by 100 foot parcels owned by CSWC and three are on 50 foot diameter parcels, also owned by CSWC. The surrounding land is in two large parcels, 305 acres and 164 acres, zoned C-APZ-60.

The seven CSWC wells on the ridgetop all tap the same Merced Formation aquifer that was described earlier for Estero Mutual. These two companies

obtain water from the same overall aquifer. The eighth CSWC well is located in a small alluvial aquifer formed by an intermittent stream crossing the sand deposits. The ground watershed of this aquifer corresponds fairly closely with the surface watershed of the stream, which is 450 acres. There is some overlap between the ground watershed of the ridgetop wells and the Dillon Beach well.

Inverness Community Water System. This water system is owned and operated by the Inverness Public Utilities District (IPUD). The IPUD system was severely damaged in the January 1982 storm, and IPUD is in the process of rebuilding the system. Before the 1982 storm, IPUD had nine surface sources and three wells. Only one of the wells was used for municipal water, and it was used as a standby source. The two other wells are disconnected, one by order of the State Health Department and the other on the recommendation of the State Health Department. The two abandoned wells produced a total of 12 gpm (19.3 AF/y).

The reconstruction of IPUD's system is about 70% complete as of December 1982. The relative contribution of wells and surface sources to IPUD's system is unclear, as the District is still evaluating both potential new surface sources and potential new well sites. IPUD will have nine surface sources when reconstruction is complete, but a number of these sources are different from those that were destroyed. IPUD does plan to reconnect the well that has been used for municipal water in 1983. The District is also investigating the possibility of selling one or both of the closed wells as a source of irrigation water.

The well used by IPUD for municipal water is located in First Valley, near the southwest corner of Inverness, at an elevation of about 100 feet. The production of the well has been measured at 6 gpm (9.7 AF/y) on a sustained basis, and up to 15 gpm for short periods. The figure of 21.4 gpm in the LCP is apparently an error. The water produced by the well has relatively high concentrations of iron and manganese, but is easily within consumer acceptance standards. The well is 407 feet deep, entirely within the Point Reyes Granitics Formation.

The IPUD well draws its water from the Point Reyes crystalline aquifer which is very complex. Inverness is located on a weathered layer of granitic rock of varying thickness, which overlays unweathered granitic rock. The weathered granitics are permeable, but the unweathered rock is not. However, the unweathered granitic rock is characterized by fractures and cracks which carry water. The aquifer is further complicated by a lack of correlation between surface geomorphic features and features of the ground watershed. The boundary of the groundwatershed does not coincide with the surface watershed

because groundwatershed boundaries are determined by the highest points of the unweathered granitic rocks rather than surface features. Similarly, the water bearing fractures and cracks have little or no relation to surface features. Consequently, it is not possible to describe the size of the ground watershed tapped by the IPUD well without extensive field survey.

Hamilton Mutual Water Company. Hamilton Mutual (HMWC) obtains its water from a single surface source: a diversion in Redwood Canyon south of Inverness. The discussion of three springs in the Unit 2 Local Coastal Program is apparently incorrect. HMWC's source was destroyed in the January 1982 storm, but has been replaced and is now operating normally. HMWC's system is static, no new demands are expected, and the Company has no plans to develop any new water sources.

Noren Estates Mutual Water Company. No response.

Point Reyes Station Water System This system is owned and operated by the North Marin County Water District (NMCWD). Water for the system is obtained entirely from wells along Lagunitas Creek. The wells are shallow, and apparently draw less than half of their water from groundwater aquifers (Nelson, et al 1979). Water from Lagunitas Creek, withdrawn directly by the wells, supplies the larger part of the Point Reyes system water. NMCWD has a superior, or preemptive, water right for water from Lagunitas Creek in whatever amount is necessary for reasonable municipal use. In 1979 the District required about 242 AF/y, and a current requirement of 261 AF/y can be calculated using the District's projected growth rate (Nelson, et al., 1979).

Three of NMCWD's wells are located on Coast Guard property adjacent to Lagunitas Creek .45 miles upstream from the Highway 1 bridge crossing at an elevation of about 5 feet. The original test well, which was also used for production, has since been abandoned. The two production wells are capable of producing 440 gpm (710 AF/y). Production is limited by the capacity of the treatment system rather than the wells pumping capacity. The water produced by these wells has high concentrations of iron and excessive concentrations of manganese, which are largely removed by the treatment process. During the drought of 1976-1977 these wells also experienced saltwater intrusion problems, resulting in excessive chloride ion (not to be confused with chlorine used for bacterial control) concentrations for a month. All of the wells are about 60 feet deep, drilled in the alluvial deposits of Lagunitas Creek and possibly extending to the underlying Franciscan shales.

The third NMCWD production well is a backup well located about 1 mile upstream from the Highway 1 bridge at roughly 20 feet above sea level on what is known as the "Downey Site". The production of this well is limited by the

pump to 300 gpm (484 AF/y). Water quality at this well is the same as the primary wells in terms of iron and manganese, as all draw most of their water from Lagunitas Creek. Salinity problems are not expected to occur at the backup well. This well is 25 feet deep and is in the Lagunitas Creek alluvial deposits. NMCWD owns a parcel of about half an acre at the well site.

A fifth NMCWD well has been drilled on the Gallagher Ranch, about 0.7 miles upstream from the Downey Site. This well is located on a gravel bar in the streambed and is 40 feet deep. The first 32 feet is in loose gravel and the bottom 8 feet in broken shale. This well has not been connected to the system, has never been tested and is capped.

The aquifer that all of the NMCWD wells tap is from an alluvial system. Most of the water withdrawn by the wells is surface water that percolates through the alluvial deposits of Lagunitas Creek. A smaller amount of the water withdrawn could be considered to be groundwater, but wells as shallow as NMCWD's would tap an aquifer fed by the immediately surrounding area.

Bolinas Community Public Utilities District The Bolinas Community Public Utilities District (BCPUD) obtains its water from Arroyo Hondo, a surface source which is almost entirely within the Point Reyes National Seashore. The water system was heavily damaged by the January 1982 storm, but temporary repairs allowing a return to pre-storm operations have been completed. BCPUD facilities are only able to serve existing customers because of system leaks and inadequate water storage capacity. A moratorium on new hookups has been in effect in the District for nearly ten years as a result of this situation. Acquisition of a new reservoir site is a high priority action for the District. An additional moratorium has been placed on new development by the Coastal Commission until the Bolinas Gridded Mesa Plan is completed and approved.

The Board of Directors of BCPUD and members of the public have expressed considerable interest in the possibility of a policy change. The Board of Directors expressed its concern that wells would be subject to contamination by the septic tanks to use on the Bolinas Mesa which would result in litigation against BCPUD or a requirement for additional public sewage treatment facilities which would be costly for the community. Concern that individual wells would constrain development on adjacent lots was also expressed.

Stinson Beach County Water District The water sources used by the Stinson Beach County Water District (SBCWD) include seven surface sources and five wells. The seven surface sources are stream catchments. The production of the surface sources is not known, but the existing wells can produce 80% of the ultimate buildout average day requirements and more than the existing capacity of the treatment plant. SBCWD owns six wells, but one has been

abandoned due to damage from the January 1982 storm and another is used on a standby basis only. The sustained production of the abandoned well would have been about 28 gpm (extrapolated from drawdown test and adjacent well).

The five wells in use can produce 257 gpm (415 AF/y) under favorable conditions. The well with the highest production, 135 gpm, must be shut down during rains because of turbidity problems. Two of the wells are fairly shallow, 75 and 80 feet deep, located at less than 50 feet above sea level in alluvial or old beach formations. The 80 foot deep well extends 13 feet into the Franciscan Formation. One of these wells is located on Stinson State Beach (the standby well) and the other is located near the Stinson Beach School. These wells produce 17 and 55 gpm, respectively. The other three wells are deeper, averaging 111 feet in depth. One well is at an elevation of about 450 feet, above the highest developed part of Stinson Beach. The other two are at lower elevations located in the area of Stinson Gulch, north of the developed area. All of the deeper wells are in the Franciscan Formation. These wells produce 135 gpm (the high elevation), 15 gpm, and 35 gpm. The SBCWD wells are on small parcels of land owned by SBCWD or on Federal land and are all surrounded by state or federal parkland.

The SBCWD wells tap two or three different types of aquifers. The two shallow wells tap alluvial aquifers. Although one of these wells penetrates a short distance into the Franciscan Formation, almost all of its water comes from the alluvial system. Most of the water withdrawn by these wells is surface water percolated into the alluvium or beach deposit. The groundwatersheds tapped by these wells should correspond fairly closely with the surface watershed. Two of the deeper wells are in undifferentiated Franciscan aquifers. The irregular nature of the Franciscan Formation makes description of the groundwatershed impossible. The third deep well is drilled in an area mapped as undifferentiated Franciscan (Galloway 1977), but the production and turbidity problem are more characteristic of the Basic Franciscan Formation which is located further up the ridge. The Basic Franciscan aquifer is formed by basalts, spillites, serpentine, and other volcanically derived rocks. These rocks often contain large cracks, which enable the Basic Franciscan aquifer to carry a large amount of water but often do not remove turbidity.

Muir Beach Community Services District The Muir Beach Community Services District (MBCSD) obtains all of its water from wells. The Unit I LCP states that MBCSD has two wells, which is no longer accurate, as a new well was recently put into production and has become MBCSD's main water source. The two wells that MBCSD used in the past are now part of the standby system.

All of MBCSD's wells are located 45 to 60 feet from Redwood Creek and about 15 feet above the Creek bed. The new well is 37 feet deep and is drilled through alluvium. No exact production figures are available, but the well

driller estimates the production at over 65 gpm (105 AF/y). The two standby wells are located nearby, and are of similar depth and in the same geologic formation. No production figures are available for these wells. The underlying formation is undifferentiated Franciscan melange. The wells are located on District owned parcels surrounded by the Golden Gate National Recreation Area.

MBCSD draws its water from a semi-alluvial or alluvial aquifer. One dry hole recently drilled at the MBCSD well site indicates that either impervious beds are present or that more true groundwater is being tapped than would be the case with a simple alluvial system. The relative contribution of surface water and true groundwater cannot be stated, but any true groundwater that is tapped would come from a groundwatershed that is similar to the surface watershed.

Effects of Individual Well Use on Coastal Resources

This section of the report contains an analysis of the effects of a policy change allowing individual domestic water wells within the service areas of water districts and companies. The effects of a policy change on the groundwater resources available in the service areas are discussed for each of the water districts. Effects on the marine environment are described where they could be significant. Buildout projections are taken from the Unit I and II Local Coastal Programs. The comments received from water districts and companies are also reflected in this section.

Estero Mutual Water Company EMWC's service area is located at lower elevations than the company's groundwater sources. Consequently individual water wells within the EMWC service area would not compete with the company for water. The marine environment that could be affected by new individual wells is near the mouth of Tomales Bay, where normal tidal action would dilute the effect of any change in the groundwater inflow to the level of insignificance. A policy change would not be expected to have any significant effect on physical or biological resources in the EMWC service area.

Coast Springs Water Company Most of CSWC's wells are located at significantly higher elevations than the service area. Individual wells within the service area would have no effect on these water sources. One of CSWC's wells is located in Dillon Beach and is surrounded by lots within the service area. However, all but one of these lots are too small to meet County requirements for separation of wells and septic systems, so no individual domestic water wells could be drilled in this area. The one parcel which could support a well would be downstream from the CSWC well. Effects on the marine environment would be insignificant for the same reason mentioned for EMWC.

Inverness Community Water District The effects of a policy change on the IPUD system are more difficult to predict than the effects on any of the

other systems. Two factors are responsible for the difficulty: the ongoing development of both the community itself and the water system, and the very complex nature of the Inverness groundwater watershed. IPUD has not been able to meet the demand for new service for a variety of reasons, causing a backlog of connection requests. A change of policy could be expected to result in new building with water supplied by individual wells. An example is the land surrounding the existing IPUD well whose owner has indicated a desire to subdivide. Development of this property may affect the IPUD well. Other development could affect existing IPUD water sources. The complexity of the aquifer makes prediction of effects impossible without extensive case-by-case field studies. For example, two wells in close proximity on the surface could be drawing water from different fractures or crack networks. Similarly, two wells separated by a relatively large distance on the surface could draw water from the same fracture or crack network and compete with each other.

Individual wells in the Inverness area have a somewhat higher potential to affect the marine environment than the systems at Dillon Beach because of the more limited tidal flushing that occurs in Tomales Bay at Inverness. This effect would be minor because the majority of the water would be returned to the groundwater basin through septic systems. The groundwater environment could also contribute to contamination of individual wells. Under normal operating conditions a septic system discharges wastes into aerobic soil where soil-inhabiting bacteria complete the purification process. Wastes from a malfunctioning system could enter the anaerobic environment of the fracture systems and be drawn into a well without aerobic purification (Cooper Clark Associates, *et al.* 1978). The significance of this problem is difficult to assess, but such contamination may have been the reason for closure of the two abandoned IPUD wells, which are located downslope from developed areas and produced foul smelling water.

Both the Board of IPUD and landowners in the Inverness area have expressed interest in a possible policy change. The IPUD Board has expressed its concern that individual water wells may adversely affect IPUD's water sources. IPUD is still investigating new sources of water, and feels that a policy change should be deferred until the economic and engineering feasibility of these options can be determined. The Board also expressed concern over the effects of the January 1982 storm on the watershed, but these effects are primarily surficial and have little or no relation to the groundwater situation. A number of residents and landowners in the IPUD service area have expressed interest in this study, and have generally favored the option of using individual wells.

Hamilton Mutual Water Company HMWC would not be affected by a policy change because of the static nature of the service district. There would be no reason for drilling individual wells in the service area.

Noren Estates Mutual Water Company Effects unknown.

Point Reyes Station Water System Most of NMCWD's service area is completely removed from the water source (Lagunitas Creek). A small part of the Point Reyes Station area could compete with NMCWD for water if individual domestic wells were allowed. Because NMCWD has a superior water right to Lagunitas Creek water, State water law would prohibit the use of new wells tapping this source. New individual wells could possibly compete with NMCWD for groundwater not associated with Lagunitas Creek, but such water is a relatively minor part of the NMCWD source.

Effects on the marine environment are potentially large in the NMCWD area, but are unlikely to occur. Lagunitas Creek is the largest and most important source of freshwater inflow to the Tomales Bay estuarine system, but the water rights held by NMCWD and others together with agreements made with the California Department of Fish and Game protect this water source.

NMCWD routinely allows individual water wells in parts of their service area outside the Coastal Zone. The only restriction placed on such wells is a requirement for an anti-backflow device at the NMCWD meter. NMCWD has requested a similar, reinforcing condition for individual domestic water wells in their service area within the Coastal Zone, should they be allowed.

Bolinas Community Public Utilities District The water source currently used by BCPUD is a protected surface source outside the service area, so individual domestic wells would not compete with BCPUD for water. Although the District plans to construct new facilities, there are no plans to drill wells, so there would also be no competition with planned District water supply facilities. The BCPUD service area is underlain by the Monterey Shale and the Merced formation. The Bolinas mesa is underlain by Monterey shale which is a poor aquifer. The Merced Formation, which underlies the eastern part of Bolinas, and alluvium along Pine Gulch Creek are good aquifers.

Individual domestic water wells would not be feasible in most of the BCPUD service area, particularly the Bolinas Mesa. Water production from the Monterey shale aquifer is poor, and petroleum is often encountered in the formation. Relatively shallow groundwater may be contaminated by septic systems (Warshall & Farnsworth 1973). Mr. Mark Kostielny, Chief of Marin County's Environmental Health Services, feels that there is very little groundwater in the Bolinas Mesa area that could meet current water quality and

testing requirements. Most lots on the Bolinas Mesa also could not meet the current requirements for separation of wells and septic systems.

Individual water wells in the BCPUD service area could have a minor effect on the marine environment in Bolinas Lagoon. Wells in close proximity to Pine Gulch Creek could cause a decrease in freshwater inflow to Bolinas Lagoon by tapping surface water percolated into the alluvium (as done by NMCWD). The properties along Pine Gulch Creek are zoned for large parcels, which would limit the number of domestic water wells that could tap the creek. Domestic water use would also be much less than the existing use of water for irrigation in the creek area.

Stinson Beach County Water District. Three of SBCWD's wells are located at a distance from the developed part of the service area. One well is located close to the service area but at a higher elevation than developable lots. The fifth well, used for standby production, is located in the developed area and taps an alluvial aquifer. New wells tapping the same alluvial aquifer are unlikely, as the alluvial area is almost completely developed.

New wells in the SBCWD service area could cause a decrease in the freshwater inflow to Bolinas Lagoon, if alluvial aquifers are tapped. However, given the level of existing development in Stinson Beach, new wells in the alluvial aquifer do not appear likely. Upland wells drilled into underlying bedrock are not drawing freshwater which flows into Bolinas Lagoon.

Muir Beach Community Services District The wells belonging to MBCSD are a distance from the service area, so individual wells would not compete with the District for water. Individual wells could decrease the freshwater inflow to Big Lagoon, but the effect would be insignificant. Very few, if any, wells would be drilled in the service area because of the existing water system. Irrigation water represents a much larger withdrawal of freshwater. The effects of a policy change on the marine environment would be insignificant at Muir Beach.

Policy and Zoning Changes

The information contained in the previous sections indicates that a more flexible policy on water wells could be adopted in the coastal zone. The State Coastal Commission has not adopted a uniform policy regarding water wells and regulations vary depending on the jurisdiction. Marin County has the most restrictive LCP policies regulating water wells within the service area of a water company or a mutual water system of any area we contacted. A similar policy exists only within two coastal communities in Sonoma County and the Soquel Creek County Water District in Santa Cruz County where this is a policy of the District and not the County's LCP.

The source of water and its availability varies by community in the coastal zone. In most communities adequate water is available to serve build-out of the service area. Drilling of domestic wells would also not compete directly with the supply of the existing water company. This is true in Muir Beach, Stinson Beach, Point Reyes Station, Olema, and Dillon Beach-Oceana Marin. In these areas existing County regulations are adequate to regulate drilling of wells for domestic purposes in the event one is requested. It is likely that wells would only be drilled on parcels in these communities where extension of water service would cost more than well drilling because water is already available.

Marin County Code requirements for domestic water wells would also regulate the drilling of new wells. Any well used for domestic purposes must have a sustained production of at least 1 gpm and must meet the water quality standards of the California Department of Public Health and the US Environmental Protection Agency. The County Code does not specify a minimum lot size for domestic wells, but domestic water wells are required to be at least 100 feet from the nearest part of any septic leach field (on either the same parcel as the well or on adjacent parcels). In a fully developed area with individual septic systems the minimum lot size for a domestic well would be about 30,000 square feet (0.7 acres). The installation of a well and septic system could be feasible on smaller lots, but may constrain development on adjacent properties.

There are two areas in the coastal zone which do have water supply problems; Bolinas and Inverness Ridge. Bolinas relies entirely on surface water impoundments and only has sufficient supplies to serve existing connections. A moratorium is currently in place which prohibits new connections and in effect new development in the service area of the BCPUD. Portions of the Bolinas area are underlain by a known aquifer and wells could be used as a water source. A policy change in this location could result in development within the BCPUD service area if other County requirements regarding water

quality could be met. Most of the lots on the Bolinas Mesa are smaller than the 30,000 square feet that would normally be necessary to contain both a well and a septic system without affecting neighboring parcels. New wells could result in development that would prevent the owner of an adjacent property from developing it. On Inverness Ridge, supply problems exist for areas not connected to the NMCWD system. Water is drawn from wells and surface sources generally upstream from developed areas. Studies have been conducted in the Inverness area which address the question of groundwater supply and possible contamination of groundwater sources by septic systems (Cooper Clark and Assoc. et. al. 1978). These studies indicate that water is available for individual wells and that density should average one unit per 2.8 acres where groundwater is used for domestic supply to avoid possible septic system contamination. No further work has been done which refines the conclusions of these studies.

Effects on the marine environment would generally be limited to possible reduction of freshwater into estuarine systems. Reduction of freshwater inflow is unlikely to be significant. Existing water rights and the fact that domestic water is largely recharged into the groundwater system after septic disposal minimizes the likelihood of this problem's occurrence.

We recommend that the following policy changes be adopted:

Unit I

Water Supply (Page 48)

3. Revise this policy to read:

Within the service area of a community or mutual system the use of individual domestic water wells to serve new construction shall be permitted provided: a) the community or mutual system is unable or unwilling to provide service, or, b) the distribution system improvements are physically and/or economically unfeasible to construct to the site. Additionally, wells or water sources shall be at least 100 feet from property lines or, a finding shall be made that no development constraints are placed on neighboring properties.

Unit II

Water Supply (Page 187)

a. Revise this policy to read:

- 2(a) Type of Service. Except as provided herein, new development, including land divisions, outside the service area of a

community or mutual water system may utilize individual wells or other private on-site water sources. Within the Inverness Planning Area, individual wells should not be allowed on parcels less than 2.8 acres in size. Exceptions to the 2.8 acre lot size limitation may be granted pursuant to the issuance of a Coastal Permit. In addition to the findings of Chapter 22.56 and 22.86, the applicant must demonstrate to the satisfaction of the Health Officer that a well can be developed on the substandard size parcel in a completely safe and sanitary manner. Within the service area of a community or mutual water system, the use of individual domestic water wells for new development shall be permitted provided: a) the community or mutual water system is unable or unwilling to provide service; or, b) the physical distribution improvements are economically or physically infeasible to extend to the proposed project site. Additionally, wells or water sources shall be at least 100 feet from property lines or, a finding shall be made that no development constraints are placed on neighboring properties. Within the Inverness Public Utility District (IPUD), individual wells for domestic use should not be permitted in the same watershed at a higher elevation than the IPUD surface water sources existing as of the date of adoption of this policy. All new development shall be required to incorporate low flow water fixtures and other water-saving devices.

We recommend that the following changes be made to Marin County Code Section 22.56.130 (A)(1):

1. Except as regulated in (a) and (b) below, the use of individual water wells within the coastal zone in conformance with Section 7.28 (Domestic Water Supply) of the Marin County Code shall be allowed:
 - a. The use of an individual well shall not preclude the development opportunity of any adjacent parcel.
 - b. Within the area served by the Inverness Public Utilities District (IPUD) individual wells shall not be allowed on parcels less than 2.8 acres in size, or in the same watershed at a higher elevation from an existing IPUD water source.

LITERATURE CITED

- Cooper Clark & Associates, J. Warren Nute, Inc, and P. Warshall. 1978. Cumulative impact study of septic tank disposal systems in the Inverness area at Marin County. Unpublished report dated 4 December, 1978.
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- Nelson, J.O., J.D. Fritz, and R.D. Grundman. 1979. Point Reyes Water System improvements engineering report and draft EIR. Prepared by the North Marin County Water District.
- Rice, S.J. and R.G. Strand. 1971. Geology and slope stability in Marin County, a pilot study of three areas. Unpublished report prepared by the California Division of Mines and Geology for the County of Marin.
- Warshall, P. and P.T. Farnsworth. 1973. Septic tank practices in Bolinas, California. Unpublished report, prepared by Warshall & Farnsworth and Associates for the Bolinas Community Public Utilities District, dated May 1973.
- Wilson, Bill. 1983. Memorandum to John Olaf Nelson, General Manager, "Point Reyes System Budgeted Capital Improvements". Staff report of North Marin County Water District dated 3/11/83.

BOARD OF SUPERVISORS OF THE COUNTY OF MARIN

ORDINANCE NO. 2786

AN ORDINANCE OF THE BOARD OF SUPERVISORS
OF THE COUNTY OF MARIN, STATE OF CALIFORNIA,
AMENDING COUNTY CODE TITLE 22 (ZONING),
CHAPTERS 22.56 AND 22.57

THE BOARD OF SUPERVISORS OF THE COUNTY OF MARIN DOES HEREBY
ORDAIN AS FOLLOWS:

SECTION I: Section 22.56.130(A) of Title 22 (Zoning) of the Marin County Code is hereby amended to read as follows:

- A. Water Supply: Coastal project permits shall be granted only upon a determination that water service to the proposed project is of an adequate quantity and quality to serve the proposed use.
1. Except as provided herein, the use of individual water wells shall be allowed within the coastal zone in conformance with Section 7.28 (Domestic Water Supply) of the Marin County Code:
 - a. New development located within the service area of a community or mutual water system may not utilize individual domestic water wells unless: the community or mutual water system is unable or unwilling to provide water or, the physical distribution improvements are economically or physically infeasible to extend to the proposed site. Additionally, wells or water sources shall be at least 100 feet from all property lines or, a finding shall be made that no development constraints are placed on neighboring properties.
 - b. Within the Inverness Planning area, individual wells for domestic use shall not be allowed on parcels of less than 2.8 acres in size. Exceptions to this requirement may be granted pursuant to the issuance of a coastal permit. In addition to the findings of Chapter 22.56 and 22.86, the applicant must demonstrate to the satisfaction of the Health Officer that a well can be developed on the substandard size parcel in a completely safe and sanitary manner.
 - c. Within the Inverness Public Utility District (IPUD), individual wells for domestic use shall not be permitted in the same watershed, at an elevation higher than the IPUD surface water sources existing as of June 14, 1983.
 - d. The issuance of a coastal permit for any well shall be subject to a finding that the well will not have an adverse impact on coastal resources individually or cumulatively.
 2. Prior to the authorization of subdivision or construction of projects utilizing individual water wells, the applicant shall demonstrate a sustained water-well yield of at least 1 gallon per minute per residential unit. Additional requirements for fire protection, including increased yield rates, water storage facilities and fire hydrants shall be installed as recommended by the applicable fire protection agency.

3. New community and mutual water wells serving 5 or more parcels shall demonstrate by professional engineering studies, that such groundwater withdrawal will not adversely affect aquifer systems. Such engineering studies shall provide the basis of establishing safe sustained yields from these wells.
4. New development shall be required to incorporate low-flow water fixtures and other water saving devices.

SECTION II: This Ordinance shall be and is hereby declared to be in full force and effect as of thirty (30) days from and after the date of its passage and shall be published once before the expiration of fifteen (15) days after its passage, with the names of the Supervisors voting for and against the same in the Coastal Post, a newspaper of general circulation published in the County of Marin.

PASSED AND ADOPTED at a regular meeting of the Board of Supervisors of the County of Marin, State of California, on the 23rd day of August, 1983, by the following vote to wit:

AYES: Supervisors: Bob Stockwell, Harold C. Brown, Al Aramburu, Bob Roumiguere

NOES: Supervisors: -

ABSENT: Supervisors: Gary Giacomini

Bob Roumiguere

CHAIRMAN OF THE BOARD OF SUPERVISORS
COUNTY OF MARIN

ATTEST:

Van Gillespie
Van Gillespie
Clerk of the Board