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AN APPROACH TO A NEW CITY: PALM COAST

*By Norman Young and Stanley Dea**

PROLOGUE

It is self-evident that our earth is finite and that our population is growing. In ever increasing numbers, man must be sheltered, and the shelter, of course, must cover land. Transportation media to and from the shelter must cover land. Shops and service facilities must cover land. Who will say that land should not be cleared for at least these purposes, assuming an increase in population?

Proceeding from this starting point, we quickly arrive at the most sensitive area of environmental turmoil: making certain that when man clears and improves land, he simultaneously maximizes environmental integrity and maintains ecosystem continuity. Thus begin the challenges to us at Palm Coast. In our deliberation on the environment and ecosystems, as will be seen, much consideration has been given to both plant and animal life. Every attempt has been and shall be made to assure maintenance of all parameters of life cycles. Literature, both scientific and lay, is full of differing criteria with regard to protection for various plants and animals. In all candor, there is no way that all the sincere voices can be satisfied.

At Palm Coast the preponderance of voices will have a city more satisfactory in the ecological sense than ever before anywhere. Neither perfection nor utopia will result . . . only the best that our talents, time, energies and resources can produce. At Palm Coast, given the fact of biological synergism, we do speak for plant life, . . . and we do speak for animal life . . . but most of all, we speak for man.

Dr. Norman Young

What follows is of necessity an all too brief discussion of an approach to a new city. The brevity is unfortunate considering the scores of thousands of words appearing in our technical studies. It is our hope that the reader will gain at least a few insights into our thinking, our philosophy, our science. We only ask him to keep in mind the alternative to what we are doing with our land. If, as is certain with land ownership, our land had been sold to independent subdividers, each of whom built a fifty unit subdivision (more than the average builder in the U.S.) there would arise at the very least 5,000 different subdivisions—unplanned, unintegrated, uncoordinated, and without all our controls. Such an eventuality would clearly be unacceptable . . . typical of the American tragic city-building past. There is another alternative, to be sure. Do not build at all; but then how would the necessity of shelter be provided for the expanding population? In a book published recently, *Housing Crisis, U.S.A.*,¹ J. P. Fried estimates that in a ten year period in the United States in order to replace inadequate housing and build the new housing needed by our expanding population, some thirty-one million new units are required. We estimate that less than two-thirds of that requirement will indeed be built. Worse. What happens later? Do we not build at all? One might as well prepare a dirge for America's funeral.

Palm Coast will be neither a "sudden city" nor an "instant" one but will grow in accordance with a pre-planned program, no matter whether it flourishes twenty, thirty or forty years from now. Palm Coast is a strip of land thirty miles long at its longest, ten miles wide at its widest, covering approximately 160 square miles. It is a fact that under the controls we will institute, despite its being larger in extent than Detroit or Philadelphia, it will have a density of, say, Beverly Hills, California. But more on this later. Palm Coast has about six miles of ocean front, approximately twenty miles on the Intracoastal Waterway, and will have significant man-made water areas. Again, these will be reviewed in the main body of the text.

Now to a brief description of the terrain. Like other areas along the east coast of Florida, the property was formed primarily by sand dunes that have been built up by the interaction of winds, waves, tidal cycles, and ocean currents. This continued accretion of land as a repetitive process has caused the creation of lagoons between the new dune and the existing land mass. It is from these lagoons that the present salt water lagoons and marshlands evolved.

The humps and hollows formed by the repetition of this process have been smoothed over the centuries by erosion and deposition. The resultant ridges and depressed areas are the primary topographic features of the site, with the ridges generally supporting a xerophytic plant community and the depressions supporting a "wet" plant community.

The types of vegetation on the site include several ecological plant zones. The *Marsh* zone contains primarily grasses which are salt-tolerant due to tidal fluctuations and includes salt marsh grass. Along the *Marsh Edge* can be found cabbage palms, southern red cedars, yaupan, and mangrove. The *Beach Scrub* and *Beach Hardwood* zones are further inland and contain live oak, hickory, southern magnolia, and sweet gum. The significant aspect of these zones is the defensive line of trees protecting the entire area. The *Upland Depression* zone is between two ridges or within stream courses, and the marginal areas of these stream courses form the *Bottomland* and *Hardwood* zones. These areas contain ash, sweet bay and water oak, mainly in the former zone, and live oak and cabbage palm in the latter. The *Cypress* classification is not really a zone but a series of irregularly occurring depressions with magnificent cypress trees as the dominant species. The *Upland Hardwood* zone contains both natural pine vegetation and commercial pine plantations.

The elevation on the site varies from sea level to forty feet above sea level. The slope of the land is toward the sea but because of the ridge lines, the natural drainage moves in a north-south direction until it reaches a natural outlet to the sea. Because of this circuitous route, drainage is naturally slow and remains on the land percolating downward through the sand and shell deposits, recharging the groundwater table below. Given this piece of land we proceed to technical management of our environment and ecology.

BIO-PHYSICAL ENVIRONMENT AND POLLUTION CONTROL

Issues of environment and ecology have captured the interest of government, industry, and most importantly, the public. Mirroring this concern for environmental quality, Palm Coast has committed major efforts toward preserving or enhancing the balance of nature in the planning and development of a future city for 750,000 people. The issue at hand can be simply stated: is it possible to have environment and development as complementary, parallel objectives, or are they mutually antagonistic to each other?

While many have emphasized the worst effects of urban or suburban land development, and certainly the effects are there, the point is that multiple land uses can be compatible and often are. It is the excess, promoted by undue short-term profits, which needs curbing. Aldo Leopold, one of our greatest ecologists, summed it up well: "A land ethic of course cannot prevent the alteration, management, and use of these resources, (water, plants, wildlife, etc.) but it does affirm their right to continued existence, and, at least in spots, in a natural state."² Ecologists have long known that nature and change go together spontaneously even in the absence of man. However, rapid and massive changes, resulting from poorly thought-out tampering with natural ecosystems, have altered the course of nature in dramatic ecological shifts that can be seen everywhere. Contrasting such transformations, men such as Leopold call for controlled, rational change of natural resource usage, where decision-making balances economics with total environmental quality.

Ecology is defined as the study of the complex inter-relationships between all living organisms—including man—and their living and non-living surroundings. Myriad actions and interactions take place continuously as man, plants, and animals respond to variations in their surroundings and to each other. All these interactions form long chains of reactions that are necessary for the maintenance of life as we know it on the earth. In this interdependent web of life, small changes are likely to be felt and compensated for eventually throughout the system.

The ideal basis for decision-making in managing the ecology would be a clear image of the over-all structure and function of nature as a system of component parts. Then planners and managers could see the strands in the web of environmental systems, "weigh the tradeoffs of potential environmental harm against the benefits of construction, look at alternatives, and incorporate environmental safeguards into the basic design of new developments."³ The safeguards, usually in the form of technology, should provide that factor of safety whereby materials cannot accumulate where they are not wanted. The overburdened natural processes by man, or sometimes nature, must be anticipated in advance. In general, natural systems are "closed," meaning that materials are transformed into vegetation, vegetation into animal life, and the latter returned to the air and soil to be recycled again and again. Waste, on the other hand, is a result of man's activities—e.g., open

sewers and dumps—which tend to develop into “open” systems. Conscious effort must now be made toward closed systems that harmonize with natural processes. Infinite natural assimilative capacity cannot be assumed any longer. Wherever and whenever possible, resources that have been turned into “wastes” should be recycled into the ecosystem and be reused, either by present or future generations. For example, tidal action, nutrients, plant species, and shellfish are one such seashore ecosystem.

It is fashionable to speak of systems analysis as an almost magical route to the solution of many problems, and indeed it is a powerful and necessary tool. One must recognize, however, that the environmental system is made up of a bewildering number of subsystems that often are only distantly interdependent. Therefore, the status of existing technology does not allow precise definition of the paths of energy and materials passing back and forth between organisms and environment.

In the order of priorities, therefore, it has been incumbent upon environmentalists to control first those critical factors that lead to unfavorable alteration of surroundings, wholly or largely as a by-product of man's actions. In the Palm Coast project, major consideration has been given not only to preventing impairment of the air–water–land resource for beneficial human uses, but also to enhancing their properties as well. It has been management's philosophy and objective to provide the public with property in a quality environment, supported by highest-caliber engineering and design capability. To that end, many significant studies and action programs initiated at the inception of the project have been carried out to establish the feasibility of environment controls on development. The first task is to foresee a potential problem, then study the alternatives, and then establish a control. The below problems have been studied, and solutions thereto have been proposed in a “first generation” effort toward this new form of city.

A. *Wastewater Treatment and Disposal*

Study: A thorough analysis was made of Florida regulations and policies concerning wastewater treatment and discharge of treated effluent into surface water bodies (rivers, streams, lakes, etc.) as well as into marine water bodies. Results of this study recommended 95% biochemical oxygen demand (BOD) reduction in secondary wastewater treatment and disposal by one of the fol-

lowing methods: (1) percolation, (2) spray irrigation, (3) evapotranspiration ponds, (4) chemical treatment and mixed media filtration, or (5) drainage wells.

Solution: Based upon these considerations, a tertiary quality central treatment plant has been designed and constructed using the percolation or recharge method for disposal. Three beneficial environmental effects of this practice will be (1) to eliminate discharge into surface bodies and thereby prevent eutrophication, (2) to recharge the saline water table and form a fresh water barrier to reduce salt water intrusion, and (3) to recycle waste effluent in order to form a reservoir of non-brackish water which will be a potential water supply source for future needs. In all canal areas now being sold there will be no septic tanks from which effluent seepage could potentially cause eutrophication in canals. A centralized sewer system is now being built to conduct wastes to the treatment plant.

B. *Improved Wastewater Collection*

Studies: Flat topography and high ground water tables necessitate higher construction costs for conventional gravity sewers and pumping stations. Very recent technology indicates that two alternate systems may be economically competitive, namely vacuum and pressure systems.

Two major analyses have been completed of an existing vacuum sewerage collection system installed and operational in a Virginia project. A detailed study of the equipment, controls, and materials show that they are of a type whose reliability, length of service, and maintenance requirements are well established. Research, conferences with manufacturers, and independent calculations and studies of construction procedures confirm the expectation of satisfactory performance of all elements of the system. The resulting diagrams, bibliography, and cost studies, establish data for consideration of this system on the Florida site.

Studies similar to those for the vacuum system are currently in progress for pressure systems. These studies will be comparatively evaluated against gravity systems in order to determine technical, capital-cost, and operating-cost feasibility.

C. *Wastes from Watercraft*

Study: A state-of-the-art study was performed to determine the characteristics of sanitary wastes from watercraft, treatment

methods available, and required treatment facilities. It was concluded that pollution caused by boats has been only recently recognized as an important wastewater source in marine waters and that the most effective control device available to date is the holding tank. On-shore-disposal facilities at marinas are necessary for boat owner pump-out service.

Solutions: Legal studies are now being instituted to determine methods of regulation of the following: (1) prohibiting discharges of all wastes from watercraft (requirements for boat owners to install holding tanks will be sought in regulations of the drainage district); (2) wastes from holding tanks must be disposed of through on-shore-disposal facilities; pumping, storage, and disposal facilities will be constructed on shore to deliver waste to the central treatment plant; (3) all other types of wastes such as litter, garbage, oil, chemicals, etc. from watercrafts.

D. *Pollutants in Drainage and Stormwater Runoff*

Studies: Studies were conducted to determine the characteristics of fertilizers (e.g., phosphates, nitrates) that contribute least to nutrient runoff into surface water bodies. The ultimate goal is to prevent eutrophication. Specific products were recommended which are capable of releasing nutrients at a controlled rate; these were preferred over the water soluble types, which release nutrients at a very rapid rate on water contact. All available data were gathered to determine the extent and degree of pollutant concentrations found in stormwater runoff from urban areas. Data indicate that runoff contains significant concentrations of BOD, suspended solids, nutrients, and dissolved solids.

Soil-erosion-control technology was reviewed with regard to minimizing the effects of sediment runoff during construction, when natural vegetative covers are removed and soil is exposed to water impact and scour energy. Alternative methods and/or practices are: (1) minimization of length of exposure time for unprotected grades areas, (2) soil treatment, seeding and mulching, or mulching alone, (3) interceptor dikes, (4) diversion dikes, (5) sediment traps. It was recommended that all of the methods studied should be applied to Palm Coast and incorporated wherever possible in design of the drainage system in order to retard water movement as much as possible.

Solutions: Whereas conventional techniques have aimed at rapid movement and disposal of rainwater from a given site, the present

thinking is to slow the water down by use of shallow swales and ribbon lakes. This has two important ecological implications. First, detention of water allows it to be recycled into a natural cycle and allows for recharge into water table. Secondly, silt and pollutants are settled, filtered out, or absorbed by the upper earth crust and not allowed to run off the land into surface water bodies. Instead of an intricate chain of gutters, pipe drains, and storm inlets, a complex system of channels, sloping hollows, and canals will be designed to simulate natural streams. Creation of ribbon lakes within greenbelts is intended to provide a multiple use function for recreation, flood control, and wildlife and fish habitats and achieve maximum recharge in line with long-term enlightened practices in water conservation. In fact, explorations are under way with regard to stocking these lakes with fish, thereby enhancing the bioproductivity of these waters. An engineering manual covering all phases of drainage design was developed to standardize the design of the Palm Coast storm-drainage system.

Exposed or disturbed soil in the waterfront areas will be seeded as soon as possible after onset of development in order to minimize silt and sediment runoff into the canals. Rapid-release fertilizers (totally watersoluble) are being prohibited in the covenants and restrictions in order to prevent or minimize nutrient runoff into the canals. Hydraulic drop devices will be installed in the drainage system which will create maximum turbulence in storm water in order to enhance dissolved-oxygen entrainment.

E. *Canal Design for Maximum Water Quality*

Study: The University of Florida conducted a major study involving the creation of a mathematical model and the gathering of data on existing conditions of water courses in the vicinity of the project. These data recommended steps to be taken to insure maximum flushing characteristics and maintenance of existing water quality by natural circulation of water through the canal system. To achieve the goal of better flushing, the canals should be built as a single loop system. Half-lives in the single loop design were found to be very favorable in comparison to other estuaries. The study also projected the maximum tidal water levels that can be expected to occur in the waterfront areas, so that the community can be planned to prevent flooding.

Solutions: (1) Findings of the University of Florida are now

being utilized in the layout, spacing, and geometry of the dredged canal systems and in establishing minimum homesite elevations. (2) Shallow canal depths of eight feet were selected in order to maximize turbulence and eliminate the possibility of stratification. Therefore, dissolved oxygen levels are maintained throughout the entire depth.

F. *Operation and Maintenance of Canals to Perpetuate Water Quality and Aesthetics*

Studies: Water quality criteria for tidal canals are classified by the State of Florida according to use. They fall into Class III standards for recreation and for propagation and management of fish and wildlife. The criteria governing these waters may be summarized as follows: modern treatment technology required for all discharges into canals; pH range of 6.0–8.5; minimum dissolved oxygen of 4.0 mg/l; coliform bacteria not to exceed 1,000 per 100 ml as a monthly average; no substances toxic to humans, animals or aquatic life; no substances causing deleterious effects or nuisance conditions; turbidity less than 50 Jackson units above background; and no damage to aquatic life, vegetation, or water use caused by temperature elevation.

An inventory of pollutant sources into the canals was made. Since the entire water front area will be centrally sewerred, there will be no domestic or industrial waste inputs. Discharges and effluents from boats will be negligible. As discussed earlier under Section D, drainage and storm water runoff is the only important source of potential pollution. However, design of the drainage system has called for maximum water retention on the land, where major fractions of the pollutants will be filtered out and/or absorbed by the soil-vegetation complex. Rainfall records have been studied to accurately determine what will be the runoff volumes and their relative distribution throughout the year. Likewise, the amount of fresh water flow into the canals has been calculated. Pollutant loading rates were projected, based upon studies which have investigated storm water quality of urban runoff. Since these published loading factors are developed from areas aimed at rapid movement and disposal of rain water from a given site, they can be substantially lowered for Palm Coast because of our drastically different approach in drainage philosophy. Both in terms of volumetric and concentration discharge, the study showed that loading

rates are favorably low for biochemical oxygen demand, nitrogen, phosphates, and solids.

Solutions: Regulatory laws will be sought in order to: (1) maintain dissolved oxygen levels at pre-determined values by combinations of natural and mechanical means; (2) maintain canal banks; (3) remove water surface debris, trash, oil, etc.; (4) maintain tributary area drainage system; and (5) maintain all drainage works. Responsive and corrective action in relation to established water quality criteria will be taken.

G. *Sampling and Monitoring of Canal Water Quality*

Solutions: Representative sampling points will be established throughout the entire system. Also established will be a periodic sampling schedule as follows, based upon degree of resident occupancy:

<i>Occupancy</i>	<i>Degree of Monitoring (Minimum)</i>
0- 25	Sampling once every four months
26- 50	Composite sampling once every two months
51- 75	Composite sampling once every month
76-100	Continuous sampling, recorded

Installation will be made of a permanent-recording, remote-sensing, water-quality monitoring system at 75% occupancy.

H. *Preservation of Tidal Wetlands*

Study: Preliminary site analysis data showed that approximately 4,000 acres of project property are tidal wetlands, which comprise areas of great biological diversity and productivity. These areas produce a wide variety of living organisms, from microscopic species to fish and shellfish, birds, and mammals. Many species spend their entire life cycles in tidal wetlands, whereas others spend portions of their cycles there. Abundant species of plant growth, which form the base for all animal life, are also evident.

Solution: No building, construction, or development will occur on tidal wetlands.

I. *Preservation of Intracoastal Waterway Water Quality*

Study: Available engineering studies, reports, and other records were gathered on the Intracoastal Waterway in the vicinity of Palm Coast relating to construction problems, erosion, and maintenance-

dredging required within the waterway. Also, conditions of the waterway within the Project tract, information on spoil easements, and data relative to flood elevations were documented in the report.

Solution: Earth plugs are used to prevent intrusion of sediment into the Waterway while canal construction is in progress. After turbidity levels in the canals subside to low background levels, the plugs are removed, leaving no adverse effects upon the water quality.

J. *Solid Waste Disposal*

Study: Solid waste disposal has become extremely important on a national scale and ranks as a forthcoming major crisis for our country. The projected population of 750,000 residents will generate approximately 1800 tons per day from waste treatment plants, residences, commercial and industrial establishments, institutions, and construction. Alternative methods for disposal are: (1) incineration, (2) sanitary landfill, (3) composting, and (4) recycling. Close supervision of the operation is needed for successful implementation of solid waste collection, handling, and disposal.

Solution: Palm Coast will attempt to establish for control of solid waste collection, handling, and disposal a franchise whereby strict operational control can be maintained. Of the alternatives available, recycling is the most favorable approach, and plans are being developed to encourage residents to segregate solid waste into glass, metal, paper, plastic, and rubbish components. Industries that can create products for reuse from these components will be encouraged to locate in Palm Coast, providing their design meets our criteria.

K. *Maintenance of General Environmental Quality*

Study: A study was made to summarize all existing rules and regulations in Florida dealing with air pollution, water pollution, solid waste disposal, radiation, noise, and vibration. The study then analyzed the feasibility of establishing legal requirements for standards of performance that would assure protection of man and his environment. For the most part, these formal regulations and requirements when adopted would be more rigid than the existing legal criteria.

Solution: Results and recommendations from the study will be incorporated as a model environmental performance code.

L. *Beach and Sand Dune Preservation*

Studies: Historical records of the tide information regarding hurricanes and northeast storms were accumulated. Historical beach dynamics were summarized, isolating the littoral drift, which apparently is to the south during most of the year and to the north during the summer. These data indicate that at Matanzas Inlet there is considerable drift into the waterway. Accompanying this report are the records on what happened at St. Augustine Beach and Crescent Beach during the Hurricane Dora, along with storm wind and swell diagrams obtained from the Corps of Engineers.

Solutions: Minimum building elevations were set based on the data obtained. Aerial photographs taken in 1943 were compared with current photographs to determine the amount of beach erosion in this area. Dr. Per Bruun of the Technical University of Norway, at Trondheim, was retained to coordinate this data and to make recommendations for construction in beachfront areas. Efforts will be made to preserve and protect existing sand dunes. Indiscriminate construction will be precluded by setting all structures back at prescribed limits. Recreational activities on the dunes will be monitored to insure that vegetative systems are preserved.

M. *Tree Preservation*

Studies: Vegetation on the site was mapped and categorized into nine ecological plant zones: marsh, marsh edge, beach scrub, beach hardwood, upland depressions, bottomland hardwood, cypress, upland hardwood, and pinelands. The two basic determinants for the function of the various associations are elevation (as related to drainage) and edaphic conditions.

Solution: Palm Coast has been planned to save as much of the existing wooded areas as possible. Road grades have been set to reduce the amount of grading and clearing required. Roads are staked out and specimen trees are tagged for saving before any clearing work begins. Commitment has been made to save a minimum of 50 trees per acre. Where trees must be removed, or where they unavoidably die in place, replanting will begin as soon as possible. A graduate professional forester who is a member of the staff will manage this program.

N. *Species Preservation*

Studies: Plans are underway to conduct a detailed study of the nature and number of existing flora and fauna species in Palm

Coast. The study will investigate such ecological parameters as ecological succession, diversity index, limiting growth factors, patterns of movement, etc. Of importance also will be the evaluation of methods and techniques to enhance natural properties of the land for those species which are most ideally suited for the environment of wildlife preserves, refuges, and botanical gardens to be established in the Project.

O. *Preservation of Natural Areas*

Studies: A master plan was developed to determine the open space requirements, and all other land use requirements, of the population that will ultimately live in Palm Coast. A species study is presently underway so that the open spaces requirements of indigenous flora and fauna may be met. (See Section N, above).

Solution: The establishment of over 15,000 acres of open space within the development which will meet the needs of all species living, or projected to live, within the planning area. The preservation of large tracts of open area in their natural state will be assured in order to retain the existing features which now dominate in these areas.

P. *Air Pollution Control*

Solutions: On a national basis, transportation is the greatest source of air pollution—especially the gasoline powered motor vehicle, which emits major portions of carbon monoxide, hydrocarbons and nitrogen oxides. Fuel combustion in stationary sources is another lesser but still important source of sulphur oxides, particulates, and nitrogen oxides. Industrial processing accounts for high loadings of carbon monoxide, particulates, and sulphur oxides. At Palm Coast the fuel combustion and industrial source components will be negligible, due to stringent control based on pre-planning. The mechanism for accomplishing this will be discussed later in the Industrial Pollution Control section.

It is therefore obvious that transportation, especially in the form of the automobile, will be the major potential air pollution source for which controls will be needed. However, rapid technological advances by automobile manufacturers have made exhaust emission control achievable in the foreseeable future. Our contribution to control of transportation pollution is to plan for modes of living which substantially reduce automobile use. This concept features planning which emphasizes bicycle paths, walking distance to shop-

ping centers, boating to shopping, and the use of electric minibuses. And, of course, low density in land use takes advantage of the air's vast dilutive and natural assimilative capacity.

WATER SUPPLY STUDIES

Studies covering the water supply potential for the Palm Coast development have been going on continuously since the inception of this development. At that time, the consulting ground-water-geology firm of Leggette, Brashears & Graham examined the area and researched all existing data to determine the ground water potential. They have reported that the water supply for the area will come from three sources. The first is a water deposit that lies within our property boundaries and would be adequate to supply water for the initial phases of our project. The second source of water also lying within the boundaries of the property would be utilized once the potential of the first supply was reached. Studies also showed that the Floridian Aquifer, which lies to the west of our property, would be adequate from a quantitative and qualitative standpoint to supply the 50-60 million gallons a day needed to meet the demands of our ultimate population. The investigation of these areas of water supply involved an exhaustive search of all existing data available in government records as well as a sampling of production wells in the area. Actual drilling of wells was made in areas of high potential so that quantitative and qualitative tests could be made in the proposed area of water supply.

Since these preliminary investigations were made, more detailed studies have borne out the existence of our initial water supply. Investigative studies and drilling programs are presently underway to finalize the quantity of water that exists in our intermediate source of supply. In addition, more detailed investigations of inland tracts, where hydrogeologic conditions indicate most of the eventual supply will have to be obtained, are now underway in order to locate exactly the water source required for our ultimate population.

Additional studies were also made to determine if there would be any adverse effect by canal construction on the fresh water supply existing in the area. The tests consisted of drilling wells in the shallow sands from the tidal lowlands to a point several miles inland, and they were done to determine the water quality in this area. The tests clearly demonstrated that the ground water in the area planned for waterfront development was, in its natural state,

too contaminated with brackish water to serve as a potable water supply. The construction of the canals has not degraded any fresh water resources nor should it result in salt water intrusion into the potable water supply in the shallow sands.

A NOTE ON INDUSTRIAL POLLUTION CONTROL

Industrial pollution, in a few words, takes three major forms—air pollution, water pollution, and thermal pollution. Air pollution is represented generally by sulphur dioxide, carbon monoxide, oxides of nitrogen, and particulates entering the atmosphere; water pollution and thermal pollution occur when industrial effluent is discharged into water courses. Our view on solution is elementary: pre-approve acceptable emissions before allowing use of land. In fact we are leaning toward a land lease-only concept so that pollution control violators can be punished with lease termination. This form of control does not exist, to our knowledge, in any city. As a corollary, open buffer zones and greenery zones to prevent noise and optical pollution can be managed in the same manner. There may be no better way to control industrial and commercially caused pollution in perpetuity than to own the land in perpetuity.

Without hesitation, it is acknowledged that portions of the Palm Coast environment will change as development progresses. Indeed, changes are inevitable in light of present economic, social, and material necessities required by our population. However, rational commitment has been made to utilize the most current and advanced technology available in order to provide for the public a development which incorporates major environmental concern through every aspect of community development.

People are tempted to ask what is to be gained by investing huge sums in environmental control. The answer must be: better health, aesthetically pleasing surroundings, lower economic costs, and preserved natural systems. It is true that the relationship between human health and specific concentrations of specific pollutants are often tenuous and that these relationships must be studied at a fundamental level. It is equally true, however, that as our population increases and continues to inject wastes into the ecosystem, our ability to contaminate the environment will rise in like measure. Positive effects of health in this growth pattern cannot proceed without environmental controls.

Ecological damage as related to man's perceptions and aspira-

tions cannot be measured. Yet citizens of existing communities are seeking better environments—in fact, they are unwilling to allow ignorance and decay to proceed unchecked. Beyond noise, fumes, and foul water, there is widespread demand for aesthetically pleasing surroundings. Offensive odors and sounds will become less and less acceptable parts of the larger community of life.

Yes, optical pollution will be minimized. This form of pollution has less to do with soot getting in your eyes, as it does in industrial areas, than to the aesthetic beauty of the community; the eye sees the natural loveliness, sees variation in plants, in greens, in flowers, in trees. Also diversity in the numbers and types of homes that may be seen, all within strict low density criteria, and with a variation in profile to avoid monotony.

THE MATTER OF ARCHITECTURAL STANDARDS

At Palm Coast there are strict covenants and restrictions with regard to residences. These include strictures with regard to setbacks, lot size, building size, peripheral structures, fences and hedges, and signs. In addition to abiding by these, the buyer of our homesite must receive architectural approval prior to putting up his home. It is hoped that in doing this there will be less disharmony in optical output than would otherwise be the case.

One could dwell in great depth on the criteria of architectural approval. Who should be the judge? This is a matter for internal company taste standards and aesthetic sensitivity. Going to experts on the outside is clearly impossible because the experts disagree with each other. One thinks of some differences between Ada Louise Huxtable of *The New York Times* and the now well-publicized Venturis. In any case, Palm Coast houses will neither be as costly as Miss Huxtable might demand nor will they be related to the neojunglephilia apparently espoused by the kitsch-cathected Venturis.

In addition to health and aesthetics, the money spent to manage the environment buys cleaner laundry in the backyard, longer life for the paint on houses, and less corrosion and breakdown of electrical and other equipment. It buys cleaner lakes and rivers for recreation. It buys relief from annoyance: a speck of ash in one's eye, unpleasant odors, yellowed foliage in the springtime. In short, the massive economic costs of pollution can be diminished given sufficient planning and technological commitment.

Natural plant and animal communities form indispensable links

in man's ability to survive. In addition, they satisfy his yearnings for beauty and recreation. But beyond this, nature *in itself* has a right to coexist with man—not just because it has utilitarian value to man, but because it is a Created integrity with inherent glory greater than that attributed to it by man. This concept is beautifully expressed by Calvin:

Because the glory of (God's) power and wisdom is more refulgent in the firmament, it is frequently designated as his palace . . . Wherever you turn your eyes, there is no portion of the world, however minute, that does not exhibit at least some sparks of beauty; while it is impossible to contemplate the vast and beautiful fabric (environment) as it extends around, without being overwhelmed by the immense weight of glory.⁴

In perspective, long-range environmental protection must consider the totality of the complex interactions of natural processes. Cities of the past and present solved their environmental problems in an ad-hoc fashion, one at a time, neglecting the strong, lasting interactions between the component parts of the problem. Figure 1

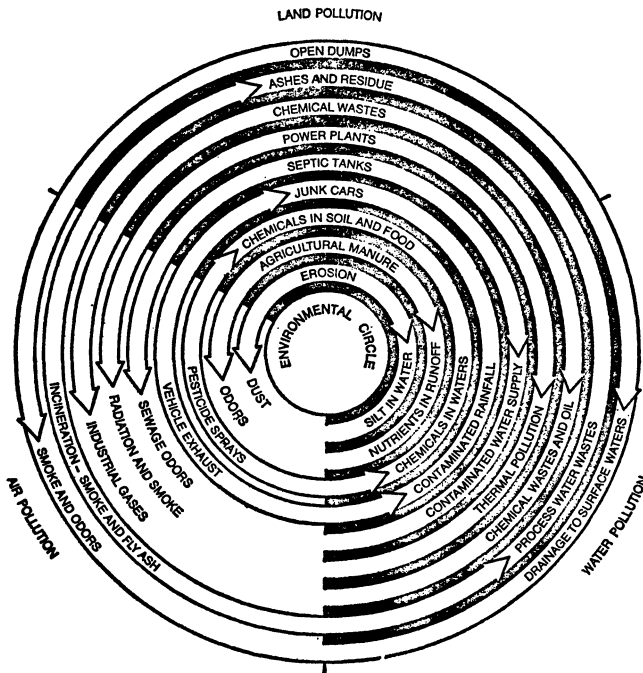


FIGURE 1

Environmental circle showing many kinds of pollution and the effect on the total environment.

shows in a very limited way how one environmental problem can lead to or cause another problem in a different but related sphere of influence. This is true whether one traverses radially or concentrically on the chart. Superimpose on this two dimensional scheme a third plane of flora-fauna and the complexity increases geometrically. Perhaps that is why lasting solutions to existing ills have been prohibitively expensive or virtually impossible. Prevention, therefore, appears to be the only viable approach. Solutions to the effects of man's actions must be ascertained in the planning stage and must be given priority in the decision-making process.

PSYCHOSOCIAL POLLUTION

At Palm Coast we persist in a design that is almost a fiat: 2.7 dwelling units per acre. Thus, as was earlier stated, we will have a city larger than Detroit or Philadelphia, with the density of, say, a Beverly Hills, California, rather than the malignant densities characteristic of the asphalt and concrete jungle. Why? Because ultra high density is cancerous. We are sure that many will quarrel with this statement, citing locales here and there where satisfaction exists in spite of ostensible crowding. Maybe it is as Deevey points out, "the mass of men, although increasingly affected with mental discomfort, do not see themselves as overcrowded."⁵ It is better to state that we deal with *probability* of sociopathic behavior. (It is similar to the tendentious arguments about the facts of cigarette smoking induced cancer—there is always that irritating "Oh, my Uncle Louie has been smoking for ninety years and is as healthy as a horse.") In any case, the preponderance of psychological, statistical, research and lay observations leaves us with the same funereal conclusion: crowding is an excrescence that society can ill-afford.

The psychological results of density—how does one begin analyzing them? The senior author is now engaged in a monograph on the subject (Stochastic Processes and Density-Induced Deviant Behavior), and therefore is aware that the subject is broad and that he can present in this medium only a few of the references. It has been in the literature a long time. For example, shall we begin the disquisition with Sir R. W. Rawson's 1839 (circa) seminal paper⁶ published by the Journal of the Statistical Society of London? Or, jump about a century to R. D. McKenzies' "The Ecological Approach to the Study of the Human Community"⁷ published in 1925, which formed the basis of the Elliott and Merrill chapter

called "Ecological Aspects of Community Disorganization" (1941).⁸ In that span of a hundred years, the observations consistently led to what is still a fundamental inference—that there is correlation between socially undesirable behavior and urban concentration. This "ancient history" has much to recommend it, for these authors' tocsins about the intensity of compression in the city served as prolegomena to recent much quoted experiments on the same subject.

First, we take the physiological side. We have Dr. Hans Selye's⁹ pioneer findings on the stress of crowding leading to endocrine system changes and enlargement of the adrenal glands. The findings of Ratcliffe and Snyder¹⁰ are pertinent, too, inasmuch as in their mammalian studies they discovered that stress from overcrowding could subject the individual to high blood pressure and heart and circulatory diseases. No doubt the symptoms on both studies are related. In any case, the organic sequelae of crowding have a firm experimental base. Of course, under not so controlled conditions, observations are made by physicians *in vivo*, where they readily connect physical breakdown with urban-complex pressures.

If crowding pressures are pathognomonic in the physiological sense, what are they in the psychological or, better said, psychosocial sense? Here again lay observations are buttressed by science. For those of us who grew up in slums, there were always too many people in the hallway; too many people in the tenement apartment; too many people bumping each other running down the steps; too many people in the sidewalks, jostling each other, even crossing the street; too many children playing ball in the gutter; playgrounds so crowded . . . that your team might wait hours to play. Or worse. Four overlapping baseball diamonds, with outfielders from each running into each other. A world of fighting for turf! A world of open air shut-ins! When we were later schooled in the well-known psychological theories of frustration-aggression and frustration-regression,¹¹ we learned only what we knew already: that if you frustrate the expansion of a person's space world, it will lead either to a form of attack behavior or to patterns appropriate to infantile character. Under attack behavior we often noticed family fights, gang wars, irrational arguments in retail stores, overt purposeful subway harassment, taxi harangues, etc. Infantile behavior was worse, if at times less identifiable: stark insulation, unintelligible silences, easy crying, furtive hiding, almost catatonic responses. A world of the depersonalized. Lonely crowds.

But enough of lay reports. The breakdown in social organization attendant upon crowds has been reported in scholarly/scientific books and journals. Calhoun uses a term, "behavioral sink,"¹² in describing results of crowding beyond a certain density. The disruption of social functions by crowding, he finds, goes beyond disorganization to collapse. One rationale inferred is that information-overload contributes to collapse. Hall reports that the development of the behavioral sink in the city may be unmanageable to the point where it is beyond the law enforcement agencies.¹³ Ardrey's work,¹⁴ centering on the general term territorial imperative, is perhaps the best encapsulated version of the behavioral realities of the effect of personalized space and the lack of it. His explanations of stress all lead to the valid conclusion that the fact of too many people crowded into too small a space is a precursor of pathology. A most disconcerting note is sounded by Eyre¹⁵ of the British Association for the Advancement of Science, who prognosticates "swarming" as the pathological end point of crowding.

Back to the practical standpoint. The more people you have per acre, the more cars you have per acre. Hence you have auto density and its attendant evils. Then you have more buses per acre . . . more transportation glut per acre. Yes, and the more information overload (in the behavioral sense) per acre. Add other congestive actions per acre, which you must multiply by the same constant, and you have a statistical morass not unlike the major cities of today.

It is unnerving for those of us seriously concerned about environment to realize that, tomorrow, if every form of pollution were terminated in the big cities—no more air pollution, or water pollution, or thermal pollution—the cities would still be unhappy places in which to live. As long as high densities persist, cities will remain factories spewing out psychosocial pollution, complete with their own types of congestive particulates and ash: tension, delinquency, crime, alienation, aggression, despair.

MODALITY OF COMMUNITY GROWTH

If one were to start a truly new city—not a bedroom community—he would have two major choices. The first would be to contact major industries and to have several agree to locate in his area, motivated by the physical, economic and political attributes of that area. In this way, the nuclear community would have as its base

the employees of the industries who could generate on a one-to-one basis commercial and service personnel, e.g., storekeepers, gas station attendants, supermarket clerks, and the like. Thus, one would have a second group of occupants for land/residences.

One of the authors, prior to his present affiliation, had experience seeking such industry cooperation in developing a new city far from any major urban concentration. A survey was made of a number of major corporations, and the results suggested that they make the pioneer move to such locations because of the serious trouble afflicting existing cities. Not one corporation (and it is estimated that at least six are required to "nucleate" a new city) found it practical—even in the period of good economy at the time—to support the idea, nor did any accept any one of the half dozen sites suggested all over the country. Among the many issues, costs of relocation and difficulties convincing the employees to move were at the forefront.

The second method is one in which we are involved. Initially, it is done through selling homesites for phased ownership and occupancy. Because we are in Florida, our first occupants will fall into the vacation/retirement category. These will then be followed by the commercial butcher-baker-candlestick maker service personnel mentioned before. This, in turn, will generate a labor force worthy of industrial attention. At Palm Coast, given that labor force, the motivation for industry will be strong because of the transportation benefits. Two major highways, I-95 and Route 1, go through Palm Coast for about 20 miles each. The Florida East Coast Railroad has facilities nearby. The climate and atmosphere in terms of employees' desires are excellent—particularly considering availability of recreational and cultural facilities.

Our rigid controls of industry, in the pollutant-generation sense, may inhibit its entry. This is not a negative. Our ability to pick and choose is beneficial. Remember, there is no exigency associated with our acquiring industry. Thus we shall have the right industries arriving without our sacrificing our rigorous standards.

PLANNING A CITY

Given the mode of growth, we confront the unhappy fact that even if engineering controls are ideal to the point where physical pollution is zeroed out, the community might still become the quintessence of social garbage heaps, amorphous in structure,

malignant to the personality, monotonous in living rhythms, dehumanized to the edge of anonymity, and unarticulated to the point of disharmony. Those who have read *The Death and Life of Great American Cities*¹⁶ by Jane Jacobs, saw chronicled in this already classic treatise some of the most monumental errors conceivable from city to city, from suburb to suburb.

It is easy to say we are cognizant of the problem and even that we know how awesome it is. But candor forces us to admit the perversity of the dilemma. This should not be surprising, because planning may be one of the most stubborn problems the world faces. One knows from the start that all the problems cannot be solved, because the state of the art is not optimal . . . nor will it ever be. Picture this: No community approaching 100,000 acres has ever been both predesigned and come to fruition. So, if nobody has planned anything of this scope, who *can* do it? We at Palm Coast, however, start by asking the question a different way—how are we *to do* it? As a minute prologue, allow us a couple of quick, simple examples.

Many communities make much of the fact that they have parks—nice green parks with quaint wooden benches in bucolic settings. There is even a tendency to automatically equate parks with proper planning. But if there is one thing that research shows, it is that a park alone means nothing. It is where the park is situated—how it is related to the residential matrix of the community and how it is related to the dynamics of the community—that is significant. This is why in so many cities a park in one area is a haven for the flowering of the human spirit, and a park in another area is a hot house for delinquency. So, it is clear that the issue is the *context* of what we offer, rather than merely what we offer.

Suprise at the paradoxes in planning is not new. Many experts have pointed out that new buildings do not prevent slums, just as old buildings do not cause them. In planning, thousands of items, big and small, are critical. In a major community, little issues are no longer little, but are magnified: the size and arrangement of the blocks, the pattern of traffic, the solution to lighting problems, the placement of shops, the development of recreation areas, the provisions for parking areas and facilities, the location of churches, and the establishment of footbridges and vehicle bridges.

What we are saying is that planning, like any other essentially vital social science, is not something readily accomplished by

shooting the breeze over the hot stove, belaboring the obvious. It is not the bailiwick of pat answers and does not take easy refuge under the umbrella called common sense. Nor should planning be the exclusive turf of the ivory tower theorist. There are more planning theories than there are political parties in France. We have the homogeneous low density horizontal Garden City concept, going back to 1898, which Lewis Mumford and his group popularized thirty years later. There is Le Corbusier's vertical city where huge skyscrapers were venerated by his disciples as opposed to low buildings. Even today, we read major articles about the newest apocalyptic city—the Arcology of Soleri, where rhapsodies are written to entire cities. Build here in the shape of a two-mile wide hexahedron, there in the shape of a 300-story cube. Which theory, if any, is correct? No one can really say. Which is even practical?

Even if there were a time-tested concept as to how a city should be planned, there still would be no true “cookie cutter” for building a city. Each city and each local environment is different. There are different local and state government regulations, varying demand rates, occupancy projections, demographic characteristics, different local building philosophies, variations in cash flow and profit generation which lead neither to easy answers nor standardization. When to these are added the incisive aspects of site analysis, such as the physiographic and hydrogeological features, together with maintaining ecological integrity and taking into account indigenous historical settings, one knows unequivocally that the use of any “handy-dandy cookie cutter” would be chimerical at best.

To us planning is a pragmatic combination of researches into what has worked successfully in other communities. (Someone once said that cities are enormous laboratories of trial and error. This is true. The trick is to profit from previous errors.) We must find out what went wrong in other communities and study their component populations for their social character. Planning, too, is observing the progress of your own program, and, as needed, making corrective and essential on-the-spot reevaluations as it grows from development size to community size, and from community size to city size. Planning is reacting with intelligence to consumer demand typologies. It is taking advantage of related disciplines and findings in psychology and sociology. Add to this the assistance of those steeped in planning experience, who have faced the manifold

headaches associated with this challenge and have developed solutions, people who have learned in the pressure cooker of practical problems.

How have we proceeded? Presently, having reviewed submissions from a variety of leading planning firms, we selected Reynolds, Smith and Hills of Jacksonville, Florida. This was because they not only have the requisite direct experience to participate with us, but their knowledge of Florida and the dynamics of its populace is unique.

Working closely with us in exhaustive studies of Palm Coast's requirements, they have generated a program of planning guidelines. Here are a random few. As may be seen some reflect material already discussed.

1. Provide choices for residents in a diversity of living environments. Example: offer recreational choices to residents, such as water sports, hunting; residential environments, such as homesites by the water, by the golf course, by the meadow; bucolic enclaves; single and multifamily housing; work and shopping choices; etc.

2. Coordinate project programs for orderly development. Example: reserve sufficient land for future potential land uses, such as commercial, recreational, and industrial, to satisfy projected demand of the residents.

3. Recognize interconnected transport systems as site organization elements. Example: utilize existing and new transportation systems to direct the orderly growth of future land uses.

4. Develop open space systems as site organization elements. Example: significant land features, drainageways, water bodies, other natural elements can be used as a major framework for development areas.

5. Utilize terrain features as an aspect of physical form. Example: reflect the linear image of coastal dunes and intricate mosaic of marshland waterways in development patterns of specific areas.

6. Program management of resources. Example: designate breeding areas for wildlife and indicate botanical and forest reserves.

7. Formulate policies for implementing the comprehensive plan. Example: utilize land use controls, development standards, and existing legal codes and agencies (air and water pollution

controls, etc.), to insure a quality environment for future populations.

8. Identify values of social significance to the regional character. Example: research historic expeditions through the site and incorporate their routes into community open space and transportation corridors. Preserve and identify historic sites.

9. Insure visual quality through the incorporation of design criteria. Example: limit the clearing of on-site vegetation to construction areas. Set up machinery for aesthetic approval of structures.

10. Develop and project the image of a totally viable community. Example: establish standards for the incorporation of religious, social, and service activities.

OPINIONS OF THE PRESS AND LOCAL CITIZENRY

In any massive undertaking, the explicit and implicit support of the local citizenry is important. We want the local community to know that we represent growth and development in the most positive sense. While it is pleasing to report that our findings indicate excellent acceptance, it is perhaps better to report on an independent survey conducted by the press. A story carried by the Associated Press (April 26, 1971) headlined: "Natives, land developer have mutual admiration—friendship blossoms." Quoting reactions of local residents: "These people convinced me they are interested in total environment." "It's fascinating the way they are going about their development." "A great asset." In another case, a conservationist queried some of the local authorities. One county official stated:

. . . based on my 12 years experience in conservation, much of which was spent in administrative capacities with the Florida Department of Natural Resources . . . I feel we are indeed fortunate that Palm Coast officials have taken so many steps to protect the environment . . .

Those of the press who have been exposed to Palm Coast have responded for the most part favorably. Peggy Poor, a renowned conservation writer, wrote for the *Orlando Sentinel* (June 28, 1970):

Preservers Applaud Palm Coast . . . Palm Coast, the country's largest housing project, in Flagler County, is winning kudos instead of kicks

from conservationists. More than that, with long-range environmental planning and careful study by staff ecologists, the mammoth venture may not only set an example for future would-be despoilers but come up with some urgently sought answers to pollution problems.

The Christian Science Monitor (June 18, 1971) stated:

Water oaks, live oaks, and palm stretch along both sides of the main access road to the property. In fact, trees have to be one of the most visible items on the property. In many housing developments from one coast to the other, many sturdy old sentinels have fallen victim to the bulldozer approach to land development.

There have been many other positive reports. But while the community and media response to what we have been doing has been gratifying, reality does dictate that because of the diversity of tastes and desires, we shall receive our share of barbs. How else will it be if one does not provide Utopia?

CONCLUSION

Having reviewed the technical and philosophical bases of Palm Coast, we do not feel an extended epilogue is necessary. We do not believe that the Palm Coast approach is the only way to program a major new city in America. That there are other solutions to the new city/population enigmas is probable. But we know of no other that we can implement. We believe we have anticipated to date as much as the state-of-the-city-building art permits. Tomorrow, if we learn more we shall then anticipate more. Recently, the National Wildlife Federation issued a circular in which parallels to our own orientation are evidenced, including aspects of control of industrial pollution, recycling, and encouragement of private landowners to preserve wildlife habitats. There are two other recommendations which correspond exactly to ours, but for the fact they involve matched federal funds for sewage plant construction and tax benefits for industry to move to the countryside. Palm Coast, as presently constituted, does not need these extrinsic dollar benefit subsidies in order to accomplish the same objectives. Indeed, many have spoken of massive infusion of government funds as a solution to environmental problems. But inherent in our attack on the problem is economic viability, not economic deficit with its requisite subsidy. Today, a person can come to Palm Coast and for \$17,000 can buy a house on a \$3,400 homesite with immense

availability of recreational and cultural facilities, a decent climate, and the knowledge that both physical and psychosocial pollution are being attacked and minimized through our efforts. This is what we are able to offer—with no massive infusion of federal funds.



FOOTNOTES

* Dr. Young is President and Chairman of the Board of ITT Community Development Corporation; Dr. Dea is Director of Environmental Engineering, Levitt and Sons, Incorporated and is Staff Consultant for Ecology to International Telephone and Telegraph Corporation.

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