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I. Introduction

A. Acknowledgements

Beach Ramirez wishes to acknowledge the assistance and collaboration of Bill Diamond of Diamond Consulting. Mr. Diamond developed (from all of the information gathered) various Concept Plan schemes that illustrated the potential layouts of the Irrigation Technology Center of Texas. Additionally, we wish to acknowledge Bryce Bankston of The Third Dimension. Mr. Bankston provided the renderings of the Concept Plan along with illustrations of the urban plots.

Beach Ramirez' analyses would have been much more difficult had it not been for the assistance of Dr. Guy Fipps and Ms. Jarah Redwine. They were extremely helpful in providing good information, contacts, reviewing our preliminary findings and analyses, and setting up meetings. We also wish to acknowledge the invaluable direction given to us by the Administration Team and the Community Stakeholders.

B. Vision and Mission of the ITC

As detailed in the Irrigation Technology Center's (ITC) vision and mission statements:

> *"The vision of the Irrigation Technology Center is to establish a world class, state of the art facility for education, testing and applied research, to promote efficient irrigation, water conservation, profitable agricultural production, and quality urban landscapes. ITC has four primary missions: develop design and performance standards for agricultural and landscape irrigation systems, establish an equipment testing and certification program, provide training and educational services for irrigators, agency and industry personnel, and develop new and improved technologies, methods, and management practices." (ITC vision and concept brochure)*

We conducted, a market validation of the vision and mission statements which became the foundation for justifying the need for the ITC facilities and staff in terms of actual demand (public and private), and thus the expenditures required to start and continue ongoing operations.

A first step is to review the current and projected water supply and demand conditions. Secondly, we looked at the irrigation industry's performance given that this industry has the potential to significantly impact the supply and demand relationship relative to more efficient water use. Then we a categorized focus areas for research and development, testing, performance standards etc. that will best encourage and aid in bringing about the more efficient use of water.

C. Texas Water Supply and Demand

According to the Texas Water Development Board's 2002 State Water Plan, water supplies are expected to decrease 18% from approximately 17.8 million AFY in 2000 to approximately 14.5 million AFY in 2050 (Table 1).

Table 1
Texas Water Supply Projections
(AFY)

Source	2000	2010	2020	2030	2040	2050
Ground Water	8,833,811	8,732,160	8,508,280	7,623,732	7,329,681	7,177,726
Surface Water	8,585,605	8,028,768	7,892,927	7,318,537	7,088,313	7,018,192
Reuse	341,386	363,658	370,331	278,668	278,358	279,458
Total	**17,760,802**	**17,124,586**	**16,772,538**	**15,220,937**	**14,696,352**	**14,475,376**
			% Change from 2000 to 2050:			***-18%***

Source: Texas Water Development Board

Water demand on the other hand is expected to increase 18% from approximately 17.0 million acre-feet in 2000 to 20 million acre-feet by 2050 (Table 2).

Table 2
Texas Water Demand Projections
(AFY)

Source	2000	2010	2020	2030	2040	2050
Municipal	4,232,056	4,805,100	5,411,198	6,024,533	6,558,065	7,064,605
Manufacturing	1,809,190	2,015,510	2,138,378	2,247,948	2,448,825	2,660,680
Mining	253,149	245,618	244,708	252,063	252,079	244,329
Steam-Electric	607,527	831,301	917,994	1,007,424	1,057,929	1,134,644
Irrigation	9,686,983	9,408,736	9,111,517	8,814,113	8,649,991	8,497,706
Livestock	330,572	355,550	371,598	386,194	402,236	420,245
Total	**16,919,477**	**17,661,815**	**18,195,393**	**18,732,275**	**19,369,125**	**20,022,209**
			% Change from 2000 to 2050:			***18%***

Source: Texas Water Development Board

From Tables 1 and 2, it is clear that by the year 2010, Texas approaches the intersection of water supply and water demand with demand becoming greater than supply. At that point, the Texas economy and the population in general, become increasingly impacted by the shortfall in water supply. Logically, remedies for pushing this point in time further into the future, or eliminating it all together, should first be addressed on the demand/consumption side of the supply/demand equation. This means promoting more efficient water use, conservation and management. This is the heart of the ITC's mission and vision.

Given the above figures and projections, we conclude, based on a market place reality, that time is of the essence in accomplishing this vision and mission.

To add to this market place foundation of the need for the ITC, please note that the numbers shown in Tables 1 and 2 only speak for Texas. Many other regions, states and nations find themselves in the same situation. To a certain extent, the ITC's benefits will extend beyond Texas through accomplishment of its vision and mission.

As shown in Table 2, the largest sectors of demand for fresh water in Texas are the Agricultural Irrigation and Municipal sectors. Both utilize a significant amount of water for irrigation and both can be highly impacted by the eventual implementation of performance standards, more efficient irrigation equipment and management, research, development and education. All of these issues are areas that the ITC anticipates addressing directly. Key in this mix is the irrigation industry itself and how it responds to the proposed development of a world-class facility such as the ITC.

D. Irrigation Industry

According to Benne Goldstein of Irrigation & Green Industry magazine, the Turf, Landscape, and Agriculture irrigation sales is a $13-14 billion per year market. If the "Do It Yourself" market is included, the total sales figure is notably higher. However, Mr. Goldstein does not estimate the "Do It Yourself" market sales figures. Table 3 below summarizes the data taken from the last three "Status Report on the Green Industry" publications by Mr. Goldstein. In general, detailed and verifiable data on the size of the industry is difficult to ascertain given the significant number of privately held companies in the industry.

Table 3
Turf, Landscape and Agriculture Irrigation National Sales Market
(Billions of $/Yr)

Market Sector	1998	1999	2000	2001
Turf and Landscape	$4.1-$4.4	$5.2-$5.5	$6.0	$6.0
Agriculture	NA	$7.0	$7.0	NA
Total		**$12.2-$12.5**	**$13.0**	

Source: Irrigation and Green Industry magazine

Up until 2001, the Turf and Landscape market sector had steady and very healthy growth. This has been mostly driven by new construction, housing starts and an overall healthy economy during thee time frames shown. The agriculture irrigation sales have been stable to declining. Mr. Goldstein projects a decline of 5-10% for 2002 for the overall Irrigation and Green industry.

In the process of briefly analyzing the industry, Beach-Ramirez conducted e-mail surveys and personal interviews with many market participants in both the Landscape and Turf sector and Agriculture sector. This data is used directly and indirectly throughout this report. In general, most market participants were optimistic, however many admitted overall industry decline, although not usually in their own companies. The e-mail surveys where respondents actually listed sales figures produced indications of 5.4% compounded annual growth in the "Urban" irrigation areas, and .6% compounded annual growth in the "Agriculture" related areas over the last several years.

Also included in our survey were questions on the industry's view of a facility with the research and development and testing capabilities such as proposed for the ITC. Approximately 70% indicated interest in utilizing such a facility in varying degrees. Given the industry's interest and the water supply/demand's shortfall, it is paramount to address issues that will add years to the time frame when water demand outpaces water supply. Therefore, we conclude that the focus of the ITC and program outlined in the mission and vision statements are important and will lead to the more efficient use of water. These programs provide the basis for needing the land, facilities, equipment, and staff to address the issues that will positively impact the more efficient use of water.

E. Areas of Focus

The focus for a world-class irrigation research and technology center, given the state of water supply and demand, needs to be directed to what eventually produces and promotes the more efficient use of water. These areas include, but are not limited to, issues such as performance standards, new and improved equipment testing, aid in research and development from both a public and private sector standpoint, and education and training so that systems of varying sorts are installed, utilized and managed correctly.

These are all efforts that must be accomplished and which will produce water conservation, efficient irrigation products, better and more readily available facilities for research and development, and more profitable agriculture production. These efforts also require facilities, equipment and people, and have a cost associated with them. Additionally, with the facilities comes the potential to produce income, both direct and indirect.

This report addresses the issues of demand, facilities and land requirements, design concepts, site selection criteria, the budgetary costs associated with building and operating the ITC, and finally the economic impact it may have locally to San Antonio.

II. Demand Analysis

A. Overview

The demand analysis is the process that Beach-Ramirez conducted in validating, and quantifying (where possible), the interest in, practicality of, and need for the ITC. In doing so, we conducted research amongst market participants in the irrigation industry, participants in other university research and testing programs, in governmental and quasi-governmental agencies, and local stakeholders who have indicated a strong willingness to financially support the ITC's development.

Our findings indicated a growing concern and realistic sense that the water supply/demand problem is not going away. Demand continues to increase and supply continues to decrease. Specifically in Texas, the Texas Water Development Board projects population in the state to grow from a year 2000 level of 20,864,933 to a year 2050 level of 39,617,389. This is an approximate doubling of the population during the course of the next 50 years. As mentioned previously, we see the ITC as key to addressing the water demand side of this equation.

As understood by economists, demand equates to price. Likewise, these demand components have the potential to produce revenue for the ITC. Some revenues will be direct such as those from product/equipment testing and certification fees, and contracts and grants for applied research. Others may be indirect such as the more cost efficient production of crops for farmers. As in any business enterprise, there are only two ways to increase net income. One is to increase revenue, and the other is to decrease expenses. The demand components we have looked at indicate that the ITC can be beneficial to the public and industry in doing both.

With that in mind, the next several sections will briefly outline different areas of demand and summarize the amounts where possible. Later in the Capital Budget, Income and Expense section, they are formulated into an overall financial picture.

B. Demand for Testing and Certification

Demand for testing and certification is expected to be one of the primary areas of revenue generation from the private sector. These tests will be done on new and existing products, indoors in controlled environments and outdoors under "live" conditions. The latter is one area where the ITC will be able to aid many manufacturers in that few outdoor testing facilities exist and none exist with the capabilities that are proposed for the ITC.

It is clear from our research, that the Center for Irrigation Technology (CIT) at Fresno State University is the leading testing facility for the irrigation industry. Many of the major irrigation manufacturers have had product testing performed at CIT.

A number of other universities also conduct testing of various sorts such as Utah State University in its hydraulics lab. Another university that has been mentioned by market participants is the University of Minnesota. They have conducted, among others, testing for oxygen transfer rates that aids in testing aerators.

In visiting with both Dr. Guy Fipps (project director for the proposed ITC) and David F. Zoldoske (director of CIT), it is clear that the potential exists for overlap and industry confusion relating to testing results. Both indicated however that by working closely together, the potential problems could be eliminated while actually having the two centers benefit each other.

Of the manufacturers that we spoke with while in attendance at the Irrigation Association's annual convention and trade show (in San Antonio, November 4-6, 2001), 70% indicated a strong interest in utilizing the ITC for testing, research and development, or other uses. Approximately 42% of the respondents indicated that they also perform "in-house testing" on their products. A couple of the points where there was consensus were:

- There needs to be the possibility of testing the performance of new products in pre-production stages without the results being published.
- The possibility of private companies utilizing the ITC's proposed facilities for research and development would significantly aid the introduction of new and improved products, especially for small and medium sized manufacturers. It would bring to fruition much more research and development than is currently taking place in the private sector because it is cost prohibitive.

We have not estimated a revenue stream for private research and development. It is not clear how it would be priced. However, we note that demand for such does exist, and it would produce a positive income stream if aggressively marketed.

The other areas that testing and certification would apply to are discussed briefly and are following.

Irrigation Labs

Concerning the irrigation testing labs, we interviewed manufacturers on their use of and need for these types of facilities, and their perceptions of how best a new

facility could benefit their company and product development. As previously mentioned, we found strong interest.

To estimate a conservative level of expected income, we reviewed the income performance of the CIT's lab testing. According to Mr. Zoldoske, the bulk of CIT's testing is made up of backflow prevention testing, sprinkler and drip testing, and some miscellaneous tests on filters, fittings and other products and generates annual revenues of approximately $200,000. Given the capabilities of the proposed ITC, at least this level of revenue should be obtainable with aggressive marketing. The ITC's proposed labs will have more capabilities, such as a wind tunnel lab, that will enable testing for sprinklers at controlled wind speeds.

Hydraulics Lab

Expected revenue are from testing and certification fees relating primarily to valve testing including cavitation tests, head loss tests, torque tests, fail tests and flow capacity tests. Also included would be various tests on pumps. Utah State University has a hydraulic lab and conducts this type of testing. Dr. Paul Tullis at Utah State indicated that an average year, in terms of valve testing revenues, is $250-$300,000. He indicated pump-testing revenue was approximately $50,000. Furthermore, he noted that they have not really focused on or marketed their pump testing capabilities, and that the market was "really wide open" in that regard (i.e. in his opinion a significant potential for expansion exists in this area). Our assessment is that the hydraulics lab should conservatively be able to produce revenues of $350,000 with aggressive marketing.

Outdoor Testing

The ITC's Urban and Ag units will have numerous outdoor testing capabilities for all types of irrigation systems including drip, pivot, linear, and furrow, among others. As is detailed in this report, these units make up the largest portion of the estimated 500+ acres that the ITC will require. Many of the same products tested in the indoor labs can also be tested under "live" outdoor conditions. Estimates have not been made for outdoor testing fees, but it is certain that at a minimum they would enhance the fees that could be charged in conjunction with the lab related testing fees.

Analytical and Market Studies

Mr. Zoldoske also indicated that income could and was being generated at CIT for market and analytical studies for manufacturer's business promotions. He indicated that CIT was receiving revenues totaling almost $150,000 annually for such projects. Again, with an aggressive marketing program (which we stress is very important), a revenue stream of a similar amount could be achieved at the

ITC. A reasonable annual projection for this function is estimated to be about $75,000.

Conclusion

In surveying the market participants, we came to the conclusion that the ITC will be able to command a significant amount of testing and certification business with focused marketing of ITC's capabilities. A couple of key points, relative to competition, are:

1. The CIT, with a new multi-million dollar contract with the California Energy Commission, will have a slightly new focus.

2. Neither the CIT or Utah State has what we would consider from a private sector viewpoint as an "aggressive marketing program".

3. Neither the CIT or Utah State will compare physically with the facilities planned for the ITC, nor does either have any significant capability of outdoor ("live") condition testing and certification.

The indications are clear that demand is present for testing and certification, but the services to be offered and the benefits of utilizing the ITC facility must be marketed aggressively. Given this, the ITC should conservatively be able to generate as much revenue from these various testing and certification areas as have both the CIT and Utah State. This undoubtedly will be a growth process. The total of the revenues estimated for certification and testing is summarized as follows:

Table 4
Certification and Testing Summary

Area	$
Irrigation Labs	$ 200,000
Hydraulics Lab	$ 350,000
Marketing and Analytical Studies	$ 75,000
Total	**$ 625,000**

It is expected that the revenue in Table 4 can be improved upon significantly over time. Also, revenue will be broken down by phases later in this report.

C. Demand For Applied Research (Contracts and Grants)

Applied research (contracts and grants), according to the ITC's Administration Team, should equate, at a minimum, 40% of the Operations and Maintenance budget (O&M budget) at the onset. Later it is expected to grow to a 1:1 ratio and

even up to a 2:1 and higher ratio. These relate to governmental and other public and private entity research projects.

As a comparison, the CIT had contracts and grants of $1.5-2.0 million for the year 2000. A similar level would place the ITC at 50-60% of its O&M budget at its onset. According to Mr. Zoldoske, the CIT submitted 15 proposals to the Agriculture Research Initiative (ARI) for a total of approximately $1,600,000 for FY 2002.

For the ITC, the 40% level represents about $1.3 million (based on a total O&M budget of approximately $3.2 million for all phases) and may be achieved at the onset. To this we have added the current budget that Dr. Fipps has in contracts and grants of $500,000. This produces a total of approximately $1,800,000. We believe this is a reasonable and conservative estimate. From that point, as the ITC matures, contracts and grants should easily grow to a level of $3-$4 million annually. In the Capital Budget, Income and Expense section, the phasing-in of the contracts and grants will be at levels that are proportionate to the O&M budget by phase and also with the physical facilities in which the contract and grant work will be accomplished.

D. Demand For Education (Training, Licensing)

The demand for education relating to the use and conservation of water in all its forms continues to grow. The ITC has planned an Administration and Education building that will allow for the on-site education and training of numerous disciplines related to the irrigation industry. This program will range from short-courses for farmers and landscape professionals, to licensing and certification training for irrigators both urban and agriculture, to international training of students/professionals/universities from other countries. Below, we will briefly discuss and conservatively estimate potential income from these types of education programs.

Licensed Irrigators continuing education courses

These are short courses generally offering 8 hours of continuing education credits. From information supplied by the Texas A&M University School of Irrigation, the courses currently offered produce approximately $61,000 annually.

According to Mr. Gene Reagan of the Texas Natural Resource Conservation Commission (which oversees the state licensing of irrigators), there are approximately 5,200 licensed irrigators in Texas. Furthermore, this figure has been growing with approximately 500-700 net members being added each year. These licensed irrigators must take continuing education courses each year. The ITC (and its staff, or affiliates) should reasonably be able to command 25% of this business according to Dr. Guy Fipps (project director of the ITC). This

amount of market share would produce approximately $162,500 (5,200 X 25% X $125/course = $162,500). **Conclusion: $162,500**.

Basic training course for "licensed irrigator candidates"

This is a 32-hour credit course in Texas that candidates must take before they are eligible to sit for the state exam and become licensed irrigators. Approximately 1,400-1,600 people take the course each year based on the number of people that sit for the exam. The most recent exam was October 22, 2001, where 654 candidates signed up for the exam. Of these 654 candidates, only 536 actually took the exam, according to Mr. Reagan at TNRCC.

This course is offered around the state a various times and places, but normally corresponding with the exam that is offered three times each year in Austin. Most groups that are approved by TNRCC to offer the course charge approximately $400 for the course. Dr. Guy Fipps indicated that the TAMU School of Irrigation does not currently offer this course, but most likely will at the proposed ITC. Dr. Fipps expects a market share of 1/4 to 1/3 of the candidates, which would produce approximately $150,000 annually (1,500 candidates X 25% X $400 course fee = $150,000). **Conclusion: $150,000.**

International Training Programs

The training and education benefit that the ITC's testing and research facilities offer will likely reach across national borders. It is expected that a host of training and education seminars will be developed at the ITC over time. These will likely be seminars and programs that are four to six weeks in length. Similar type training programs occur, for example, at Utah State University through their International Irrigation Center (IIC).

Dr. Herman Sabillon is the associate director of the IIC. He indicated that since 1980 they have trained some 3,000 international students in the U.S., and another 34,000 in other countries. In many cases they send professors and other professionals into developing countries to train people who are part of larger governmental projects.

Additionally, Dr. Sabillon indicated that "distance learning" is becoming more and more commonplace. With the costs of travel, and the current economic situations in many countries, this has become a viable alternative. The ITC has planned for this in its overall capabilities, and it appears likely that it will be needed in the years to come.

It is expected that over time this could be a large revenue contributor in terms of education demand at the ITC. A specific estimate is difficult to arrive at, but its expected that many of these courses would be lengthy and could generate fees in the range of $2,000-$6,000 per course (generally a $750-$1,000 fee per week

per student). Given this, even with just 50-100 students per year, revenues could easily be between $200,000 and $400,000 annually with a much larger potential. **Conclusion: $200,000**

Overall Conclusion

The total of the revenues estimated for education demand are summarized as follows:

Table 5
Education and Student Revenues Summary

	# Students	$
Continuing Education Courses	1,300	$ 162,500
Basic Training Course	375	$ 150,000
International Training	75	$ 200,000
Total	**1,750**	**$ 512,500**

E. Demand For Visitors

The City of San Antonio is one of the most visited cities in the country. Because of its unique history and attractions, the city commands a significant number of convention, vacation, and business visitors. The latest data (1999) from the Texas Department of Economic Development indicates that the San Antonio Metropolitan Statistical Area (MSA) attracted 47,000,000 person-trips. A person trip is defined as one person on one trip irrespective of trip length. Person trips include day-trips as well as overnight trips, and leisure as well as business.

Parts B, C, and D of this section address a portion of the potential visitors that would participate in one facet or another of the training, education, certification, and testing being offered by the ITC. The estimates included licensed irrigators, basic courses, and international training. We did not attempt to determine the demand or potential revenue for installers, water budgeting/urban conservation programs, agriculture conferences/workshops, students, urban industry training, or agriculture industry training. The assumptions used by Dr. Lonnie Jones' economic impact analysis indicated a total of 21,450 total participants in ITC programs and/or visitations. Of that, 7,000 was estimated for training and education, and 14,450 was estimated for agricultural and urban/landscape visitors and major conventions.

Beach Ramirez' estimates are approximate and include an overall total for both components. The basis for the estimates was the travel data for San Antonio both leisure and business (Table 6). The business portion of the analysis included education, training, and conventions. The Agricultural-related and Urban/landscape visitors constitute the core of visitor demand. Given our

analysis of licensed irrigator, basic courses, and international training along with the assumptions used by Dr. Jones, we believe that the 7,000 total for this segment is realistic. This would be almost a one percent market share of the total number of business travelers to San Antonio.

With regards to demand for the visitors component, we determined that the closest "nearest twin" to the ITC visitor center and the adjoining urban plots would be the San Antonio Botanical Gardens. Although this facility does not have an agricultural component, it is the facility most similar in the local market. The number of visitors in 2001 has been annualized using data from the first eleven months of 2001. Approximately 64,092 people paid from $1 to $4 to visit the botanical gardens. This represents a market share of almost 1 percent of the total leisure travel visitors in 1999 that indicated they toured facilities of various types in San Antonio.

Given the differences in focus and purpose of each facility, we do not believe that the ITC can achieve this same level of market share. We project that the ITC can achieve approximately 25% of the Botanical Gardens visitors or about two-tenths of one percent of the total leisure travel visitors that toured this type of facility in 1999. This translates into approximately 15,500 visitors to the ITC.

Together our estimate of 9,475 visitors coming for training and education along with 15,566 leisure visitors comes to a total of about 25,000. This estimate is relatively close to the assumptions used in Dr. Jones' model of 21,450 total visitors. These estimates assume that all phases of the ITC are in place.

TABLE 6
PRELIMINARY VISITOR DEMAND ANALYSIS

San Antonio Total Visitors (1999)	Percent 100%	Total Person/ Trips(1) 47,000,000	San Antonio Botanical Gardens Visitors (2)	% Mkt Share	Assumptions Jones Eco. Impact Analysis	% Market Share	% Mkt Share ITC (3)	ITC Number Visitors (4)
Business Travel	**28%**	**13,160,000**						
Business Travel- Meetings: Seminar/Training	6%	789,600			7,000	0.89%	1.00%	7,896
Business Travel- Meetings: Conventions	6%	789,600			2,000	0.25%	0.20%	1,579
Total Business Travel- ITC		1,579,200						9,475
Leisure Travel	**72%**	**33,840,000**						
Leisure Travel- Touring	23%	7,783,200	64,092	0.82%			0.20%	15,566
Total		7,783,200						15,566
Grand Total all Potential Visitors to ITC								**25,042**

Notes:
1. Source: Texas Destination, DKS &A Directions, Texas Department of Commerce; represents number of Person-Trips (one person on one trip irrespective of trip length. Person-Trips include day-trips as well as overnight trips, Leisure as well as Business.
2. Source: San Antonio Botanical Gardens; data from Jan-Nov 2000 is annualized.
3. Estimation for Business Travel based on upward adjustment to TEEX's current market share.
4. Estimate for visitors based on San Antonio Botanical Gardens visitor count with downward adjustment.

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III. Facilities and Land Requirements

A. Demand-based facilities requirements

The size, type, and amount of needed land and buildings are directly dependent on the projected demand for the center. The Demand Analysis, presented in the previous section of this report, acts as the foundation for our projections of the required land and buildings.

An integral part of the demand is the specific needs of the Irrigation Technology Center. These needs are dictated by the ITC's vision and mission. With that in mind, Beach Ramirez conducted extensive interviews with Texas A&M University officials, specifically with the Project Director (Dr. Guy Fipps) and the ITC Administration Team.

B. Units of Research and Equipment Requirements

The Irrigation Technology Center of Texas is divided into various "Research Units" including:

The Irrigation Testing Unit **-** Lab 1 (Wind Tunnel), Lab 2, Lab 3 (Drip Testing), and the Hydraulics Lab.

The Urban Landscape Irrigation Outdoor Systems **-** Various plots that support outdoor testing and training facilities including: Sprinkler Testing & Performance, Runoff Collection, Microclimate, Irrigation Scheduling & Water Use, Surface & Sub-surface Drip Irrigation, Open-component Installation, Linear Move, a two-hole Golf Course and a storage facility.

The Agricultural Outdoor Systems - Various plots that support outdoor testing and training facilities including: Center Pivots, Linear-Move, Solid Set, Improved Furrow, Drip, a canal, a Teaching System and storage.

The Wastewater Unit **-** Various systems, plots, and facilities including Storm Water Catchement & Recirculating, On-site Water Treatment and Reuse, Water and Wastewater Characteristics, Instrumentation & Application, Disinfection, Wastewater Storage, Pumps & Filters, and Storage.

All other facilities are in support of the units and systems described above and each has specific equipment needs that have been identified by the ITC project director. The cost of the facilities and equipment are estimated in the capital budget presented in Section VII of this report.

C. Land, Facilities and Building Requirements

The Demand information, along with private, public and industry sector interviews was used to develop the Building and Land Requirements schedule that is summarized in Table 7 that is located at the end of this section.

Table 7 includes the following information blocks:

Phasing

Based on the direction given by the client, the ITC will be phased according to budget requirements, urgency of demand for specific facilities, and interdependency of specific land areas and facilities.

Facility Number

For purposes of control and discussion, each land and building requirement was assigned a number.

Building Letter

For purposes of identification and discussion, each building was assigned a letter.

Facility Name

Each needed parcel of land, building and building component is identified in this column.

Facility Type

This column identifies whether the requirement is a plot of land, the type of building, a system or a site.

Facility Dimensions

Where known, identifies the dimensions of buildings, building components, plots, and sites when known.

Land (Net Square Feet)

Identifies the net square feet of needed land plots and sites.

Building Square Foot Calculations

Includes calculations and estimates of the gross and net square feet of building requirements. Each building facility was assigned an "add-on factor" based on its type. This add-on factor accounts for access and egress, common areas (bathrooms, elevator lobbies, etc.), and mechanical/electrical closets. The building space for Labs 1 and 2, includes a 20 % add-on factor while a 40% factor was used for the support space (offices, conference rooms, break rooms, etc.) For Drip Test Lab 3 (which has no support space), a 10% factor was utilized. For the Hydraulics Lab and the Education and Administration Building a 40% factor was used. In most other cases, a 20% factor was used. Given the lack of specific design requirements, add-on factors from 10 to 40% are considered reasonable.

Parking Space

The number of parking spaces was based on planning and city standards for the different types of buildings. In order to calculated land requirements, an amount of 400 square feet per parking space was used which included all driveways, access and egress points, islands, etc. The estimate of parking spaces may decrease or increase depending on the use of shared parking and the City's review of the eventual parking plan.

Acres

The total number of required acres is calculated on a net and gross basis. The net numbers are grossed up by 20% to account for easements, roads, access points, landscape requirements, buffers, and other unknowns.

Based on our demand analysis and conversations with the project director of the ITC and the Administration Team, we recommended additional acreage and building square feet to meet potential future demand. This includes approximately 17,000 square feet of additional (second story) space in the Administration and Education Building to accommodate future ITC growth and local, state, and federal outside agency use. Additionally, we recommend a reserve of land between 40 and 70 acres for ITC expansion, private sector research and development, and a future Visitor Center (6 acres).

This analysis indicates (and our recommendation is for) a total building requirement of approximately 211,000 square feet with approximately 444 parking spaces producing a land requirement of approximately 525 acres.

D. Building Description Details

Once the amount of building space was determined, the next step was to profile the type of building needed to accommodate each use. The variables that were used included the size, the number of floors, the dimensions (if known), the clear height, type of structural frame, type of exterior wall, the type foundation, whether the building would have a sprinkler system, type of lighting, wall composition, interior floor finish, ceiling type, and whether the building would have a heating/ventilation/air condition (HVAC) system.

Information from the project director and the Administration Team was used to develop the Building Description Detail (Table 8). Subsequently, this information was utilized as the basis to calculate the building construction costs.

E. Project Phasing of the Irrigation Technology Center

The intent of the ITC project director, the Administration Team, and the Texas A&M University System is to complete the project in phases. Based on their input, the project is expected to be phased as follows:

Phase 1-A Irrigation Testing Lab #1 (Wind Tunnel), Building A, approximately 14,200 square feet of building on about one-half acre. This does not include a temporary building (of undetermined square feet) to house offices, conference, break room, and other support facilities.

Phase 1-B Irrigation Testing Lab #2 (Building B), Drip Testing Lab #3 (Building C), and a Garage (Building E). Total building square feet of about 87,000 with 10 parking spaces on approximately 2 acres.

Phase 2 Hydraulics Lab (Building F) containing approximately 43,000 square feet with 7 parking spaces on 1.25 acres.

Phase 3 Urban/ Landscape Irrigation Outdoor System plots (30 acres) & storage (Building D), Agricultural Irrigation Outdoor System with Storage (Building G) and the Central Shop (Building H) containing approximately 11,520 square feet with 5 parking spaces on 419 acres. The total building square feet is about 16,300 with 5 parking spaces on 449 acres. The bulk of the acreage is taken up in 99 plots ranging in size from one-half acre to 48 acres and a canal and two-hole golf course.

Phase 4 Wastewater Unit with Storage (Building I), square footage requirements are unknown, minimal amount of acreage**.** The ITC may choose to have this facility off-site.

Phase 5 Administration and Education Building (Building J) and Outdoor Pavilion (Building K) containing approximately 48,500 square feet and 419 parking spaces on approximately 6 acres.

Phase 6 Reserve for ITC expansion, private sector research and development, and a future Visitor Center (Building L), unknown number of parking spaces with an estimated need of between 40 and 70 acres.

TABLE 7
IRRIGATION TECHNOLOGY CENTER OF TEXAS
PRELIMINARY BUILDING AND LAND REQUIREMENTS
Page 1

PHASE	FAC NO.	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
1-A	1	**A**	**Irrigation Testing Lab #1 (WT)**	1-story building	100x70x32		7,000	1,400	8,400	2	800	0.21	0.25
	2		Control Room/Observation Deck	Mezzanine	40x60		2,400	480	2,880	1	400	0.08	0.09
	3		4 Offices (separate bldg.)										
	4		Conference Room (separate bldg.)										
	5		Breakroom (separate bldg.)										
	6		Janitor Closet (separage bldg.)		6x8		48	10	58			0.00	0.00
	7		Storeroom (separate bldg.)		40x60		2,400	480	2,880	-	-	0.07	0.08
			Subtotal				11,848	2,370	14,218	3	1,200	0.35	0.42
			TOTAL PHASE 1-A				**11,848**	**2,370**	**14,218**	**3**	**1,200**	**0.35**	**0.42**

PHASE	FAC NO.	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
1-B	8	**B**	**Irrigation Testing Lab #2**	1- story building	140X70X32		9,800	1,960	11,760	2	800	0.29	0.35
	9		2 Offices		10x12		240	96	336	2	800	0.03	0.03
	10		Control Room/Observation Deck	Mezzanine	40x60		2400	480	2,880			0.07	0.08
	11		Storage Room		40x60		2,400	480	2,880			0.07	0.08
			Subtotal				14,840	3,016	17,856	4	1,600	0.38	0.46
1-B	12	**C**	**Drip Testing Lab #3**	1-story building	1200x50x20		60,000	6,000	66,000	3	1,200	1.54	1.85
1-B	13	**E**	**Garage**	1-story	40x60		2,400	480	2,880	3	1,200	0.09	0.11
			TOTAL PHASE 1-B				**77,240**	**9,496**	**86,736**	**10**	**4,000**	**2**	**2**

PHASE	FAC NO.	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
			Irrigation Systems Testing Unit										
2	14	**F**	**Hydraulics Lab**	2-story building	120X250X30		30,000	12,000	42,000	3	1,200	0.99	1.19
	15		4 Offices		10x12		480	192	672	4	1,600	0.05	0.06
			Subtotal				30,480	12,192	42,672	7	2,800	1.04	1.25
			TOTAL PHASE 2				**30,480**	**12,192**	**42,672**	**7**	**2,800**	**1.04**	**1.25**

TABLE 7
IRRIGATION TECHNOLOGY CENTER OF TEXAS
PRELIMINARY BUILDING AND LAND REQUIREMENTS
Page 2

PHASE	FAC NO.	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
3			**Urban/Landscape Irrigation Unit**										
	16		Sprinkler Testing & Performance	16 Plots	100x100	160,000						3.67	4.41
	17		Runoff Collection	4 Plots	100x100	40,000						0.92	1.10
	18		Microclimate	18 Plots	50x50	45,000						1.03	1.24
	19		Irrigation Scheduling & Water Use	18 Plots	100x100	180,000						4.13	4.96
	20		Surface & Sub-surface Drip Irrigation	24 Plots	100x100	240,000						5.51	6.61
	21		Open-component Installation	1 Plots	100x200	20,000						0.46	0.55
	22		Linear Move	Land	160 x 300	48,000						1.10	1.32
	23		Golf Course Holes	2-hole	300x600	360,000						8.26	9.92
	24	**D**	Storage	1-Building	40x60		2400	-	2,400	-	-	0.06	0.07
			Total Urban/Landscape Irrigation Unit			685,000	2400	-	2,400	-	-	25.1	30.2
3			**Agricultural Irrigation Unit**										
	25		Center Pivots	Land (4 plots)	960X960	3,686,400						84.63	101.55
	26		Linear-move	Land (1plot)	600x1000	600,000						13.77	16.53
	27		Solid Set	Land (1plot)	1000x870	870,000						19.97	23.97
	28		Improved Furrow	Land (5 plots)	1000x875	4,375,000						100.44	120.52
	29		Drip	Land (3 plots)	1000x435	1,305,000						29.96	35.95
				Land (3 plots)	1000x870	2,610,000						59.92	71.90
	30		Canal	Land	1000x4	4,000						0.09	0.11
	31	**G**	Storage	Building	40x60		2,400		2,400			0.06	0.07
	32		Teaching System	Land (1plot)		1,742,400						40.00	48.00
			Total Agriculture Irrigation Unit			15,192,800	2,400	-	2,400	-	-	349	419
3		**H**	**Central Shop**										
	33		Central Shop	Building	120x80		9,600	1,920	11,520	5	2,000	0.31	0.37
			TOTAL PHASE 3			**15,877,800**	**14,400**	**1,920**	**16,320**	**5**	**2,000**	**374**	**449**

PHASE	UNIT	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
4			**Wastewater Unit**										
	34		Storm water catchement/recirculating	System	Pond								
	35		On-site water treatment/reuse	System									
	36		Water/wastewater characteristics	Lab (in Admin.)									
	37		Instrumentation/application	Site									
	38		Disinfection	System									
	39		Wastewater storage	Facility									
	40		Pumps/filters	Site									
	41	**I**	Storage	Building	40x60		2,400	-	2,400	-	-	0.06	0.07
			Total Wastewater Unit				2,400	-	2,400	-	-	0.06	0.07
			TOTAL PHASE 4				**2,400**		**2,400**		**-**	**0.06**	**0.07**

TABLE 7
IRRIGATION TECHNOLOGY CENTER OF TEXAS
PRELIMINARY BUILDING AND LAND REQUIREMENTS
Page 3

PHASE	FAC NO.	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
5		**J**	**Administration and Education Bldg.**	2- story building									
	42		8 Offices (1person each)		10x12		960	384	1,344	8	3,200	0.10	0.13
	43		1 Conference room (16 persons)		20x30		600	240	840	8	3,200	0.09	0.11
	44		1 TTVN Classroom (50 persons)				2,000	800	2,800	25	10,000	0.29	0.35
	45		1 Classroom (50 persons)				2,000	800	2,800	25	10,000	0.29	0.35
	46		1 Computer Lab (25 persons)				1,000	400	1,400	13	5,200	0.15	0.18
	47		1 Auditorium (300 persons)				3,000	2,250	5,250	150	60,000	1.50	1.80
	48		Lounge/Breakroom		15x20		300	120	420			0.01	0.01
	49		6 Storage rooms		10x20		1,200	480	1,680	-	-	0.04	0.05
	50		Outside agency use & future growth				11,860	4,744	16,604	40	16,000	0.75	0.90
	51		1 Wet lab		40x40		1,600	640	2,240			0.05	0.06
	52		1 Water/Wastewater lat		40x40		1,600	640	2,240			0.05	0.06
	53		1 Instrumentation lab		20x30		600	240	840	-	-	0.02	0.02
			Subtotal indoor Admin/Education Bldg.				26,720	11,738	# 38,458	269	# 107,600	3.4	# 4.0
	54	**K**	1 Outdoor pavilion	Building	60x120		7,200	2,880	10,080	150	60,000	1.61	1.93
			Total Admin. & Education Bldg				33,920	14,618	48,538	419	167,600	5.0	6.0
			TOTAL PHASE 5				**33,920**	**14,618**	**48,538**	**419**	**167,600**	**5.0**	**6.0**

PHASE	FAC NO.	BLDG.	FACILITY NAME	TYPE	DIMENSIONS	LAND NET SQUARE FEET	BUILDING NET SQUARE FEET	BUILDING ADDITIONAL SQUARE FEET	BUILDING GROSS TOTAL SQ. FT.	PARKING PARKING SPACES	PARKING PARKING SQ. FT.	ACRES NET ACRES REQUIRED	ACRES GROSS ACRES REQUIRED
6			**RESERVE**										
	55		Reserve- Other									50	60
	56	**L**	Reserve- Visitor Center									5	6
			TOTAL PHASE 6									**55**	**66**
			Grand Totals				170,288	40,596	210,884	444	177,600	438	525

Total Building Square Feet	**210,884**
Total Parking Spaces	**444**
Total Acreage Requirements	**525**

TABLE 8
BUILDING DESCRIPTION DETAIL

Bldg.	Bldg. Name	Size	No. Floors	Dimensions *	Clear Height	Structural Frame	Exterior Wall System	Slab System	Sprinkled	Lighting	Interior Finish Walls	Interior Finish Flooring	Interior Finish Ceiling	HVAC
A	Irrigation Testing Lab #1	14,218	1	100x70	32 feet	Steel	Conc. Blk	Concrete	No	Industrial	Exposed	Concrete	Exposed	Heat only
B	Irrigation Testing Lab #2	17,856	1	140x70	32 feet	Steel	Metal	Concrete	No	Industrial	Exposed	Concrete	Exposed	Yes
C	Drip Testing Lab #3	66,000	1	1200x50	20 feet	Steel	Metal	Concrete	No	Industrial	Exposed	Concrete	Exposed	Heat only
D	Storage (Urban/Landscape)	2,400	1	40x60	12 feet	Bearing Walls	Metal	Concrete	No	Industrial	None	Concrete	Exposed	No
E	Garage (8-10 Vehicles)	2,880	1	40x60	12 feet	Steel	Metal	Concrete	No	Industrial	None	Concrete	Exposed	No
F	Hydraulics Lab	42,672	2	120x250	30 feet	Steel	Brick/stone	Concrete	Yes	Industrial	Concrete Blk	Concrete/Carpet	Exposed	Yes
G	Storage (Agriculture Unit)	2400	1	40x60	12 feet	Bearing Walls	Metal	Concrete	No	Industrial	None	Concrete	Exposed	No
H	Central Shop	11,520	1	120x80	22 feet	Steel	Metal	Concrete	Yes	Industrial	Metal Panel	Concrete	Exposed	Yes
I	Storage (Wastewater Unit)	2,400	1	40x60	12 feet	Bearing Walls	Metal	Concrete	No	Industrial	None	Concrete	Exposed	No
J	Admin./Education Building	38,458	2	TBD	12 feet	Steel	Brick/Stone	Concrete	Yes	2x4 Flour	Sheet Rock	Carpet/Tile	Acoustical	Yes
K	Outdoor Pavilion (300 people)	10,080	1	60x120	18 feet	Steel	None	Concrete	NO	Industrial	None	Concrete	Exposed	No
L	Reserve													
	Total	**210,884**												

* Dimensions shown relect the dimensions of the net square footage in Table 7.

IV. Design Concepts

A. Various Design Concept Schemes

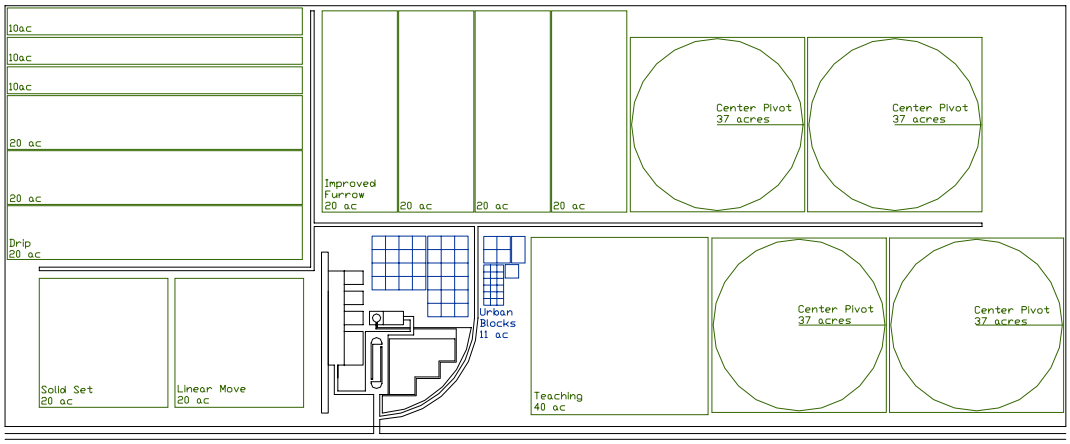
After assessing the ITC's facilities and land requirements, we worked with Dr. Fipps, the Administration Team and Bill Diamond of Diamond Consulting to put together a Concept Plan that depicts how the ITC facilities could be developed. Because the actual site has not been chosen, Diamond Consulting approached the design and layout with several different schemes.

The schemes allow for a tract that was square in shape and for one that was rectangular in shape. The three schemes were developed for two purposes. First, the three layouts provided a basis for discussing preferences with Dr. Fipps and the Administration Team; second, it allowed us to test the flexibility of overall site geometry and orientation to the highway.

The rectangular shape was designed in two ways - one with road frontage on the short side, and one with frontage on the long side (See Figures 1-3). Additionally, Diamond Consulting developed a design concept that portrays the core area that includes all of the buildings, the urban plots, golf course holes, water feature, and parking (See Figure 4). This area would be the centerpiece of the ITC.

Subsequently, the most desirable of the three layouts was selected. At the end of this section, the final Design Concept can be seen (Figure 5) with an enlargement of the core area (Figure 6) depicted showing the relationship of the buildings with each other and with the various land components.

Figure 1



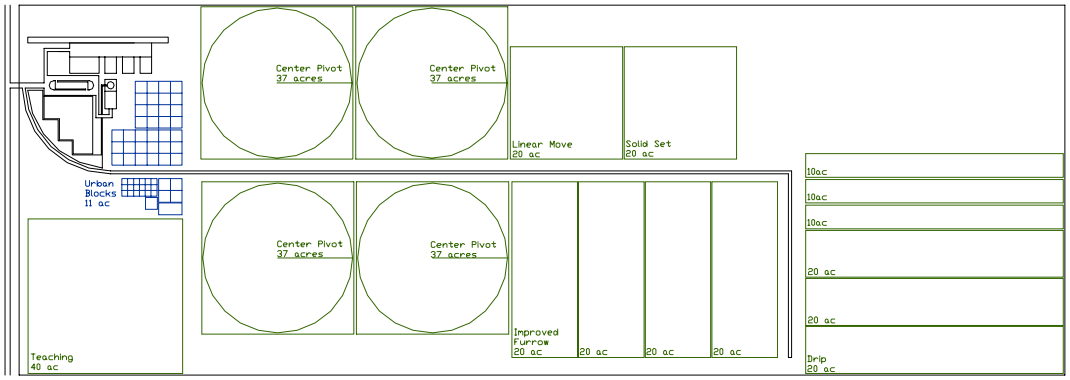
Texas A&M
Irrigation Technology Center

Preliminary

Irrigation Technology Center of Texas **Texas A&M University System**

Beach Ramirez in association with **Diamond Consulting**

Figure 2



Short Frontage Scheme B
650 acres

200 1000
0 500
October 2, 2001

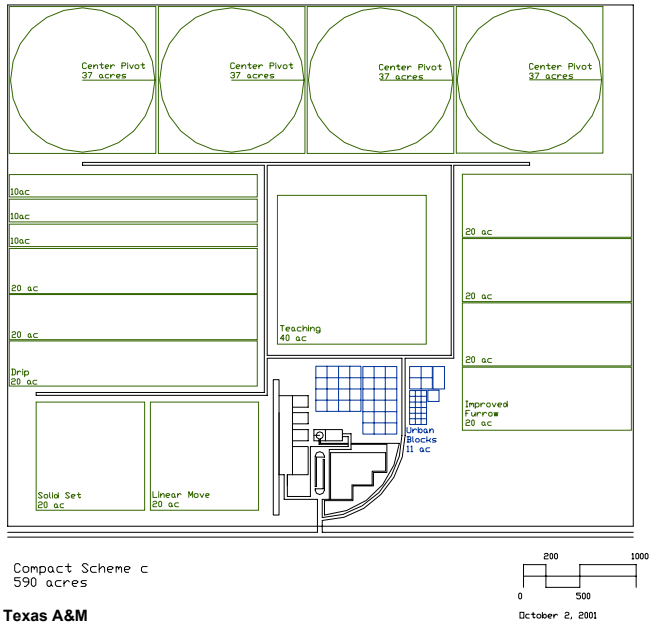
Texas A&M
Irrigation Technology Center

Preliminary

Irrigation Technology Center of Texas **Texas A&M University System**

Beach Ramirez in association with **Diamond Consulting**

Figure 3

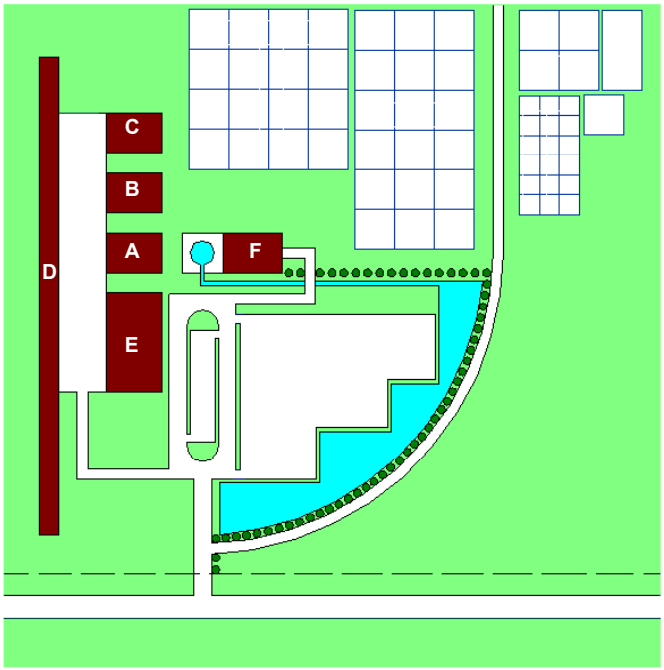


Preliminary

Irrigation Technology Center of Texas **Texas A&M University System**

Beach Ramirez in association with **Diamond Consulting**

Figure 4



Building Complex

A. Irrigation Lab 1
B. Irrigation Lab 2
C. Central Shop
D. Drip Testing Lab
E. Hydraulics Lab
F. Admin and Education Bldg

Preliminary

Irrigation Technology Center of Texas Texas A&M University System

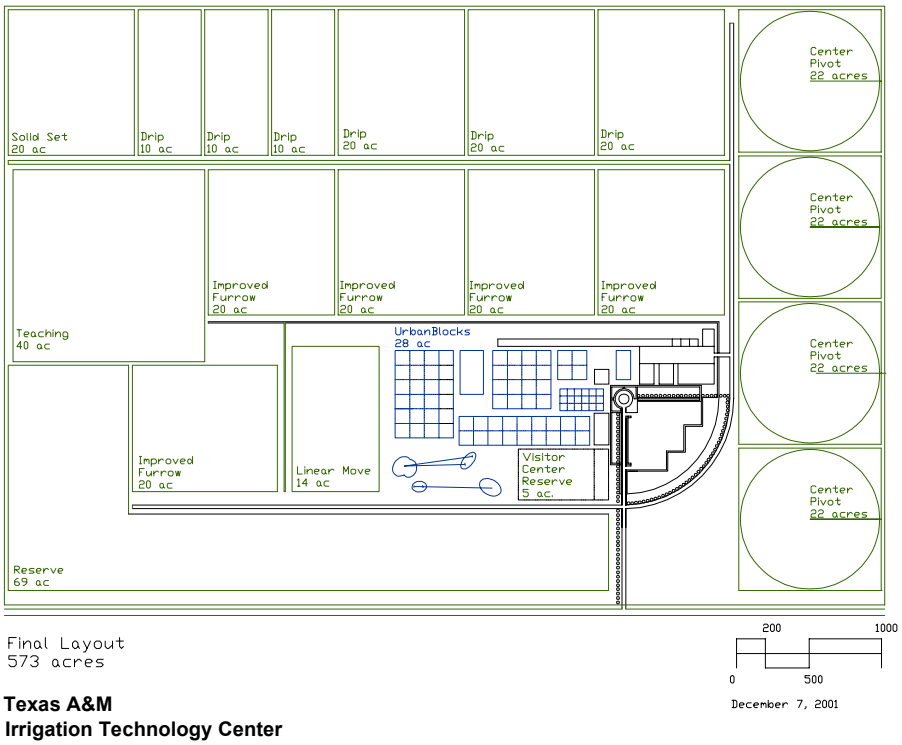
Beach Ramirez in association with **Diamond Consulting**

B. Summary

The final Design Concept chosen (Figure 5) was a redesign of the square layout scheme (Figure 3). This accommodated all of the elements that were identified in the Building and Land Requirements (Table 7) and the input from Dr. Fipps and the Administration Team. At this level of planning, the relationship among the different land and building purposes was configured as close to the wants and needs of the client as possible.

Figure 6 is the final concept plan of the core area or central building complex. The complex is organized around a water system that serves the practical need for storm water retention and irrigation of the core area while visually expressing the mission of the ITC. The concept plan accommodates the future visitor center at the front and entrance of the ITC. Additionally, the plan provides for a reserve of about 70 acres to allow for future ITC expansion, other related governmental or educational agency use, and private sector use for collaboration of research and development.

Figure 5



Irrigation Technology Center of Texas **Texas A&M University System**

Beach Ramirez in association with **Diamond Consulting**

Figure 6

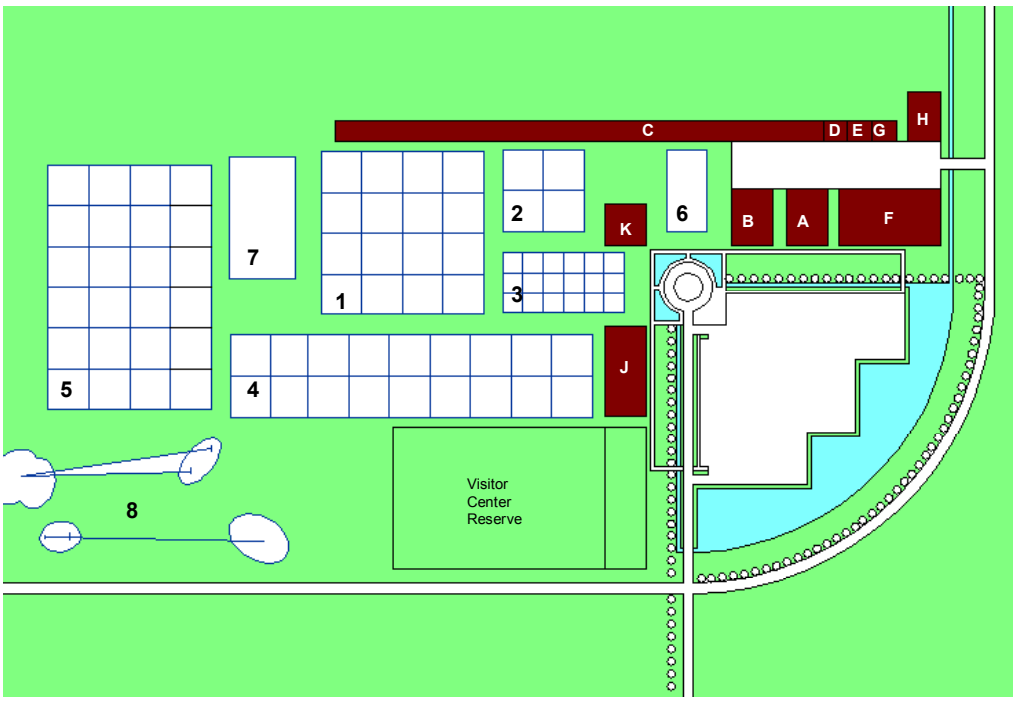
Buildings

A. Irrigation Lab 1
B. Irrigation Lab 2
C. Drip Testing Lab
D. Storage
E. Garage
F. Hydraulics Lab
G. Storage
H. Central Shop
J. Admin & Ed Bldg.
K. Outdoor Pavilion

Urban / Landscape Irrigation Unit

1, Sprinkler Testing
2. Runoff Collection
3. Microclimate
4. Irrigation Scheduling & Water use
5. Surface & Subsurface Drip
6. Open-component
7. Linear Move
8. Golf Course Holes

Final Draft Building Complex



Irrigation Technology Center of Texas **Texas A&M University System**

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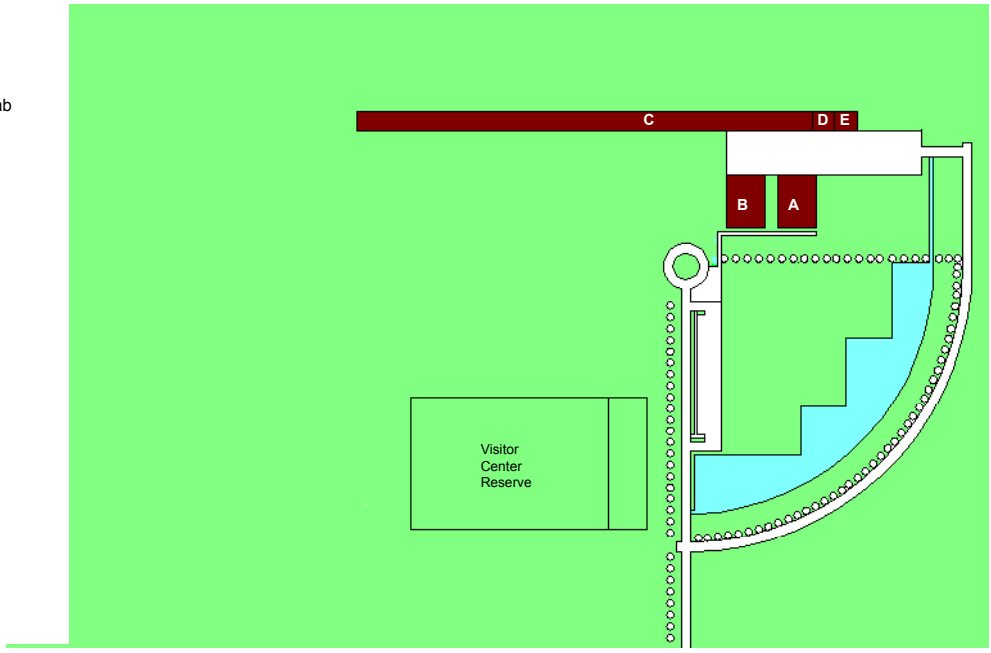
Figure 7 below illustrates the overall concept plan for Phase 1 of the Irrigation Technology Center of Texas as well as an enlargement of the core building area for Phase 1. As described previously, Phase 1 includes Irrigation Testing Labs 1 (Wind Tunnel) & Lab 2, the Drip Testing Lab, and the Garage.

Final Draft **Phase 1 Building Complex**

Buildings

A. Irrigation Lab1
B. Irrigation Lab 2
C. Drip Testing Lab
D. Storage
E. Garage



Irrigation Technology Center of Texas **Texas A&M University System**

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C. Development Controls

Development controls would be determined first by the requirements of the Texas A&M University System then by any local (i.e., City of San Antonio) controls. The development controls that should be considered include requirements addressing: architecture style, building materials, building sizes, building height, land-to-building ratios, landscaping, parking, easements, signage restrictions, lighting requirements, buffers, entryway designs, road design, etc.

Once a final master plan is commissioned and approved, then detailed development controls can be established. Until then, it is noted that development controls will be required by the university system and should be an integral part of the master planning process.

V. Site Selection Criteria

In the selection of a site, various categories of criteria should be analyzed. Typically, site selection criteria are divided into three levels of priority (Primary, Secondary, and Tertiary). Each level is assigned a weight and a matrix is developed to determine the "score" for each site.

Since the site selection process has not been initiated by the ITC, we have not formulated the Primary, Secondary, and Tertiary criteria. Based on the uniqueness of the Irrigation Technology Center of Texas along with our experience in other projects, we recommend the use of the categories below for site selection.

Transportation

- ◊ Access - ease of access to the site and into the site from the road frontage
- ◊ Egress - ease of egress out of the site
- ◊ Linkages to major thoroughfares - direct link to major arterial(s) that provide linkages to city center, airport, rail, hotels, retail, suppliers, and routes to other cities.

Infrastructure

- ◊ Availability of water, sewer, electricity, phone and data, cable - including type of service, ability to tap into these services, and distance to available services.
- ◊ Capacity of water, sewer, electricity, phone and data, cable - including current and future capacity and upgrades to services and timetable for future capacity upgrades.

Cost

- ◊ Land cost - per acre cost comparison
- ◊ Cost to bring utilities to and through the site - includes distance and need for up-sizing of lines for require current and future capacity.
- ◊ Cost to bring roads to and through the site - including cost for any easement crossings, bridges, etc.
- ◊ Extraordinary cost to build as a result of soil conditions, slope, other
- ◊ Impact Fees - as required by local governing agencies

Location

- ◊ Access to natural water sources and bodies of water - includes proximity to ponds, lakes, rivers, streams, aquifers, reservoirs, etc.
- ◊ Access to all outsourced services - including maintenance service entities
- ◊ Access to support facilities - includes: universities, community colleges, local, state and federal agencies, specialized educational programs, hotels, restaurants, retail, suppliers, etc.

- ◊ Compatibility with surrounding land uses - similar or like uses and transitional uses.

Terrain

- ◊ Optimal type of terrain - as required by the various functions of the ITC
- ◊ Optimal size and shape - as required by the various functions of the ITC
- ◊ Optimal types of vegetation - compatible with the functions of the ITC and its teaching programs
- ◊ Drainage - including flood-zone area, proximity to flood areas, ease of drainage, and drainage requirements such as retention/detention.
- ◊ Usability - percent of usable land after deductions for flood area, easements, setbacks, greenbelts, road right-of-ways, other.

Political

- ◊ Jurisdictional considerations - such as city/county boundaries, extra-territorial jurisdictions, etc.
- ◊ District considerations - such as congressional, schools, water, city council, tax, road, etc.)
- ◊ Consistency with political positions and their desire to see future city growth in certain areas of the city and that is also consistent with the city's development plan.

Regulatory

- ◊ Environmental considerations - such as wetlands, brownfields, and contaminated sites and proximity to those sites.
- ◊ Archeological considerations
- ◊ Water rights considerations - do they come with or without the land, restrictions to water rights, other.
- ◊ Zoning - current zoning designation(s), restrictions, variances, and changes in progress (with site and surrounding sites).

Visibility

- ◊ Primary, secondary considerations - including view of site from main road, percent of site visible from main road, and natural and man-made obstructions to view of site.
- ◊ Sense of arrival (frontage) - including location along main road, visual barriers and traffic congestion at entry point, ease of identification of facility, other.
- ◊ Image considerations - in terms of type of profile the ITC wishes to establish.

City Compatibility

- ◊ How does the site fit in with other governmental entities' plans for growth and development of the city and its infrastructure.

VI. Capital Budget, Income and Operating Expenses

This section of the report briefly summarizes the capital expenditures needed to set the ITC facilities and equipment in place as planned. The first portion will give an overall summary followed by detailed summaries that apply to each of the major categories shown below in Table 9. Secondly, a summary of the income estimates that were discussed in the Demand Analysis section will be re-stated along with some other comments relating to stakeholder support/contribution and endowment expectations. Finally, a summary of the anticipated operations and maintenance expenses will be detailed and briefly discussed.

A. Buildings, Infrastructure and Equipment Costs

Table 9 contains a summary of the overall capital budget as broken down by category.

Table 9
ITC Capital Budget Summary

	Category	Budget $
I.	Real Estate / Buildings / Soft Costs / FFE / Infrastructure	$26,629,669
II.	Equipment - Labs and Related	$1,160,400
III.	Urban Landscape Irrigation Outdoor System	$526,000
IV.	Agricultural Irrigation Outdoor System	$674,800
V.	Waste Water Unit	$703,000
VI.	ET Unit	$616,700
VII.	Computer and Information Systems	$403,200
VIII.	Support Equipment	$437,700
TOTAL CAPITAL BUDGET		**$31,151,469**
Other Assets		
	Land at Market Value (525 + acres @ $2,500/acre)*	$1,312,500
TOTAL ASSETS		**$32,463,969**

* The $2,500/acre figure includes the value of water rights.

B. Capital Budget Support Summaries

The following tables detail the categories outlined in the capital budget (Table 9). The reader is also referred to the Addendum of this report for further breakdown of construction costs by building.

Table 10

			Costs
I. Real Estate / Buildings / Soft Costs / FF&E / Infrastructure			
1.	**Land**	Assumed to be donated - costs shown here are est. incidental costs.	$100,000
2.	**Buildings Construction Costs - Includes Soft Costs and FF&E**		
	A	Irrigation Testing Lab #1	$873,093
	B	Irrigation Testing Lab #2	$1,119,076
	C	Drip Testing Lab #3	$3,391,814
	E	Garage	$263,575
	F	Hydraulics Lab	$4,784,383
	H	Central Shop	$889,868
	J	Administration and Education Building	$5,094,842
	K	Pavilion	$430,416
	D,G,I	Storage Rooms	$219,600
		Contingency (30%) :	$5,120,000
	Total:		**$22,186,667**
3.	**Infrastructure - From Dr. Guy Fipps' Budget**		
	A.	Water Distribution System	
		1. Main Pipeline #1 (650', 10" Class 310 PVC (installed)	$6,400
		2. Main Pipeline #2 (650', 10" Class 310 PVC (installed)	$6,400
		3. Main Pipeline #3 (2000', 6" Class 200 PVC (installed)	$7,400
		4. Secondary Pipelines (4,000', 6" Class 310 PVC, 2,000', 4" Class 310 PVC (installed)	$20,200
		5. Canal (2,000', 4' wide X 3' deep, lined)	$48,101
		6. Pumping Plants (3 @ $35,000, 1 @ $10,000)	$115,000
		7. Valves, Fittings, Supplies (20% of pipe costs)	$3,700
	B.	Electricity, Control Lines, Local Network - based on 60,000 lf @ $1.35/lf	$81,000
		Total	**$288,201**
4.	**Infrastructure - Other - Beach Ramirez Estimates**		
	A.	Total ($2.00/sf * 40 acres, which is the Urban and Facilities acreage est.)	$3,484,800
	B.	Water feature around the Admin / Education Building	$350,000
		Total	**$3,834,800**
5.	**Site Work**		
	A.	Const. and landscaping of two golf course holes (200 yds X 100 yds each)	$220,000
Overall Total			**$26,629,669**

Table 11

II	***Equipment - Labs and Related***	
A.	**Hydraulics Lab Equipment / Design / Calibration**	**Costs**
1.	Lab Pumps/Starters/Motors	$70,500
2.	Lab Valves and Operators	$80,500
3.	Flow Meters	$51,000
4.	Lab Pipe and Fittings	$38,500
5.	Sound Isolation for Pumps	$45,000
6.	2 Electric Fork Lifts	$60,000
7.	Lab Weigh Tanks - two 30,000 lb weigh tanks	$58,250
8.	Electronic, Computers, and Photagraphy Equip.	$56,500
9.	Constant Level Tank	$15,900
10.	Tilting Test Flume	$3,500
11.	Miscellaneous - fittings, testers, radios, gauges	$66,700
12.	Engineering Design - of eqipment layout	$50,650
13.	Open Channel Meter Calibration	$10,000
14.	Lab Personnel Training	$49,500
	TOTAL	**$656,500**
B.	**Irrigation Testing Lab #2 Equipment**	
1.	Test Equipment and Supplies	$80,000
2.	Automatic Catch Volume Syatem	$14,000
	TOTAL	**$94,000**
C.	**Irrigation Testing Lab #1 Equipment**	
1.	Test Equipment and Supplies	$80,000
2.	Automatic Catch Volume Syatem	$14,000
3.	Wind Machines and Control Systems	
	200 - 48" fans and motors	$80,000
	Control System	$20,000
	Support Structures	$30,000
	Engineering Design	$12,000
	TOTAL	**$236,000**
D.	**Irrigation Drip Testing Lab #3 Equipment**	
1.	Test Equipment and Supplies	$50,000
2.	Constant Level Tank	$15,900
	TOTAL	**$65,900**
E.	**Outdoor Test Equipment**	
1.	Test Equipment and Supplies	$80,000
2.	Automatic Catch Volume Systems	$28,000
	TOTAL	**$108,000**
	Overall Total	**$1,160,400**

Table 12

III. Urban Landscape Irrigation Outdoor Systems

		Costs
1.	Landscaping and Plot Establishment	$240,000
2.	Irrigation Systems	$149,000
3.	Materials and Supplies	$47,000
4.	Installation	$90,000
	Total	**$526,000**

Table 13

IV. Agricultural Irrigation Outdoor Systems

		Costs
1.	Center Pivot Irrigation System (4) - 640' long	$120,000
2.	Linear Move Irrigation System (2) - 960' long	$120,000
3.	Solid Set Irrigation System (20 acre)	$50,000
4.	Portable Solid Set Irrigation System (10 acre)	$25,000
5.	Surge Valves (2) - 10 inch	$3,200
6.	Surge Valves (2) - 6 inch	$2,400
7.	ARFIS - 20 acre	$24,000
8.	Drip Related	
	Tape	$20,000
	Tape / Plastic Mulch	$30,000
	Permanent Buried Drip	$48,000
	Micro Spray	$48,000
	Drip Pump Trailer	$18,000
9.	Big Guns (3)	$40,500
10.	Side Roll (3)	$16,500
11.	Pumping Plant Efficiency Testing Unit	
	Torque Cell Instrumentation	$7,500
	Flow Meters (propeller and ultrasound)	$11,000
	Tools and Parts	$2,500
	Test Shaft Kits	$4,600
	Portable PC and Printer	$2,600
	Trailer	$2,500
	Vehicle - Pickup	$22,000
12.	Miscellaneous	$56,500
	Total	**$674,800**

Table 14

V. Waste Water Unit	
	Costs
1. On Site Wastewater Treatment	$205,000
2. Water and Wastewater Lab	$175,000
3. Instrumentation of Waste Water Application Sites	$100,000
4. Disinfection Systems	$84,000
5. Wastewater Storage Facilities	$54,000
6. Pumps and Filters for Wastewater Containing Solids	$35,000
7. Design Services	$50,000
Total	**$703,000**

Table 15

VI. ET Unit	
A. Weighing Lysimeters	**Costs**
1. Large Weighing Lysimeters (4)	$340,000
2. Medium Weighing Lysimeters (9)	$90,000
3. Small Weighing Lysimeters (18)	$90,000
4. Engineering Design	$10,000
B. Weather Stations	
1. Weather Stations (3)	$15,000
2. Spare Parts and Sensors	$7,000
3. Installation Costs	$3,000
4. Portable PC	$2,200
C. Soil Water Monitoring / Control and ET Devices	
1. Neutron Probe	$5,000
2. Time Domain Reflectometer	$15,000
3. Resistance Blocks and Meters	$6,000
4. Portable Probes	$3,000
5. Tensiometers With Charge Kits and Spare Parts	$2,500
6. Switching Tensiometers, Solenoid Valves	$4,000
7. Automatic Moisture Sensing Capacitance Meter	$12,000
8. ET Devices	$4,000
9. Sap Flow System	$8,000
Total	**$616,700**

Table 16

VII. Computer and Information Systems

		Costs
1.	Internet Server	$5,000
2.	Local Network Server	$5,000
3.	TTVN Equipment	$119,000
4.	Computer Lab (20 computers)	$50,000
5.	Office Computers and Network Printers	$45,000
6.	Audio Visual Equipment	$12,000
7.	Instrumentation Lab Equipment	$25,000
8.	Phone Systems	$75,000
9.	Contingency - 20%	$67,200
	Total	**$403,200**

Table 17

VIII. Support Equipment

		Costs
A.	**Machinery / Implements**	
1.	Tractor	$83,000
2.	6-Row Planter	$16,000
3.	6-Row Conservation Cultivator	$15,000
4.	Flail Shredder	$12,000
5.	6-Row Ripper	$4,000
6.	6-Row Fertlilizer Injector	$5,000
7.	6-Row Tiller	$9,000
8.	6-Row Disk Bailer	$7,000
9.	4-Row Ripper	$8,000
10.	4' Drill	$14,000
11.	8-Row, 4-Wheel Drive Sprayer	$80,000
12.	Tank Set	$3,500
13.	Drip Tape Plastic Mulch Installer	$15,000
B.	**Landscape Maintenance Equipment**	
1.	Mowers	$30,000
2.	Aerifiers	$8,000
3.	Fertilizer Spreaders and Sprayers	$8,000
4.	Lawn Tractor, Box Blade and Loader	$35,000
C.	**Vehicles**	
1.	PickUps (2)	$44,000
2.	Auto	$22,000
3.	Trailer	$1,200
4.	Van (passenger)	$18,000
	Total	**$437,700**

C. Capital Budget Summary By Phase

As shown in Table 18, the Capital Budget for the ITC project is estimated at approximately $31,000,000. It is projected that this figure will be invested over time as the facilities and equipment for each phase are put in place. Given our previous description of the phases and their content in terms of facilities and equipment, the capital budget is broken down by phase as follows:

Table 18
Capital Budget Summary By Phases

Phase	Budget $
Ia.	$2,971,021
Ib.	$7,654,906
II.	$8,313,898
III.	$3,637,128
IV.	$988,480
V.	$7,586,035
VI.	Not Estimated
TOTAL CAPITAL BUDGET	**$31,151,467**

See support exhibit in Addendum (Table 25)

D. Financing Considerations For the Capital Budget

Given a capital budget totaling over $31,000,000, the resulting assets will provide the capabilities to generate a notable amount of income in numerous areas. The Demand Analysis section discussed a number of these areas. To the extent that the size of the capital budget is a stumbling block in getting started, a number of financing alternatives could be explored and pursued that could take advantage of the ITC's ability to generate revenue as well as its ability to gain state and federal initiatives, philanthropic donations and local stakeholder support.

The generation of predictable revenue affords the ability to leverage and thus pay for the capital budget over time. A number of options could be explored including:

1. Private Financing: Developer/Investment group builds-to-suit the ITC facilities with land pledged as collateral along with an installment purchase agreement over 10-20 years. This arrangement could be crafted numerous different ways to satisfy concerns of all parties involved.

2. Public Financing: The City of San Antonio, or other entities with bond-issuing authority, could issue bonds to raise the capital needed with payment to the bondholders recouped over 10-30 year periods. If needed, this method could be set up in phases that matched the maturing of the ITC in terms of facilities and revenue generation.

E. Potential Income Generation

As partially detailed in the Demand Analysis section, the facilities and equipment expenditures outlined in the capital budget will enable the ITC to produce numerous revenue streams. Also included as an "in-flow" of dollars are donations from local stakeholders as well as endowment contributions from philanthropic minded individuals or entities that wish to take part in aiding the conservation of water, among other things.

Table 19
Income Projections Apart From State and Federal Initiatives

Description	Phase I A	Phase I B	Phase II	Phase III	Phase IV	Phase V	Phase VI	Total All Phases
Revenue Source								
Stakeholder Annual Participation	$ 125,000	$ 125,000	$ 125,000	$ 125,000				$ 500,000
Endowment Annual Participation								
Contracts and Grants	$ 839,231	$ 116,308	$ 242,308	$ 429,692	$ 32,308	$ 109,846		$ 1,769,692
Testing and Certification Fees	$ 125,000	$ 125,000	$ 125,000	$ 150,000	$ 100,000			$ 625,000
Training and Educational						$ 512,500		$ 512,500
Publications, Software and Web Based Income	Has not been estimated, but demand for publications and software does exist and will flow out of the research, testing and training accomplished at the ITC.							
Patent Fees and/or Technology Transfer Fees	Has not been estimated, but income from eventual patents and proprietary or partnered technology will exist and will flow out of the research, development, and testing accomplished at the ITC.							
Facility Leasing To Other TAMUS Agencies	Has not been estimated, but is potentially a revenue stream that can generated from excess facility capacity and/or through other arrangements.							
TOTAL REVENUE	***$ 964,231***	***$ 241,308***	***$ 367,308***	***$ 579,692***	***$ 132,308***	***$ 622,346***		***$ 2,907,192***

Stakeholders

Potential stakeholders include entities such as San Antonio Water System, San Antonio River Authority, City of San Antonio, Edwards Aquifer Authority, and Bexar Metropolitan, among others. It is expected that at least a portion of the donations from local stakeholders will be tied to research projects or contracts to perform particular services.

In visiting with the local stakeholders, they were unwilling to project specific dollar amounts relating to their potential contributions. However, it is clear that a significant involvement from them in these terms will take place, and a conservative estimate is $500,000 annually.

Endowment
The Texas A&M University Agriculture Program's Director of Development, Mark C. Tuschak, will solicit endowment and other contributions for the ITC's development from alumni, corporations and other entities. Mr. Tuschak's estimate of endowment contributions will be based upon the total capital budget.

Contracts and Grants
These were estimated in the Demand Analysis section as Applied Research. As shown in Table 19 above, the figures total between $1.7 and $1.8 million and are broken down by phase corresponding with the O&M budget.

Testing and Certification Fees
These figures were estimated in the Demand Analysis section. As shown in Table 19, the total figure of $625,000 is broken down by phase generally corresponding with the facilities being brought on-line in each phase.

Training and Education
These figures were estimated in the Demand Analysis section. As shown in Table 19, the figure of $512,500 is shown under Phase V. This is the phase where the Administration and Education building will be built.

Publications, Software, and Web Based Income
The ITC will undoubtedly develop publications and software that details the testing and research accomplished at the ITC.

Patent Fees and Technology Transfer Fees
Revenue is possible from patents that are owned by the ITC. Also, as more and more research and development is accomplished, technology transfer fees in cooperation with the private sector is likely.

Facility Leasing
Our research has shown that numerous agencies could potentially be interested in leasing excess office and/or lab space/lab use at the ITC facilities. The Administration and Education building was intentionally expanded so that its second floor could be utilized in this regard as demand surfaces.

Other / Conclusion
There will be numerous other possibilities for revenue generation. Eventually, local visitor interest could be generated by utilizing the outdoor testing areas in the Agriculture and Urban units as "U-Pick'em", "Choose and Cut", "Choose and Dig" areas where visitors could come and cut Christmas trees, pick fruit, etc.

The design plan also allows for an expansion area where other facilities can eventually be built that meet the needs for opportunities that arise as the ITC matures. An example of this is the potential for a research and development

park where the private sector could locate near the ITC for utilization of its facilities and equipment. It is expected that a focused and aggressive marketing effort, over time, will produce numerous opportunities for the ITC.

F. Operations and Maintenance Expense Budget

Table 20 breaks down projected expenses by phase in three major categories. The Salaries and Personnel figures were developed by Dr. Guy Fipps and his staff based upon expected personnel needs at the ITC by phase. The detail of the personnel and salary requirements can be found in the Addendum of this report. This category of Salaries/Personnel is the catalyst for our estimation of the Operation and Maintenance (O&M). The O&M expense includes all the costs to operate the ITC such as utilities, supplies, transportation, maintenance and repair etc.

Table 20
Operations and Maintenance Expense Projection

Description	Phase I A	Phase I B	Phase II	Phase III	Phase IV	Phase V
Operations and Maintenance Expenses						
Salaries / Personnel	$525,000	$180,000	$375,000	$665,000	$50,000	$170,000
Operations and Maintenance	$282,692	$96,923	$201,923	$358,077	$26,923	$91,538
Other / Contingency / Reserves (5%)	$40,385	$13,846	$28,846	$51,154	$3,846	$13,077
TOTAL	**$848,077**	**$290,769**	**$605,769**	**$1,074,231**	**$80,769**	**$274,615**
TOTAL - ALL PHASES	**$ 3,174,231**					

The O&M expense is estimated based on a relationship of 65% salaries/personnel and 35% O&M. This relationship assumption was made based on indications from the ITC Administration Team who indicated that a ratio 70%/30% was common among the University's research and extension centers. In addition, an analysis of CIT's annual operating plan indicated an approximate 60%/40% relationship. As a result, we have made a projection based upon a relationship of 65%/35%. Also included is an allowance for contingency expenses. This expense category is estimated for equipment replacement reserves as well as unexpected expenses. It is calculated as 5% of the other two categories.

It should be noted that the total expenses may be higher once the facilities are in place simply due to the passage of time before they are implemented. However, it is not expected that the ratio will change significantly.

VII. Economic Impact Analysis

Economic impact analysis is primarily measured by Direct and Indirect or Induced impact. This type of analysis traces spending through an economy and measures its cumulative effects. What is measured is employment, income, sales, etc.

The two most utilized economic assessment programs are IMPLAN (Impact Analysis for Planning) and RIMS (Regional Input-output Modeling System). The IMPLAN system was originally developed by the U.S. Department of Agriculture Forest Service and then extended by the Minnesota IMPLAN Group Inc. as a DOS and then Windows application. The RIMS II model is maintained by the U.S. Department of Commerce Economics and Statistics Administration and the Bureau of Economic Analysis.

Beach Ramirez reviewed the preliminary Economic Impact Analysis produced in February 2000 by Dr. Lonnie Jones of the Agricultural Economics Department at Texas A&M University, College Station. In that analysis, Dr. Jones considered impact of on-going operations as well as the visitor expenditure impact. The model for Dr. Jones impact analysis was the IMPLAN program. Dr. Jones did not account for the on-going materials and supplies impact of the ITC or the one-time construction local economic impact.

It was not part of Beach Ramirez' scope of services to develop an IMPLAN model for the impact areas not addressed in Dr. Jones analysis. However, we used rough industry multipliers to derive an approximate one-time construction economic impact number (jobs and dollars). The analysis did not account for the phasing of the project over time, but instead assumed the entire project would be developed at one time.

Most conservative income multipliers used by analyst are in the range of 1.5 to 2.5, and most employment multipliers are in the range of 20 to 40 employees per million dollars in sales. (Measuring How Much Economic Change Will Mean to Your Community, Walden, North Carolina State University, March 15, 2000).

As shown in Table 21, the initial one-time construction impact (including equipment and supplies) is approximately $44,500,000 and should produce approximately 1,524 jobs. The amounts were adjusted downward to give more realistic numbers of people employed and dollars spent that would stay in the local San Antonio economy.

Table 21
Preliminary Economic Impact Analysis
Summary of Direct and Indirect Impact

	Initial $ Impact	Employment	Annual $ Impact	Employment
Construction, Equip. and Supplies	$ 44,328,900	1,518		
Visitor Expenditures			$ 15,953,000	291
ITC Operations			$ 6,815,324	124
Local Purchas of Supplies and Materials			$ 3,360,000	100
Total	**$ 44,328,900**	**1,518**	**$ 26,128,324**	**515**

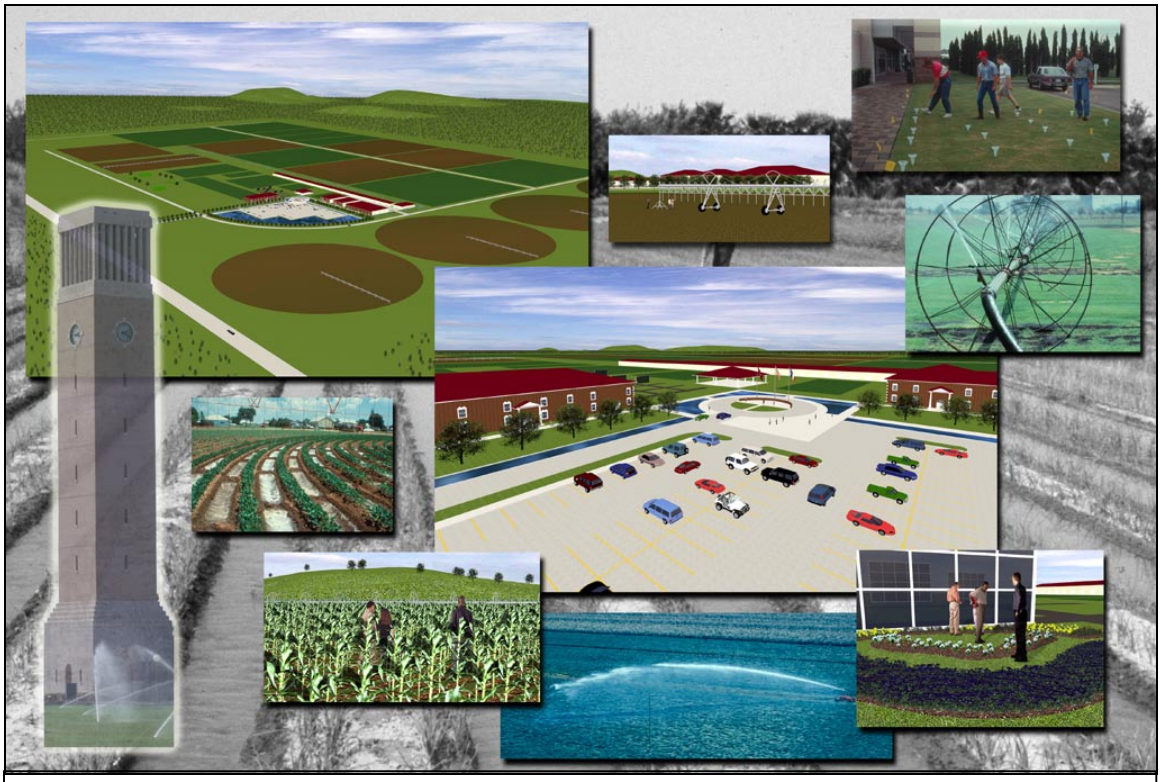
Dr. Jones' model indicates an annual visitor and ITC Operations impact of $22,768,000 and 415 jobs. Adding the on-going local purchases for supplies and materials ($3,360,000) that Beach Ramirez estimates, the total impact increases to approximately $26,100,000 annually. An industry rule-of-thumb relationship predicts 30 jobs per $1 million in expenditures will produce 100 additional jobs for local purchases of supplies and materials. Thus the total job impact is estimated at 515 jobs.

In summary, the initial local economic impact to the City of San Antonio is approximately $44,500,000 in one-time construction/supplies/equipment impact and would produce approximately 1,524 jobs. The annual on-going local San Antonio Impact would be approximately $26,100,000 providing over 500 jobs.

VIII. Rendering

Mr. Bryce Bankston of The 3rd Dimension, Inc. has developed several renderings of the ITC based upon direction from Beach Ramirez, Dr. Fipps, the Administration Team and Bill Diamond. A colage of the different renderings was developed to bring, under one illustration, a visual depiction of the ITC's vision and mission. A reduced size of the rendering follows with larger hard copies and electronic files under separate cover.

Figure 8



THE IRRIGATION TECHNOLOGY CENTER OF TEXAS
TEXAS A&M UNIVERSITY SYSTEM

Addendum

A. Construction costs estimates for each building (Table 22)

B. Construction cost estimates for each building by phase (Table 23)

C. Irrigation Association Survey Summary (Table 24)

D. Capital Budget Breakdown by Phase - Support Exhibit (Table 25)

Table 22
Preliminary Construction Cost
Irrigation Technology Center of Texas

Bldg.	Component	Sq. Ft.	Cost	Cost per Sq. Ft.
A	**Irrigation Testing Lab #1**	14,218	$ 715,650	$ 50.33
	Total Soft & FFE Cost (22%)		$ 157,443	$ 11.07
	Total		$ 873,093	$ 61.41
B	**Irrigation Testing Lab #2**	17,856	$ 917,275	$ 51.37
	Total Soft & FFE Cost (22%)		$ 201,801	$ 11.30
	Total		$ 1,119,076	$ 62.67
C	**Drip Testing Lab #3**	66,000	$ 2,780,175	$ 42.12
	Total Soft & FFE Cost (22%)		$ 611,639	$ 9.27
	Total		$ 3,391,814	$ 51.39
E	**Garage**	2,880	$ 216,045	$ 75.02
	Total Soft & FFE Cost (22%)		$ 47,530	$ 16.50
	Total		$ 263,575	$ 91.52
F	**Hydraulics Lab**	42,672	$ 3,921,625	$ 91.90
	Total Soft & FFE Cost (22%)		$ 862,758	$ 20.22
	Subtotal		$ 4,784,383	$ 112.12
H	**Central Shop**	11,520	$ 729,400	$ 63.32
	Total Soft & FFE Cost (22%)		$ 160,468	$ 13.93
	Total		$ 889,868	$ 77.25
J	**Administration & Education Building**			
	Classrooms/lab/other	33,208	$ 3,300,225	$ 99.38
	Auditorium	5,250	$ 875,875	$ 166.83
	Subtotal	38,458	$ 4,176,100	$ 108.59
	Total Soft & FFE Cost (22%)		$ 918,742	$ 23.89
	Subtotal		$ 5,094,842	$ 132.48
K	**Pavilion**	10,080	$ 352,800	$ 35.00
	Total Soft & FFE Cost (22%)		$ 77,616	$ 7.70
	Total		$ 430,416	$ 42.70
D/G/I	**Storage Rooms**	7,200	$ 180,000	$ 25.00
	Total Soft & FFE Cost (22%)		$ 39,600	$ 5.50
	Total		$ 219,600	$ 30.50
	TOTAL	**210,884**	**$ 17,066,665**	**80.93**
	CONTINGENCY (30%)		**$ 5,120,000**	**24.28**
	GRAND TOTAL		**$ 22,186,665**	**105.21**

Table 23
Preliminary Building Construction Cost By Phase
Irrigation Technology Center Of Texas

Phase		Construction Cost	% of Total Bldg. Cost
Phase 1-A			
Irrigation Testing Lab #1	$	873,093	
Contingency	$	261,928	
TOTAL	**$**	**1,135,021**	**0.05**
Phase 1-B			
Irrigation Testing Lab #2	$	1,119,076	
Garage	$	263,575	
Drip Testing Lab #3	$	3,391,814	
Subtotal	$	4,774,464	
Contingency	$	1,432,339	
TOTAL	**$**	**6,206,803**	**28.0%**
Phase 2			
Hydraulics Lab	$	4,784,383	
Contingency	$	1,435,315	
TOTAL	**$**	**6,219,697**	**28.0%**
Phase 3			
Urban Landscape Irrigation Unit	$	73,200	
Agricultural Irrigation Unit	$	73,200	
Central Shop	$	889,868	
Subtotal	$	1,036,268	
Contingency	$	310,880	
TOTAL	**$**	**1,347,148**	**6.1%**
Phase 4			
Wastewater Unit	$	73,200	
Contingency	$	21,960	
TOTAL	**$**	**95,160**	**0.4%**
Phase 5			
Administration/Education Bldg.	$	5,094,842	
Pavilion	$	430,416	
Subtotal	$	5,525,258	
Contingency	$	1,657,577	
TOTAL	**$**	**7,182,835**	**32.4%**
Phase 6		Not Estimated	
Future Visitor Center			
Subtotal	**$**	**17,066,665**	
Contingency	**$**	**5,120,000**	
TOTAL	**$**	**22,186,665**	**100.0%**

TABLE 24
IRRIGATION ASSOCIATION SURVEY SUMMARY
SAN ANTONIO, TEXAS NOVEMBER 4-6, 2001

No.	Name of Company	Contact	Phone	Type of Industry	In-House Testing ?	Business Indicator	Interest In ITC of Texas	Comment
1	OASE	Larry McDonald	800-365-3880	Fountain Scapes	No, Use University Minnesota	Growth	Yes	Industry needs : testing on standard oxygen transfer rates (OTR); flow tests; need 100' round tank to properly test OTR
2	Champion	Frank Frederick	323-221-2108	Urban Landscape	Yes, in-house	Stable/Growth	No	
3	Action Machine	Dee Zesiger	801-292-9299	Manifold & filter manufact.	Yes, Rainbird test lab	Stable	No	
4	Valterra	David Cadis	818-898-1671	Manuf. Of low pressue valves	Yes, in-house	Stable/Slow	No	They conduct their own pressure and fail tests.
5	Heron	Jimmy Carter	011-44-1903-724343	Electric controller manufact	Yes, in-house	Growth	No	They are a German company and new to the U.S. market.
6	Carroll Childers Co.	Steven Fritsche	713-991-7501	Pump packaging co.	No	Growth	No	They mentioned that there is a need for pump certification on larger scale pumps.
7	K-Rain	Bob Finnegan	561-844-1002	Sprinkler- Urban	Some in-house	Growth	Yes	They have experienced growth of 5-8%/yr. The ITC is viewed by them as a strong positive. They see a need for preliminary testing that is non-published data. They would be interested in being a contributor.
8	Tradewinds	David Courtney	305-592-9745	Pump and engine packager	No	Growth	Yes	They would like to see the big pump manufactures such as Berkley and Cornell do independent testing of their pumps.
9	Drip Incorporated	Gideon Ruttenberg	760-347-6800	Pulsating sprikler products	No	Growth	Yes	This is a smaller company, and they have had their products tested at various universities. They see a great need for testing and certification to aid smaller and medium sized manufacturers in the development of new products.
10	Tuckasee Irrigation	Ken Moore	800-725-5986	Sprikler Manuf. Ag.	Yes, in-house	Stable/Slow	Yes	The Ag. industry has slowed. They are interested in sending products to the ITC for testing.
11	Bowsmith	Robet Yarnell	559-592-9485	Drip Equipment & sprinklers	No	Stable	Yes	CIT test most of their products. They would be interested in also utilizing the ITC particularly if the ITC would do preliminary testing that is not published. Further, they would be interested in teaming up with the ITC in doing "outsourced" research and development.
12	Goulds Pumps	Roy Sanchez	210-614-6643	Pumps	Yes, in-house	Growth	No	They do no certification or testing outside of their company, They have a foundry in Lubbock, TX.
13	Chameleon	Rob Smith	800-652-0207	Pumping stations, control valves	No	Growth	Yes	They are looking to do testing by mid 2002 on pump control valves versus variable speed drive pumps.
14	Jane Titan Ind.	Mr. Kim Stephens	800-658-4086	Pump and irrigation systems Drip, PVC Casings and Screens	No	Growth	Yes	They are interested in testing pumps and irrigation systems.
15	Signature Control Systems	Kirt Schaubel	215-886-5931	Mfg. Control systems and valves	Yes, in house	Growth	Yes	Their valves are mfg. in Denmark They would be Interested in outside testing of valves.
16	Otterbein Barebo	Charlie Barebo	800-237-8837	Floating Aerators	No, University of MN	Growth	Yes	They would welcomes third party testing for oxygen transfer and

No.	Name of Company	Contact	Phone	Type of Industry	In-House Testing ?	Business Indicator	Interest In ITC of Texas	Comment
								flow rate. University of Minnesota is too cold for year round OTR testing. Their typical costs for flow rate test is $525/unit. Their typical costs for OT rate test is $2,000/unit. They see a need for education in lake management.
17	Sta-Rite Berkley	Al Iseppon	262-728-7217	Pumps mfg.	Yes, lab in Wisconsin	Growth	No	If they have a need for third party testing, they conduct it in their own lab with a third party as a witness.
18	Febco/CMB Ind.	Steve Ledermann	559-252-0791	Irrigation/waterworks/Indust/ plumbing/fire line (valves/back flow)	No	Growth	Yes	They indicaterd that sales are up a few points over last year. They believe USC needs competition. NSF 61 type testing needed. Need alternative to They see a need for an alternative to AWWA (American Water Works) Association testing courses at USC.
19	Hunter	Jeff Kremicki Kevin Gordon	760-591-7061 760-591-7117	Pumps/sprinlers/valves/ controls	Yes, in-house	Decline/ some areas	Yes	They would like to have another option to CIT. They are willing to provide/donate products for use by ITC.
20	NDS/Agrifim	Dan Chamberlin	888-720-8024	Irrigation Equipment Manuf. Drip	Yes, some in house	Some lines down, over-all growth	Yes	They are interested in ITC testing & certification, but will continue to use CIT.
21	Roberts	Jack Butler	760-744-4511	Irrigation Products 100% Ag.	Yes, limited	Growth	Yes	They normally use CIT. They see need for testing for actual field performance, resistance tpo emmitter plugging (side by side Need for putting together a program of testing several products side by side. Record sales for Roberts despite fact that national market is down 10-15%. Robert's success is due to manufacturing efficiencies.
22	WATTS	David Riley	972-888-3808	Regulators, valves, backflow	No	Growth	Yes	They use USC, CIT, & Stevens Institute for testing. Needs: Cycle testing added to backflow prevention testing - CIT does not conduct this test; Educational needs : Backflow Preventor certification testing, water supply protection specialist, backflow repair. They are Interested in bidding on ITC equipment needs and suggested providing ITC w/some necessary equipment at no cost. They would use ITC services if approved for testing by ASCE, NSF, and others.
23	BEAR	Glen Grizzle	909-308-1633	Irrigation equipment Golf courses only	No	Stable	Yes	They use ITC for testing. The industry would benfit tremendously w/ access to ITC. Needs: Urban testing of precipitation. They do not think the industry has a good education system. It needs training courses in hydraulics, electrical, and water hammer. Need testing for valves. They offered to provide sprinklers for golf course holes at ITC.
24	Ewing	Paul Mitcham	972-572-9530	Distributor & some manuf.	No	Stable	NO	
25	Valmont	Philip Reh	402-359-6147	Irrigation equipment	No	Stable	Yes	They are interested in ITC testing and certification.
26	Teeter	Randy Froelich	316-675-8330	Mfg. Pivot system accessories	No	Growth	Yes	
27	Cornell Pump Co.	Edward Ezell	503-794-0219	Pump mfg.	Yes	Growth	Yes	They are interested I ITC and would like to visit in regards to independent testing. They do their own testing and bring in witnesses when verification

No.	Name of Company	Contact	Phone	Type of Industry	In-House Testing ?	Business Indicator	Interest In ITC of Texas	Comment
								is needed. They are $27 M company with $7 M in Ag and $8M in municipal. They had their second best year ever in 2001. The Ag. side of their business has declined slightly but all due to international sales decline. They see a strong need for testing pumps specifically in the "effeciency of energy use" area.
28	Kasco Marine, Inc	Tony Vogel	715-262-4488	Aerators and Fountains	No	Stable	Yes	They have not done any outside testing in several years. When they do test, they have sent the work to the University of MN. They are not convinced that there is anyone in the testing marketplace who can accurately test for oxygen transfer rates on aerators. Industry needs an accurate test.
29	Kid Group	Phil Teel	800-373-9325	Big gun type sprinklers	No	Growth	Yes	This company manafactures and sells the portable big gun type sprinklers mainly to sports users such as golf courses and scools (football fields). Their business continues to increase. They would be interested in donating equipment for testing puroses. They do not see a huge advantage to them in terms of the testing helping them to market their product.
30	Nelson	John George	800-800-0993	Lanscape sprinkler products	Yes	Growth	Yes	The marketing people in Nelson would be interested in third party testing to aid them in selling product. They do their own testing in Florida, and they do some with CIT. Their business has done well. They have introduced 5-6 new products over the previous year.
31	NAANDAN / PSI	Phil Lubars	559-498-6800	Ag and Landscape sprinklers	Yes	Growth		They send their testing to CIT and also have a lab in France The Ag side of the business has slowed, the lawn and garden side has increased. They would be interested in ITC testing and possible R&D use of their facilities.
32	Nebraska Irrigation	Brent Brettenhauser	402-564-1514	Irrigation products	No	Stable	No	Mainly a distributor, but does mfg. some electrical parts. They have witnessed the Ag side if the industry slow down in the last two years. From their position as a distributor in the industry, they can see the need for more independent testing and for facilities that would serve as R&D bases for small and medium sized manufactures.
33	Reinke	Tim Goldhammer	402-365-7251	Pivot sytem mfg.	Yes	Stable	Yes	Reinke is a $60M company. They made the first bow string truss designs for center pivots. Ag sales have declined industry wide, but they have witnessed stable to slightly growing Ag sales. Would be interested in testing - but not in paying for it. Their reputation is tops and speaks for itself industry wide. They would possibly donate equipment to ITC.

Table 25
Capital Budget By Phase - Support

Phase		Description		Costs
1A		Land Acquisition costs		$100,000
		Infrastructure - BR		$1,500,000
	A	Lab #1 construction costs		$873,093
		30% Contingency on construction costs		$261,928
		Lab #1 Equipment		$236,000
			Total	**$2,971,021**
1B				
	B	Lab #2 construction costs		$1,119,076
	C	Drip Lab #3 contruction costs		$3,391,814
	D	Garage construction costs		$263,575
		30% Contingency on construction costs		$1,432,340
		Infrastructure - Dr. Fipps		$288,201
		Infrastructrue - BR		$1,000,000
		Lab #2 Equip.		$94,000
		Drip Lab #3 Equip.		$65,900
			Total	**$7,654,906**
2				
	E	Hydraulics Lab construction costs		$4,784,383
		30% Contingency on construction costs		$1,435,315
		Infratstructure - BR		$1,000,000
		Hydraulics Lab Equip.		$656,500
		Support Equip.		$437,700
			Total	**$8,313,898**
3				
	F	Central Shop construction costs		$889,868
		30% Contingency on construction costs		$266,960
		Infrastructure BR		$334,800
		Outdoor Test Equip.		$108,000
		Ag. Irr. Unit Equip		$674,800
		Site Work - Golf Holes		$220,000
		Urban Unit Equip.		$526,000
		ET Unit Equip.		$616,700
			Total	**$3,637,128**
4				
	I	Storage Rooms construction costs		$219,600
		30% Contingency on construction costs		$65,880
		Wastewater Unit Euip.		$703,000
			Total	**$988,480**
5				
	G	Admin and Educ. Bldg. Construction costs		$5,094,842
	H	Pavilion construction costs		$430,416
		30% Contingency on construction costs		$1,657,577
		Computer Information Systems		$403,200
			Total	**$7,586,035**
6				$0
		Overall Total		**$31,151,467**