

Fermilab Library



0 1160 0052482 1

SDC-90-00068

SDC
SOLENOIDAL DETECTOR NOTES

SSC MEMO REGARDING ROUTE RECONNAISSANCE

Ron Hoffmann

August 3, 1990

David Bentinger

Superconducting Super Collider Laboratory
2550 Beckleymeade, Building 4
Dallas, Texas 75237-3946

Conventional Construction Division

TO: Ray Stefanski
FROM: Ron Hoffmann *R.A.H.*
DATE: August 3, 1990
SUBJECT: Route Reconnaissance

REFERENCE: Letter of Dec. 9, 1988 from Chip Belding of Belding Corp. to Bob Shovan of FNAL, subject: Moving (8) eight coils 33 ft in diameter - 7 ft high, weighing 100 tons each from water at Galveston, Texas to Waxahachie, Texas.

INTRODUCTION:

In 1988, the Belding Corporation made a preliminary study for moving large magnet coil sections from the Gulf coast to Waxahachie. Their findings and estimates are reported in the referenced letter which is attached to the end of this memorandum for convenience. Using this letter as a starting point, the author made a reconnaissance on July 26 & 27 to determine what complications would be encountered if the items to be transported were the cryogenic pressure vessels for the central barrel and end caps of the calorimeter shown in Figure 1 of this memorandum. In the course of the reconnaissance several problem areas were encountered and investigated for alternate solutions which are discussed herein and included in the proposed line-of-march. A general discussion, summary and recommendations are also included, with maps, sketches and photographs provided in the appendices.

LOAD ASSUMPTIONS:

The desire has been expressed to ship the three pressure vessels complete, that is one central barrel and two end caps. The vessel for the central barrel could be broken down into three pieces which would be about the same overall size as the end cap vessels but this requires onsite facilities to assemble them and some factions in the collaboration would like to avoid this. In order for the reconnaissance to cover both aspects, two loads have been considered; a light or low load which has been designated as LL, and a heavy or high load which has been designated as HL.

LL has been assumed to consist of an end cap vessel or a one-third section of the central barrel vessel and is considered to be a vertical cylinder 34.1 ft in diameter by 11.2 ft high mounted on a transporter in such a manner that a vertical clearance of 15.25 ft is required to pass the load. The gross weight of the load is considered to be in the order of 150 tons.

HL has been assumed to consist of the complete central barrel vessel of the calorimeter and is considered to be a horizontal cylinder 34.1 ft in diameter by 30.2 ft long mounted on a transporter in such a manner that a vertical clearance of 38.25 ft is required to pass the load. The gross weight of the load is considered to be in the order of 300 tons.

PROPOSED LINE-OF-MARCH:

Maps are provided in Appendix A of the areas through which the line-of-march passes. Bridges have been noted as two types, significant and lesser. Significant bridges are considered to be those which are long enough to be required to support the whole load while lesser bridges are considered to be those which are short enough to be required to support only about half of the load.

Mile 000.0 Texas Highway (TH)35 bridge over the Brazos River near East Columbia. See Problem Area #1

HL & LL Proceed east on TH35. Cross one significant bridge over creek. Go through West Columbia.

Mile 003.8 Junction TH35 & TH36.

HL & LL Proceed north on TH36. Cross two lesser bridges over creeks. Go through Damon, Guy, Needville, and Pleak.

Mile 034.1 Junction TH36 & United States Highway (US)59. US59 overpasses TH36 with diamond interchange. See problem area #2.

HL Avoid underpass by going east on US59 on-ramp to US59 eastbound lanes, cross over to US59 westbound lanes on temporary crossover, exit US59 westbound on off-ramp to TH36, and proceed north on TH36.

LL Proceed north on TH36 under the overpass.

Mile 035.9 Junction TH36 & US90 Alt. in Rosenberg. See Problem Area #3.

HL & LL Proceed west on TH36/US90 Alt. for one block to junction with Texas Farm Road (FR)723. Proceed north on FR723. Cross one significant bridge over river.

Mile 040.9 Junction FR723 & FR359.

HL & LL Proceed north on FR359. Cross three lesser bridges over creeks. Go through Fulshear.

Mile 056.4 Junction FR359 & Interstate Highway (IH)10. IH10 overpasses FR359 with diamond interchange. See problem area #4.

HL & LL Avoid underpass by going east on IH10 on-ramp to IH10 eastbound lanes, cross over to IH10 westbound lanes on temporary crossover,

exit IH10 westbound on off-ramp to FR359, and proceed north on FR359.

Mile 056.9 Junction FR359 & US90.

HL & LL Proceed west on FR359/US90.

Mile 057.2 Junction FR359 & US90.

HL & LL Proceed north on FR359. Cross four lesser bridges over creeks. Go through Pattison and Monaville.

Mile 079.2 Junction FR359 & US290.

HL & LL Proceed west on US290. Cross four significant bridges over rivers and creeks. Go through Hempstead.

Mile 083.0 Junction US290 & TH6.

HL & LL Proceed north on TH6. Cross four significant bridges over rivers and creeks. Go through Howth.

Mile 098.7 Junction TH6 & Business TH6 to Navasota.

HL & LL Proceed north on TH6. Cross one lesser and three significant bridges over rivers and creeks. Cross one railroad overpass. Other overpasses can be avoided by using the off and on ramps of the diamond interchanges.

Mile 121.0 Junction TH6 & Business TH6 to College Station and Bryan.

HL & LL Proceed north on TH6. Cross one significant bridge over river. Other overpasses and underpasses can be avoided by using the off and on ramps of the diamond interchanges and the frontage road.

Mile 132.2 Woodville Road overpasses TH6 and its frontage road. No interchange. See Problem Area #5.

HL Avoid underpass by turning north on temporary road, cross Woodville Road at a convenient grade, return south to TH6 on temporary road, and proceed north on TH6.

LL Proceed north on TH6 under the overpass.

Mile 133.3 Junction TH6 & Business TH6 from Bryan. Northbound Business TH6 overpasses TH6. See Problem Area #6.

HL Avoid underpass by temporary crossovers to and back from the frontage road. Proceed north on TH6.

LL Proceed north on TH6 under the overpass.

Mile 138.5 Railroad overpasses TH6. See Problem Area #7.

HL Avoid underpass via temporary ramps to grade crossing. Proceed north on TH6. Cross railroad overpass. Go through Hearne.

LL Proceed north on TH6 under the overpass. Cross railroad overpass. Go through Hearne.

Mile 148.7 Junction TH6, US79, US190, and FR391. At this junction TH6 comes from the south and goes north; US90 comes from the south and goes west; US79 comes from the north and goes west; and FR391 comes from the east, overpasses TH6, and goes west. See Problem Area #8.

HL Avoid underpass by turning west on Wheelock, proceeding two blocks to Cedar, then north on Cedar seven blocks to Davis, and then two blocks east on Davis back to TH6. Proceed north on TH6.

LL Proceed north on TH6 under the overpass.

Mile 150.9 Junction TH6 & US79. At this junction TH6 comes from the south and goes north while US79 comes from the east and goes south. Both lanes of US79 overpass the northbound lanes of TH6. The southbound lanes of TH6 are unimpaired. See Problem Area #9.

HL Avoid underpass by crossing over from the northbound lanes of TH6 to the southbound lanes, then proceed north the wrong way for 0.7 miles, then cross back over to the northbound lanes and proceed north on TH6. Go through Calvert and Hammond.

LL Proceed north on TH6 under the overpass. Go through Calvert and Hammond.

Mile 167.3 Junction TH6 & TH14.

HL & LL Proceed north on TH14. Cross one significant bridge and six lesser bridges. Go through Bremond, Kosse, Thornton, Groesbeck and Mexia.

Mile 209.0 Junction TH14 & TH171.

HL & LL Proceed west on TH171. Cross three lesser bridges. Go through Tehuacana, Coolidge, Hubbard, and Malone.

Mile 238.2 Junction TH171 & FR308. See Problem Area #10.

HL & LL Proceed north on FR308. Cross eight lesser bridges. Go through Irene, Mertens, and Milford.

Mile 254.0 Junction FR308 & US77.

HL & LL Proceed north on US77. Go through Italy.

Mile 259.3 Junction US77 & TH34. See Problem Area #11.

HL & LL Proceed west on TH34.

Mile 260.3 Junction TH34 & IH35E.

HL & LL Proceed north on IH35E Cross one significant bridge.

Mile 264.0 Farm road overpasses IH35E; no interchange. See Problem Area #12.

HL Avoid underpass by turning east on temporary road, crossing farm road at a convenient grade, and returning west to IH35E on temporary road. Proceed north on IH35E.

LL Proceed north on IH35E to Mile 273.2. Cross one significant bridge.

Mile 264.7 Junction IH35E & FR329.

HL Proceed east on FR329. Go through Forreston.

Mile 265.2 Junction FR329 & US77.

HL Proceed north on US77. Cross one significant bridge.

Mile 272.5 Junction US77 & IH35E northbound frontage road. See Problem Area #13.

HL Proceed north on IH35E frontage road.

Mile 273.2 See Problem Area #13.

HL Cross over from northbound IH35E frontage road to southbound IH35E frontage road via temporary crossovers. Proceed north on southbound IH35E frontage road, the wrong way for 0.2 miles.

LL Cross over from northbound IH35E lanes to southbound IH35E frontage road via temporary crossovers. Proceed north on southbound IH35E frontage road, the wrong way for 0.2 miles.

Mile 273.4 Junction IH35E southbound frontage road & FR66.

HL & LL End of line-of-march for this reconnaissance.

PROBLEM AREAS:

Maps are provided in Appendix A which indicate the location of the problem areas.

Problem Area #1 - Mile 000.0 Having only the sketchy information in the referenced letter and no detailed local map of the area, the author was unable to determine the intended point of off-loading from water transport to land transport. For purposes of this reconnaissance it has been assumed that the off-loading point is the TH35 bridge over the Brazos River. Pictures 1 thru 7 of Appendix C show this area. Additional

investigation in this regard must be made before this end of the line-of-march can be finalized.

Problem Area #2 - Mile 034.1 The TH36 underpass under US59 has a clearance of only 16.25 ft. This is a problem for the HL only. The underpass can be locally circumvented by going east on the US59 on-ramp to the US59 eastbound lanes, crossing over to the US59 westbound lanes on a temporarily constructed crossover, then exiting the US59 westbound lanes on the off-ramp to TH36, and proceeding north on TH36. Sketch 1 of Appendix B shows the circumvention. Photographs 8 and 9 of Appendix C show the underpass and the area of the temporary crossover construction.

Problem Area #3 - Mile 035.9 The route proposed in the referenced letter proceeded west from Rosenberg on TH36 to Sealy and then back east to Brookshire on IH10 and US90. This route is not possible. There are two minimal clearance railroad underpasses on TH36/US90 Alt. as it proceeds west through Rosenberg which will pass neither the HL nor the LL. The area is congested and there is no room for local circumvention. The line-of-march had to be changed to take either FR723 north to FR359, or US90 Alt. east through Richmond to FR359. For purposes of this reconnaissance, the route north on FR723 was chosen because it is shorter and avoids congested areas even though it crosses the Brazos River on a farm-road-class bridge. A cost trade study should be made of the two routes before this area of the line-of-march is finalized.

Problem Area #4 - Mile 056.4 The FR359 underpass under IH10 has a clearance of only 14.75 ft. This is a problem for both the HL and the LL. The underpass can be locally circumvented in the same manner as described in Problem Area #2.

Problem Area #5 - Mile 132.2 The TH6 underpass under Woodville Road has clearance to pass the LL but not the HL. The underpass can be locally circumvented by going north on a temporarily constructed road across the frontage road and along Woodville Road to a convenient grade with Woodville Road, crossing Woodville Road, and then proceeding back to TH6 on a temporarily constructed road. Sketch 2 of Appendix B shows the circumvention.

Problem Area #6 - Mile 133.3 The TH6 underpass under northbound Business TH6 from Bryan has clearance to pass the LL but not the HL. The underpass can be locally circumvented by crossing over to the frontage road on a temporarily constructed crossover, proceeding on the frontage road to a point past the underpass, and then crossing back to the TH6 northbound lanes on another temporarily constructed crossover.

Problem Area #7 - Mile 138.5 The TH6 underpass under the railroad about 10 miles south of Hearne has clearance to pass the LL but not the HL. The underpass can be locally circumvented by temporarily constructing off and on ramps adjacent to TH6 to a convenient grade crossing with the railroad. Photographs 10 and 11 of Appendix C show the underpass and its approaches.

In an attempt to solve this problem area without temporary construction, an alternate route was investigated which would go west on TH21 from Bryan to FR50, north on FR50 to US79/US190, and then back to TH6 on US79/US190. This alternate was abandoned when another railroad underpass, with less local circumvention potential, was found on TH21 between OSR and FR50. Another alternate route was investigated which would come from the south on TH36 to US79/US190 and then go east on US79/US190 back to TH6. This alternate was also abandoned upon the discovery of an even worse railroad underpass on TH36 just south of its junction with US79/US190.

Problem Area #8 - Mile 148.7 The TH6 underpass under FR391 in Hearne has clearance to pass the LL but not the HL. The underpass can be locally circumvented on the streets of Hearne by turning west at Wheelock prior to reaching the underpass, going two blocks on Wheelock to Cedar, then going seven blocks north on Cedar to Davis, and then going two blocks east on Davis back to TH6. This route was chosen by the author based on space at the city street intersections which is anticipated to be required to make the turns. Further study in this area should be performed before the line-of-march is finalized. Photographs 12 through 16 of Appendix C show the underpass and the route of circumvention.

Problem Area #9 - Mile 150.9 The northbound lanes of TH6 underpass US79 about 2 miles north of Hearne. The clearance of the underpass is not marked but is estimated by the author to be in the order of 20 ft. This is a problem for the HL only. Since the southbound lanes of TH6 are unimpaired at this junction, the underpass can be locally circumvented by crossing over from the northbound lanes of TH6 to the southbound lanes south of the underpass; then proceeding north, the wrong way in the southbound lanes of TH6 for 0.7 miles; and then crossing back over to the northbound lanes of TH6 north of the underpass. This plan of circumvention must be approved by the Texas Department of Public Safety before finalization of this area of the line-of-march. Photograph 17 of Appendix C shows the underpass. Sketch 3 of Appendix B shows the circumvention.

Problem Area #10 - Mile 238.2 The route proposed in the referenced letter proceeded on TH171 "...northwest to Brandon; then north on Route 77..." As shown on Map 3 of Appendix A, Brandon is not on TH171 nor US77; its on TH22. Two alternate routes in this area were investigated by the author; the first going northwest from Malone on TH171 to IH35, north on IH35 to US77, and then north on US77 to Milford; the second going north from Malone on FR308 through Mertens to Milford. The second alternate route was chosen because it is far less inhibited by congested areas and does not have non-interchange-underpasses which must be circumvented for the HL as does the first alternate route. Photographs 18 and 19 of Appendix C show these underpasses.

Problem Area #11 - Mile 259.3 The route proposed in the referenced letter proceeds "...north on Route 77 to the site at Waxahachie." The US77 bridge over Chambers Creek three miles north of Italy is a through-truss type bridge with a vertical clearance of 14.67 ft and a total width of approximately 21 ft. Photograph 20 of Appendix C shows the bridge. Neither the HL nor the LL can pass this bridge. The bridge would have to be replaced or the line-of-march would have to be changed. For purposes of this reconnaissance the later alternative was chosen as the least expensive.

Problem Area #12 - Mile 264.0 About four miles north of the junction of IH35E and TH34, IH35E underpasses a farm road. The clearance of this underpass is sufficient to pass the LL but not the HL. The underpass can be circumvented in a manner similar to that described in Problem Area #5. There are ruminants of old roads in the area which may be of use in the temporary construction.

Problem Area #13 - Mile 272.5 The referenced letter ended the route at Waxahachie. The ultimate goal of the line-of-march is the West Campus of the SSCL. In order to reach this goal the author has assumed that FR66 will be improved from IH35E to the site and all that need be included in this reconnaissance is a way to reach FR66 on the west side of IH35E. Both the overpass over IH35E for FR66 and the one a mile to the south are inhibited for our use by the sharp turns required to get on and off of them.

Photographs 21 through 23 of Appendix C illustrate this problem. There is, however, an area just south of the FR66 overpass where the northbound frontage road, the northbound lanes, the southbound lanes, and the southbound frontage road of IH35E are all at approximately the same grade and temporary crossovers can be constructed at minimal expense. This solution requires traversing the southbound frontage road of IH35E in the wrong direction for about 0.2 miles. This plan must be approved by the Texas Department of Public Safety before this area of the line-of-march can be finalized. Photographs 24 through 27 of Appendix C show the area of the proposed crossovers.

GENERAL DISCUSSION:

Horizontal Clearances In all cases the width of the paved lanes is at least 12 ft except for FR308 from Mertens to Milford where the lanes narrow to 10 ft. But even here, as elsewhere, the width of the right-of-way is adequate for either load. There will be some tight squeezes in some of the urban areas which need further investigation but the author expects no problems in this regard.

Pavement Loads Pavement loads depend upon the design of the transporter. The line-of-march traverses interstate, US, Texas state, and Texas farm road systems. The transporter design must be coordinated with the Texas State Department of Highways and Public Transportation. It is the opinion of the author that a transporter can be designed for either of the loads which will minimize the amount of pavement improvement and/or repair required.

Bridges There are approximately 19 significant and 27 lesser bridges on the line-of-march. Of the 19 significant bridges over which the LL passes, 2 are on the Interstate Highway System, 4 are on the United States Highway System, 12 are on the Texas State Highway System, and 1 is on the Texas Farm Road System. For the HL, this distribution is, 1 on the Interstate Highway System, 5 on the United States Highway System, 12 on the Texas State Highway System, and 1 on the Texas Farm Road System. The distribution of the lesser bridges is 12 on the Texas State Highway System, and 15 on the Texas Farm Road System for both the HL and the LL. The final determination of the need for the bracing or replacing these bridges must be the result of a coordinated effort between the transport designer and the Texas State Department of Highways and Public Transportation. Due to the loads being considered in this reconnaissance being somewhat greater than in the referenced letter, the author feels that the cost of bridge bracing and replacement will be, at least, proportionately higher.

Overhead Wires Based on sample area counts, it is estimated that there are 925 overhead wire crossings, each having an average of 5 wires consisting of guywires, local power distribution wires and telephone cables. In addition, it is estimated that there are 25 overhead high-voltage power transmission crossings of the types shown in photographs 28 and 29 of Appendix C, and 30 overhead traffic signals either suspended by wires or mounted on ridged structures. All of these wire crossings and traffic signals are estimated to be high enough to pass the LL, but none are estimated to be able to pass the HL. To pass the HL, the interruption of the service which is provided by these wires would have to be coordinated with both the provider and the user, the wires and their associated obstructions removed for passage of the HL, and then all of it put back to the satisfaction of the owner after the HL has passed. The author estimates that this will require at least 32,000 man-hours of electrical construction work plus about 4,000 man-hours of engineering/ coordination effort. At about \$100 per hour for salaries, benefits, material, equipment, overhead, profit, etc. this item adds at least \$3.6M to the cost.

Too Big
for C5

Tree Trimming The LL will pass all areas with minimal, if any, tree trimming required. Tree trimming will definitely be required for the passage of the HL especially in some of the urban areas through which the line-of-march passes. Many of the trees which will have to be cut back are beautiful old shade trees which the townsfolk will not be too happy about us whacking on.

Public Sentiment The LL can pass through most areas more quickly and with less disruption to the local residents. The HL's passing will be accompanied by disruptions in power, telephone, cable and possibly other television, traffic flow, and, more or less, the beauty of the community .

CONCLUSIONS:

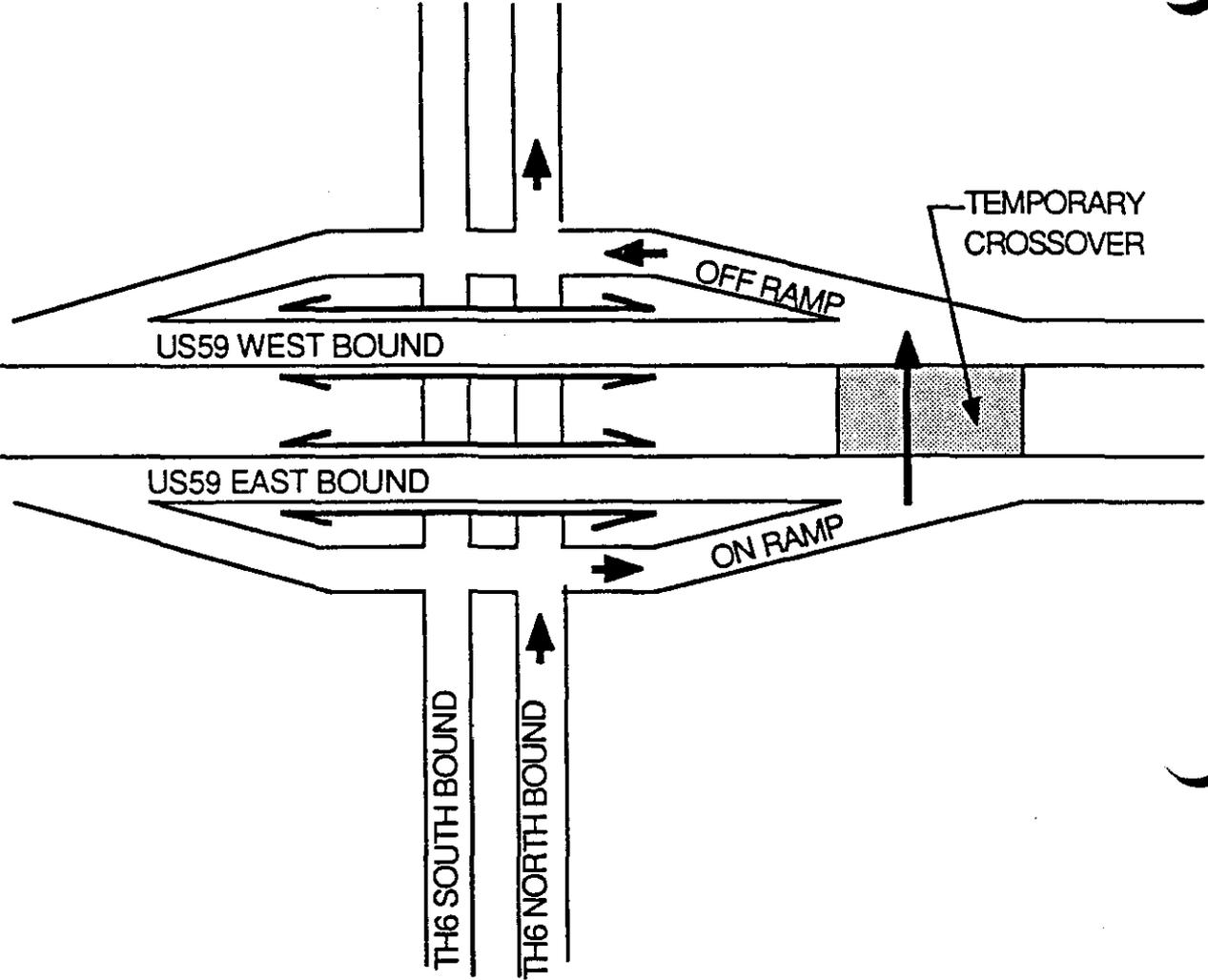
Based on the intelligence gained by this reconnaissance, the following conclusions can be drawn:

- 1.** Loads which require vertical clearances in excess of what can be accommodated on most state and interstate highway systems cause problems which have expensive solutions.
- 2.** If higher than normal loads must be transported, the secondary road systems are better; their junctions with other secondary roads and railroads are usually at grade.
- 3.** Local populations will be less disturbed if the load can pass through quickly with minimal advanced preparation and minimal post-passing clean-up being required
- 4.** Heavy loads can probably be better transported over state and interstate-type systems because of the greater load carrying capacity of their pavements and bridges.
- 5.** While transporting either the LL or the HL over the line-of-march proposed herein can be accomplished, HL transportation will be at much greater expense in dollars and in public sentiment.

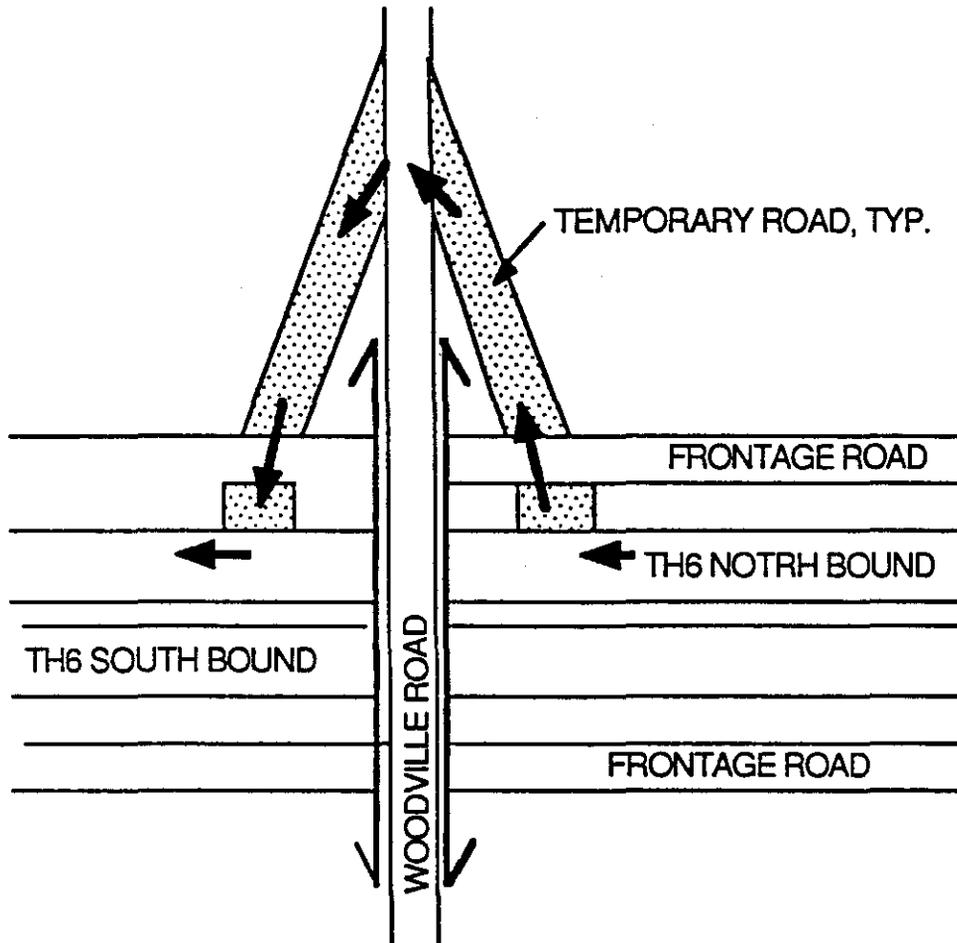
RECOMMENDATIONS:

It is the authors opinion that one-piece shipment of the cryogenic pressure vessel for the central barrel of the calorimeter is feasible but not desirable.

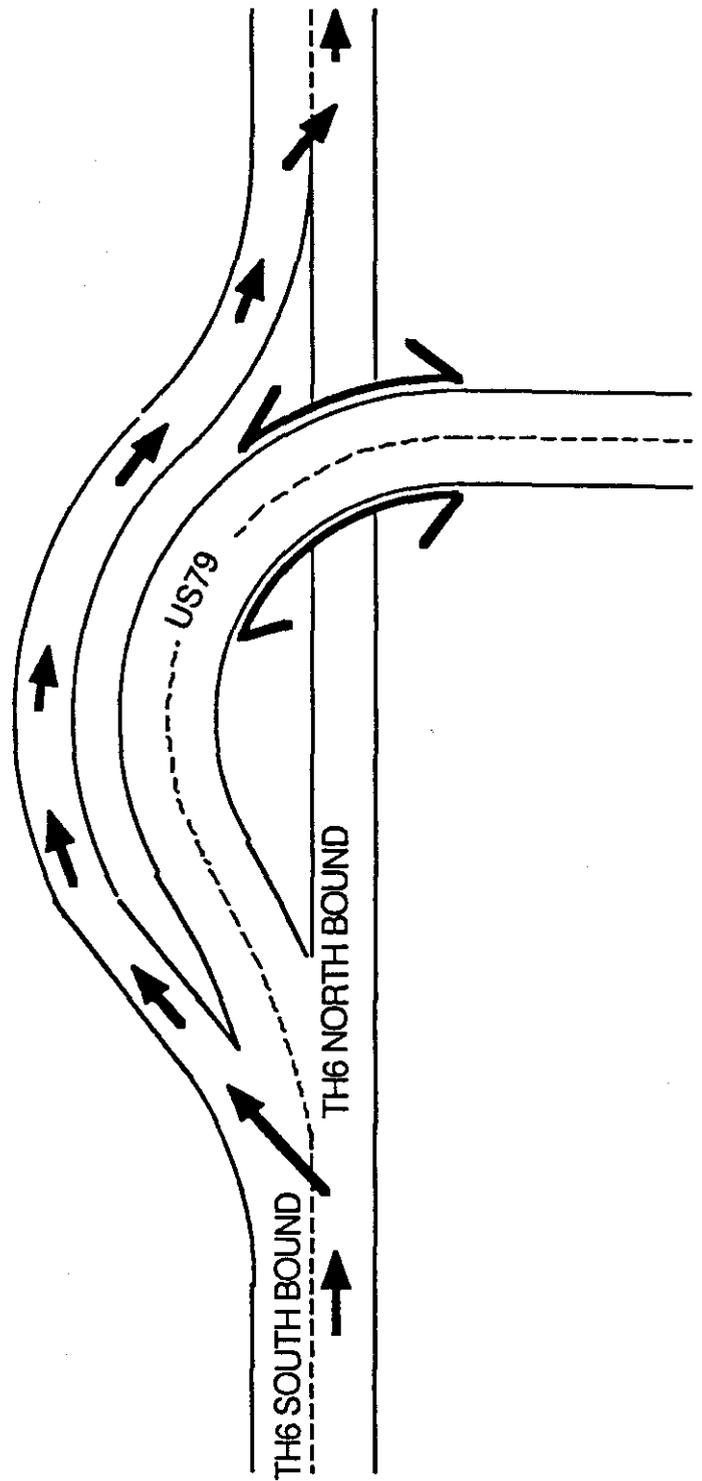
APPENDIX B
SKETCH 1



APPENDIX B
SKETCH 2



APPENDIX B
SKETCH 3



APPENDIX C



PHOTOGRAPH 1
Brazos River looking south from TH35 bridge.



PHOTOGRAPH 2
West bank of Brazos River south of TH35 bridge.

APPENDIX C



PHOTOGRAPH 3
East bank of Brazos River south of TH35 bridge.



PHOTOGRAPH 4
Brazos River looking north from TH35 bridge.

APPENDIX C



PHOTOGRAPH 5
East bank of Brazos River north of TH35 bridge.



PHOTOGRAPH 6
West bank of Brazos River north of TH35 bridge.

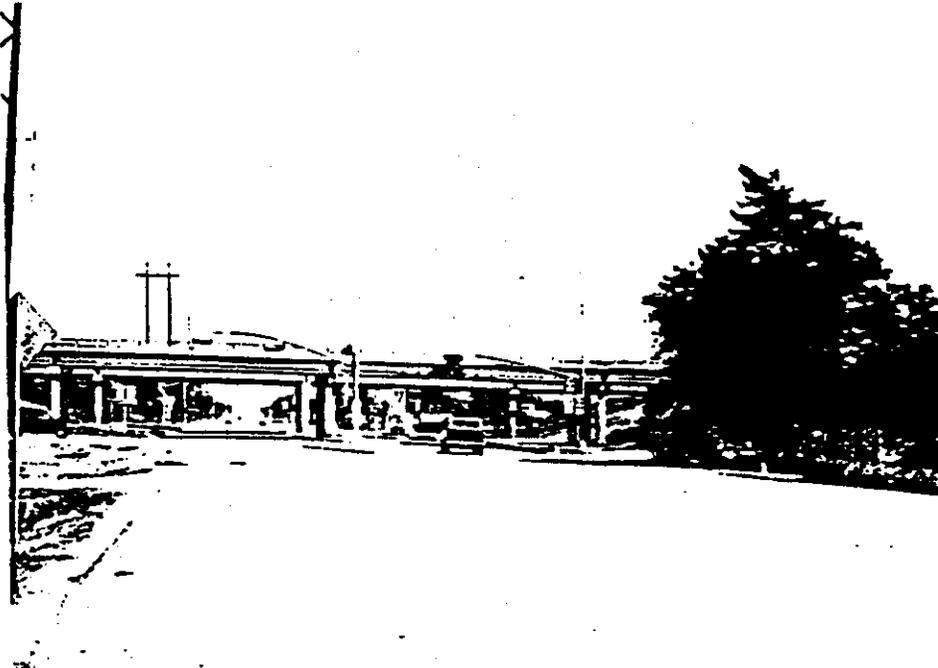
APPENDIX C



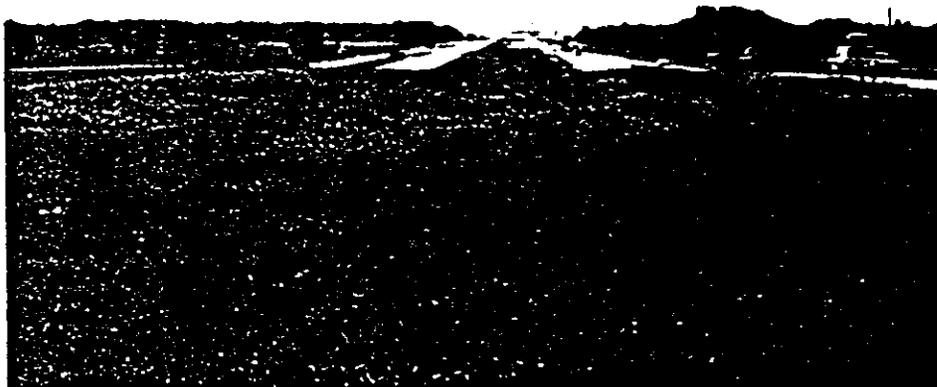
PHOTOGRAPH 7

Looking east under TH35 Brazos River bridge at 8' deep girders.

APPENDIX C

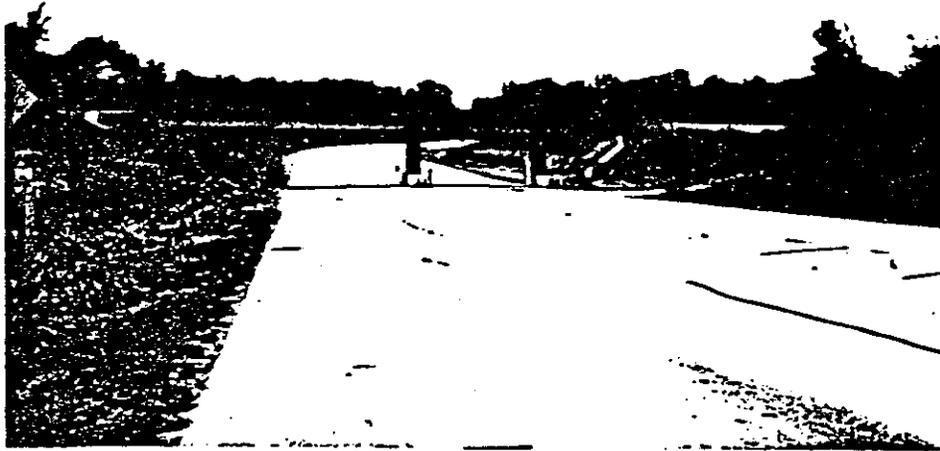


PHOTOGRAPH 8
Looking north at the US59 overpass over TH36.

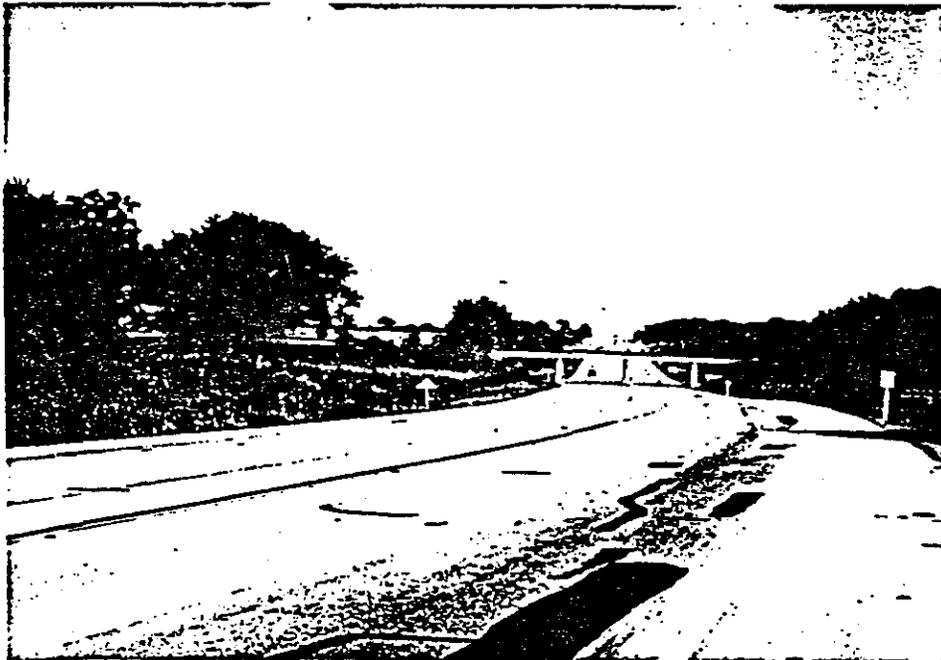


PHOTOGRAPH 9
Looking east on US59 from the top of the overpass over TH36.

APPENDIX C

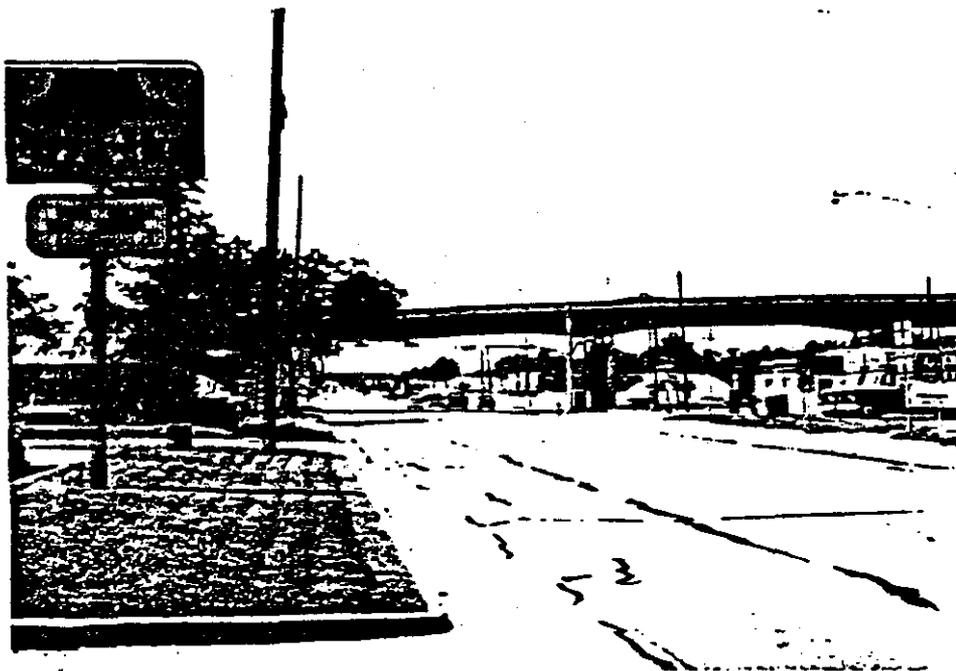


PHOTOGRAPH 10
Looking north at railroad underpass on TH6 south of Hearne.



PHOTOGRAPH 11
Looking south at railroad underpass on TH6 south of Hearne.

APPENDIX C



PHOTOGRAPH 12
Looking north at FR391 overpass over TH6 in Hearne.



PHOTOGRAPH 13
Looking east on Wheelock from Cedar in Hearne.
e.

APPENDIX C



PHOTOGRAPH 14
Looking north on Cedar from Wheelock in Hearne.

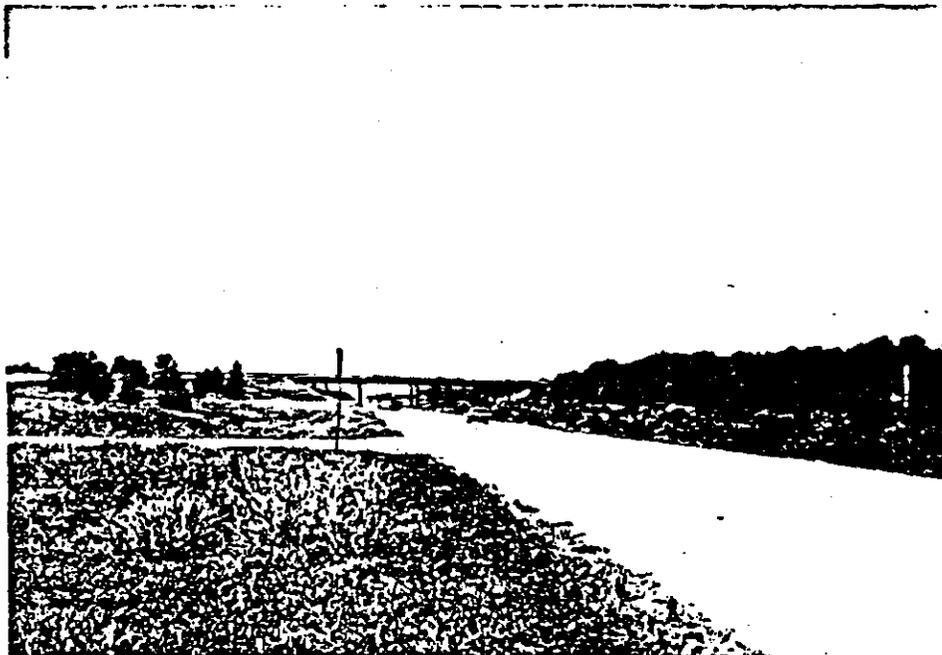


PHOTOGRAPH 15
Looking south on Cedar from Davis in Hearne.

APPENDIX C



PHOTOGRAPH 16
Looking east on Davis from Cedar in Hearne.

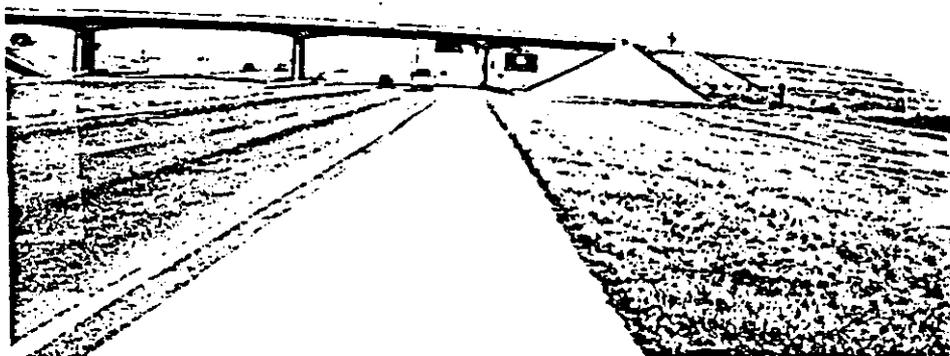


PHOTOGRAPH 17
Looking north at US79 overpass over northbound lanes of TH6.

APPENDIX C



PHOTOGRAPH 18
Looking north at railroad underpass on IH35 between TH171 and US77.

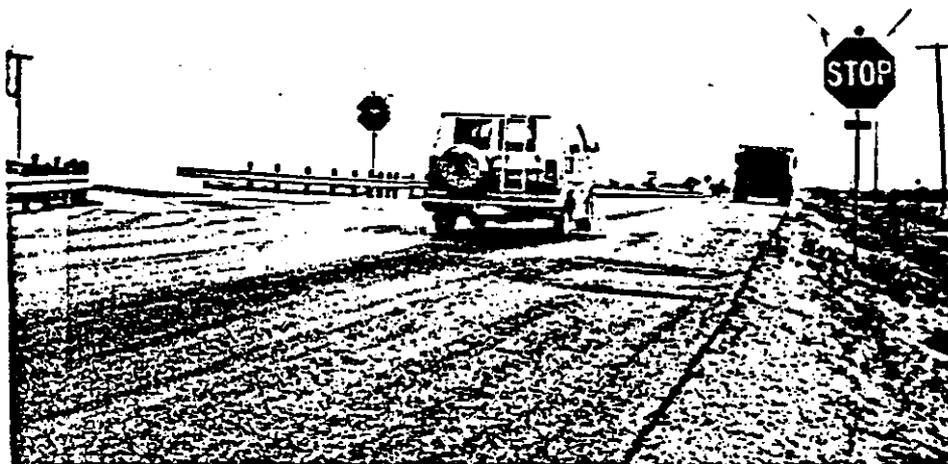


PHOTOGRAPH 19
Looking north at farm road underpass on IH35 between TH171 and US77.

APPENDIX C

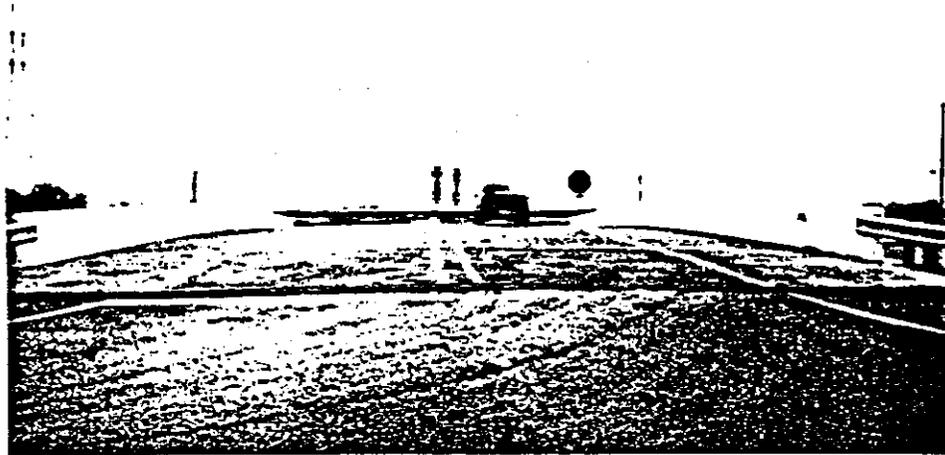


PHOTOGRAPH 20
Looking north at US77 bridge over Chambers Creek.

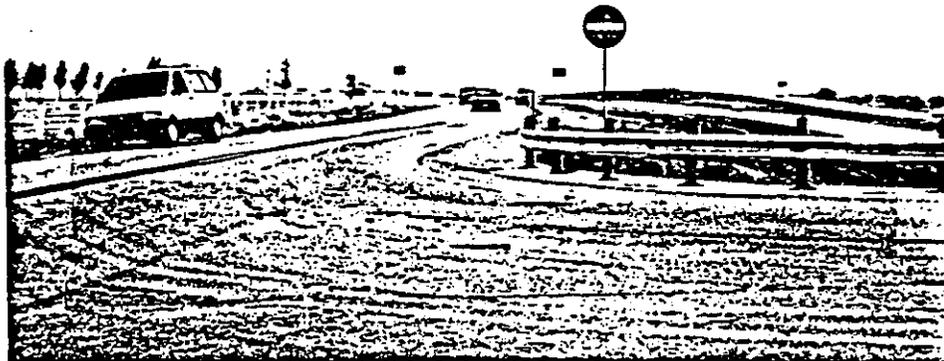


PHOTOGRAPH 21
Looking north on US77 at approach to overpass over IH35E one mile south of FR66.

APPENDIX C



PHOTOGRAPH 22
Looking east across overpass over IH35E one mile south of FR66.



PHOTOGRAPH 23
Looking north on IH35E southbound frontage road from overpass one mile south of FR66

APPENDIX C



PHOTOGRAPH 24
Looking south on northbound frontage road of IH35E just south of FR66.



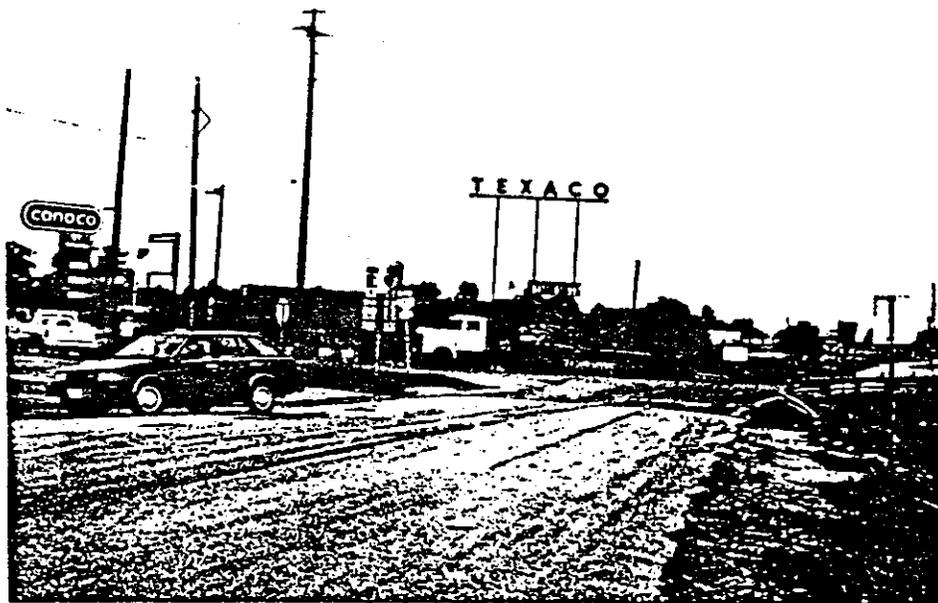
PHOTOGRAPH 25
Looking northwest across IH35E from northbound frontage road just south of FR66.

APPENDIX C



PHOTOGRAPH 26

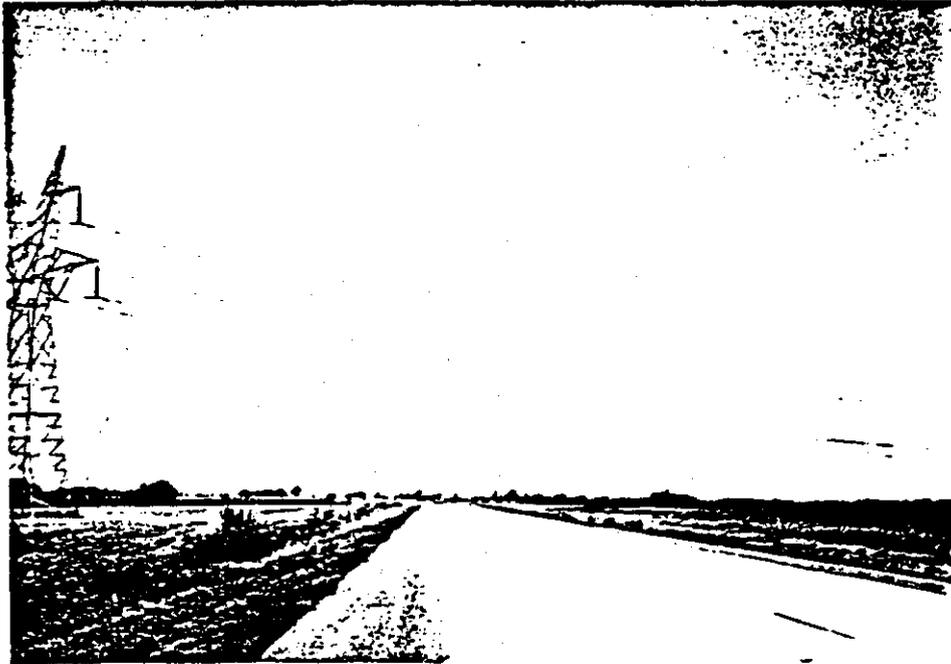
Looking southeast across IH35E from southbound frontage road just south of FR66.



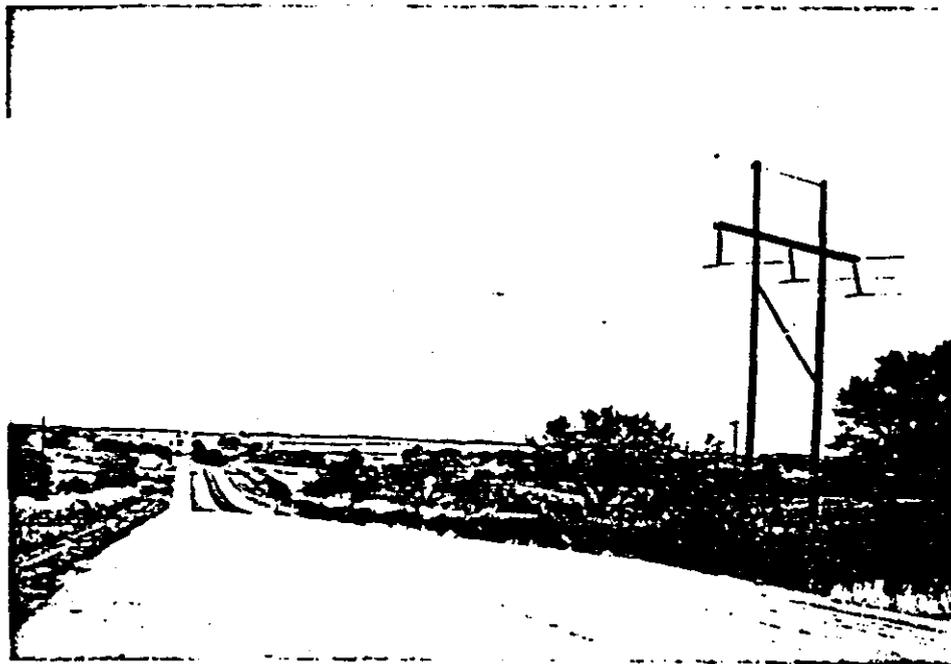
PHOTOGRAPH 27

Looking north on southbound frontage road of IH35E just south of FR66.

APPENDIX C



PHOTOGRAPH 28
Typical high voltage transmission line on towers



PHOTOGRAPH 29
Typical high voltage transmission line on poles.

SSC DETECTOR SOLENOID DESIGN NOTE #38

Title: Overland Transportation of Solenoid Modules



130 WEST GRAND LAKE BOULEVARD
P.O. BOX No. 227
WEST CHICAGO, IL 60185-0227

Suburban (312) 231-5200
Chicago (312) 287-0104
FAX (312) 231-0318

December 9, 1938

Mr. Bob Shovan
Fermi National Accelerator Laboratory
M S 318
P. O. Box 500
Batavia, IL 60510

Reference: Moving eight (8) coils
33 ft. in diameter - 7 ft. high
Weighing 100 tons each
From the water at Galveston, Texas
to Waxahachie, Texas

Dear Mr. Shovan:

Our people believe that the State of Texas would cooperate in every way possible to allow this move to be done. Their suggestion is as follows:

Rather than Galveston, go up the Brasos River at Freeport to Columbia. This stretch has been navigable for barging nuclear products and heavy reactors in the past. We would offload in Columbia, and move up Highway 36 to Sealy.

Then: move West on interstate #10 to Brookshire, then North on Route 359 to Sauney Stand; North on Route 6 to Hearne; then North on Route 14 to Mexia.

From Mexia, take Route 171 Northwest to Brandon; then North on Route 77 to the site at Waxahachie.

Possible cost for this move:

Engineering fee to the State of Texas, which would include examining bridges and possibly moving light and telephone wires for proper clearances:

\$25,000

