

Well Design and Construction Specification Checklist

Derived from Attachment B, Groundwater Compliance Plan (CP-50310)

The following checklist shall be completed for each well or series of wells.

Well ID: _____ Contract Number: _____

PART I

- | | | | | |
|---|-------------------------------|-------------------------------|--------------------------------|--|
| 1 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The well drilling methods used minimized potential adverse effects on the quality of water samples withdrawn from the well, and minimized or eliminated the introduction of foreign fluids into the borehole. [CP Atch B, #1] |
| 2 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Well was constructed to meet the terms of this Compliance Plan such that the well can be routinely sampled with a pump, bailer, or alternate sampling device. [CP Atch B, #2] |
| 3 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Piping associated with recovery well(s) was/were fitted with sample port(s) or an acceptable alternative sampling method to facilitate sampling of the recovered ground water on a well by well basis. [CP Atch B, #2] |
| 4 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Above the saturated zone the well casing used was: [CP Atch B, #3 1 st ¶] <input type="checkbox"/> 2-inch diameter or larger schedule 40 or 80 PVC rigid pipe or stainless steel or polytetrafluoroethylene (PTFE or "teflon") or <input type="checkbox"/> an approved alternate material (specify material used: _____) <input type="checkbox"/> Solvent cementing compounds were not used to bond joints and all connections were flush-threaded. <input type="checkbox"/> In and below the saturated zone, the well casing used was stainless steel or PTFE. Note: PVC casing must bear the National Sanitation-Foundation logo for potable water applications (NSF-pw). |
| 5 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The Permittee may use PVC or fiberglass reinforced resin as an alternate well casing material below the saturated zone provided that it yields samples for ground-water quality analysis that are unaffected by the well casing material. <input type="checkbox"/> PVC <input type="checkbox"/> Fiberglass (check if used) [CP Atch B, #3 2 nd ¶] |
| 6 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Well casings and screens were steam cleaned prior to installation to remove all oils, greases, and waxes. [CP Atch B, #5] <input type="checkbox"/> Well casings and screens made of fluorocarbon resins were cleaned by detergent washing. |
| 7 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The well screen length was less than or equal to ten (10) feet within a given transmissive zone. [CP Atch B, #6] <input type="checkbox"/> The well screen length exceeded (10) feet within a given transmissive zone and written approval from the Executive Director is attached. <input type="checkbox"/> The well screen length exceeded ten (10) feet within a given transmissive zone, however screen lengths exceeding ten (10) feet were installed in ground-water recovery or injection wells to optimize the ground-water remediation process in accordance with standard engineering practice. |
| 8 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The well intake portion was designed and constructed so as to allow sufficient water flow into the well for sampling purposes and to minimize the passage of formation materials into the well during pumping. [CP Atch B, #7 1 st ¶] <input type="checkbox"/> The intake portion of the well consisted of commercially manufactured stainless steel or PTFE screen or approved alternate material. [Specify material used: _____] <input type="checkbox"/> The annular space between the screen and the borehole was filled with clean siliceous granular material (i.e., filter pack) that has a proper size gradation to provide mechanical retention of the formation sand and silt. <input type="checkbox"/> The well screen slot size was compatible with the filter pack size as determined by sieve analysis data. <input type="checkbox"/> The filter pack extended no more than three (3) feet above the well screen. <input type="checkbox"/> A silt trap, no greater than one (1) foot in length, was added to the bottom of the well screen to collect any silt that may enter the well. <input type="checkbox"/> The bottom of the well casing was capped with PTFE or stainless steel or approved alternate material. [Specify material used: _____] |
| 9 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Ground-water recovery and injection wells were designed in accordance with standard engineering practice to ensure adequate well production and to accommodate ancillary equipment. [CP Atch B, #7 2 nd ¶] <input type="checkbox"/> Silt traps exceeding one (1) foot were utilized to accommodate ancillary equipment. <input type="checkbox"/> Well heads were fitted with mechanical well seals, or equivalent, to prevent entry of surface water or debris. |

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| 10 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | A minimum of two (2) feet of pellet or granular bentonite immediately overlaid the filter pack in the annular space between the well casing and borehole. [CP Atch B, #8 1 st ¶] |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Where the saturated zone extends above the filter pack, pellet or granular bentonite was used to seal the annulus. |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Above the minimum two (2) foot thick bentonite seal, the annular space was sealed with a cement/bentonite grout mixture. |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The grout was placed in the annular space by means of a tremie pipe or pressure grouting methods equivalent to tremie grouting standards. |
| 11 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | A cement/bentonite grout mixture or TNRCC approved alternative grout mixture filled the annular space to within two (2) feet of the surface. [Specify material used: _____] [CP Atch B, #8 2 nd ¶] |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The annular space was sealed with concrete, and was blended into a cement apron at the surface that extends at least two (2) feet from the outer edge of the monitor well for aboveground completions. |
| 12 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | In cases where flush-to-ground completions are unavoidable, a protective structure such as a utility vault or meter box was installed around the well casing and the concrete pad design will prevent infiltration of water into the vault. [CP Atch B, #8 3 rd ¶] In addition, the installer ensured that: |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The well/cap juncture was watertight. |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The bond between the cement surface seal and the protective structure was watertight. |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The protective structure with a steel lid or manhole cover has a rubber seal or gasket. |
| 13 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Water added as a drilling fluid to the well did not contain bacteriological or chemical constituents that could interfere with the formation or with the chemical constituents being monitored. Note: For ground-water recovery and injection wells, drilling fluids containing freshwater and treatment agents may be utilized in accordance with standard engineering practice to facilitate proper well installation. In these cases, the water and agents added should be chemically analyzed to evaluate their potential impact on in-situ water quality and to assess the potential for formation damage. All such additives shall be removed to the extent practicable during well development. [CP Atch B, #9] |
| 14 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The well was developed to remove any fluids used during well drilling and to remove fines from the formation to provide a particulate-free discharge to the extent achievable by accepted completion methods and by commercially available well screens. [CP Atch B, #10 1 st ¶] |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Development was accomplished by reversing flow direction, surging the well or by airlift procedures. |
| | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | No fluids other than formation water were added during development of the well unless the aquifer screened was a low-yielding water-bearing aquifer. In this case, the water to be added was chemically analyzed to evaluate its potential impact on in-situ water quality, and to assess the potential for formation damage. |
| 15 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Recovery and injection wells. Well development methods were utilized in accordance with standard engineering practice to remove fines and maximize well efficiency and specific capacity. Addition of freshwater and treatment agents may be utilized during well development or re-development to remove drilling fluids, inorganic scale or bacterial slime. In these cases, the water and agents added were chemically analyzed to evaluate their potential impact on in-situ water quality and to assess the potential for formation damage. A copy of the chemical analysis will be provided to the base technical project manager. All such additives were removed to the extent practicable during well development. [CP Atch B, #10 2 nd ¶] |
| 16 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The well was secured and/or designed to maintain the integrity of the well borehole and ground water. [CP Atch B, #11] |
| 17 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | The aboveground portion of the well was protected by bumper guards and/or metal outer casing. [CP Atch B, #12] |
| 18 | <input type="checkbox"/> Y | <input type="checkbox"/> N | <input type="checkbox"/> NA | Copies of drilling and construction details demonstrating compliance with the items of this provision have been submitted to Kelly AFB. This submittal included the following information: [CP Atch B, #13] |

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| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> name/number of well (well designation) | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> filter pack material/size |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> intended use of the well(sampling, recovery, etc.) | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> filter pack volume (how many bags, buckets, etc.) |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> date/time of construction | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> filter pack placement method |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> drilling method and drilling fluid used | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> sealant materials |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> well location (\pm 0.5 ft.) | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> sealant volume (how many bags, buckets, etc.) |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> bore hole diameter and well casing diameter | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> sealant placement method |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> well depth (\pm 0.1 ft.) | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> surface seal design/construction |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> drilling and lithologic logs | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> well development procedure |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> depth to first saturated zone | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> type of protective well cap |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> casing materials | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> ground surface elevation (\pm 0.01 ft. MSL) |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> screen materials and design | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> top of casing elevation (\pm 0.01 ft. MSL) |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> casing and screen joint type | <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> detailed drawing of well (include dimensions) |
| <input type="checkbox"/> | <input type="checkbox"/> | | <input type="checkbox"/> screen slot size/length | | | | |

19 The installer clearly marked the well number on each well at the site. [CP Atch B, #15]
 Y **N** **NA**

20 The well's screened interval was appropriately designed and installed to meet the well's specific objective. [CP Atch B, #19]
 Y **N** **NA**

 All wells designed to detect, monitor, or recover DNAPL were drilled to intercept the bottom confining layer of the aquifer.
 Y **N** **NA**

 The screened interval to detect DNAPL extends from the top of the lower confining layer to above the portion of the aquifer saturated with DNAPL.
 Y **N** **NA**

 The screened interval for all wells designed to detect, monitor, or recover LNAPL extends high enough into the vadose zone to provide for fluctuations in the seasonal water table.
 Y **N** **NA**

 The sandpicks for the recovery or monitoring well's screened interval were coarser than surrounding media to ensure the movement of NAPL to the well.
 Y **N** **NA**

"I certify, to the best of my knowledge, that I (we) have complied with the requirements stipulated in Part I above."

Contractor/Installer

Date

PART II

The installer shall complete construction of each well in accordance with the requirements of the Compliance Plan (CP-50310) and 30 TAC §238.41 through §238.50 and shall certify such proper construction within sixty (60) days of installation. If the contractor installs any additional or replacement wells, well completion logs for each well shall be submitted within sixty (60) days of well completion and development in accordance with 30 TAC §340.73. Certification of each well shall be submitted within sixty (60) days of installation for an individual well project or within sixty (60) days from the date of completion of a multiple well installation project. The certification shall be prepared by a qualified geologist or geotechnical engineer. Each well certification shall be accompanied by a certification report, including an accurate log of the soil boring, which thoroughly describes and depicts the location, elevations, material specifications, construction details, and soil conditions encountered in the boring for the well. A copy of the certification and certification report shall be kept on the facility, and a second copy shall be submitted to the Executive Director. Required certification shall be in the following form:

"This is to certify that installation of the following facility components authorized or required by TNRCC Compliance Plan No. CP-50310 has been completed, and that construction of said components has been performed in accordance with and in compliance with the design and construction specifications of Compliance Plan No. CP-50310:" (Description of facility components with reference to applicable Compliance Plan provisions).

[CP Atch B, #14]

"I certify, to the best of my knowledge, that I (we) have complied with the requirements stipulated in Part II above."

Contractor/Installer

Date

