Procedure for DNA Reagent Preparation and Quality Control

1.0 Purpose - This procedure specifies the required elements for the preparation of, and quality control procedures for, reagents used in the Forensic Biology Section.

2.0 Scope – This procedure applies to all Forensic Scientists in the Forensic Biology Section.

3.0 Definitions – See Section Definition list

4.0 Equipment, Materials and Reagents

- pH test strips (see Forensic Biology Section Procedure for Body Fluid Unit Quality Control)
- Chemicals: concentrated hydrochloric acid (HCl), sodium hydroxide pellets (NaOH), ethylenediaminetetraacetic acid, granular (EDTA), sodium chloride, granular (NaCl), sodium dodecyl sulfide (SDS), Trizma base (Tris), glycogen, glacial acetic acid, sodium acetate anhydrous
- Nuclease-free distilled water (nuclease-free dH_2O)
- Distilled water (dH_2O) from in-house filtered water supply system
- Certified Biosafety Cabinet and/or certified chemical fume hood
- Various lab equipment (lab tape, autoclave tape, Alconox (or equivalent), Kimwipes, pipettes and associated tips, cleaned and sterilized glassware, heat/stir plate, vacuum pump, magnetic stir bars, 96-well trays and septa, amplification trays, pH buffers)

5.0 Procedure – All documentation of quality control checks shall be approved by the Technical Leader prior to use in casework.

5.1 NIST SRM/ Standard Traceable to NIST

5.1.1 Purpose and Use: The QCO shall test the analytical procedures used against the appropriate National Institute of Standards and Technology (NIST) Standard Reference Material (SRM), or Standard Traceable to NIST (NIST-TS), on an annual basis. The NIST SRM or NIST-TS shall also be tested when substantial changes, new procedures, or new platforms are validated in these units, as well as against commercially produced kits.

5.1.2 Creating a Standard Traceable to NIST: The QCO shall create a batch of known human bloodstains from a male individual whose DNA profile has been previously established as follows:

5.1.2.1 Dispense liquid blood from donor onto several sheets of FP705 paper (or equivalent) until all collected liquid blood is deposited and allowed to dry completely.

5.1.2.2 A sample from this batch of bloodstains shall then be extracted (using current Forensic Biology Section extraction procedure(s)) along with an associated negative extraction control (Neg K), as well as any part of the NIST SRM that requires extraction (i.e., SRM's E and F in NIST SRM 2391c).

5.1.2.3 This extracted bloodstain and Neg K, as well as any extracted NIST SRMs shall then be quantitated, amplified, electrophoresed and analyzed simultaneously, along with any NIST SRMs which may have already been supplied in liquid form (i.e., NIST SRMs A-D in NIST SRM 2391c) according to applicable Forensic

Biology Section DNA procedures.

5.1.2.4 The bloodstain and all NIST SRMs shall provide the expected allele calls, and all testing negatives (including Neg K) shall be free of any alleles. If either condition is not met (for reasons other than instrument failure or known artifacts), then the QCO may retest the bloodstain and/or NIST SRMs once. If both conditions are not met this second time, a new lot of bloodstains and/or NIST SRM shall be tested.

5.1.2.5 Once the conditions in **5.1.2.4** are met (i.e., the expected allele calls are obtained and the testing negatives are free of any alleles), this batch of bloodstains shall be accepted as a suitable NIST-TS and the entire lot of bloodstains shall be named/referred to by the initials of the blood donor, followed by the date on which the bloodstains were prepared (e.g., XXX_12012010). The QCO shall document the testing performed and retain such documentation in the Section, along with the NIST SRM documentation provided by the manufacturer.

5.1.2.6 If other testing kits become available for use in the Forensic Biology Section, the appropriate NIST SRM for that kit shall be tested against a batch of known human bloodstains from a male individual. This batch may be the same NIST-TS currently in use if enough of that batch remains available for testing.

5.1.3 **Storage:** The NIST SRM shall be stored long-term at -20 °C with limited access by the QCO; the NIST-TS (bloodstains) shall be stored with limited access by the QCO at room temperature; extracted NIST-TS (liquid form) and associated Neg K shall be stored at 4°C for up to 1 year after date of approval for use by the DNA Technical Leader with limited access by the QCO for use in QC testing. After 1 year, these extracts shall be discarded by the QCO.

5.2 UV Treatment

5.2.1 Reagents prepared in house shall be treated with UV light exposure for a minimum of 30 minutes after autoclaving prior to use.

5.2.2 Plasticware, to include the tubes used for extraction and quantification and amplification setup, strip tubes, conical tubes for reagents, and 96 well plates used for amplification shall be treated with UV light exposure for a minimum of 30 minutes prior to use. Plasticware used in the post-amp lab does not need to be treated with UV. 96 well plates used for quantitation setup shall not be treated with UV light. Plasticware that has been treated by the manufacturer to substantially reduce the possibility of exogenous DNA (e.g EO treatment or QC tested for DNA contamination) does not need to be treated with UV.

5.3 Preparation and QC of Reagents/Solutions/Standards – The expiration date provided by the manufacturer will be used for any reagent received within the Forensic Biology Section.

5.3.1 Naming/Recording of Reagents/Solutions/Standards:

5.3.1.1 The following items shall be recorded in Forensic Advantage (FA) under the Resource Manager by the QCO as follows: Item description expiration date (e.g., 0.5M EDTA_06082011):

- 0.5M EDTA
- 1M Tris-HCl
- STR-SEB
- STR-TE
- STR-Tris-EDTA-NaCl (STR-TEN)
- 3M NaOAc pH 5.0

5.3.1.2 The following items shall be recorded in FA under the Resource Manager by the QCO as follows: Item lot number expiration date (e.g., A9815D0209_03152011):

- ProK (aliquots)
- DTT (aliquots)
- Formamide (aliquots)
- Carrier RNA (aliquots)
- Nuclease-free dH_2O
- EDTA
- Any item listed in **5.3.1.1** or **5.3.1.2** if purchased directly from manufacturer

5.3.1.3 The following items shall be recorded in FA under the Resource Manager by the QCO based upon the lot numbers provided by the manufacturer. Any expiration dates (if applicable) shall be noted within the individual lot Resource Instance Details:

- Kits (**PowerPlex® Fusion 6C and PowerPlex® Y23**, Quantifiler® Trio, DNA Investigator)
- Kit components (e.g., reaction mix, primer, Taq, DNA standard, allelic ladder, positive and negative amplification controls, Carrier RNA, ProK)
- 3500XL POP-4, anode and cathode buffers
- ProK, DTT, Hi-Di formamide, nuclease-free dH_2O (stock)
- SDS, HCl, EDTA, NaOH, NaCl, Tris base

5.3.2 For all items which require testing for reliability (QC check), the date on which the item passes Quality Control (QC) shall be entered into FA under the "date verified" line by the QCO performing the QC check.

5.3.3 Aliquots of differing reagents (e.g., ProK, DTT, cRNA) must be stored in different colored tubes for easy identification.

5.3.4 **Documentation:** Any documentation generated from the preparation or QC check of any reagents, kits or standards shall be documented by the QCO in the QC files and thereafter maintained in the Section.

5.3.5 **Solution/Reagent/Standards Preparation and QC (as noted):**
Note: Glass bottles used in the preparation and storage of buffers and components shall be cleaned with Alconox (or equivalent), rinsed with dH_2O and autoclaved prior to use (see Forensic Biology Section Procedure for Aseptic Technique and Contamination Control).

5.3.5.1 0.5 M EDTA

Chemical/Reagent	Amount (for 500 mL)	Amount (for 1L)
EDTA	93.0 g	186.1 g
dH_2O	400 mL	800 mL
NaOH pellets	As needed	As needed

5.3.5.1.1 Verify pH test strips using known buffers.

5.3.5.1.2 Add EDTA to dH_2O.

5.3.5.1.3 Add NaOH pellets to get EDTA into solution (may take several pellets; add individually and wait several minutes to dissolve before testing pH and determining whether additional pellets are necessary). Use a magnetic stir bar on a stir/hot plate to mix EDTA. Heat may also be used to aid dissolution if kept on lowest setting.

5.3.5.1.4 Adjust to pH 8.0 (±0.3) with additional NaOH pellets (may require several pellets; add individually and wait several minutes to dissolve before testing pH) and evaluating for pH with test strips.

5.3.5.1.5 Adjust volume to 1 L (or 500 mL) once EDTA has gone into solution and pH 8.0 (±0.3) has been achieved.

5.3.5.1.6 Filter-sterilize with a 75 mm Nalgene filtration unit (or equivalent) using vacuum suction.

5.3.5.1.7 0.5 M EDTA shall be stored at 4 °C and discarded 6 months after date of preparation. Record preparation information in FA.

5.3.5.2 1 M Tris-HCl

Chemical/Reagent	Amount (500 mL)	Amount (1L)
Tris base	60.6 g	121.2 g
dH_2O	400 mL	800 mL
Concentrated HCl	~22.5 mL	~46 mL

5.3.5.2.1 Verify pH test strips using known buffers.

5.3.5.2.2 Add Tris base to dH_2O. Adjust pH to 8.0 (±0.3) by adding HCl, slowly and evaluating for pH with test strips. CAUTION: HCl is extremely corrosive. Use a magnetic stir bar on stir/hot plate to mix solution.

5.3.5.2.3 Bring to final volume with dH_2O.

5.3.5.2.4 Autoclave.

5.3.5.2.5 1 M Tris-HCl shall be stored at room temperature and discarded 6 months after date of preparation. Record preparation information in FA.

5.3.5.3 20 % SDS

Chemical/Reagent	Amount (500 mL)	Amount (1L)
Sodium dodecyl sulfate (SDS)	100 g	200 g
dH_2O	400 mL	800 mL

5.3.5.3.1 Dissolve SDS in dH_2O. To aid with dissolution, solution may be heated (lowest setting) and stirred using a magnetic stir bar on stir/hot plate.

5.3.5.3.2 Adjust to final volume with dH_2O.

5.3.5.3.3 Autoclave.

5.3.5.3.4 If the 20 % SDS falls out of solution (i.e., appears cloudy), that batch may be used if approved by the DNA Technical Leader, and shall be stored at 37 °C to keep the SDS in solution.

5.3.5.3.5 20 % SDS shall be stored at room temperature (unless **5.3.4.3.4** applies) and discarded 6 months after date of preparation. Record preparation information in FA.

5.3.5.4 STR-TE

Chemical/Reagent	Amount (for 1L)
1 M Tris-HCl	10 mL
0.5 M EDTA	200 µL
dH_2O	990 mL

5.3.5.4.1 Add EDTA to dH_2O.

5.3.5.4.2 Add Tris-HCl to dH_2O.

5.3.5.4.3 Using magnetic stir bar and stir/hot plate, mix together for 5 minutes.

5.3.5.4.4 Verify pH with test strips, adjust as necessary.

5.3.5.4.5 Autoclave.

5.3.5.4.6 STR-TE shall be stored at room temperature and discarded on the date either the Tris-HCl or EDTA expires, whichever is earlier. Record preparation information in FA.

5.3.5.4.7 QC Testing:

5.3.5.4.7.1 A sample of the NIST-TS and Neg K shall be extracted, quantitated, amplified, electrophoresed, and analyzed according to applicable Section DNA Procedures.

5.3.5.4.7.2 The new lot of STR-TE shall be used at all steps which require the addition or use of STR-TE (after extraction).

5.3.5.4.7.3 The expected results for the NIST-TS shall be obtained for all loci and the alleles shall be balanced within and between loci and peak heights above the analytical threshold and < 15000 RFUs. The Neg K shall be free of any alleles. If either condition is not met (for reasons other than instrument failure or known artifacts), then the QCO may retest the new lot of STR-TE only once. If either condition is not met this second time, a new lot of STR- TE shall be prepared and tested.

5.3.5.5 STR-SEB

Chemical/Reagent	Amount (for 1 L)
NaCl	5.84 g
1 M Tris-HCl	10 mL
0.5 M EDTA	20 mL
dH_2O	~500 mL
20 % SDS	100 mL

5.3.5.5.1 Verify pH test strips using known buffers.

5.3.5.5.2 Add NaCl, EDTA, and Tris-HCl to ~500 mL of dH_2O until dissolved using a magnetic stir bar on the stir/hot plate. Slight heat (lowest setting) may be used to aid in dissolution.

5.3.5.5.3 Adjust to pH 8.0 (±0.3) with approximately 1 pellet of NaOH (if more are necessary, add only one at a time and allow it to dissolve completely before retesting the pH). Evaluate pH with test strips.

5.3.5.5.4 Add SDS.

5.3.5.5.5 Bring to final volume with dH_2O.

5.3.5.5.6 Autoclave.

5.3.5.5.7 STR-SEB shall be stored at room temperature and discarded on the date the Tris-HCl, EDTA, or SDS expires, whichever is earlier. If the 20 % SDS falls out of solution (see **5.3.4.3.5**), then the STR-SEB shall be kept at 37 °C, including any aliquots, in order to keep the SDS in solution. Record preparation information in FA.

5.3.5.5.8 QC Testing:

5.3.5.5.8.1 A sample of the NIST-TS and Neg K shall be extracted, quantitated, amplified, electrophoresed, and analyzed according to applicable Forensic Biology Section DNA Procedures.

5.3.5.5.8.2 The new lot of STR-SEB shall be used at the extraction step.

5.3.5.5.8.3 The expected results for the NIST-TS shall be obtained for all loci and the alleles shall be balanced within and between loci and peak heights above the analytical threshold and < 15000 RFUs. The Neg K shall be free of any alleles. If either condition is not met (for reasons other than instrument failure, known artifacts), then the QCO may retest the new lot of STR-SEB only once. If either condition is not met this second time, a new lot of STR- SEB shall be prepared and tested.

5.3.5.6 STR-TEN

Chemical/Reagent	Amount (for 1 L)
NaCl	5.84 g
1 M Tris-HCl	10 mL
0.5 M EDTA	2 mL
dH_2O	~ 700 mL

5.3.5.6.1 Verify pH test strips using known buffers.

5.3.5.6.2 Add NaCl, EDTA, and Tris-HCl to the dH_2O and stir until dissolved.

5.3.5.6.3 Adjust to pH 8.0 (±0.3) with approximately 1 pellet of NaOH. Evaluate pH with test strips.

5.3.5.6.4 Bring to final volume with dH_2O.

5.3.5.6.5 Autoclave.

5.3.5.6.6 STR-TEN shall be stored at room temperature and discarded on the date either the Tris-HCl or EDTA expires, whichever is earlier. Record preparation information in FA.

5.3.5.6.7 QC Testing:

5.3.5.6.7.1 A known semen (containing sperm) stain shall be extracted via differential extraction; only the sperm fraction and associated control is required to be carried through QC testing (e.g., quantitated, amplified, electrophoresed and analyzed) according to applicable Forensic Biology Section DNA Procedures.

5.3.5.6.7.2 The expected results for the known male contributor shall be obtained for all loci and the alleles shall be balanced within and between loci and peak heights above the analytical threshold and < 15000 RFUs. The negative extraction control shall be free of any alleles. If either condition is not met (for reasons other than instrument failure, known artifacts), then the QCO may retest the new lot of STR-TEN only once. If either condition is not met this second time, a new lot of STR-TEN shall be prepared and tested.

5.3.5.7 0.39M STR-Dithiothreitol (DTT)

Chemical/Reagent	**Amount (for 10 mL)**	**Amount (for 25 mL)**
Dithiothreitol (McCleland's reagent, stock)	601 mg	1.5 g
Sterile nuclease-free dH_2O	10 mL	25 mL

5.3.5.7.1 Add water to DTT to reconstitute and mix well.

5.3.5.7.2 Aliquot 200 µL into sterile colored 0.5 mL tubes while under a Biological Safety Cabinet (or equivalent).

5.3.5.7.3 Freeze aliquots immediately at -10 °C. Once aliquot is thawed it shall not be refrozen and after use, the remainder of the aliquot shall be discarded. The master supply of aliquots shall be stored at -20 °C; working stock supplies of DTT shall be kept at -10 °C.

5.3.5.7.4 See **5.3.1** for naming convention and FA entry.

5.3.5.7.5 Aliquots expire 1 year after date of reconstitution, or when stock supply expires, whichever occurs first.

5.3.5.8 Hi-Di Formamide

5.3.5.8.1 The QCO shall thaw formamide and aliquot as follows [(0.5ul WEN ILS 500) x (# of samples)] + [(9.5ul Hi-Di formamide) X (# samples)] into autoclaved clear 1.5 mL sterile tubes for casework. Aliquots and WEN amounts may be adjusted to account for pipetting variations.

5.3.5.8.2 The aliquots shall be frozen immediately at -10 °C. Once aliquot is

thawed it shall not be refrozen, and after use the remainder of the aliquot shall be discarded by the Forensic Scientist. Aliquots expire 1 year after date of preparation, or when stock supply expires, whichever occurs first.

5.3.5.8.3 See **5.3.1** for naming convention and FA entry.

5.3.5.9 3M Sodium Acetate pH 5.0 (3M NaOAc)

Chemical/Reagent	Amount (for 100 mL)
Sodium acetate anhydrous	**24.6 g**
dH2O	**80 mL**
Glacial acetic acid	**As needed**

5.3.5.9.1 Dissolve the sodium acetate in dH2O. To aid with dissolution, solution may be heated (lowest setting) and stirred using a magnetic stir bar on stir/hot plate.

5.3.5.9.2 Once all the salts have dissolved, adjust the pH to 5.0 with glacial acetic acid. Verify pH strips with known buffers. Evaluate the pH level with test strips.

5.3.5.9.3 Bring to final volume with dH2O.

5.3.5.9.4 Autoclave.

5.3.5.9.5 3M NaOAc shall be stored at room temperature and discarded 6 months after date of preparation. Record preparation information in FA.

5.3.5.10 Carrier RNA

Chemical/Reagent	Amount
Carrier RNA	**310 µg (one tube)**
Sterile nuclease free dH2O	**310 µL**

5.3.5.10.1 Add water to RNA to reconstitute and mix well.

5.3.5.10.2 Aliquot 50 µL into sterile colored 0.5 mL tubes while under a Biological Safety Cabinet (or equivalent).

5.3.5.10.3 Freeze aliquots immediately at -10 °C. Once aliquot is thawed it shall not be refrozen and after use. The remainder of the aliquot shall be discarded. The master supply of aliquots shall be stored at -20 °C; working stock supplies of RNA shall be kept at -10°C. Aliquots expire 1 year after date of preparation, or when stock supply expires, whichever occurs first.

5.3.5.10.4 See **5.3.1** for naming convention and FA entry.

5.3.5.11 DNA Quantitation Standards

5.3.5.11.1 The Forensic Scientist shall prepare Standard "1" as described below using the Quantifiler® Trio THP DNA Dilution Buffer and the Quantifiler® THP DNA standard provided in the Quantifiler® Trio Kits. . The remaining standards shall be prepared for manual quantification only as a serial dilution starting with Standard 1. Volumes may be adjusted by the Forensic Scientist as long as the dilution factor remains constant.

5.3.5.11.2 Each standard shall be mixed thoroughly and centrifuged before proceeding to the next standard.

5.3.5.11.3 The standards shall be prepared every 2 weeks, or as needed until their expiration date. The standards shall be prepared in sterile 1.5 mL clear plastic tubes.

5.3.5.11.4 Standard "5" will have a higher volume when preparation is complete.

5.3.5.11.5 Quantitation standards shall be stored at 4 °C.

Standard	Amount of Quantifiler Trio THP DNA Dilution Buffer (in µL)	Amount of Standard (in µL)
1	10	10 (stock)
2	90	10 of Standard 1
3	90	10 of Standard 2
4	90	10 of Standard 3
5	90	10 of Standard 4

5.4 QC of Commercial Kits

5.4.1 PowerPlex® Fusion 6C and PowerPlex® Y23: The performance of each lot of Fusion 6C and Y23 shall be checked by the QCO against the NIST-TS as described below prior to use in the Forensic Biology Section.

5.4.1.1 The following items shall be, amplified, electrophoresed and analyzed according to applicable Forensic Biology Section DNA Procedures:

5.4.1.1.1 Standard Traceable to NIST and associated Neg K (previously extracted, if available).

5.4.1.1.2 2800M (positive amplification control).

5.4.1.1.3 Negative Amplification Control.

5.4.1.2 Both the Standard Traceable to NIST and 2800M shall produce the expected results at all loci tested. Alleles shall be balanced within and between loci and peak heights above the analytical threshold and < 15000 RFUs.

5.4.1.3 The Neg K and negative amplification control shall not exhibit any alleles. If multiple Neg K samples are used, at a minimum one must be free of alleles. If a single peak is seen in the second, this does not necessarily need to be repeated. The data will be evaluated by the QCO and DNA Technical Leader and a decision on how to proceed will be documented.

5.4.1.4 The allelic ladder associated with each new lot of Fusion 6C and Y23 shall produce the correct expected alleles.

5.4.1.5 If the kit fails to meet either **5.4.1.2**, **5.4.1.3**, or **5.4.1.4** (for reasons other than instrument failure, known artifacts), it may be retested once. If the kit fails this second re-test, it shall not be accepted for any use in the Section and the DNA Technical Leader and kit manufacturer shall be notified immediately by the QCO.

5.4.1.6 The kit information (lot numbers, date verified, and expiration date) shall be entered into the FA system per **5.3.1.** by the QCO.

5.4.1.7 The general supply of Fusion 6C and Y23 kits shall be stored at -20 °C by the QCO; active working stock shall be kept at 4 °C.

5.4.2 **Quantifiler® Trio:** the performance of each lot of Quantifiler® Trio shall be evaluated by the QCO as described below. The same ABI 7500 shall be used throughout the evaluation. The QCO shall use the pipettes designated for QC purposes only.

5.4.2.1 **Kit QC Testing:** Prepare Standard 1 for Qiagility setup (DNA Quantitation with Quantifiler Trio 5.5.3) or see 5.3.4.11.5 for manual setup. Prepare Master mix according to Biology Workbook using reagents (reaction mix and primer) from the new lot number. QC plate must contain the following: a standard curve (in duplicate), at least two NTCs, one Standard Traceable to NIST and the associated negative extraction control(s) for the Standard Traceable to NIST (if applicable).

5.4.2.2 At least one negative control(s) shall be free of DNA or have an IPC of ≥ 40. All Standards Traceable to NIST shall indicate the presence of DNA.

5.4.2.3 The standard curve shall have acceptable quality metrics as follows:

Target	Slope Range
Small Autosomal (SA)	-3.0 to -3.6
Large Autosomal (LA)	-3.1 to -3.7
Y Target (Y)	-3.0 to -3.6

The R^2 shall be ≥ 0.99.

5.4.2.4 If these criteria are not met, the test may be repeated upon the authority and direction of the DNA Technical Leader. If the criteria are successfully met, the new lot of Quantifiler Trio shall be passed for QC.

5.4.2.5 The kit information (lot numbers, date verified, and expiration date) shall be entered into the FA system per **5.3.1** by the QCO.

5.4.2.6 The general supply of Quantifiler® Trio kits shall be stored at -20 °C by the QCO; active working stock shall be kept at 4 °C or -10 °C.

5.4.3 DNA Investigator: Prior to use in the Forensic Biology Section, the performance of each lot of DNA Investigator kits shall be checked by the QCO against the NIST-TS as described below using an amplification kit that is in use within the section.

5.4.3.1 The following items shall be extracted, quantitated, amplified, electrophoresed and analyzed according to applicable Forensic Biology Section DNA Procedures:

5.4.3.1.1 Standard Traceable to NIST.

5.4.3.1.2 Negative Extraction Control (Neg K).

5.4.3.2 The Standard Traceable to NIST shall produce the expected results at all loci tested. Alleles shall be balanced within and between loci and peak heights above the analytical threshold and < 15000 RFUs.

5.4.3.3 The Neg K shall not exhibit any alleles. If multiple Neg K samples are used, at a minimum one must be free of alleles. If a single peak is seen in the second, this does not necessarily need to be repeated. The data will be evaluated by the QCO and DNA Technical Leader and a decision on how to proceed will be documented.

5.4.3.4 If the kit fails to meet either **5.4.3.2** or **5.4.3.3** (for reasons other than instrument failure, known artifacts), it may be retested once. If the kit fails this second re-test, it shall not be accepted for any use in the Section and the DNA Technical Leader and kit manufacturer shall be notified immediately by the QCO.

5.4.3.5 The kit information (lot numbers, date verified, and expiration date) shall be entered into the FA system by the QCO as provided in **5.3.1**.

5.4.3.6 The general supply of DNA Investigator kits shall be stored at 15-25°C by the QCO.

5.4.4 Qiagen Proteinase K

5.4.4.1 Prior to use in the Forensic Biology Section, the performance check of Qiagen ProK shall be checked by the QCO against the NIST-TS as described below:

5.4.4.1.1 The following shall be extracted, quantitated, amplified, electrophoresed, and analyzed using currently quality control tested kits according to applicable Section procedures: Standard Traceable to NIST and a Negative Extraction Control (NegK).

5.4.4.1.2 The Standard Traceable to NIST shall produce the expected results at all loci tested.

5.4.4.1.3 Alleles shall be balanced within and between loci and give peak heights between approximately 1000 and 15000 RFUs.

5.4.4.1.4 If the Qiagen ProK lot fails to meet either **5.4.4.1.2** or **5.4.4.1.2** (for reasons other than instrument failure or known artifacts), the lot may be retested once. If the Qiagen ProK lot fails this retest, it shall not be accepted for any use in the Section and the DNA Technical Leader and the manufacturer shall be notified immediately by the QCO.

5.4.4.2 The kit information (lot numbers, date verified, and expiration date) shall be entered into FA by the QCO as provided in **5.3.1**.

5.4.4.3 After the lot passes the performance check, aliquot 250 µl into colored sterile 0.5mL tubes while under a Biological Safety Cabinet (or equivalent).

5.4.4.4 Aliquots shall be stored at 15-25 °C.

5.4.4.5 Aliquots expire 1 year after date of receipt of stock supply.

5.5 Expiration Dates for Commercial Reagents without Manufacturer-Provided Dates

5.5.1 The following reagents shall have an expiration date set 3 years from date of receipt or preparation within the Forensic Biology Section:

- Dithiothreitol (stock supply).

5.5.2 The following reagents shall have an expiration date set 2 years from date of receipt or preparation within the Forensic Biology Section:

- Hi-Di Formamide (stock supply).
- WEN sizing standard.

5.5.3 The following reagents shall have an expiration date set 1 year from date of receipt or preparation within the Forensic Biology Section (unless manufacturer has provided an expiration date):

- Proteinase K provided by Qiagen (aliquots).
- Proteinase K (provided in the DNA Investigator kit).
- Dithiothreitol (aliquots).
- Hi-Di Formamide (aliquots).
- 20 % SDS (in solution, purchased from an outside supplier).

5.5.4 For those reagents which are aliquoted, both the date of preparation and expiration shall be marked on the container along with reagent description, initials of preparer, and lot number (unless already covered by previously listed items).

5.5.5 If the reagent container is too small for individual notation of expiration dates, it shall be noted on the parent container (box, bag, bottle or equivalent) storing the main supply of reagents. Lot numbers for reagents can also be checked against FA.

5.5.6 Reagent expiration dates shall be noted in FA by the QCO. Expired reagents shall be disposed

of appropriately and not retained in the section

6.0 Limitations - See **5.0**.

7.0 Safety

7.1 When using HCl in the preparation of Tris-HCl, extreme caution shall be used due to its corrosive nature including wearing eye protection and other personal protective equipment.

7.2 DTT, SDS: when using these chemicals in powder form, masks shall be worn due to the potential as strong respiratory irritants.

7.3 Buffer/Reagent preparation: safety glasses shall be worn at all times when preparing the STR buffers and associated reagents/solutions, unless working behind a BioSafety Cabinet/Fume hood.

7.4 Formamide is a known chemical hazard and can cause eye, skin and respiratory tract irritation. It is a possible reproductive and birth defect hazard. Wear appropriate eyewear, gloves and clothing when in use.

8.0 References

Forensic Biology Section Procedure for Safety
Forensic Biology Section Procedure for DNA Extractions Using the EZ1 Advanced XL Forensic
Biology Section Procedure for PCR Amplification for Casework
Forensic Biology Section Procedure for Human DNA Quantitation with Quantifiler® Trio
Forensic Biology Section Procedure for Use of the 3500 Genetic Analyzer for Casework
Forensic Biology Section Procedure for Body Fluid Unit Quality Control
Forensic Biology Section Procedure for Aseptic Technique and Contamination Control

9.0 Records

- Temperature Charts for Freezers/Refrigerators
- QC Testing Worksheets
- PowerPlex® Fusion 6C QC Form
- PowerPlex® Y23 QC Form
- Quantifiler® Trio Kit QC Form
- QC Testing Worksheet Templates
- DNA Investigator Kit QC Form

10.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original Document

12/7/2012	2	5.1.3 - extend lifetime for NIST-traceable standards; 5.2.1.3 - added phenol/chloroform and 10X buffer to list recorded in FA; 5.3.3 - changed QC check procedure for Quantifiler kit; 5.3.4 - removed section for Y Quant, removed references to Y-Quant in definitions; 5.2.1.3, 5.2.4.12, 5.2.4.7.7.1 - changed shall to required to
12/22/2012	3	Removed BSA – definitions, 5.2.1.2, 5.2.1.3, 5.4.2., 5.4.4; Added Identifiler Plus and Quantifiler Duo and removed Yfiler and Quantifiler Human – definitions, 5.2.1.3, 5.2.4.4.6.1, 5.2.4.5.8.1, 5.2.4.6.7.1, ; Changed 7000 to 7500 – definitions, 5.3.3, 5.4.4; Removed threshold and injection time - 5.1.2.3, 5.2.4.4.6.1, 5.2.4.5.8.1, 5.2.4.6.7.1, 5.3.1.1, 5.3.2.1; Changed "activity or peaks" to "alleles" -5.1.2.4, 5.1.2.5, 5.2.4.4.6.3, 5.2.4.5.8.3, 5.2.4.6.7.2, 5.3.1.3, 5.3.2.3 ; 5.2.4.5 – Removed Quantitation TE (DNA Standards) section; 5.2.4.6.7.1 – Removed "neat"; Removed 5.2.4.10 STR BSA Section; 5.2.4.10 – renamed quantitation standard TE to buffer; Removed 5.2.4.12.2; 5.2.4.10.3 – removed preparation requirement; 5.3.1 – removed casework unit; 5.3.2 – changed YFiler to Identifiler Plus throughout section; 5.3.2.1 – added requirement to quantitate 9947A; Changed 007 to 9947A – 5.3.2.1.2, 5.3.2.2; Removed 5.3.2.1.3; Removed 9947A – 5.3.2.3; Added requirement for 9947A concentration – 5.3.2.6; Removed requirement for Taq storage – 5.3.2.7; 5.3.3 – Changed "Human" to "Duo" throughout; Added note to QC Duo kit with no current kit – 5.3.3; 5.3.3.1 – Added requirement to only utilize human results; 5.3.3.1.3 – added "DNA"; 5.3.3.2 – corrected section reference numbers; 5.3.3.2.4, 5.3.3.3.2 – clarify comparison for Duo curves and metrics; 5.3.3.5 – removed storage requirement for reaction mix; References – updated procedures titles; Records – removed BSA and Quantifiler Human Kit
09/25/2013	4	QC forms, Changed YFiler to Identifiler Plus form Header – added issuing authority; 3.0 – added ProK and Carrier RNA to commercial reagent; added DNA Investigator to critical reagent; 5.1.2.2 – updated procedure name; 5.2.1.1 – added 3M NaOAc; 5.2.1.2 – added carrier RNA; 5.2.1.3 – added DNA Investigator kit, ProK and carrier RNA; 5.2.4.4.6.2 – edited to quant step; 5.2.4.10 – inserted 3M NaOAc; 5.2.4.11 – inserted Carrier RNA; 5.2.4.12.1, 5.2.4.12.3 – updated quant standards preparation; 5.3.1.1.1, 5.3.1.3 – changed Neg K to negative extraction control; 5.3.1.2 – revised to add how multiple punches are treated; 5.3.4 – inserted DNA Investigator kit; 5.4.4 – added ProK (DNA investigator kit); 8.0 – updated extraction procedure name; grammar corrections in document
12/18/2013	5	1.0, 2.0, 3.0, 5.1.1, 5.1.2.6, 5.2.1.3, 5.2.4.7.3, 5.2.4.9– removed references to DNA database Unit/reagents; 5.3.1 – removed Identifiler kit (Database use only), 5.3.2 – updated section references; 5.4.3 – removed reference to ATL buffer (Database use only); 8.0 – removed Database procedure references; Changed Units to Section throughout; reworded NIST Traceable Standard to Standard Traceable to NIST throughout

04/18/2014	6	3.0, 5.2.1.3, 5.4.3 – removed phenol/chloroform; 5.2.4.1.7, 5.2.4.2.5, 5.2.4.3.5, 5.2.4.4.5, 5.2.4.5.7, 5.2.4.6.6, 5.2.4.8.3, 5.2.4.9.5, 5.2.4.10.4, 5.2.4.10.5 – changed recording from worksheet to FA; 5.2.4.7 – removed STR-ProK section; 5.2.4.9.3, 5.2.4.11.4 – added reference for naming; 5.3.4 – added new section for QC of Qiagen ProK; 5.4.2, 7.2 – removed ProK; 5.4.4 – added Qiagen; 5.4.5 – removed (Database use only); 9.0 – removed forms now kept in FA, added DNA Investigator Kit QC Form
12/28/2015	7	5.2.4.8.1, 5.2.4.10.2 – updated aliquot amounts; 5.2.4.11.1 – clarified amounts to use in preparation; 5.3.1.7 – updated storage; 5.3.2 – updated Quant Duo kit QC procedures
12/20/2016	8	3.0 – moved to section list; 5.2 – added UV treatment; 5.3.1.3 – updated kit names; 5.3.4.4.6.3, 5.3.4.8.3, 5.3.4.6.7.2 – updated due to 3500 data; 5.3.4.8 – updated amounts; 5.3.4.11 – updated due to Quant Trio kit; 5.3 – updated for amp and quant kits; 5.4 – added EDTA to list; 5.4.3 – updated for new amp kits; 5.4.4 – updated for 3500; 8.0, 9.0 – updated names
2/14/2018	9	5.2 – adjust times, add note allowing manufacturer treatment; 5.3.4.8.1 – update amounts aliquoted; 5.4.1.1.3 – updated requirements; 5.4.2 – update naming and curve parameters; 5.4.3 – clarified what kits to amplify
01/25/2019	10	5.0 add note for TL approval of documentation; 5.3.3 – added note regarding use of colored tubes; 5.3.4.7.2, 5.3.4.10.2, 5.4.4.3-remove specific tube color; 5.3.4.4, 5.3.4.9.2 – add pH strip verification; 5.4.4.1.3 – update rfu values; 5.5.1 remove expiration dates (now come with dates from manufacturer)